

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Exhibit 2: Infringement Contentions for U.S. Patent No. 11,562,402 vs. Home Depot Retail Media +

Plaintiff RavenWhite accuses Defendants The Home Depot Inc. and Home Depot U.S.A., Inc. (collectively, “Home Depot”) of making, using, offering for sale, selling in (including licensing) and/or importing into the United States Home Depot’s Retail Media+ platform, the Home Depot website, and Home Depot Mobile Applications (the “Accused Instrumentalities”). The term “Accused Instrumentalities” includes the associated software and data, associated hardware, and processes and methods related thereto.

Home Depot directly infringes U.S. Patent No. 11,562,402 (the “’402 Patent”) by performing each and every step of the claims or making, using, selling, or offering for sale the Accused Instrumentalities which exhibit every element of the claims, as shown below. Home Depot also directly infringes the asserted claims of the ’402 patent to the extent Home Depot contracted with or directed a third-party to perform any of the steps or provide any element of the asserted claims. Home Depot also directly infringes the asserted claims to the extent it conditions participation in an activity or receipt of a benefit upon performance of a step or steps of a patented method and establishes the manner or timing of that performance or to the extent it controls the Accused Instrumentalities as a whole and obtains benefit from them. Home Depot is therefore liable for infringement of the ’402 Patent under 35 U.S.C. § 271(a).

Home Depot induces infringement of the ’402 Patent by providing to third parties including users, customers, agents and others the Accused Instrumentalities to utilize in an infringing manner, as charted below. Home Depot intends to cause infringement by such third parties because Home Depot instructs and/or controls and directs third parties to use the Accused Instrumentalities in an infringing manner, including without limitation by instructing the users to operate the Accused Instrumentalities. Home Depot manifests this intent by providing support services for the Accused Instrumentalities, including providing instruction, support training, and services, and actively inducing its customers to sign up for online accounts. See, e.g., <https://www.homedepot.com/auth/view/createaccount>; see also https://www.homedepot.com/c/customer_service; see also <https://corporate.homedepot.com/page/contact-us>; see also https://www.homedepot.com/c/View_Pro_Directory; see also https://www.homedepot.com/c/pro_customer_support. The underlying direct infringement occurs, for example, when an end-user conducts searches as described in the claims below. End-users obtain benefits such as targeted search results. Home Depot is therefore liable for infringement of the ’402 Patent under 35 U.S.C. § 271(b).

The asserted claims include elements that are implemented, at least in part, by proprietary and specialized electronics, firmware and software in the Accused Instrumentalities. The precise designs, processes, and algorithms used in them are held secret, at least in part, and are not publicly available in their entirety. An analysis of Home Depot’s documentation and/or source code may be necessary to fully and accurately describe all infringing features and functionality of the Accused Instrumentalities and, accordingly, Plaintiffs reserve the right to supplement these contentions once such information is made available to Plaintiffs. Furthermore, Plaintiffs reserve the right to revise these contentions, including as discovery in the case progresses, in view of any non-infringement arguments Home

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

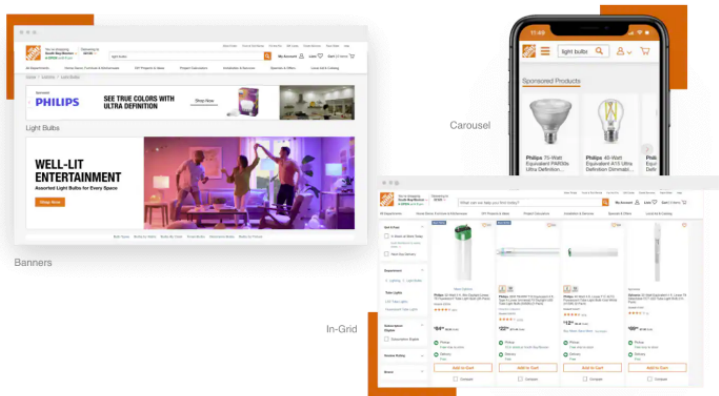
Depot may make (e.g., to allege infringement under the doctrine of equivalents), in view of the Court's final claim construction in this action and in connection with the provision of expert reports.

Claim Language	Evidence of Infringement by Accused Instrumentalities
1[pre]: A method, comprising:	To the extent the preamble is limiting, Home Depot operates the Accused Instrumentalities in a manner that practices this claim, including Retail Media+, which uses an advertising and media network for Home Depot advertising. Home Depot advertises that Retail Media+ allows advertisers to “connect your brand to our customers.”  CONNECT YOUR BRAND TO OUR CUSTOMERS Proven advertising solutions to help grow your business. Learn More Retail Media+. Available at https://www.homedepot.com/c/Retail_Media_Advertising_Solutions Reach Advertising with The Home Depot means reaching our 198M individual customers online and in our 2,322 stores. Our website attracts 3.6 billion visits each year. Retail Media+ allows you to connect your brand to our customers. Retail Media+. Available at https://www.homedepot.com/c/Retail_Media_Advertising_Solutions

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Home Depot offers ad placements “on The Home Depot owned channels, including placements in-grid and in carousels for sponsored products, top of page banners, and customized email sends.”

Onsite Advertising Ad Units [Get Started](#)



Reach customers through ads on The Home Depot owned channels, including placements in-grid and in carousel for sponsored products, top of page banners and customized email sends.

Users spent 10% more time on homedepot.com when engaged with Retail Media+ products

Users were 26% more likely to convert when engaged with Retail Media+ products

Users spent 28% more \$ per visit when engaged with Retail Media+ products

Retail Media+. Available at https://www.homedepot.com/c/Retail_Media_Advertising_Solutions

Home Depot describes that Retail Media+ “tracks customer interest via our website.”

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

About Retail Media+

The Home Depot Retail Media network offers businesses like yours the opportunity to connect with consumers like never before. Regardless of your budget, we have a solution to meet your marketing needs. Choose one of our advertising offerings or mix and match to find what is right for your company and your specific products. The Home Depot advertising department leverages a myriad of online and offline channels to spread awareness of your brand and promote your products. From email advertising to social media branded marketing, these solutions are designed to propel your business and help increase sales. The Home Depot's advertising center tracks customer interest via our website, enabling us to promote your brand through retargeted ads and other off-site channels to keep your products top of mind. Retail advertising is key to setting yourself apart from competitors in an ever-changing market.

EXPAND YOUR REACH

Reach more customers using our ad center with The Home Depot Retail Media, which provides visibility for 198 million individual customers. Our advertising efforts aided in massive digital growth over the past few years, which benefits partners like you. Retail Media offers both self-service and custom capabilities to suit your advertising needs.

Creating an omni-channel experience for customers to interact with your brand is the mission of Retail Media. You can grow your business by harnessing the power of The Home Depot advertising across multiple channels that are proven to engage potential customers. A few examples of successful branded marketing tactics include email, onsite and offsite advertising. Looking to maximize your campaigns? You can do it all.

Retail Media+. Available at https://www.homedepot.com/c/Retail_Media_Advertising_Solutions

In interviews, Home Depot describes that Retail Media+ operates “on-site,” “off-site,” and “offline.”

AdExchanger: What inventory does The Home Depot have in the retail media platform?

MELANIE BABCOCK: The media comes in three buckets. We have, of course, our own properties, which could be either email, in-app or websites, which we refer to as “on-site.” And we have an equally healthy business off-site, with media partners like Meta, Google and Pinterest, as well as programmatic partners. Third, we have in-store placements, which we call “offline.”

The Home Depot's Path To Becoming A Global Advertising Player. James Hercher. April 13, 2023. Available at <https://www.adexchanger.com/commerce/the-home-depots-path-to-becoming-a-global-advertising-player/>

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Retail Media+ includes the Home Depot search engine. The audience segmentation work that Villagomez’s team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot’s retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ Third parties recognize the benefit of Retail Media+. For example, psfk.com writes that Home Depot uses Retail Media+ to “drive products that are mutually beneficial to Home Depot and its shoppers.”
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Retail Media+ from the Home Depot is a full-service advertising and media network solution to help the brand's third-party vendors drive sales and promote products that are mutually beneficial to Home Depot and its shoppers.

Home Depot Turns Ecosystem Touchpoints Into Vendor Media Network, June 19, 2022. Available at <https://www.psfk.com/2022/06/home-depot-turns-ecosystem-touchpoints-into-vendor-media-network.html>

Similarly, moloco.com notes that Retail Media+ offers a “robust range of sponsored content promotions,” including through searches.

Home Depot Retail Media+

Home Depot offers a robust range of sponsored content promotions under “Retail Media+” — a program that supports onsite and offsite ad placements. Any advertiser looking to promote a new product will have access to three kinds of onsite sponsorships:

- **Search grid:** Traditional sponsored result listings that align with relevant keywords.
- **Carousel:** A display wheel of sponsored products that relate to customer searches.
- **Banner:** A top-of-page ad placement that uses imagery to stand out from search results.

Home Depot also helps advertisers supplement their sponsored content with offsite placements and retargeting options. For example, if a customer views a product during a search, brands can deploy follow-up ads for the item to associated social media feeds and email addresses. This grants advertisers a larger perspective of the buyer's journey, helping advertisers optimize their efforts beyond sponsored promotions and keywords.

What are sponsored results & how do they work? December 3, 2021. Available at <https://www.moloco.com/blog/sponsored-results>

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

1[a].
determining a first quality level associated with a user profile, wherein the first quality level is based at least in part on an estimate of a likelihood of an event, wherein the first quality level is determined based at least in part on at least one of: (1) a first search associated with the user profile or (2) a first purchase associated with the user profile, and wherein the determining of the first quality level is based

Home Depot determines a first quality level associated with a user profile, wherein the first quality level is based at least in part on an estimate of a likelihood of an event, wherein the first quality level is determined based at least in part on at least one of: (1) a first search associated with the user profile or (2) a first purchase associated with the user profile, and wherein the determining of the first quality level is based at least in part on a unique identifier and clustering.

Home Depot determines a first quality level, such as, for example, the likelihood of a user’s interaction with a recommendation. Home Depot publishes the recommendation algorithms it uses on its data in, for example, the Association for Computing Machinery (ACM).

M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations

Walid Shalaby
walid_shalaby@homedepot.com
The Home Depot
Atlanta, Georgia, USA

Sejoon Oh
soh337@gatech.edu
Georgia Institute of Technology
Atlanta, Georgia, USA

Amir Afsharinejad
amir_afsharinejad@homedepot.com
The Home Depot
Atlanta, Georgia, USA

Srijan Kumar
srijan@gatech.edu
Georgia Institute of Technology
Atlanta, Georgia, USA

Xiquan Cui
xiquan_cui@homedepot.com
The Home Depot
Atlanta, Georgia, USA

Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 573. Available at <https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

In the Shalaby et al. paper, Home Depot bases the first quality level at least in part on an estimate of a likelihood of an event, such as a “click” or an “add-to-cart” event.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

at least in part on a unique identifier and clustering;	Session-based recommender systems (SBRs) accurately model sequential and evolving preferences of users from their session data (e.g., clicks and add-to-cart events). Session data can be associated with item metadata, allowing SBRs to capture item dependencies at the attribute level within the session. However, most of the existing SBRs take the IDs of users and items as the main input source to learn session contexts and produce next item recommendations [13, 14, 40]. Recent hybrid models demonstrated improved performance when combining item embeddings and their attributes to be used as additional side information [5, 10, 27, 31, 32, 32, 38]. Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 573. Available at https://dl.acm.org/doi/pdf/10.1145/3523227.3551477 In the Shalaby et al. paper, Home Depot also describes that its objective is to “maximize the prediction probability of the next item the user is most likely to interact with.”
--	---

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations", RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

Home Depot bases the first quality level at least in part on a first search associated with the user profile. For example, Retail Media+ uses a search as one input to provide a product (and vendor) to a customer.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The audience segmentation work that Villagomez’s team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot’s retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ Home Depot also advertises that it uses “past searches” when populating search results. Personalization: The Next Frontier In addition to building accurate, lightning-fast search results, we’re also creating a personalized search experience for customers. Our technology team has built our online channels to consider location, past searches, personalized deal and guide recommendations when populating search results. The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Home Depot also advertises that it uses “ongoing search data” when showing results to customers. Intent Search: A Smarter Platform Delivering Smarter Results Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar. That’s why our team focuses on the <i>intent</i> of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, “weed whacker” vs. “string trimmer”). Plus, <u>our learning algorithm uses ongoing search data</u> to more accurately show customers exactly what they're looking for the first time. The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all Home Depot also uses search history (“including past searches”) through its “vector search engine.”
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings.

“I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge,” Qu says. “We’ve really removed the friction of asking the customer to specify ‘I need this five-foot downrod outdoor ceiling fan specifically.’”

Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022.
<https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/>

Home Depot bases the first quality level at least in part on a first purchase associated with the user profile. For example, Home Depot describes that they collect information when a customer “[makes] an online purchase.”

How Do We Collect Information?

There are 3 ways we collect your information:

We collect information directly from you. You provide us with your information when you visit our stores, register for an account, **make an online purchase** or rent equipment.

We collect information from you passively. We use tools like cookies to collect information when you use our websites or interact with our emails.

We collect information from affiliates and third parties. This includes shipping companies, installers, service providers, social media platforms, and more.

Privacy & Security at a Glance. Available at <https://www.homedepot.com/privacy/privacy-and-security-at-a-glance>

Home Depot uses this collected purchase information to, among other things, “[recommend] products.”

	How Do We Use Information? We use your information to improve your experience, process your information, and keep things running smoothly. We provide you with products, including order fulfillment, contest or sweepstakes entries, registration, returns, and product reviews. We improve our business, products, and services, including optimizing our websites and apps and improving store layouts and purchasing experiences. We personalize your experience, including recommending products and updating inventory to match demand. We monitor for fraud and asset protection purposes, including processing and tracking returns and confirming the identity of customers renting tools and equipment. We advertise to you, including supporting targeted advertising for select third parties and sending you promotions, newsletters, and information from other select companies we think you might find interesting. Privacy & Security at a Glance. Available at https://www.homedepot.com/privacy/privacy-and-security-at-a-glance Home Depot bases the first quality level at least in part on a unique identifier. For example, Home Depot associates unique identifiers with users as evidenced by their login identifier, such as an email address or other identifying information.
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402



Sign In or Create an Account

[< Back](#)

First, enter your email address

Email Address

Continue

Don't Have an Account?

Create an Account

By selecting 'Sign In' you are agreeing to the Pro Xtra Terms and Conditions, Privacy and Security Statement, Notice of Financial Incentive & My Account Terms and Conditions. For Two-Factor Authentication, message and data rates may apply.

Sign In or Create an Account, Home Depot. <https://www.homedepot.com/auth/view/signin>

After a user inputs their email address and password, web traffic shows that the user is associated with both an “svocCustomerAccountId” and a “userId.”

