UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

META PLATFORMS, INC.
Petitioner,

v.

IMMERSION CORPORATION
Patent Owner.

Case IPR2023-00946
U.S. Patent No. 9,727,217

EXHIBIT 2002

DECLARATION OF GREGORY ABOWD, D.Phil.

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I, Gregory Abowd, declare as follows:

1. I have been retained by Folio Law Group PLLC, counsel for Patent Owner Immersion Corporation ("Immersion") to assess the challenged claims of U.S. Patent No. 9,727,217 ("the '217 patent"). I am being compensated for my time. My compensation is not dependent in any way upon any outcome of the Petition for *Inter Partes* Review of the '217 patent ("the Petition").

I. BACKGROUND AND QUALIFICATIONS

2. I have more than 30 years of experience in the field of computer science. In 1986, I received a Bachelor of Science ("B.S.") with Honors in Mathematics from the University of Notre Dame. In 1987, I obtained a Master of Science ("M.Sc.") from the University of Oxford in the United Kingdom in Computation. In 1991, I received a D. Phil. from the University of Oxford in Computation. At the University of Oxford, the term "Computation" referred to the field that is known in the United States as "Computer Science."

3. I am employed by Northeastern University ("Northeastern"), where I am the Dean of the College of Engineering and Professor of Electrical and Computer Engineering.

4. I have extensive experience in Human-Computer Interaction (HCI), with specific expertise in the technologies of interaction including haptics and touch interfaces. My D. Phil. thesis was entitled *Formal Aspects of Human-Computer*

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Interaction. I am co-author of one of the first textbooks in HCI, first published in 1994. I have won numerous Best Paper awards at a number of conferences related to user interfaces and wireless networks. I have also received several "test of time" awards for my publications, which is usually awarded to papers 10 years after publication and based on long-term impact. I am the most cited academic author in the world in the area of mobile and ubiquitous computing technologies.

5. My contributions to the fields of HCI and Ubiquitous Computing have been recognized through numerous awards. In 2008, I was named a Fellow of the Association for Computing Machinery. That same year, I was inducted into the ACM CHI Academy, the most prestigious honor for researchers in HCI. In 2023, I was awarded the Lifetime Research Achievement award by ACM SIGCHI, the leading academic professional society in HCI.

6. A detailed record of my professional qualifications, including a list of patents and academic and professional publications, is set forth in my curriculum attached as an appendix to this declaration.

II. BASES OF OPINIONS

7. In the course of performing my analysis and forming my opinions, I have reviewed the Petition and its Exhibits 1001–1008 including the materials listed below:

- U.S. Patent No. 9,727,217 ("the '217 Patent") (Ex. 1001)

- IPR Petition IPR2023-00946
- Declaration of Dr. Jeremy Cooperstock (Ex. 1002)
- US Patent App. Pub. 2009/0066725 ("Nogami") (Ex. 1003)
- Prosecution History of the '217 Patent. (Ex. 1012)

III. APPLICABLE LEGAL STANDARDS

A. Ordinary Skill in the Art

8. My opinions in this declaration are based on the understandings of a person of ordinary skill in the art—sometimes referred to as an "ordinary artisan" or by the acronyms "POSITA" (person of ordinary skill in the art) or "PHOSITA" (person having ordinary skill in the art)—as of the time of the invention, which I understand to be the earliest priority date (September 30, 2010) of the '217 Patent. I understand that the person of ordinary skill in the art is a hypothetical person who is presumed to have known the art relevant to the challenged claims of the '217 Patent at the time of the invention.

9. I understand that, in assessing the level of skill of a person of ordinary skill in the art, one should consider the type of problems encountered in the art, the prior solutions to those problems found in the prior art references, the rapidity with which innovations are made, the sophistication of the technology, the level of education of active workers in the field, and my own experience working with those of skill in the art at the time of the invention.

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10. I understand that the Petitioner has proposed that the level of skill in the art at the time of the '217 patent is as follows:

> A person of ordinary skill in the art would have possessed a bachelor's degree in electrical engineering or computer science (or an equivalent degree), and two years of practical or industry experience in the field of human computer interaction, including implementation of computer-based systems and software for providing haptic feedback effects to a user and determining the position and/or orientation of a device used by a user (such as a device worn on the human body). A person could also have qualified as an ordinarily skilled artisan with more formal education and less practical or industry experience, or vice versa.

11. In my opinion, the definition of a POSITA should be defined as:

> A person of ordinary skill in the art would have possessed a bachelor's degree in electrical engineering or computer science (or an equivalent degree), and two years of practical or industry experience in the field of human computer interaction, including implementation of computer-based systems and software for providing haptic feedback effects to a user. A person could also have qualified as an ordinarily skilled artisan with more formal education and less practical or industry experience, or vice versa.

12. Consistent with this definition, I was at the time of invention, and am, a POSITA through my education, research experience and work experience. As of the date of the invention, I was familiar with the types of problems encountered in systems that use haptic feedback and the rapidity at which innovations are made.

B. Claim Construction

13. I understand that claims of the ’217 Patent in this IPR are generally interpreted according to their ordinary and customary meaning taking into consideration the so-called “intrinsic evidence” of the patent consisting of (1) the claim language; (2) the specification; and (3) the prosecution history.

14. I understand that claim terms may be explicitly defined in the patent specification or they may be implicitly defined through consistent usage in the specification. I also understand that the scope of claim terms may be limited by statements in the specification or prosecution history where the applicant clearly disavows or disclaims subject matter.