THD_USER	"eyJjdXN0b21ldIR5cG...	.homedepot.com
----------	------------------------	----------------

[Traffic capture of a user ID token used to identify a user on the Home Depot website after login]

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Decoded EDIT THE PAYLOAD AND SECRET HEADER: ALGORITHM & TOKEN TYPE <pre>{ "customerType": "B2C", "svocCustomerId": "0514A[REDACTED]", "logonId": "j[REDACTED].com", "userId": "0514A[REDACTED]" }</pre> [Traffic capture of a user ID token used to identify a user on the Home Depot website after login] As another example, Home Depot discloses that it uses a unique identifier to identify users in its privacy policy.
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The tracking tools we use include: Browser and flash cookies, which send text files to your computer or device to identify your browser or store information and settings. Server logs, which record information about your device, browser, or operating system. Web beacons and pixels, which collect information about how you interact with content. Application software, which collects information about how you interact with our apps. We use these tools to: Identify new users and recognize returning customers Understand how you accessed our digital services and keep you logged in Personalize your experience Identify your location Optimize our websites and apps Make product recommendations and provide advertising content Better understand our audiences and customers Provide correct pricing and ads for your local store Privacy & Security at a Glance. Available at https://www.homedepot.com/privacy/privacy-and-security-at-a-glance Home Depot bases the first quality level at least in part on a unique identifier and clustering. Home Depot has developed techniques such as session-based recommender systems to estimate the likelihood of an event such as a product click by recommending the most relevant item based on a user's unique ID.
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Session-based recommender systems (SBRs) accurately model sequential and evolving preferences of users from their session data (e.g., clicks and add-to-cart events). Session data can be associated with item metadata, allowing SBRs to capture item dependencies at the attribute level within the session. However, most of the existing SBRs take the IDs of users and items as the main input source to learn session contexts and produce next item recommendations [13, 14, 40]. Recent hybrid models demonstrated improved performance when combining item embeddings and their attributes to be used as additional side information [5, 10, 27, 31, 32, 32, 38]. Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 573. Available at https://dl.acm.org/doi/pdf/10.1145/3523227.3551477
--	---

	3 METHODOLOGY Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as: $p(I_n \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$ where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n. As in previous works [9, Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574 https://dl.acm.org/doi/pdf/10.1145/3523227.3551477 An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
1[b]. determining,	Home Depot determines, for a user associated with the user profile, an indication of interest in a first category, wherein the indication of interest in the first category is determined based at least in part on at least one of: (1) a

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

for a user associated with the user profile, an indication of interest in a first category, wherein the indication of interest in the first category is determined based at least in part on at least one of: (1) a second search associated with the user profile or (2) a second purchase associated with the user profile;	second search associated with the user profile or (2) a second purchase associated with the user profile. For example, Home Depot's session-based search recommendation algorithm determines customer intent (interest) in a category based on at least in part a previous search (a second search associated with the user profile) and purchase history (a second purchase associated with the user profile), among other things. 3 METHODOLOGY Next Item Prediction: We denote a user session $S = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session S, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in S. Formally, the probability of the target item I_n can be formulated as: $p(I_n S_{[I_{<n}]}; \theta) \quad (1)$ where θ denotes the model parameters and $S_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n. As in previous works [9, Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations", RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 574 https://dl.acm.org/doi/pdf/10.1145/3523227.3551477 For example, Home Depot determines customer intent based on at least in part past user searches to provide
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	search results. The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings. “I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge,” Qu says. “We’ve really removed the friction of asking the customer to specify ‘I need this five-foot downrod outdoor ceiling fan specifically.’” Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022. https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/ Home Depot also determines customer intent based on at least in part past purchases.
--	---

How Do We Collect Information?

There are 3 ways we collect your information:

We collect information directly from you. You provide us with your information when you visit our stores, register for an account, **make an online purchase** or rent equipment.

We collect information from you passively. We use tools like cookies to collect information when you use our websites or interact with our emails.

We collect information from affiliates and third parties. This includes shipping companies, installers, service providers, social media platforms, and more.

Privacy & Security at a Glance. Available at <https://www.homedepot.com/privacy/privacy-and-security-at-a-glance>

How Do We Use Information?

We use your information to improve your experience, process your information, and keep things running smoothly.

We provide you with products, including order fulfillment, contest or sweepstakes entries, registration, returns, and product reviews.

We improve our business, products, and services, including optimizing our websites and apps and improving store layouts and purchasing experiences.

We personalize your experience, including recommending products and updating inventory to match demand.

We monitor for fraud and asset protection purposes, including processing and tracking returns and confirming the identity of customers renting tools and equipment.

We advertise to you, including supporting targeted advertising for select third parties and sending you promotions, newsletters, and information from other select companies we think you might find interesting.

Privacy & Security at a Glance. Available at <https://www.homedepot.com/privacy/privacy-and-security-at-a-glance>

This is shown, for example, by the type of information that Home Depot collects, evidenced by the Home Depot Privacy & Security Statement:

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Internet Activity What Information Does This Include? Browsing history, search history, information about your interaction with our websites, applications, electronic communications, or advertisements, and information about your activities when using our in-store WiFi. Session replay software may be used to record and replay your interaction. Where Do We Collect It From? • Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information. • Social media platforms. • Advertising companies and content publishers that present you with our ads. Why Do We Collect and Disclose It? • Fulfilling orders and processing returns. • Customer care. • Communicating with you. • Administering contests and promotions. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection. https://www.homedepot.com/privacy/privacy-and-security-statement
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Commercial Information			
What Information Does This Include?	Where Do We Collect It From?	Why Do We Collect and Disclose It?	
Products or services purchased, purchasing history, products or services you like, reviews you submit, or where you shop.	• Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Other customers that may provide us with your information to recommend a product or service, ship products to you, or list you as a recipient of products or services. • Companies that provide services on our behalf (e.g., installers). • Security and fraud prevention services that help us confirm that transactions are valid and otherwise help us protect our assets and you. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information.	• Fulfilling orders and processing returns. • Customer care. • Administering contests and promotions. • Registering you for a website or program. • Communicating with you. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection.	
https://www.homedepot.com/privacy/privacy-and-security-statement			
An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused			

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.			
1[c]. storing, in a record associated with the user, the indication of interest in the first category;	Home Depot stores, in a record associated with the user, the indication of interest in the first category. For example, Home Depot saves indications of interest in a first category through the user’s browsing history, search history, interaction with Home Depot’s website, purchase history, liked products, and reviews. Internet Activity <table><tr><td> What Information Does This Include? Browsing history, search history, information about your interaction with our websites, applications, electronic communications, or advertisements, and information about your activities when using our in-store WiFi. Session replay software may be used to record and replay your interaction. </td><td> Where Do We Collect It From? • Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information. • Social media platforms. • Advertising companies and content publishers that present you with our ads. </td><td> Why Do We Collect and Disclose It? • Fulfilling orders and processing returns. • Customer care. • Communicating with you. • Administering contests and promotions. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection. </td></tr></table>	What Information Does This Include? Browsing history, search history, information about your interaction with our websites, applications, electronic communications, or advertisements, and information about your activities when using our in-store WiFi. Session replay software may be used to record and replay your interaction.	Where Do We Collect It From? • Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information. • Social media platforms. • Advertising companies and content publishers that present you with our ads.	Why Do We Collect and Disclose It? • Fulfilling orders and processing returns. • Customer care. • Communicating with you. • Administering contests and promotions. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection.
What Information Does This Include? Browsing history, search history, information about your interaction with our websites, applications, electronic communications, or advertisements, and information about your activities when using our in-store WiFi. Session replay software may be used to record and replay your interaction.	Where Do We Collect It From? • Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information. • Social media platforms. • Advertising companies and content publishers that present you with our ads.	Why Do We Collect and Disclose It? • Fulfilling orders and processing returns. • Customer care. • Communicating with you. • Administering contests and promotions. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection.		

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	https://www.homedepot.com/privacy/privacy-and-security-statement Commercial Information <table><tr><th data-bbox="436 389 886 462">What Information Does This Include?</th><th data-bbox="924 389 1302 462">Where Do We Collect It From?</th><th data-bbox="1413 389 1795 462">Why Do We Collect and Disclose It?</th></tr><tr><td data-bbox="436 487 886 612"> Products or services purchased, purchasing history, products or services you like, reviews you submit, or where you shop. </td><td data-bbox="924 487 1302 1385"> • Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Other customers that may provide us with your information to recommend a product or service, ship products to you, or list you as a recipient of products or services. • Companies that provide services on our behalf (e.g., installers). • Security and fraud prevention services that help us confirm that transactions are valid and otherwise help us protect our assets and you. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information. </td><td data-bbox="1413 487 1795 1278"> • Fulfilling orders and processing returns. • Customer care. • Administering contests and promotions. • Registering you for a website or program. • Communicating with you. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection. </td></tr></table>	What Information Does This Include?	Where Do We Collect It From?	Why Do We Collect and Disclose It?	Products or services purchased, purchasing history, products or services you like, reviews you submit, or where you shop.	• Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Other customers that may provide us with your information to recommend a product or service, ship products to you, or list you as a recipient of products or services. • Companies that provide services on our behalf (e.g., installers). • Security and fraud prevention services that help us confirm that transactions are valid and otherwise help us protect our assets and you. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information.	• Fulfilling orders and processing returns. • Customer care. • Administering contests and promotions. • Registering you for a website or program. • Communicating with you. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection.
What Information Does This Include?	Where Do We Collect It From?	Why Do We Collect and Disclose It?					
Products or services purchased, purchasing history, products or services you like, reviews you submit, or where you shop.	• Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Other customers that may provide us with your information to recommend a product or service, ship products to you, or list you as a recipient of products or services. • Companies that provide services on our behalf (e.g., installers). • Security and fraud prevention services that help us confirm that transactions are valid and otherwise help us protect our assets and you. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information.	• Fulfilling orders and processing returns. • Customer care. • Administering contests and promotions. • Registering you for a website or program. • Communicating with you. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection.					

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	https://www.homedepot.com/privacy/privacy-and-security-statement Home Depot uses this indication of interest in a category (“the history of what we know about a customer”) to store, for example, a user’s interest in outdoor ceiling fans. The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings. “I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge,” Qu says. “We’ve really removed the friction of asking the customer to specify ‘I need this five-foot downrod outdoor ceiling fan specifically.’” Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022. https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/ Home Depot describes a user’s indication of interest, for example, as a user’s “intent.”
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Intent Search: A Smarter Platform Delivering Smarter Results Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar. That's why our team focuses on the <i>intent</i> of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time. The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all The indication of interest from the sequence of items a user interacted with is also stored.
--	---

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

1[d]. subsequent to determining the indication of interest in the first category, determining, for the user, that a need relative to the first category has been met based at least in part on at least one of: (1) a third search associated with the user profile or (2) a third purchase associated with the user profile;	Home Depot, subsequent to determining the indication of interest in the first category, determines, for the user, that a need relative to the first category has been met based at least in part on at least one of: (1) a third search associated with the user profile or (2) a third purchase associated with the user profile. Home Depot determines whether a need relative to the first category has been met as part of optimizing search and ad results taking into customer intent including search queries and purchase history. Home Depot uses sequences of events including search history in the determination. Intent Search: A Smarter Platform Delivering Smarter Results Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar. That's why our team focuses on the <i>intent</i> of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time. The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Personalization: The Next Frontier In addition to building accurate, lightning-fast search results, we're also creating a personalized search experience for customers. Our technology team has built our online channels to consider location, past searches, personalized deal and guide recommendations when populating search results. This is especially helpful for customers in specific trade professions, such as an electrician searching for “pliers,” which the app will properly search for as “electrician’s pliers.” The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all Home Depot also uses a user’s purchase history to determine whether their need relative to the first category has been met.
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Commercial Information			
What Information Does This Include?	Where Do We Collect It From?	Why Do We Collect and Disclose It?	
Products or services purchased, purchasing history, products or services you like, reviews you submit, or where you shop.	• Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Other customers that may provide us with your information to recommend a product or service, ship products to you, or list you as a recipient of products or services. • Companies that provide services on our behalf (e.g., installers). • Security and fraud prevention services that help us confirm that transactions are valid and otherwise help us protect our assets and you. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information.	• Fulfilling orders and processing returns. • Customer care. • Administering contests and promotions. • Registering you for a website or program. • Communicating with you. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection.	
Home Depot Privacy & Security Statement, https://www.homedepot.com/privacy/privacy-and-security-statement			
In populating search results, Home Depot’s search engine recognizes that a shopper has a need for a next product and recommends that product to them.			

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The audience segmentation work that Villagomez's team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot's retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ As another example, Home Depot looks at whether the user's need has been met from their interaction history and recommends an item to the user based on whether that need has been met.
--	---

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

1[e]. based at least in part on the determination that the need relative to the first category has been met, determining an indication of interest in a second category, wherein the indication of interest in the first category and the indication of interest in the second category comprise a sequence of related indications of interest;	Home Depot, based at least in part on the determination that the need relative to the first category has been met, determines an indication of interest in a second category, wherein the indication of interest in the first category and the indication of interest in the second category comprise a sequence of related indications of interest. For example, Home Depot determines an indication of interest in a second category using a set of search queries. For example, if a need for a patio item has been met (past searches), the interest in a second category of five-foot downrod outdoor ceiling fans will be related. With terabytes of historic data to work with, Qu's vector search engine is able to discover hidden connections among products, such as sloped ceilings, ceiling fans, and downrods. So when a would-be customer who needs to pair their ceiling fan purchase with a downrod of a certain type and length executes their search, the engine will return more relevant results. The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings. "I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge," Qu says. "We've really removed the friction of asking the customer to specify 'I need this five-foot downrod outdoor ceiling fan specifically.'"
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022.

<https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/>

As another example, the Shalaby paper shows that Home Depot attempts to maximize the probability of the user's next interaction in a session, which would necessarily be based on a prior item's needs being met. The interest in the first and second categories will be related by, for example, a probability formula such as formula (1) shown below.

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$

as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical.

In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations", RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
1[f]. in response to determining that the need relative to the first category has been met, determining a second quality level associated with the user, wherein the second quality level is determined with respect to the first category;	Home Depot, in response to determining that the need relative to the first category has been met, determines a second quality level associated with the user, wherein the second quality level is determined with respect to the first category. For example, Home Depot determines a second quality level associated with the user considering a need relative to a first category has been met using determined customer intent, which includes product category and purchase history. This is used to determine a second quality level to respond to further searches to present “the right product for the right customer at the right time,” “when they need it.” The audience segmentation work that Villagomez’s team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot’s retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/

Intent Search: A Smarter Platform Delivering Smarter Results

Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar.

That's why our team focuses on the *intent* of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time.

The Home Depot Introduces Improved Search For All. April 19, 2022.

<https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all>

Personalization: The Next Frontier

In addition to building accurate, lightning-fast search results, we're also creating a personalized search experience for customers. Our technology team has built our online channels to consider location, past searches, personalized deal and guide recommendations when populating search results.

The Home Depot Introduces Improved Search For All. April 19, 2022.

<https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all>

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings.

“I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge,” Qu says. “We’ve really removed the friction of asking the customer to specify ‘I need this five-foot downrod outdoor ceiling fan specifically.’”

Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022.
<https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/>

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

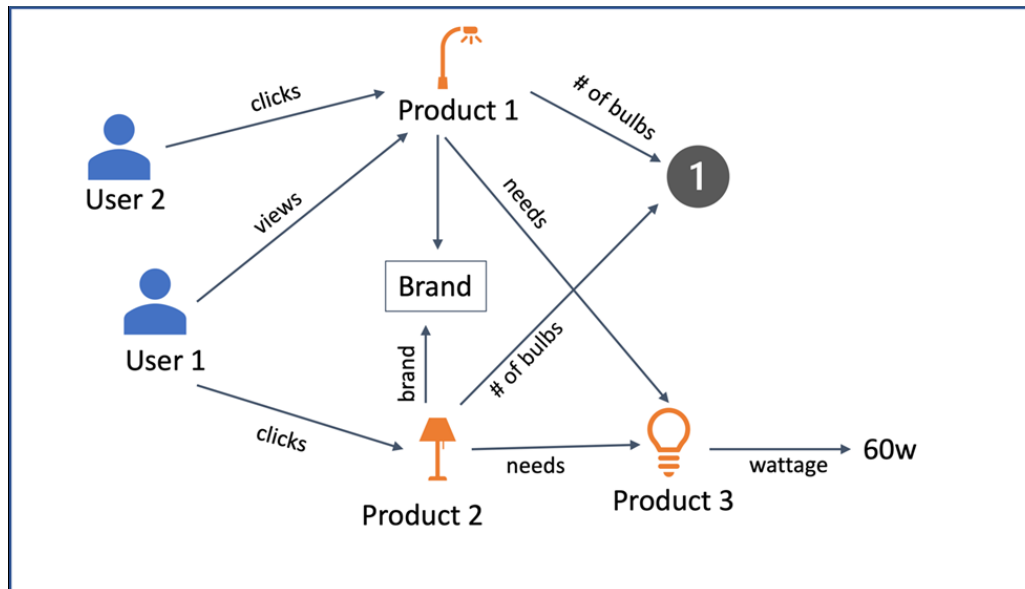
where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations", RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

As another example, Home Depot may recommend a lightbulb to a user if their need for a lamp has been met.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402



We can observe that the interactions between users, products and their attributes are easier to visualize when represented as a 3-dimensional graph. It becomes intuitive to recommend Product 3 to User1 and User 2 even though both users have not interacted with Product 3, since the relationship between Product 1, Product 2 and Product 3 becomes more easily discoverable through this graph.

Balaji, Janani, Data Science Manager, The Home Depot. Knowledge Graphs in E-Commerce.
<https://roundtable.datascience.salon/knowledge-graphs-in-e-commerce>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

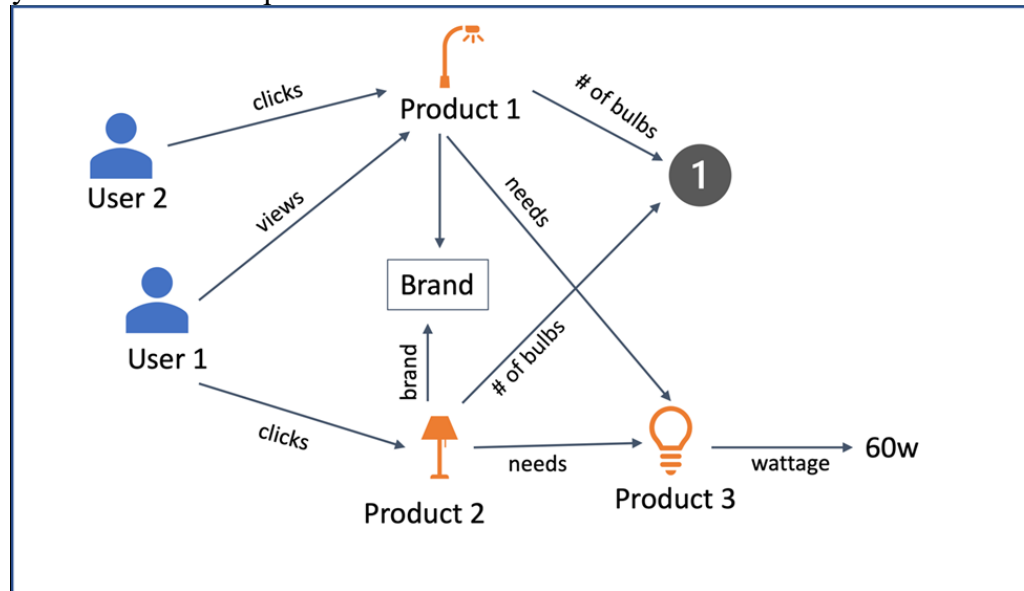
1[g]. wherein at least one of the first quality level or the second quality level is based at least in part on a conversion assessment associated with the user profile, and wherein the conversion assessment is based at least in part on historical click behavior; and	Home Depot bases at least one of the first quality level or the second quality level at least in part on a conversion assessment associated with the user profile, and wherein the conversion assessment is based at least in part on historical click behavior. For example, Home Depot's quality levels are based at least in part on a conversion assessment associated with the user profile, which is based at least in part on historical click behavior. For example, Shalaby et al. explains that Home Depot tracks "the items a user interacted within that session." In order to maximize the probability of interacting with the next item (a conversion assessment). 3 METHODOLOGY Next Item Prediction: We denote a user session $S = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session S, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in S. Formally, the probability of the target item I_n can be formulated as: $p(I_n S_{[I_{<n}]}; \theta) \quad (1)$ where θ denotes the model parameters and $S_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n. As in previous works [9, Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-
---	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574 https://dl.acm.org/doi/pdf/10.1145/3523227.3551477 The M2TRec algorithm in Shalaby et al. is compared against two common algorithms which recommend the user’s most frequent past sessions’ categories and the top items based on all metadata. Predicting next item’s category: One of the main objectives of this research is to develop a scalable architecture that serves both item and category recommendations in one model using an efficient MTL regime. We found significant performance gains when jointly training our model to predict next item and its categories at different levels of the catalog taxonomy (see ablation study below). We demonstrate the efficacy of training our SBRS to predict next category over deriving it from session items by comparing the category prediction performance against two heuristics: (1) Personalized top-N Frequent: This simple heuristic uses past session items’ categories and recommends the most frequent ones, and (2) Top-N Predicted: This simple strategy works by first predicting top-N next items from a metadata-aware single task model called MeTRec (see ablation study below), and then uses their categories as recommendations such that the category of the top-ranked next item will be ranked first and so on. Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 576 https://dl.acm.org/doi/pdf/10.1145/3523227.3551477 As another example, Home Depot may recommend a lightbulb to a user if their need for a lamp has been met,
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

which is explicitly based on a user's prior clicks.



We can observe that the interactions between users, products and their attributes are easier to visualize when represented as a 3-dimensional graph. It becomes intuitive to recommend Product 3 to User1 and User 2 even though both users have not interacted with Product 3, since the relationship between Product 1, Product 2 and Product 3 becomes more easily discoverable through this graph.

Balaji, Janani, Data Science Manager, The Home Depot. Knowledge Graphs in E-Commerce.
<https://roundtable.datascience.salon/knowledge-graphs-in-e-commerce>

Home Depot's privacy policy confirms that it saves users' interaction with Home Depot's website.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Internet Activity What Information Does This Include? Browsing history, search history, information about your interaction with our websites, applications, electronic communications, or advertisements, and information about your activities when using our in-store WiFi. Session replay software may be used to record and replay your interaction. Where Do We Collect It From? • Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information. • Social media platforms. • Advertising companies and content publishers that present you with our ads. Why Do We Collect and Disclose It? • Fulfilling orders and processing returns. • Customer care. • Communicating with you. • Administering contests and promotions. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection. https://www.homedepot.com/privacy/privacy-and-security-statement Home Depot also uses Google Cloud to analyze its clickstream data.
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	While THD's legacy data warehouse contained 450 terabytes of data, the BigQuery enterprise data warehouse has over 15 petabytes. That means better decision-making by utilizing new datasets like website clickstream data and by analyzing additional years of data. The Home Depot: Helping Doers Get More Done Through a Data-Driven Approach. Available at https://cloud.google.com/customers/the-home-depot Home Depot advertises that its conversion numbers are improved by Retail Media+, including through placements “in-grid” (search) and “in carousel.” Reach customers through ads on The Home Depot owned channels, including placements in-grid and in carousel for sponsored products, top of page banners and customized email sends. Users spent 10% more time on homedepot.com when engaged with Retail Media+ products Users were 26% more likely to convert when engaged with Retail Media+ products Users spent 28% more \$ per visit when engaged with Retail Media+ products https://www.homedepot.com/c/Retail_Media_Advertising_Solutions An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
1[h]. displaying an advertisement to the user based at least in part on at	Home Depot displays an advertisement to the user based at least in part on at least one of the first quality level or the second quality level. For example, Home Depot displays advertisements to users through its Retail Media+ system, including through placements “in-grid” (search) and “in carousel.”

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

least one of the first quality level or the second quality level.	Reach customers through ads on The Home Depot owned channels, including placements in-grid and in carousel for sponsored products, top of page banners and customized email sends. Users spent 10% more time on homedepot.com when engaged with Retail Media+ products Users were 26% more likely to convert when engaged with Retail Media+ products Users spent 28% more \$ per visit when engaged with Retail Media+ products https://www.homedepot.com/c/Retail_Media_Advertising_Solutions Retail Media+ includes the Home Depot search engine. The audience segmentation work that Villagomez's team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot's retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right vendor for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/
---	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	As described above, a user's first and second quality level are based on user behavior including search and interaction history. Intent Search: A Smarter Platform Delivering Smarter Results Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar. That's why our team focuses on the <i>intent</i> of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time. The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all For example, Shalaby et al. explains that Home Depot tracks "the items a user interacted within that session." In order to maximize the probability of interacting with the next item (a conversion assessment).
--	--

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

As described above, Home Depot determines a first or second quality level in order to present “the right product for the right customer at the right time,” “when they need it.”

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The audience segmentation work that Villagomez’s team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot’s retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
2. The method of claim 1, wherein the second quality level is determined with respect to the second category.	Home Depot comprises the method of claim 1, wherein the second quality level is determined with respect to the second category. For example, as described in claim 1[f], Home Depot determines a second quality level associated with the user considering a need relative to a first category has been met using determined customer intent, which includes product category and purchase history. This is used to determine a second quality level to respond to further searches to present “the right product for the right customer at the right time,” “when they need it.”

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The audience segmentation work that Villagomez’s team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot’s retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ Home Depot determines a second quality level relative to a second category using the same “right product” approach, which includes product category and purchase history, which is used to determine a second quality level to determine relevancy. For example, Home Depot will prioritize products such as a “downrod outdoor ceiling fan,” in a second category, if a sloped roof was mentioned in connection with a different category.
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings. “I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge,” Qu says. “We’ve really removed the friction of asking the customer to specify ‘I need this five-foot downrod outdoor ceiling fan specifically.’” Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022. https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/ An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
3. The method of claim 1, wherein at least one of the	Home Depot comprises the method of claim 1, wherein at least one of the first quality level or the second quality level is based at least in part on an assessment of a purchase likelihood associated with the user profile.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

first quality level or the second quality level is based at least in part on an assessment of a purchase likelihood associated with the user profile.	For example, Home Depot's determination of both the first and second quality level is based on a determination of a purchase likelihood associated with the user profile. One example of a conversion is a purchase likelihood such as an add-to-cart event or "interaction," which are calculated for users from their session data. Session-based recommender systems (SBRs) accurately model sequential and evolving preferences of users from their session data (e.g., clicks and add-to-cart events). Session data can be associated with item metadata, allowing SBRs to capture item dependencies at the attribute level within the session. However, most of the existing SBRs take the IDs of users and items as the main input source to learn session contexts and produce next item recommendations [13, 14, 40]. Recent hybrid models demonstrated improved performance when combining item embeddings and their attributes to be used as additional side information [5, 10, 27, 31, 32, 32, 38]. Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations", RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 573. Available at https://dl.acm.org/doi/pdf/10.1145/3523227.3551477
--	--

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

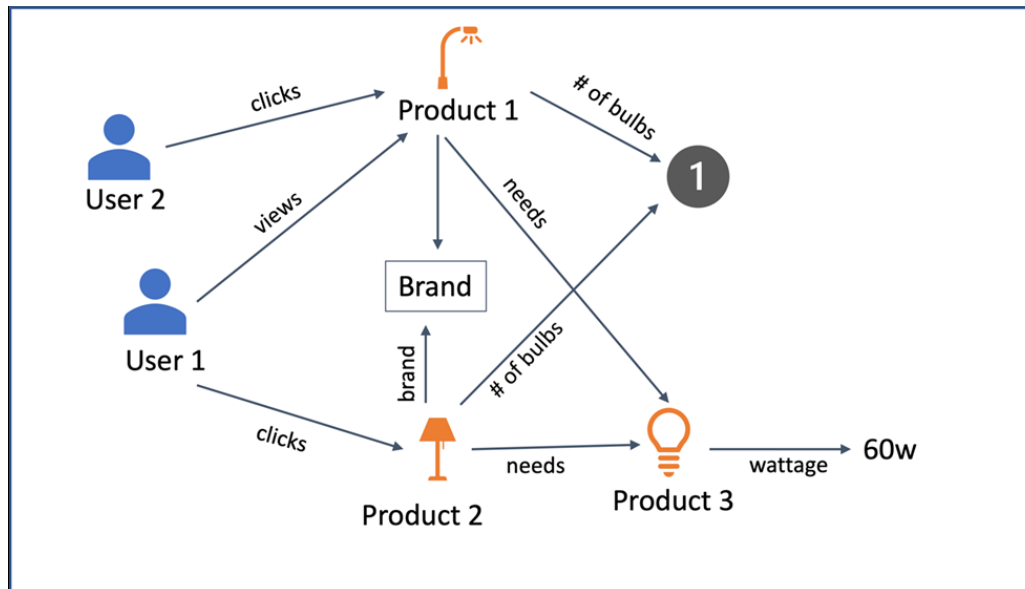
Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574
<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

As another example, Home Depot recognizes a purchase likelihood increases when a product is shown to a user “right when they need it,” which decreases the time to find the right products to complete their projects.”

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The audience segmentation work that Villagomez's team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot's retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ As another example, Home Depot may recommend a lightbulb to a user where the user purchased either the product 1 or product 2 lamps.
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402



We can observe that the interactions between users, products and their attributes are easier to visualize when represented as a 3-dimensional graph. It becomes intuitive to recommend Product 3 to User1 and User 2 even though both users have not interacted with Product 3, since the relationship between Product 1, Product 2 and Product 3 becomes more easily discoverable through this graph.

Balaji, Janani, Data Science Manager, The Home Depot. Knowledge Graphs in E-Commerce.
<https://roundtable.datascience.salon/knowledge-graphs-in-e-commerce>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	infringement contentions once such information is made available to Plaintiff.
4. The method of claim 3, wherein the purchase likelihood is determined relative to the advertisement.	Home Depot comprises the method of claim 3, wherein the purchase likelihood is determined relative to the advertisement. For example, Home Depot determines a purchase likelihood (decreasing the time to ... complete their projects) relative to when a product is advertised to a user, which Home Depot charges its vendors for. The audience segmentation work that Villagomez's team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot's retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

5. The method of claim 1, wherein at least one of the first quality level or the second quality level is determined at least in part by using machine learning.	Home Depot comprises the method of claim 1, wherein at least one of the first quality level or the second quality level is determined at least in part by using machine learning. For example, Home Depot describes that many of the aspects of its search and recommendations are based on machine learning.
---	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

How is Home Depot solving challenging E-commerce problems using the power of AI and Data Science?

Khalifeh: Home Depot has a mature data science organization with world-class data scientists that came from top schools and research labs. This organization leverages different aspects of data science to solve challenging problems like search relevancy, query understanding, personalized recommendations, and other applications of data science. One of the areas where [Home Depot] leveraged data science is in automation of collection recommendation. The customer pain point was to find all the products that form a collection when they shop for bathroom renovation or kitchen renovation or patio furniture. The customer can find one product, such as a faucet, which they like and wants to complete the bathroom set with shower head, towel bar, towel ring, and other coordinated items which have the same style, color, color finishing, and brand. At this point the customer has to conduct a separate search for each of the other products to find them in our catalog which is a time consuming and frustrating experience. Our deep learning multi-modal algorithm was designed to automate the process of finding all the products in our catalog that form a collection and provide those as recommendations whenever the customer lands on the product page. This work was published in the [ACM RecSys 2019](#) and we have many other use cases which you can read about in these published research papers.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Schmelzer, Ron. How Home Depot Is Enhancing The Ecommerce Experience With AI. October 17, 2020. Available at https://www.forbes.com/sites/cognitiveworld/2020/10/17/how-home-depot-is-enhancing-the-ecommerce-experience-with-ai/?sh=5d167edb2445 The Shalaby et al. paper also describes that its M2TRec algorithm (and therefore the first and second quality levels) is based on Multi-task Learning, which is a subset of machine learning.
--	--

Multi-task Learning: M2TRec incorporates multi-task learning (MTL) to boost the performance of next item prediction. MTL has proven to be an effective mechanism to reduce the risk of over-fitting, learn more generalized shared representations for all the tasks, and improve the overall performance on each task by sharing the knowledge acquired from other related tasks [24]. The target space of next item prediction (i.e., all item-IDs) is much larger than the space of other item attributes such as all categories or brands. Therefore, the task of next item category or brand prediction should be easier to learn than next item prediction. Moreover, learning such auxiliary tasks would benefit the task of next item prediction since it biases the metadata encoding and the Transformer encoder layers to learn representations that are close not only to next item, but also to other similar items belonging to the same category or brand, thus, narrowing down the space of possible next item candidates to a much smaller set of items. To this end, we train M2TRec to predict next item attributes (e.g., item categories) as auxiliary tasks to the task of next item-ID prediction. For each task, including next item-ID prediction, we create a prediction head composed of Fully Connected Layer (FCN) followed by Softmax function to generate the probability distribution over all candidates for the corresponding task, i.e.,

$$\hat{y}_k = \text{softmax}(\text{FCN}_k(v_S; \theta^{(k)})) \in \mathbb{R}^{d_k} \quad (6)$$

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 573. Available at https://dl.acm.org/doi/pdf/10.1145/3523227.3551477 An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
6. The method of claim 1, wherein at least one of the first quality level or the second quality level is determined with respect to the advertisement.	Home Depot comprises the method of claim 1, wherein at least one of the first quality level or the second quality level is determined with respect to the advertisement. For example, Home Depot determines both the first and second quality level with respect to when a product is advertised to a user, which Home Depot charges its vendors for. The audience segmentation work that Villagomez’s team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot’s retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

<https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/>

For example, as described in element 1[a], in the Shalaby et al. paper, Home Depot bases the first quality level at least in part on an estimate of a likelihood of an event, such as a “click” or an “add-to-cart” event.

Session-based recommender systems (SBRs) accurately model sequential and evolving preferences of users from their session data (e.g., clicks and add-to-cart events). Session data can be associated with item metadata, allowing SBRs to capture item dependencies at the attribute level within the session. However, most of the existing SBRs take the IDs of users and items as the main input source to learn session contexts and produce next item recommendations [13, 14, 40]. Recent hybrid models demonstrated improved performance when combining item embeddings and their attributes to be used as additional side information [5, 10, 27, 31, 32, 32, 38].

Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 573. Available at <https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

8. The method of claim 1, wherein the event comprises a conversion.	Home Depot comprises the method of claim 1, wherein the event comprises a conversion. For example, as described in element 1[a], Home Depot bases the first quality level at least in part on an estimate of a likelihood of an event, such as a “click” or an “add-to-cart” event. Both click and add-to-cart events are conversions. Session-based recommender systems (SBRs) accurately model sequential and evolving preferences of users from their session data (e.g., clicks and add-to-cart events). Session data can be associated with item metadata, allowing SBRs to capture item dependencies at the attribute level within the session. However, most of the existing SBRs take the IDs of users and items as the main input source to learn session contexts and produce next item recommendations [13, 14, 40]. Recent hybrid models demonstrated improved performance when combining item embeddings and their attributes to be used as additional side information [5, 10, 27, 31, 32, 32, 38]. Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 573. Available at https://dl.acm.org/doi/pdf/10.1145/3523227.3551477 In the Shalaby et al. paper, Home Depot also describes that its objective is to “maximize the prediction probability of the next item the user is most likely to interact with.”
--	--

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

9. The method of claim 1, wherein the event comprises a purchase.	Home Depot comprises the method of claim 1, wherein the event comprises a purchase. For example, as described in element 1[a], Home Depot bases the first quality level at least in part on an estimate of a likelihood of an event, such as a “click” or an “add-to-cart” event. Session-based recommender systems (SBRs) accurately model sequential and evolving preferences of users from their session data (e.g., clicks and add-to-cart events). Session data can be associated with item metadata, allowing SBRs to capture item dependencies at the attribute level within the session. However, most of the existing SBRs take the IDs of users and items as the main input source to learn session contexts and produce next item recommendations [13, 14, 40]. Recent hybrid models demonstrated improved performance when combining item embeddings and their attributes to be used as additional side information [5, 10, 27, 31, 32, 32, 38]. Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 573. Available at https://dl.acm.org/doi/pdf/10.1145/3523227.3551477 In the Shalaby et al. paper, Home Depot also describes that its objective is to “maximize the prediction probability of the next item the user is most likely to interact with.”
--	---

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations", RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 574
<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

Home Depot also determines customer intent based on at least in part past purchases, which may be an event.

How Do We Collect Information?

There are 3 ways we collect your information:

We collect information directly from you. You provide us with your information when you visit our stores, register for an account, **make an online purchase** or rent equipment.

We collect information from you passively. We use tools like cookies to collect information when you use our websites or interact with our emails.

We collect information from affiliates and third parties. This includes shipping companies, installers, service providers, social media platforms, and more.

Privacy & Security at a Glance. Available at <https://www.homedepot.com/privacy/privacy-and-security-at-a-glance>

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Commercial Information		
What Information Does This Include?	Where Do We Collect It From?	Why Do We Collect and Disclose It?
Products or services purchased, purchasing history, products or services you like, reviews you submit, or where you shop.	• Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Other customers that may provide us with your information to recommend a product or service, ship products to you, or list you as a recipient of products or services. • Companies that provide services on our behalf (e.g., installers). • Security and fraud prevention services that help us confirm that transactions are valid and otherwise help us protect our assets and you. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information.	• Fulfilling orders and processing returns. • Customer care. • Administering contests and promotions. • Registering you for a website or program. • Communicating with you. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection.

<https://www.homedepot.com/privacy/privacy-and-security-statement>

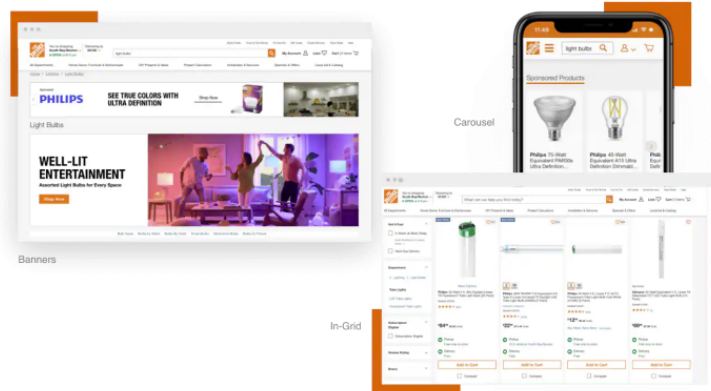
An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
10[pre]. A system, comprising: a processor configured to:	To the extent the preamble is limiting, the Accused Instrumentalities comprise a system comprising a processor configured to conduct advanced second-price auctions for Home Depot advertising. Home Depot advertises that Retail Media+ allows advertisers to “connect your brand to our customers.” CONNECT YOUR BRAND TO OUR CUSTOMERS Proven advertising solutions to help grow your business. Learn More  Retail Media+. Available at https://www.homedepot.com/c/Retail_Media_Advertising_Solutions Reach Advertising with The Home Depot means reaching our 198M individual customers online and in our 2,322 stores. Our website attracts 3.6 billion visits each year. Retail Media+ allows you to connect your brand to our customers. Retail Media+. Available at https://www.homedepot.com/c/Retail_Media_Advertising_Solutions Home Depot offers ad placements “on The Home Depot owned channels, including placements in-grid and in carousels for sponsored products, top of page banners, and customized email sends.”

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Onsite Advertising Ad Units [Get Started](#)



Reach customers through ads on The Home Depot owned channels, including placements in-grid and in carousel for sponsored products, top of page banners and customized email sends.

Users spent 10% more time on homedepot.com when engaged with Retail Media+ products

Users were 26% more likely to convert when engaged with Retail Media+ products

Users spent 28% more \$ per visit when engaged with Retail Media+ products

Retail Media+. Available at https://www.homedepot.com/c/Retail_Media_Advertising_Solutions

Home Depot describes that Retail Media+ “tracks customer interest via our website.”

About Retail Media+

The Home Depot Retail Media network offers businesses like yours the opportunity to connect with consumers like never before. Regardless of your budget, we have a solution to meet your marketing needs. Choose one of our advertising offerings or mix and match to find what is right for your company and your specific products. The Home Depot advertising department leverages a myriad of online and offline channels to spread awareness of your brand and promote your products. From email advertising to social media branded marketing, these solutions are designed to propel your business and help increase sales. The Home Depot's advertising center tracks customer interest via our website, enabling us to promote your brand through retargeted ads and other off-site channels to keep your products top of mind. Retail advertising is key to setting yourself apart from competitors in an ever-changing market.

EXPAND YOUR REACH

Reach more customers using our ad center with The Home Depot Retail Media, which provides visibility for 198 million individual customers. Our advertising efforts aided in massive digital growth over the past few years, which benefits partners like you. Retail Media offers both self-service and custom capabilities to suit your advertising needs.

Creating an omni-channel experience for customers to interact with your brand is the mission of Retail Media. You can grow your business by harnessing the power of The Home Depot advertising across multiple channels that are proven to engage potential customers. A few examples of successful branded marketing tactics include email, onsite and offsite advertising. Looking to maximize your campaigns? You can do it all.

Retail Media+. Available at https://www.homedepot.com/c/Retail_Media_Advertising_Solutions

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	In interviews, Home Depot describes that Retail Media+ operates “on-site,” “off-site,” and “offline.” AdExchanger: What inventory does The Home Depot have in the retail media platform? MELANIE BABCOCK: The media comes in three buckets. We have, of course, our own properties, which could be either email, in-app or websites, which we refer to as “on-site.” And we have an equally healthy business off-site, with media partners like Meta, Google and Pinterest, as well as programmatic partners. Third, we have in-store placements, which we call “offline.” The Home Depot’s Path To Becoming A Global Advertising Player. James Hercher. April 13, 2023. Available at https://www.adexchanger.com/commerce/the-home-depots-path-to-becoming-a-global-advertising-player/ Retail Media+ includes the Home Depot search engine.
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The audience segmentation work that Villagomez’s team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot’s retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ Third parties recognize the benefit of Retail Media+. For example, psfk.com writes that Home Depot uses Retail Media+ to “drive products that are mutually beneficial to Home Depot and its shoppers.” Retail Media+ from the Home Depot is a full-service advertising and media network solution to help the brand’s third-party vendors drive sales and promote products that are mutually beneficial to Home Depot and its shoppers. Home Depot Turns Ecosystem Touchpoints Into Vendor Media Network, June 19, 2022. Available at
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	https://www.psfk.com/2022/06/home-depot-turns-ecosystem-touchpoints-into-vendor-media-network.html Similarly, moloco.com notes that Retail Media+ offers a “robust range of sponsored content promotions,” including through searches. <u>Home Depot Retail Media+</u> Home Depot offers a robust range of sponsored content promotions under “Retail Media+” — a program that supports onsite and offsite ad placements. Any advertiser looking to promote a new product will have access to three kinds of onsite sponsorships: • Search grid: Traditional sponsored result listings that align with relevant keywords. • Carousel: A display wheel of sponsored products that relate to customer searches. • Banner: A top-of-page ad placement that uses imagery to stand out from search results. Home Depot also helps advertisers supplement their sponsored content with offsite placements and retargeting options. For example, if a customer views a product during a search, brands can deploy follow-up ads for the item to associated social media feeds and email addresses. This grants advertisers a larger perspective of the buyer’s journey, helping advertisers optimize their efforts beyond sponsored promotions and keywords. What are sponsored results & how do they work? December 3, 2021. Available at https://www.moloco.com/blog/sponsored-results
10[a]. determine a first quality level associated with a user profile, wherein the first quality level is based at least in part on an estimate	The Accused Instrumentalities determine a first quality level associated with a user profile, wherein the first quality level is based at least in part on an estimate of a likelihood of an event, wherein the first quality level is determined based at least in part on at least one of: (1) a first search associated with the user profile or (2) a first purchase associated with the user profile, and wherein the determining of the first quality level is based at least in part on a unique identifier and clustering. Home Depot determines a first quality level, such as, for example, the likelihood of a user’s interaction with a recommendation. Home Depot publishes the recommendation algorithms it uses on its data in, for example, the Association for Computing Machinery (ACM).

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

of a likelihood of an event, wherein the first quality level is determined based at least in part on at least one of: (1) a first search associated with the user profile or (2) a first purchase associated with the user profile, and wherein the determining of the first quality level is based at least in part on a unique identifier and clustering;	M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations		
	Walid Shalaby walid_shalaby@homedepot.com The Home Depot Atlanta, Georgia, USA	Sejoon Oh soh337@gatech.edu Georgia Institute of Technology Atlanta, Georgia, USA	Amir Afsharinejad amir_afsharinejad@homedepot.com The Home Depot Atlanta, Georgia, USA
	Srijan Kumar srijan@gatech.edu Georgia Institute of Technology Atlanta, Georgia, USA	Xiquan Cui xiquan_cui@homedepot.com The Home Depot Atlanta, Georgia, USA	
	Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 573. Available at https://dl.acm.org/doi/pdf/10.1145/3523227.3551477		
	In the Shalaby et al. paper, Home Depot bases the first quality level at least in part on an estimate of a likelihood of an event, such as a “click” or an “add-to-cart” event.		

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Session-based recommender systems (SBRs) accurately model sequential and evolving preferences of users from their session data (e.g., clicks and add-to-cart events). Session data can be associated with item metadata, allowing SBRs to capture item dependencies at the attribute level within the session. However, most of the existing SBRs take the IDs of users and items as the main input source to learn session contexts and produce next item recommendations [13, 14, 40]. Recent hybrid models demonstrated improved performance when combining item embeddings and their attributes to be used as additional side information [5, 10, 27, 31, 32, 32, 38]. Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 573. Available at https://dl.acm.org/doi/pdf/10.1145/3523227.3551477 In the Shalaby et al. paper, Home Depot also describes that its objective is to “maximize the prediction probability of the next item the user is most likely to interact with.”
--	---

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations", RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

Home Depot bases the first quality level at least in part on a first search associated with the user profile. For example, Retail Media+ uses a search as one input to provide a product (and vendor) to a customer.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The audience segmentation work that Villagomez’s team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot’s retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ Home Depot also advertises that it uses “past searches” when populating search results. Personalization: The Next Frontier In addition to building accurate, lightning-fast search results, we’re also creating a personalized search experience for customers. Our technology team has built our online channels to consider location, past searches, personalized deal and guide recommendations when populating search results. The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Home Depot also advertises that it uses “ongoing search data” when showing results to customers. Intent Search: A Smarter Platform Delivering Smarter Results Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar. That’s why our team focuses on the <i>intent</i> of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, “weed whacker” vs. “string trimmer”). Plus, <u>our learning algorithm uses ongoing search data</u> to more accurately show customers exactly what they're looking for the first time. The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all Home Depot also uses search history (“including past searches”) through its “vector search engine.”
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings. “I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge,” Qu says. “We’ve really removed the friction of asking the customer to specify ‘I need this five-foot downrod outdoor ceiling fan specifically.’” Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022. https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/ Home Depot bases the first quality level at least in part on a first purchase associated with the user profile. For example, Home Depot describes that they collect information when a customer “[makes] an online purchase.”
--	---

How Do We Collect Information?

There are 3 ways we collect your information:

We collect information directly from you. You provide us with your information when you visit our stores, register for an account, **make an online purchase** or rent equipment.

We collect information from you passively. We use tools like cookies to collect information when you use our websites or interact with our emails.

We collect information from affiliates and third parties. This includes shipping companies, installers, service providers, social media platforms, and more.

Privacy & Security at a Glance. Available at <https://www.homedepot.com/privacy/privacy-and-security-at-a-glance>

Home Depot uses this collected purchase information to, among other things, “[recommend] products.”

How Do We Use Information?

We use your information to improve your experience, process your information, and keep things running smoothly.

We provide you with products, including order fulfillment, contest or sweepstakes entries, registration, returns, and product reviews.

We improve our business, products, and services, including optimizing our websites and apps and improving store layouts and purchasing experiences.

We personalize your experience, including recommending products and updating inventory to match demand.

We monitor for fraud and asset protection purposes, including processing and tracking returns and confirming the identity of customers renting tools and equipment.

We advertise to you, including supporting targeted advertising for select third parties and sending you promotions, newsletters, and information from other select companies we think you might find interesting.

Privacy & Security at a Glance. Available at <https://www.homedepot.com/privacy/privacy-and-security-at-a-glance>

Home Depot bases the first quality level at least in part on a unique identifier. For example, Home Depot associates unique identifiers with users as evidenced by their login identifier, such as an email address or other identifying information.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402



Sign In or Create an Account

[< Back](#)

First, enter your email address

Email Address

Continue

Don't Have an Account?

Create an Account

By selecting 'Sign In' you are agreeing to the Pro Xtra Terms and Conditions, Privacy and Security Statement, Notice of Financial Incentive & My Account Terms and Conditions. For Two-Factor Authentication, message and data rates may apply.

Sign In or Create an Account, Home Depot. <https://www.homedepot.com/auth/view/signin>

After a user inputs their email address and password, web traffic shows that the user is associated with both an “svocCustomerAccountId” and a “userId.”

THD_USER	"eyJjdXN0b21lcIR5cG...	.homedepot.com
----------	------------------------	----------------

[Traffic capture of a user ID token used to identify a user on the Home Depot website after login]

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Decoded EDIT THE PAYLOAD AND SECRET HEADER: ALGORITHM & TOKEN TYPE <pre>{ "customerType": "B2C", "svocCustomerId": "0514A[REDACTED], "logonId": "j[REDACTED].com", "userId": "0514A[REDACTED] }</pre> [Traffic capture of a user ID token used to identify a user on the Home Depot website after login] As another example, Home Depot discloses that it uses a unique identifier to identify users in its privacy policy.
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The tracking tools we use include: Browser and flash cookies, which send text files to your computer or device to identify your browser or store information and settings. Server logs, which record information about your device, browser, or operating system. Web beacons and pixels, which collect information about how you interact with content. Application software, which collects information about how you interact with our apps. We use these tools to: Identify new users and recognize returning customers Understand how you accessed our digital services and keep you logged in Personalize your experience Identify your location Optimize our websites and apps Make product recommendations and provide advertising content Better understand our audiences and customers Provide correct pricing and ads for your local store Privacy & Security at a Glance. Available at https://www.homedepot.com/privacy/privacy-and-security-at-a-glance Home Depot bases the first quality level at least in part on a unique identifier and clustering. Home Depot has developed techniques such as session-based recommender systems to estimate the likelihood of an event such as a product click by recommending the most relevant item based on a user's unique ID.
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Session-based recommender systems (SBRs) accurately model sequential and evolving preferences of users from their session data (e.g., clicks and add-to-cart events). Session data can be associated with item metadata, allowing SBRs to capture item dependencies at the attribute level within the session. However, most of the existing SBRs take the IDs of users and items as the main input source to learn session contexts and produce next item recommendations [13, 14, 40]. Recent hybrid models demonstrated improved performance when combining item embeddings and their attributes to be used as additional side information [5, 10, 27, 31, 32, 32, 38]. Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 573. Available at https://dl.acm.org/doi/pdf/10.1145/3523227.3551477
--	---

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

10[b]. determine, for a user associated with the user profile, an indication of interest in a first category, wherein the indication of interest in the first category is determined based at least in part on at least one of: (1) a second search associated with the user profile or (2) a second purchase associated with the user profile;	The Accused Instrumentalities determine, for a user associated with the user profile, an indication of interest in a first category, wherein the indication of interest in the first category is determined based at least in part on at least one of: (1) a second search associated with the user profile or (2) a second purchase associated with the user profile. For example, Home Depot's session-based search recommendation algorithm determines customer intent (interest) in a category based on at least in part a previous search (a second search associated with the user profile) and purchase history (a second purchase associated with the user profile), among other things. 3 METHODOLOGY Next Item Prediction: We denote a user session $S = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session S, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in S. Formally, the probability of the target item I_n can be formulated as: $p(I_n S_{[I_{<n}]}; \theta) \quad (1)$ where θ denotes the model parameters and $S_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n. As in previous works [9, Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574 https://dl.acm.org/doi/pdf/10.1145/3523227.3551477 For example, Home Depot determines customer intent based on at least in part past user searches to provide search results. The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings. “I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge,” Qu says. “We’ve really removed the friction of asking the customer to specify ‘I need this five-foot downrod outdoor ceiling fan specifically.’” Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022. https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/ Home Depot also determines customer intent based on at least in part past purchases.
--	---

How Do We Collect Information?

There are 3 ways we collect your information:

We collect information directly from you. You provide us with your information when you visit our stores, register for an account, **make an online purchase** or rent equipment.

We collect information from you passively. We use tools like cookies to collect information when you use our websites or interact with our emails.

We collect information from affiliates and third parties. This includes shipping companies, installers, service providers, social media platforms, and more.

Privacy & Security at a Glance. Available at <https://www.homedepot.com/privacy/privacy-and-security-at-a-glance>

	How Do We Use Information? We use your information to improve your experience, process your information, and keep things running smoothly. We provide you with products, including order fulfillment, contest or sweepstakes entries, registration, returns, and product reviews. We improve our business, products, and services, including optimizing our websites and apps and improving store layouts and purchasing experiences. We personalize your experience, including recommending products and updating inventory to match demand. We monitor for fraud and asset protection purposes, including processing and tracking returns and confirming the identity of customers renting tools and equipment. We advertise to you, including supporting targeted advertising for select third parties and sending you promotions, newsletters, and information from other select companies we think you might find interesting. Privacy & Security at a Glance. Available at https://www.homedepot.com/privacy/privacy-and-security-at-a-glance This is shown, for example, by the type of information that Home Depot collects, evidenced by the Home Depot Privacy & Security Statement:
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Internet Activity What Information Does This Include? Browsing history, search history, information about your interaction with our websites, applications, electronic communications, or advertisements, and information about your activities when using our in-store WiFi. Session replay software may be used to record and replay your interaction. Where Do We Collect It From? • Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information. • Social media platforms. • Advertising companies and content publishers that present you with our ads. Why Do We Collect and Disclose It? • Fulfilling orders and processing returns. • Customer care. • Communicating with you. • Administering contests and promotions. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection. https://www.homedepot.com/privacy/privacy-and-security-statement
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Commercial Information			
What Information Does This Include?	Where Do We Collect It From?	Why Do We Collect and Disclose It?	
Products or services purchased, purchasing history, products or services you like, reviews you submit, or where you shop.	• Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Other customers that may provide us with your information to recommend a product or service, ship products to you, or list you as a recipient of products or services. • Companies that provide services on our behalf (e.g., installers). • Security and fraud prevention services that help us confirm that transactions are valid and otherwise help us protect our assets and you. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information.	• Fulfilling orders and processing returns. • Customer care. • Administering contests and promotions. • Registering you for a website or program. • Communicating with you. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection.	
https://www.homedepot.com/privacy/privacy-and-security-statement			
An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused			

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
10[c]. store, in a record associated with the user, the indication of interest in the first category;	The Accused Instrumentalities store, in a record associated with the user, the indication of interest in the first category. For example, Home Depot saves indications of interest in a first category through the user's browsing history, search history, interaction with Home Depot's website, purchase history, liked products, and reviews.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Internet Activity What Information Does This Include? Browsing history, search history, information about your interaction with our websites, applications, electronic communications, or advertisements, and information about your activities when using our in-store WiFi. Session replay software may be used to record and replay your interaction. Where Do We Collect It From? • Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information. • Social media platforms. • Advertising companies and content publishers that present you with our ads. Why Do We Collect and Disclose It? • Fulfilling orders and processing returns. • Customer care. • Communicating with you. • Administering contests and promotions. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection. https://www.homedepot.com/privacy/privacy-and-security-statement
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Commercial Information			
What Information Does This Include?	Where Do We Collect It From?	Why Do We Collect and Disclose It?	
Products or services purchased, purchasing history, products or services you like, reviews you submit, or where you shop.	• Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Other customers that may provide us with your information to recommend a product or service, ship products to you, or list you as a recipient of products or services. • Companies that provide services on our behalf (e.g., installers). • Security and fraud prevention services that help us confirm that transactions are valid and otherwise help us protect our assets and you. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information.	• Fulfilling orders and processing returns. • Customer care. • Administering contests and promotions. • Registering you for a website or program. • Communicating with you. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection.	
https://www.homedepot.com/privacy/privacy-and-security-statement			
Home Depot uses this indication of interest in a category (“the history of what we know about a customer”) to			

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	store, for example, a user's interest in outdoor ceiling fans. The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings. "I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge," Qu says. "We've really removed the friction of asking the customer to specify 'I need this five-foot downrod outdoor ceiling fan specifically.'" Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022. https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/ Home Depot describes a user's indication of interest, for example, as a user's "intent."
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Intent Search: A Smarter Platform Delivering Smarter Results Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar. That's why our team focuses on the <i>intent</i> of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time. The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all The indication of interest from the sequence of items a user interacted with is also stored.
--	---

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

10[d]. subsequent to determining the indication of interest in the first category, determine, for the user, that a need relative to the first category has been met based at least in part on at least one of: (1) a third search associated with the user profile or (2) a third purchase associated with the user profile;	The Accused Instrumentalities, subsequent to determining the indication of interest in the first category, determine, for the user, that a need relative to the first category has been met based at least in part on at least one of: (1) a third search associated with the user profile or (2) a third purchase associated with the user profile. Home Depot determines whether a need relative to the first category has been met as part of optimizing search and ad results taking into customer intent including search queries and purchase history. Home Depot uses sequences of events including search history in the determination. Intent Search: A Smarter Platform Delivering Smarter Results Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar. That's why our team focuses on the <i>intent</i> of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time. The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all
---	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Personalization: The Next Frontier In addition to building accurate, lightning-fast search results, we're also creating a personalized search experience for customers. Our technology team has built our online channels to consider location, past searches, personalized deal and guide recommendations when populating search results. This is especially helpful for customers in specific trade professions, such as an electrician searching for “pliers,” which the app will properly search for as “electrician’s pliers.” The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all Home Depot also uses a user’s purchase history to determine whether their need relative to the first category has been met.
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Commercial Information			
What Information Does This Include?	Where Do We Collect It From?	Why Do We Collect and Disclose It?	
Products or services purchased, purchasing history, products or services you like, reviews you submit, or where you shop.	• Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Other customers that may provide us with your information to recommend a product or service, ship products to you, or list you as a recipient of products or services. • Companies that provide services on our behalf (e.g., installers). • Security and fraud prevention services that help us confirm that transactions are valid and otherwise help us protect our assets and you. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information.	• Fulfilling orders and processing returns. • Customer care. • Administering contests and promotions. • Registering you for a website or program. • Communicating with you. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection.	
Home Depot Privacy & Security Statement, https://www.homedepot.com/privacy/privacy-and-security-statement			
In populating search results, Home Depot’s search engine recognizes that a shopper has a need for a next product and recommends that product to them.			

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The audience segmentation work that Villagomez's team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot's retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ As another example, Home Depot looks at whether the user's need has been met from their interaction history and recommends an item to the user based on whether that need has been met.
--	---

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

10[e]. based at least in part on the determination that the need relative to the first category has been met, determine an indication of interest in a second category, wherein the indication of interest in the first category and the indication of interest in the second category comprise a sequence of related indications of interest;	The Accused Instrumentalities, based at least in part on the determination that the need relative to the first category has been met, determine an indication of interest in a second category, wherein the indication of interest in the first category and the indication of interest in the second category comprise a sequence of related indications of interest. For example, Home Depot determines an indication of interest in a second category using a set of search queries. For example, if a need for a patio item has been met (past searches), the interest in a second category of five-foot downrod outdoor ceiling fans will be related. With terabytes of historic data to work with, Qu's vector search engine is able to discover hidden connections among products, such as sloped ceilings, ceiling fans, and downrods. So when a would-be customer who needs to pair their ceiling fan purchase with a downrod of a certain type and length executes their search, the engine will return more relevant results.
---	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings.

“I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge,” Qu says. “We’ve really removed the friction of asking the customer to specify ‘I need this five-foot downrod outdoor ceiling fan specifically.’”

Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022.
<https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/>

As another example, the Shalaby paper shows that Home Depot attempts to maximize the probability of the user’s next interaction in a session, which would necessarily be based on a prior item’s needs being met. The interest in the first and second categories will be related by, for example, a probability formula such as formula (1) shown below.

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9, Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574 <https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

10[f]. in response to determining that the need relative to the first category has been met, determine a second quality level associated with the user, wherein the second quality level is determined with respect to the first category;	The Accused Instrumentalities, in response to determining that the need relative to the first category has been met, determine a second quality level associated with the user, wherein the second quality level is determined with respect to the first category. For example, Home Depot determines a second quality level associated with the user considering a need relative to a first category has been met using determined customer intent, which includes product category and purchase history. This is used to determine a second quality level to respond to further searches to present “the right product for the right customer at the right time,” “when they need it.” The audience segmentation work that Villagomez’s team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot’s retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right vendor for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/
---	--

Intent Search: A Smarter Platform Delivering Smarter Results

Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar.

That's why our team focuses on the *intent* of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time.

The Home Depot Introduces Improved Search For All. April 19, 2022.

<https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all>

Personalization: The Next Frontier

In addition to building accurate, lightning-fast search results, we're also creating a personalized search experience for customers. Our technology team has built our online channels to consider location, past searches, personalized deal and guide recommendations when populating search results.

The Home Depot Introduces Improved Search For All. April 19, 2022.

<https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all>

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings. “I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge,” Qu says. “We’ve really removed the friction of asking the customer to specify ‘I need this five-foot downrod outdoor ceiling fan specifically.’” Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022. https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/
--	---

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

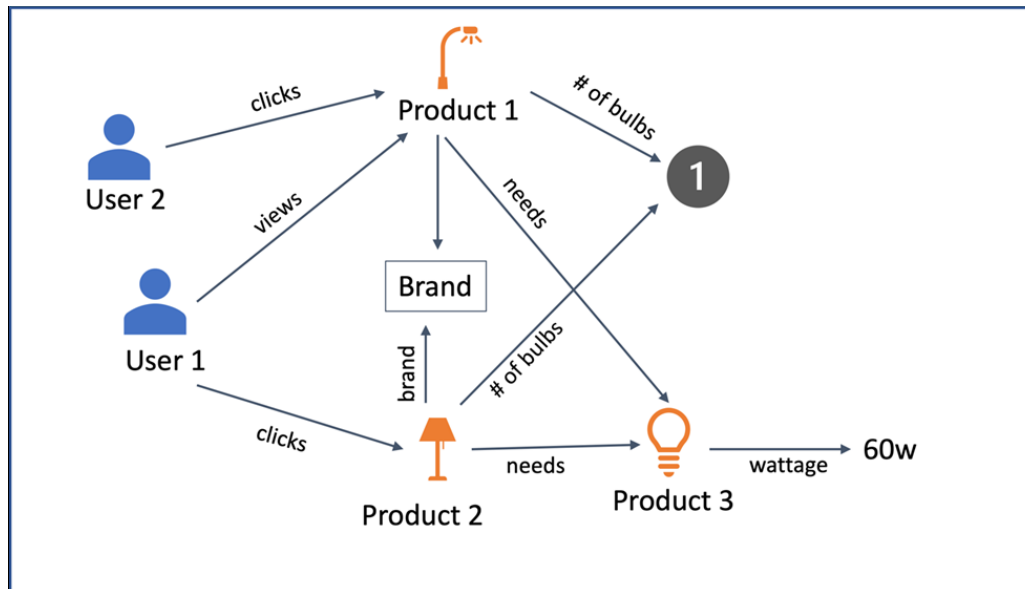
where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations", RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

As another example, Home Depot may recommend a lightbulb to a user if their need for a lamp has been met.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402



We can observe that the interactions between users, products and their attributes are easier to visualize when represented as a 3-dimensional graph. It becomes intuitive to recommend Product 3 to User1 and User 2 even though both users have not interacted with Product 3, since the relationship between Product 1, Product 2 and Product 3 becomes more easily discoverable through this graph.

Balaji, Janani, Data Science Manager, The Home Depot. Knowledge Graphs in E-Commerce.
<https://roundtable.datascience.salon/knowledge-graphs-in-e-commerce>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

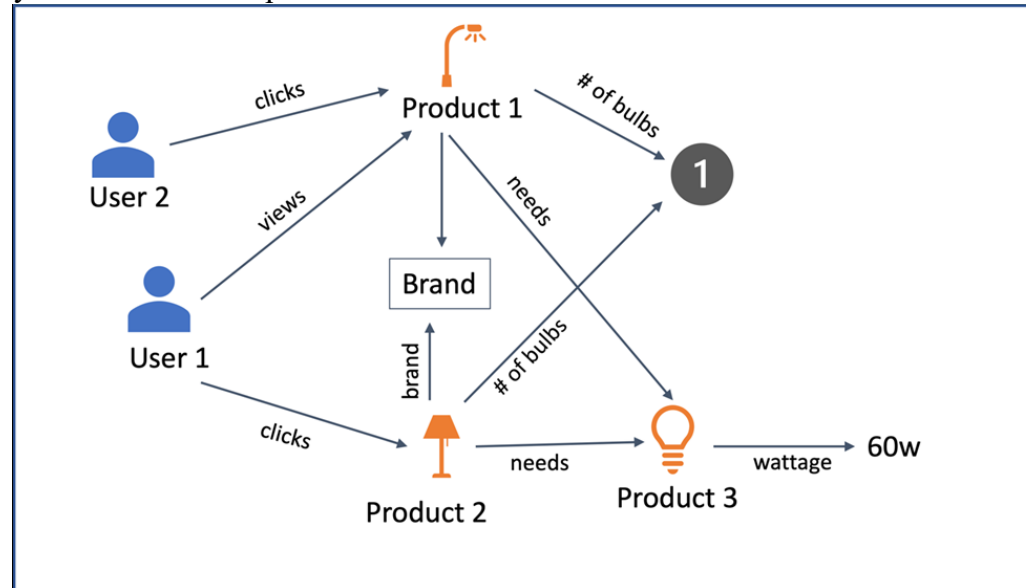
10[g]. wherein at least one of the first quality level or the second quality level is based at least in part on a conversion assessment associated with the user profile, and wherein the conversion assessment is based at least in part on historical click behavior; and	The Accused Instrumentalities base at least one of the first quality level or the second quality level at least in part on a conversion assessment associated with the user profile, and wherein the conversion assessment is based at least in part on historical click behavior. For example, Home Depot's quality levels are based at least in part on a conversion assessment associated with the user profile, which is based at least in part on historical click behavior. For example, Shalaby et al. explains that Home Depot tracks "the items a user interacted within that session." In order to maximize the probability of interacting with the next item (a conversion assessment). 3 METHODOLOGY Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as: $p(I_n \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$ where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n. As in previous works [9,
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574 https://dl.acm.org/doi/pdf/10.1145/3523227.3551477 The M2TRec algorithm in Shalaby et al. is compared against two common algorithms which recommend the user’s most frequent past sessions’ categories and the top items based on all metadata. Predicting next item’s category: One of the main objectives of this research is to develop a scalable architecture that serves both item and category recommendations in one model using an efficient MTL regime. We found significant performance gains when jointly training our model to predict next item and its categories at different levels of the catalog taxonomy (see ablation study below). We demonstrate the efficacy of training our SBRS to predict next category over deriving it from session items by comparing the category prediction performance against two heuristics: (1) Personalized top-N Frequent: This simple heuristic uses past session items’ categories and recommends the most frequent ones, and (2) Top-N Predicted: This simple strategy works by first predicting top-N next items from a metadata-aware single task model called MeTRec (see ablation study below), and then uses their categories as recommendations such that the category of the top-ranked next item will be ranked first and so on. Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 576 https://dl.acm.org/doi/pdf/10.1145/3523227.3551477
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

As another example, Home Depot may recommend a lightbulb to a user if their need for a lamp has been met, which is explicitly based on a user's prior clicks.



We can observe that the interactions between users, products and their attributes are easier to visualize when represented as a 3-dimensional graph. It becomes intuitive to recommend Product 3 to User1 and User 2 even though both users have not interacted with Product 3, since the relationship between Product 1, Product 2 and Product 3 becomes more easily discoverable through this graph.

Balaji, Janani, Data Science Manager, The Home Depot. Knowledge Graphs in E-Commerce.
<https://roundtable.datascience.salon/knowledge-graphs-in-e-commerce>

Home Depot's privacy policy confirms that it saves users' interaction with Home Depot's website.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Internet Activity What Information Does This Include? Browsing history, search history, information about your interaction with our websites, applications, electronic communications, or advertisements, and information about your activities when using our in-store WiFi. Session replay software may be used to record and replay your interaction. Where Do We Collect It From? • Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information. • Social media platforms. • Advertising companies and content publishers that present you with our ads. Why Do We Collect and Disclose It? • Fulfilling orders and processing returns. • Customer care. • Communicating with you. • Administering contests and promotions. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection. https://www.homedepot.com/privacy/privacy-and-security-statement Home Depot also uses Google Cloud to analyze its clickstream data.
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	While THD's legacy data warehouse contained 450 terabytes of data, the BigQuery enterprise data warehouse has over 15 petabytes. That means better decision-making by utilizing new datasets like website clickstream data and by analyzing additional years of data. The Home Depot: Helping Doers Get More Done Through a Data-Driven Approach. Available at https://cloud.google.com/customers/the-home-depot Home Depot advertises that its conversion numbers are improved by Retail Media+, including through placements “in-grid” (search) and “in carousel.” Reach customers through ads on The Home Depot owned channels, including placements in-grid and in carousel for sponsored products, top of page banners and customized email sends. Users spent 10% more time on homedepot.com when engaged with Retail Media+ products Users were 26% more likely to convert when engaged with Retail Media+ products Users spent 28% more \$ per visit when engaged with Retail Media+ products https://www.homedepot.com/c/Retail_Media_Advertising_Solutions An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
10[h]. display an advertisement to the user based at least in part on at	The Accused Instrumentalities display an advertisement to the user based at least in part on at least one of the first quality level or the second quality level. For example, Home Depot displays advertisements to users through its Retail Media+ system, including through placements “in-grid” (search) and “in carousel.”

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

least one of the first quality level or the second quality level; and a memory coupled to the processor and configured to provide the processor with instructions.	Reach customers through ads on The Home Depot owned channels, including placements in-grid and in carousel for sponsored products, top of page banners and customized email sends. Users spent 10% more time on homedepot.com when engaged with Retail Media+ products Users were 26% more likely to convert when engaged with Retail Media+ products Users spent 28% more \$ per visit when engaged with Retail Media+ products https://www.homedepot.com/c/Retail_Media_Advertising_Solutions Retail Media+ includes the Home Depot search engine. The audience segmentation work that Villagomez's team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot's retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right vendor for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/
---	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	As described above, a user's first and second quality level are based on user behavior including search and interaction history. Intent Search: A Smarter Platform Delivering Smarter Results Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar. That's why our team focuses on the <i>intent</i> of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time. The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all For example, Shalaby et al. explains that Home Depot tracks "the items a user interacted within that session." In order to maximize the probability of interacting with the next item (a conversion assessment).
--	---

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

As described above, Home Depot determines a first or second quality level in order to present “the right product for the right customer at the right time,” “when they need it.”

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The audience segmentation work that Villagomez’s team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot’s retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
11. The system recited in claim 10, wherein the second quality level is determined	The Accused Instrumentalities comprise the system of claim 1, wherein the second quality level is determined with respect to the second category. Plaintiff integrates the evidence used with respect to claim 2. An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

with respect to the second category.	infringement contentions once such information is made available to Plaintiff.
12. The system recited in claim 10, wherein at least one of the first quality level or the second quality level is based at least in part on an assessment of a purchase likelihood associated with the user profile.	The Accused Instrumentalities comprise the system of claim 10, wherein at least one of the first quality level or the second quality level is based at least in part on an assessment of a purchase likelihood associated with the user profile. Plaintiff integrates the evidence used with respect to claim 3. An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
13. The system recited in claim 12, wherein the purchase likelihood is determined relative to the advertisement.	The Accused Instrumentalities comprise the system of claim 12, wherein the purchase likelihood is determined relative to the advertisement. Plaintiff integrates the evidence used with respect to claim 4. An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

14. The system recited in claim 10, wherein at least one of the first quality level or the second quality level is determined at least in part by using machine learning.	The Accused Instrumentalities comprise the system of claim 10, wherein at least one of the first quality level or the second quality level is determined at least in part by using machine learning. Plaintiff integrates the evidence used with respect to claim 5. An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
15. The system recited in claim 10, wherein at least one of the first quality level or the second quality level is determined with respect to the advertisement.	The Accused Instrumentalities comprise the system of claim 10, wherein at least one of the first quality level or the second quality level is determined with respect to the advertisement. Plaintiff integrates the evidence used with respect to claim 6. An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
17. The system recited in claim 10, wherein the event	The Accused Instrumentalities comprise the system of claim 10, wherein the event comprises a conversion. Plaintiff integrates the evidence used with respect to claim 8. An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

comprises a conversion.	Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
18. The system recited in claim 10, wherein the event comprises a purchase.	The Accused Instrumentalities comprise the system of claim 10, wherein the event comprises a purchase. Plaintiff integrates the evidence used with respect to claim 8. An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
19[pre]. A computer program product embodied in a non-transitory computer readable storage medium and comprising computer instructions for:	To the extent the preamble is limiting, the Accused Instrumentalities comprise a computer program product embodied in a non-transitory computer readable storage medium and comprising computer instructions which uses advanced second-price auction for Home Depot advertising. Home Depot advertises that Retail Media+ allows advertisers to “connect your brand to our customers.” CONNECT YOUR BRAND TO OUR CUSTOMERS Proven advertising solutions to help grow your business. Learn More  Retail Media+. Available at https://www.homedepot.com/c/Retail_Media_Advertising_Solutions

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

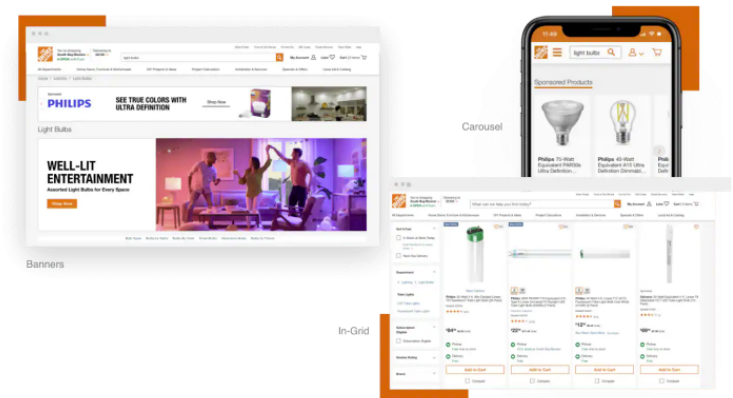
Reach

Advertising with The Home Depot means reaching our 198M individual customers online and in our 2,322 stores. Our website attracts 3.6 billion visits each year. Retail Media+ allows you to connect your brand to our customers.

Retail Media+. Available at https://www.homedepot.com/c/Retail_Media_Advertising_Solutions

Home Depot offers ad placements “on The Home Depot owned channels, including placements in-grid and in carousels for sponsored products, top of page banners, and customized email sends.”

Onsite Advertising Ad Units [Get Started](#)



Reach customers through ads on The Home Depot owned channels, including placements in-grid and in carousel for sponsored products, top of page banners and customized email sends.

Users spent 10% more time on homedepot.com when engaged with Retail Media+ products

Users were 26% more likely to convert when engaged with Retail Media+ products

Users spent 28% more \$ per visit when engaged with Retail Media+ products

Retail Media+. Available at https://www.homedepot.com/c/Retail_Media_Advertising_Solutions

Home Depot describes that Retail Media+ “tracks customer interest via our website.”

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

About Retail Media+

The Home Depot Retail Media network offers businesses like yours the opportunity to connect with consumers like never before. Regardless of your budget, we have a solution to meet your marketing needs. Choose one of our advertising offerings or mix and match to find what is right for your company and your specific products. The Home Depot advertising department leverages a myriad of online and offline channels to spread awareness of your brand and promote your products. From email advertising to social media branded marketing, these solutions are designed to propel your business and help increase sales. The Home Depot's advertising center tracks customer interest via our website, enabling us to promote your brand through retargeted ads and other off-site channels to keep your products top of mind. Retail advertising is key to setting yourself apart from competitors in an ever-changing market.

EXPAND YOUR REACH

Reach more customers using our ad center with The Home Depot Retail Media, which provides visibility for 198 million individual customers. Our advertising efforts aided in massive digital growth over the past few years, which benefits partners like you. Retail Media offers both self-service and custom capabilities to suit your advertising needs.

Creating an omni-channel experience for customers to interact with your brand is the mission of Retail Media. You can grow your business by harnessing the power of The Home Depot advertising across multiple channels that are proven to engage potential customers. A few examples of successful branded marketing tactics include email, onsite and offsite advertising. Looking to maximize your campaigns? You can do it all.

Retail Media+. Available at https://www.homedepot.com/c/Retail_Media_Advertising_Solutions

In interviews, Home Depot describes that Retail Media+ operates “on-site,” “off-site,” and “offline.”

AdExchanger: What inventory does The Home Depot have in the retail media platform?

MELANIE BABCOCK: The media comes in three buckets. We have, of course, our own properties, which could be either email, in-app or websites, which we refer to as “on-site.” And we have an equally healthy business off-site, with media partners like Meta, Google and Pinterest, as well as programmatic partners. Third, we have in-store placements, which we call “offline.”

The Home Depot's Path To Becoming A Global Advertising Player. James Hercher. April 13, 2023. Available at <https://www.adexchanger.com/commerce/the-home-depots-path-to-becoming-a-global-advertising-player/>

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Retail Media+ includes the Home Depot search engine. The audience segmentation work that Villagomez’s team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot’s retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ Third parties recognize the benefit of Retail Media+. For example, psfk.com writes that Home Depot uses Retail Media+ to “drive products that are mutually beneficial to Home Depot and its shoppers.”
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Retail Media+ from the Home Depot is a full-service advertising and media network solution to help the brand's third-party vendors drive sales and promote products that are mutually beneficial to Home Depot and its shoppers.

Home Depot Turns Ecosystem Touchpoints Into Vendor Media Network, June 19, 2022. Available at <https://www.psfk.com/2022/06/home-depot-turns-ecosystem-touchpoints-into-vendor-media-network.html>

Similarly, moloco.com notes that Retail Media+ offers a “robust range of sponsored content promotions,” including through searches.

Home Depot Retail Media+

Home Depot offers a robust range of sponsored content promotions under “Retail Media+” — a program that supports onsite and offsite ad placements. Any advertiser looking to promote a new product will have access to three kinds of onsite sponsorships:

- **Search grid:** Traditional sponsored result listings that align with relevant keywords.
- **Carousel:** A display wheel of sponsored products that relate to customer searches.
- **Banner:** A top-of-page ad placement that uses imagery to stand out from search results.

Home Depot also helps advertisers supplement their sponsored content with offsite placements and retargeting options. For example, if a customer views a product during a search, brands can deploy follow-up ads for the item to associated social media feeds and email addresses. This grants advertisers a larger perspective of the buyer's journey, helping advertisers optimize their efforts beyond sponsored promotions and keywords.

What are sponsored results & how do they work? December 3, 2021. Available at <https://www.moloco.com/blog/sponsored-results>

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
19[a]. determining a first quality level associated with a user profile, wherein the first quality level is based at least in part on an estimate of a likelihood of an event, wherein the first quality level is determined based at least in part on at least one of: (1) a first search associated with the user profile or (2) a first purchase associated with the user profile, and	The Accused Instrumentalities determine a first quality level associated with a user profile, wherein the first quality level is based at least in part on an estimate of a likelihood of an event, wherein the first quality level is determined based at least in part on at least one of: (1) a first search associated with the user profile or (2) a first purchase associated with the user profile, and wherein the determining of the first quality level is based at least in part on a unique identifier and clustering. Home Depot determines a first quality level, such as, for example, the likelihood of a user's interaction with a recommendation. Home Depot publishes the recommendation algorithms it uses on its data in, for example, the Association for Computing Machinery (ACM). M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations Walid Shalaby walid_shalaby@homedepot.com The Home Depot Atlanta, Georgia, USA Sejoon Oh soh337@gatech.edu Georgia Institute of Technology Atlanta, Georgia, USA Amir Afsharinejad amir_afsharinejad@homedepot.com The Home Depot Atlanta, Georgia, USA Srijan Kumar srijan@gatech.edu Georgia Institute of Technology Atlanta, Georgia, USA Xiquan Cui xiquan_cui@homedepot.com The Home Depot Atlanta, Georgia, USA Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations", RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 573. Available at https://dl.acm.org/doi/pdf/10.1145/3523227.3551477 In the Shalaby et al. paper, Home Depot bases the first quality level at least in part on an estimate of a likelihood of an event, such as a "click" or an "add-to-cart" event.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

wherein the determining of the first quality level is based at least in part on a unique identifier and clustering;	Session-based recommender systems (SBRs) accurately model sequential and evolving preferences of users from their session data (e.g., clicks and add-to-cart events). Session data can be associated with item metadata, allowing SBRs to capture item dependencies at the attribute level within the session. However, most of the existing SBRs take the IDs of users and items as the main input source to learn session contexts and produce next item recommendations [13, 14, 40]. Recent hybrid models demonstrated improved performance when combining item embeddings and their attributes to be used as additional side information [5, 10, 27, 31, 32, 32, 38]. Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 573. Available at https://dl.acm.org/doi/pdf/10.1145/3523227.3551477 In the Shalaby et al. paper, Home Depot also describes that its objective is to “maximize the prediction probability of the next item the user is most likely to interact with.”
--	---

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations", RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

Home Depot bases the first quality level at least in part on a first search associated with the user profile. For example, Retail Media+ uses a search as one input to provide a product (and vendor) to a customer.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The audience segmentation work that Villagomez’s team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot’s retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ Home Depot also advertises that it uses “past searches” when populating search results. Personalization: The Next Frontier In addition to building accurate, lightning-fast search results, we’re also creating a personalized search experience for customers. Our technology team has built our online channels to consider location, past searches, personalized deal and guide recommendations when populating search results. The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Home Depot also advertises that it uses “ongoing search data” when showing results to customers. Intent Search: A Smarter Platform Delivering Smarter Results Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar. That’s why our team focuses on the <i>intent</i> of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, “weed whacker” vs. “string trimmer”). Plus, <u>our learning algorithm uses ongoing search data</u> to more accurately show customers exactly what they're looking for the first time. The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all Home Depot also uses search history (“including past searches”) through its “vector search engine.”
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings. “I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge,” Qu says. “We’ve really removed the friction of asking the customer to specify ‘I need this five-foot downrod outdoor ceiling fan specifically.’” Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022. https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/ Home Depot bases the first quality level at least in part on a first purchase associated with the user profile. For example, Home Depot describes that they collect information when a customer “[makes] an online purchase.”
--	---

How Do We Collect Information?

There are 3 ways we collect your information:

We collect information directly from you. You provide us with your information when you visit our stores, register for an account, **make an online purchase** or rent equipment.

We collect information from you passively. We use tools like cookies to collect information when you use our websites or interact with our emails.

We collect information from affiliates and third parties. This includes shipping companies, installers, service providers, social media platforms, and more.

Privacy & Security at a Glance. Available at <https://www.homedepot.com/privacy/privacy-and-security-at-a-glance>

Home Depot uses this collected purchase information to, among other things, “[recommend] products.”

How Do We Use Information?

We use your information to improve your experience, process your information, and keep things running smoothly.

We provide you with products, including order fulfillment, contest or sweepstakes entries, registration, returns, and product reviews.

We improve our business, products, and services, including optimizing our websites and apps and improving store layouts and purchasing experiences.

We personalize your experience, including recommending products and updating inventory to match demand.

We monitor for fraud and asset protection purposes, including processing and tracking returns and confirming the identity of customers renting tools and equipment.

We advertise to you, including supporting targeted advertising for select third parties and sending you promotions, newsletters, and information from other select companies we think you might find interesting.

Privacy & Security at a Glance. Available at <https://www.homedepot.com/privacy/privacy-and-security-at-a-glance>

Home Depot bases the first quality level at least in part on a unique identifier. For example, Home Depot associates unique identifiers with users as evidenced by their login identifier, such as an email address or other identifying information.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402



Sign In or Create an Account

[< Back](#)

First, enter your email address

Email Address

Continue

Don't Have an Account?

Create an Account

By selecting 'Sign In' you are agreeing to the Pro Xtra Terms and Conditions, Privacy and Security Statement, Notice of Financial Incentive & My Account Terms and Conditions. For Two-Factor Authentication, message and data rates may apply.

Sign In or Create an Account, Home Depot. <https://www.homedepot.com/auth/view/signin>

After a user inputs their email address and password, web traffic shows that the user is associated with both an “svocCustomerAccountId” and a “userId.”

THD_USER	"eyJjdXN0b21lcIR5cG...	.homedepot.com
----------	------------------------	----------------

[Traffic capture of a user ID token used to identify a user on the Home Depot website after login]

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Decoded EDIT THE PAYLOAD AND SECRET HEADER: ALGORITHM & TOKEN TYPE <pre>{ "customerType": "B2C", "svocCustomerId": "0514A[REDACTED]", "logonId": "j[REDACTED].com", "userId": "0514A[REDACTED]" }</pre> [Traffic capture of a user ID token used to identify a user on the Home Depot website after login] As another example, Home Depot discloses that it uses a unique identifier to identify users in its privacy policy.
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The tracking tools we use include: Browser and flash cookies, which send text files to your computer or device to identify your browser or store information and settings. Server logs, which record information about your device, browser, or operating system. Web beacons and pixels, which collect information about how you interact with content. Application software, which collects information about how you interact with our apps. We use these tools to: Identify new users and recognize returning customers Understand how you accessed our digital services and keep you logged in Personalize your experience Identify your location Optimize our websites and apps Make product recommendations and provide advertising content Better understand our audiences and customers Provide correct pricing and ads for your local store Privacy & Security at a Glance. Available at https://www.homedepot.com/privacy/privacy-and-security-at-a-glance Home Depot bases the first quality level at least in part on a unique identifier and clustering. Home Depot has developed techniques such as session-based recommender systems to estimate the likelihood of an event such as a product click by recommending the most relevant item based on a user's unique ID.
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Session-based recommender systems (SBRs) accurately model sequential and evolving preferences of users from their session data (e.g., clicks and add-to-cart events). Session data can be associated with item metadata, allowing SBRs to capture item dependencies at the attribute level within the session. However, most of the existing SBRs take the IDs of users and items as the main input source to learn session contexts and produce next item recommendations [13, 14, 40]. Recent hybrid models demonstrated improved performance when combining item embeddings and their attributes to be used as additional side information [5, 10, 27, 31, 32, 32, 38].

Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations", RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 573. Available at <https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations", RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

19[b]. determining, for a user associated with the user profile, an indication of interest in a first category, wherein the indication of interest in the first category is determined based at least in part on at least one of: (1) a second search associated with the user profile or (2) a second purchase associated with the user profile;	The Accused Instrumentalities determine, for a user associated with the user profile, an indication of interest in a first category, wherein the indication of interest in the first category is determined based at least in part on at least one of: (1) a second search associated with the user profile or (2) a second purchase associated with the user profile. For example, Home Depot's session-based search recommendation algorithm determines customer intent (interest) in a category based on at least in part a previous search (a second search associated with the user profile) and purchase history (a second purchase associated with the user profile), among other things. 3 METHODOLOGY Next Item Prediction: We denote a user session $S = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session S, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in S. Formally, the probability of the target item I_n can be formulated as: $p(I_n S_{[I_{<n}]}; \theta) \quad (1)$ where θ denotes the model parameters and $S_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n. As in previous works [9, Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations", RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 574
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

For example, Home Depot determines customer intent based on at least in part past user searches to provide search results.

The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings.

“I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge,” Qu says. “We’ve really removed the friction of asking the customer to specify ‘I need this five-foot downrod outdoor ceiling fan specifically.’”

Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022.
<https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/>

Home Depot also determines customer intent based on at least in part past purchases.

	How Do We Collect Information? There are 3 ways we collect your information: We collect information directly from you. You provide us with your information when you visit our stores, register for an account, make an online purchase or rent equipment. We collect information from you passively. We use tools like cookies to collect information when you use our websites or interact with our emails. We collect information from affiliates and third parties. This includes shipping companies, installers, service providers, social media platforms, and more. Privacy & Security at a Glance. Available at https://www.homedepot.com/privacy/privacy-and-security-at-a-glance
--	---

	How Do We Use Information? We use your information to improve your experience, process your information, and keep things running smoothly. We provide you with products, including order fulfillment, contest or sweepstakes entries, registration, returns, and product reviews. We improve our business, products, and services, including optimizing our websites and apps and improving store layouts and purchasing experiences. We personalize your experience, including recommending products and updating inventory to match demand. We monitor for fraud and asset protection purposes, including processing and tracking returns and confirming the identity of customers renting tools and equipment. We advertise to you, including supporting targeted advertising for select third parties and sending you promotions, newsletters, and information from other select companies we think you might find interesting. Privacy & Security at a Glance. Available at https://www.homedepot.com/privacy/privacy-and-security-at-a-glance This is shown, for example, by the type of information that Home Depot collects, evidenced by the Home Depot Privacy & Security Statement:
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Internet Activity What Information Does This Include? Browsing history, search history, information about your interaction with our websites, applications, electronic communications, or advertisements, and information about your activities when using our in-store WiFi. Session replay software may be used to record and replay your interaction. Where Do We Collect It From? • Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information. • Social media platforms. • Advertising companies and content publishers that present you with our ads. Why Do We Collect and Disclose It? • Fulfilling orders and processing returns. • Customer care. • Communicating with you. • Administering contests and promotions. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection. https://www.homedepot.com/privacy/privacy-and-security-statement
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Commercial Information			
What Information Does This Include?	Where Do We Collect It From?	Why Do We Collect and Disclose It?	
Products or services purchased, purchasing history, products or services you like, reviews you submit, or where you shop.	• Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Other customers that may provide us with your information to recommend a product or service, ship products to you, or list you as a recipient of products or services. • Companies that provide services on our behalf (e.g., installers). • Security and fraud prevention services that help us confirm that transactions are valid and otherwise help us protect our assets and you. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information.	• Fulfilling orders and processing returns. • Customer care. • Administering contests and promotions. • Registering you for a website or program. • Communicating with you. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection.	
https://www.homedepot.com/privacy/privacy-and-security-statement			
An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused			

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
19[c]. storing, in a record associated with the user, the indication of interest in the first category;	The Accused Instrumentalities store, in a record associated with the user, the indication of interest in the first category. For example, Home Depot saves indications of interest in a first category through the user's browsing history, search history, interaction with Home Depot's website, purchase history, liked products, and reviews.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Internet Activity What Information Does This Include? Browsing history, search history, information about your interaction with our websites, applications, electronic communications, or advertisements, and information about your activities when using our in-store WiFi. Session replay software may be used to record and replay your interaction. Where Do We Collect It From? • Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information. • Social media platforms. • Advertising companies and content publishers that present you with our ads. Why Do We Collect and Disclose It? • Fulfilling orders and processing returns. • Customer care. • Communicating with you. • Administering contests and promotions. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection. https://www.homedepot.com/privacy/privacy-and-security-statement
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Commercial Information			
What Information Does This Include?	Where Do We Collect It From?	Why Do We Collect and Disclose It?	
Products or services purchased, purchasing history, products or services you like, reviews you submit, or where you shop.	• Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Other customers that may provide us with your information to recommend a product or service, ship products to you, or list you as a recipient of products or services. • Companies that provide services on our behalf (e.g., installers). • Security and fraud prevention services that help us confirm that transactions are valid and otherwise help us protect our assets and you. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information.	• Fulfilling orders and processing returns. • Customer care. • Administering contests and promotions. • Registering you for a website or program. • Communicating with you. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection.	
https://www.homedepot.com/privacy/privacy-and-security-statement			
Home Depot uses this indication of interest in a category (“the history of what we know about a customer”) to			

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	store, for example, a user's interest in outdoor ceiling fans. The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings. "I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge," Qu says. "We've really removed the friction of asking the customer to specify 'I need this five-foot downrod outdoor ceiling fan specifically.'" Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022. https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/ Home Depot describes a user's indication of interest, for example, as a user's "intent."
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Intent Search: A Smarter Platform Delivering Smarter Results Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar. That's why our team focuses on the <i>intent</i> of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time. The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all The indication of interest from the sequence of items a user interacted with is also stored.
--	---

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

19[d]. subsequent to determining the indication of interest in the first category, determining, for the user, that a need relative to the first category has been met based at least in part on at least one of: (1) a third search associated with the user profile or (2) a third purchase associated with the user profile;	The Accused Instrumentalities, subsequent to determining the indication of interest in the first category, determine, for the user, that a need relative to the first category has been met based at least in part on at least one of: (1) a third search associated with the user profile or (2) a third purchase associated with the user profile. Home Depot determines whether a need relative to the first category has been met as part of optimizing search and ad results taking into customer intent including search queries and purchase history. Home Depot uses sequences of events including search history in the determination. Intent Search: A Smarter Platform Delivering Smarter Results Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar. That's why our team focuses on the <i>intent</i> of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time. The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all
---	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Personalization: The Next Frontier In addition to building accurate, lightning-fast search results, we're also creating a personalized search experience for customers. Our technology team has built our online channels to consider location, past searches, personalized deal and guide recommendations when populating search results. This is especially helpful for customers in specific trade professions, such as an electrician searching for “pliers,” which the app will properly search for as “electrician’s pliers.” The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all Home Depot also uses a user’s purchase history to determine whether their need relative to the first category has been met.
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

Commercial Information			
What Information Does This Include?	Where Do We Collect It From?	Why Do We Collect and Disclose It?	
Products or services purchased, purchasing history, products or services you like, reviews you submit, or where you shop.	• Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Other customers that may provide us with your information to recommend a product or service, ship products to you, or list you as a recipient of products or services. • Companies that provide services on our behalf (e.g., installers). • Security and fraud prevention services that help us confirm that transactions are valid and otherwise help us protect our assets and you. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information.	• Fulfilling orders and processing returns. • Customer care. • Administering contests and promotions. • Registering you for a website or program. • Communicating with you. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection.	
Home Depot Privacy & Security Statement, https://www.homedepot.com/privacy/privacy-and-security-statement			
In populating search results, Home Depot’s search engine recognizes that a shopper has a need for a next product and recommends that product to them.			

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The audience segmentation work that Villagomez's team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot's retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ As another example, Home Depot looks at whether the user's need has been met from their interaction history and recommends an item to the user based on whether that need has been met.
--	---

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

19[e]. based at least in part on the determination that the need relative to the first category has been met, determining an indication of interest in a second category wherein the indication of interest in the first category and the indication of interest in the second category comprise a sequence of related indications of interest;	The Accused Instrumentalities, based at least in part on the determination that the need relative to the first category has been met, determine an indication of interest in a second category, wherein the indication of interest in the first category and the indication of interest in the second category comprise a sequence of related indications of interest. For example, Home Depot determines an indication of interest in a second category using a set of search queries. For example, if a need for a patio item has been met (past searches), the interest in a second category of five-foot downrod outdoor ceiling fans will be related. With terabytes of historic data to work with, Qu's vector search engine is able to discover hidden connections among products, such as sloped ceilings, ceiling fans, and downrods. So when a would-be customer who needs to pair their ceiling fan purchase with a downrod of a certain type and length executes their search, the engine will return more relevant results.
--	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings.

“I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge,” Qu says. “We’ve really removed the friction of asking the customer to specify ‘I need this five-foot downrod outdoor ceiling fan specifically.’”

Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022.
<https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/>

As another example, the Shalaby paper shows that Home Depot attempts to maximize the probability of the user’s next interaction in a session, which would necessarily be based on a prior item’s needs being met. The interest in the first and second categories will be related by, for example, a probability formula such as formula (1) shown below.

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9, Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574 <https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

19[f]. in response to determining that the need relative to the first category has been met, determining a second quality level associated with the user, wherein the second quality level is determined with respect to the first category;	The Accused Instrumentalities, in response to determining that the need relative to the first category has been met, determine a second quality level associated with the user, wherein the second quality level is determined with respect to the first category. For example, Home Depot determines a second quality level associated with the user considering a need relative to a first category has been met using determined customer intent, which includes product category and purchase history. This is used to determine a second quality level to respond to further searches to present “the right product for the right customer at the right time,” “when they need it.” The audience segmentation work that Villagomez’s team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot’s retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right vendor for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/
---	--

Intent Search: A Smarter Platform Delivering Smarter Results

Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar.

That's why our team focuses on the *intent* of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time.

The Home Depot Introduces Improved Search For All. April 19, 2022.

<https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all>

Personalization: The Next Frontier

In addition to building accurate, lightning-fast search results, we're also creating a personalized search experience for customers. Our technology team has built our online channels to consider location, past searches, personalized deal and guide recommendations when populating search results.

The Home Depot Introduces Improved Search For All. April 19, 2022.

<https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all>

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The vector search also has the capability to bring other information to bear on the problem, including past searches, Qu says. Perhaps Home Depot knows that a particular customer is in the middle of a patio renovation, which instantly narrows the search down to outdoor ceiling fans. And if at any point a sloped roof was mentioned in a search, the vector search engine knows to prioritize products associated with that, rather than fans designed to be installed against flat ceilings. “I would call it a combination of stitching the history of what we know about a customer and then connecting that with the product knowledge,” Qu says. “We’ve really removed the friction of asking the customer to specify ‘I need this five-foot downrod outdoor ceiling fan specifically.’” Home Depot Finds DIY Success with Vector Search. Alex Woodie. March 15, 2022. https://www.datanami.com/2022/03/15/home-depot-finds-diy-success-with-vector-search/
--	--

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

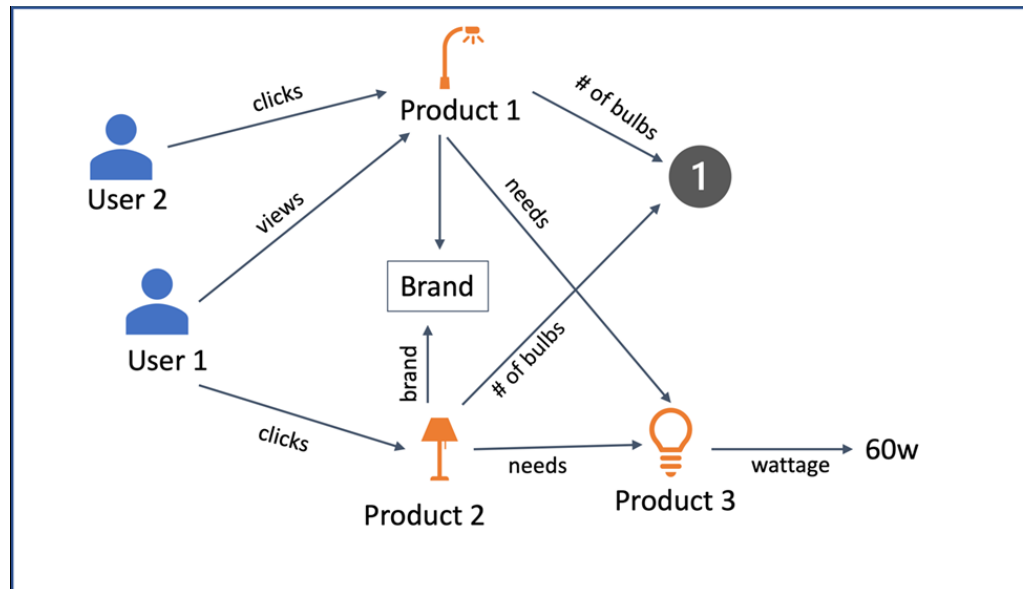
where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations", RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

As another example, Home Depot may recommend a lightbulb to a user if their need for a lamp has been met.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402



We can observe that the interactions between users, products and their attributes are easier to visualize when represented as a 3-dimensional graph. It becomes intuitive to recommend Product 3 to User1 and User 2 even though both users have not interacted with Product 3, since the relationship between Product 1, Product 2 and Product 3 becomes more easily discoverable through this graph.

Balaji, Janani, Data Science Manager, The Home Depot. Knowledge Graphs in E-Commerce.
<https://roundtable.datascience.salon/knowledge-graphs-in-e-commerce>

An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.

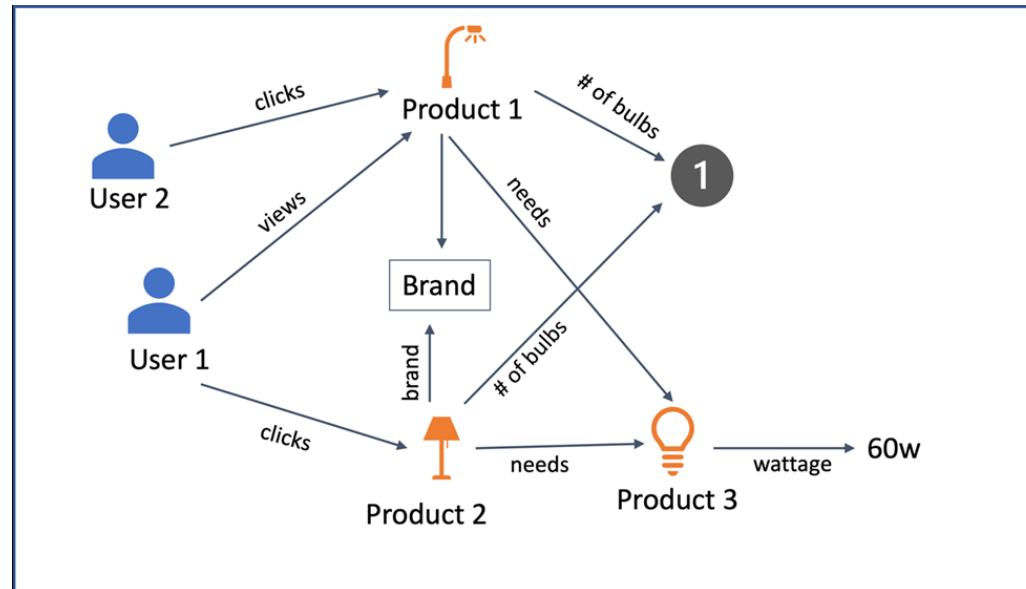
Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

19[g]. wherein at least one of the first quality level or the second quality level is based at least in part on a conversion assessment associated with the user profile, and wherein the conversion assessment is based at least in part on historical click behavior; and	The Accused Instrumentalities base at least one of the first quality level or the second quality level at least in part on a conversion assessment associated with the user profile, and wherein the conversion assessment is based at least in part on historical click behavior. For example, Shalaby et al. explains that Home Depot tracks “the items a user interacted within that session.” In order to maximize the probability of interacting with the next item (a conversion assessment). 3 METHODOLOGY Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as: $p(I_n \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$ where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n. As in previous works [9, Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574 https://dl.acm.org/doi/pdf/10.1145/3523227.3551477
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The M2TRec algorithm in Shalaby et al. is compared against two common algorithms which recommend the user's most frequent past sessions' categories and the top items based on all metadata. Predicting next item's category: One of the main objectives of this research is to develop a scalable architecture that serves both item and category recommendations in one model using an efficient MTL regime. We found significant performance gains when jointly training our model to predict next item and its categories at different levels of the catalog taxonomy (see ablation study below). We demonstrate the efficacy of training our SBRS to predict next category over deriving it from session items by comparing the category prediction performance against two heuristics: (1) <i>Personalized top-N Frequent:</i> This simple heuristic uses past session items' categories and recommends the most frequent ones, and (2) <i>Top-N Predicted:</i> This simple strategy works by first predicting top-N next items from a metadata-aware single task model called MeTRec (see ablation study below), and then uses their categories as recommendations such that the category of the top-ranked next item will be ranked first and so on. Shalaby et al., "M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations", RecSys '22, September 18–23, 2022, Seattle, WA, USA, p. 576 https://dl.acm.org/doi/pdf/10.1145/3523227.3551477 As another example, Home Depot may recommend a lightbulb to a user if their need for a lamp has been met, which is explicitly based on a user's prior clicks.
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402



We can observe that the interactions between users, products and their attributes are easier to visualize when represented as a 3-dimensional graph. It becomes intuitive to recommend Product 3 to User1 and User 2 even though both users have not interacted with Product 3, since the relationship between Product 1, Product 2 and Product 3 becomes more easily discoverable through this graph.

Balaji, Janani, Data Science Manager, The Home Depot. Knowledge Graphs in E-Commerce.
<https://roundtable.datascience.salon/knowledge-graphs-in-e-commerce>

Home Depot's privacy policy confirms that it saves users' interaction with Home Depot's website.

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	Internet Activity What Information Does This Include? Browsing history, search history, information about your interaction with our websites, applications, electronic communications, or advertisements, and information about your activities when using our in-store WiFi. Session replay software may be used to record and replay your interaction. Where Do We Collect It From? • Directly from you or the devices you use to access digital services, such as websites, mobile applications, and applications for connected devices. • Marketing companies that help us learn about our customers and the devices they use to access digital content. • Companies that supplement our customer records with additional information. • Social media platforms. • Advertising companies and content publishers that present you with our ads. Why Do We Collect and Disclose It? • Fulfilling orders and processing returns. • Customer care. • Communicating with you. • Administering contests and promotions. • Improving our products and services, including improving store layouts and digital content. • Learning about customer trends and interests. • Personalizing digital content. • Delivering marketing communications and advertising. • Identifying the devices you use to access digital content. • Fraud prevention, security, and asset protection. https://www.homedepot.com/privacy/privacy-and-security-statement Home Depot also uses Google Cloud to analyze its clickstream data.
--	--

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	While THD's legacy data warehouse contained 450 terabytes of data, the BigQuery enterprise data warehouse has over 15 petabytes. That means better decision-making by utilizing new datasets like website clickstream data and by analyzing additional years of data. The Home Depot: Helping Doers Get More Done Through a Data-Driven Approach. Available at https://cloud.google.com/customers/the-home-depot Home Depot advertises that its conversion numbers are improved by Retail Media+, including through placements “in-grid” (search) and “in carousel.” Reach customers through ads on The Home Depot owned channels, including placements in-grid and in carousel for sponsored products, top of page banners and customized email sends. Users spent 10% more time on homedepot.com when engaged with Retail Media+ products Users were 26% more likely to convert when engaged with Retail Media+ products Users spent 28% more \$ per visit when engaged with Retail Media+ products https://www.homedepot.com/c/Retail_Media_Advertising_Solutions An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
19[h]. displaying an advertisement to the user based at least in part on at	The Accused Instrumentalities display an advertisement to the user based at least in part on at least one of the first quality level or the second quality level. For example, Home Depot displays advertisements to users through its Retail Media+ system, including through placements “in-grid” (search) and “in carousel.”

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

least one of the first quality level or the second quality level.	Reach customers through ads on The Home Depot owned channels, including placements in-grid and in carousel for sponsored products, top of page banners and customized email sends. Users spent 10% more time on homedepot.com when engaged with Retail Media+ products Users were 26% more likely to convert when engaged with Retail Media+ products Users spent 28% more \$ per visit when engaged with Retail Media+ products https://www.homedepot.com/c/Retail_Media_Advertising_Solutions Retail Media+ includes the Home Depot search engine. The audience segmentation work that Villagomez's team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot's retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right vendor for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/
---	---

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	As described above, a user's first and second quality level are based on user behavior including search and interaction history. Intent Search: A Smarter Platform Delivering Smarter Results Not all search engines are created equal, especially when our customers bring various levels of home improvement knowledge to what they type into the search bar. That's why our team focuses on the <i>intent</i> of the person searching, rather than the actual words. This also solves any complications that could arise from geographic terminology differences (for example, "weed whacker" vs. "string trimmer"). Plus, our learning algorithm uses ongoing search data to more accurately show customers exactly what they're looking for the first time. The Home Depot Introduces Improved Search For All. April 19, 2022. https://corporate.homedepot.com/news/products/home-depot-introduces-improved-search-all For example, Shalaby et al. explains that Home Depot tracks "the items a user interacted within that session." In order to maximize the probability of interacting with the next item (a conversion assessment).
--	---

3 METHODOLOGY

Next Item Prediction: We denote a user session $\mathcal{S} = [I_1, I_2, I_3, \dots, I_n]$ as a sequence of items a user interacted within that session. Each item $I_k = \{A_{k,1}, A_{k,2}, A_{k,3}, \dots, A_{k,m}\}$ is described by a set of m attributes which could be context-specific or item-specific. In this work, we consider item-specific attributes only (e.g., title, description, category). Each attribute A could be either textual, categorical, or numerical. In the setting of session-based recommendations, we are given a session $\mathcal{S}$, and our objective is to maximize the prediction probability of the next item the user is most likely to interact with given all previous items in $\mathcal{S}$. Formally, the probability of the target item I_n can be formulated as:

$$p(I_n | \mathcal{S}_{[I_{<n}]}; \theta) \quad (1)$$

where θ denotes the model parameters and $\mathcal{S}_{[I_{<n}]}$ denotes the sequence of items prior to the target item I_n . As in previous works [9,

Shalaby et al., “M2TRec: Metadata-aware Multi-task Transformer for Large-scale and Cold-start free Session-based Recommendations”, RecSys ’22, September 18–23, 2022, Seattle, WA, USA, p. 574

<https://dl.acm.org/doi/pdf/10.1145/3523227.3551477>

As described above, Home Depot determines a first or second quality level in order to present “the right product for the right customer at the right time,” “when they need it.”

Exhibit 2 - Claim Chart for U.S. Patent No. 11,562,402

	The audience segmentation work that Villagomez’s team has done is immensely valuable to brands looking to reach specific consumer subsegments. Through The Home Depot’s retail media practice, Retail Media+, not only can the home improvement retailer suggest the right product for the right customer at the right time, but it can also suggest the right <i>vendor</i> for that product. Take a kitchen remodel, for example; the search engine recognizes the shopper needs a new faucet, and a vendor can purchase the right to display its particular faucet to that shopper right when they need it. This not only helps the vendor get their products in front of the right customers, but it also provides a seamless shopping experience, decreasing the time to find the right products to complete their projects. The Home Depot Doubles Down on Data Science. WIRED Brand Lab. Available at https://www.wired.com/sponsored/story/the-home-depot-doubles-down-on-data-science/ An analysis of source code may be necessary to fully and accurately describe the functionality of the Accused Instrumentalities with respect to this limitation and, accordingly, Plaintiff reserves the right to supplement these infringement contentions once such information is made available to Plaintiff.
--	---