C. Obviousness

15. Counsel has informed me, and I understand, that an issued patent claim is invalid as obvious if it can be shown that the differences between the patented subject matter and the prior art are such that the subject matter as a whole would have been obvious, at the time the invention was made, to a person having ordinary skill in the art. Relevant considerations include the level of ordinary skill in the art;

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the scope and content of the prior art; differences between the prior art and the claims at issue; and the objective indicia, or secondary considerations, of nonobviousness.

16. In this regard, I am informed and I understand that the secondary considerations of nonobviousness could include factors such as commercial success, long felt but unresolved needs, the failure of others, skepticism by experts, praise by others, award and accolades, and copying.

17. Counsel has informed me, and I understand, that in order to evaluate the obviousness of any claim of the ’217 Patent over a given prior art combination, I should analyze whether the prior art references, included collectively in the combination, disclose each and every element of the allegedly invalid claim as those references are read by the person of ordinary skill in the art at the time of the invention.

18. Counsel has informed me, and I understand, that even where all of the claim limitations are expressly disclosed in the prior art references, there must be some showing that a person of ordinary skill in the art would have been motivated to combine such prior art references, and explanation of how the combination would be achieved, and that there would have been a reasonable expectation of successfully achieving the claimed invention from such combination.

19. Counsel has informed me, and I understand, that absent some additional reasoning, mere routine optimization for a person of ordinary skill in the art to arrive at the claimed invention through combination of prior art references is insufficient to support a conclusion of obviousness.

20. Counsel has informed me, and I understand, that to rely on a reference it must be analogous prior art. Counsel has informed me and I understand that a reference is considered analogous prior art: (1) if the reference is from the same field of endeavor as the claimed subject matter, or (2) if the reference "is reasonably pertinent to the particular problem with which the inventor is involved," even though the reference is not within the field of the inventor's endeavor.

21. Counsel has informed me, and I understand, in considering the obviousness of a claimed invention, one should not view the invention and the prior art with the benefit of hindsight. In an obviousness analysis, one must be aware of the distortion caused by hindsight bias and must be cautious of arguments reliant upon ex post reasoning. Counsel has instructed me and I understand that when considering obviousness, I should not consider what is known today or what was learned from the asserted patents. Instead, obviousness is assessed by the person of ordinary skill in the art at the time the invention was made.

22. In this regard, I am informed and I understand that the '217 Patent may not be used as a guide to select and understand the prior art, because such an

approach, at a minimum, discounts the value of combining various existing features or principles in a new way so as to achieve a new result.

23. Counsel has informed me, and I understand, that obviousness cannot be predicated on what was unknown at the time of the invention, even if the inherency of a certain feature is later established. Counsel has also informed me, and I understand, that unknown properties of the prior art may not be relied upon to provide the rationale for modifying or combining the prior art to reach the claimed subject matter.

24. Counsel has informed me, and I understand, that a reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant of the ’217 Patent.

IV. OVERVIEW OF THE ’217 PATENT

25. The ’217 patent is directed to a system and method for providing haptically enhanced interactivity with interactive content such as virtual objects displayed to a user via live video. EX1001, Abstract, 1:17-42. In virtual reality systems, users can interact with virtual objects in a virtual environment, e.g., by manipulating physical objects in the real world to interact with a virtual object. *Id*.,

1:35-42. These systems typically further incorporate augmented reality technology to integrate 3D virtual objects based on this live video. *Id*., 1:30-42.

26. As mentioned above, the ’217 patent teaches techniques that enhance the user experience in virtual reality systems. The inventors of the ’217 patent recognized that in conventional virtual reality systems at the time, visual and/or audio feedback may provide a sense of interaction with virtual objects to users. EX1001, 1:36-37. However, virtual objects may be presented to a user on video displays such that the virtual object can be seen as moving with accompanying sound effects at times, while at other times, the virtual object may be seen moving without accompanying sound effects. *Id*., 1:37-42.

27. The inventors of the ’217 patent sought to further enhance how users experienced and interacted with such virtual objects by introducing a physical sense of interaction with virtual objects to users by way of haptic feedback on peripheral devices worn or held by users (e.g., interactive clothing, accessories, mobile devices, remote controls, etc.). *See, e.g., id*., 11:40-42, 1:65-2:19, 2:57-3:5, 3:55-4:4. This type of haptic feedback, such as vibrations and touch feedback to the user, provides “a more compelling and complete user experience while interacting with interactive virtual content.” *Id*., 2:57-3:5.

V. EXEMPLARY CLAIM OF THE ’217 PATENT

28. Independent claim 1 is recited below:

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1. A system comprising:

a manipulatable input device movable through real space in at least three degrees of freedom, the manipulatable input device incorporating a haptic output device;

a processor in communication with the haptic output device;

a memory on which instructions executable by the processor are stored for causing the processor to:

receive one or more sensor signals indicating a position of the manipulatable input device in the at least three degrees of freedom and an identification of the manipulatable input device;

establish a communication pathway between the manipulatable input device and the processor;

after establishing the communication pathway, determine a feedback parameter based at least in part on the position of the manipulatable input device in the at least three degrees of freedom and the identification of the manipulatable input device; and

transmit a haptic signal to the haptic output device, the haptic signal configured to cause the haptic output device to output a haptic effect according to the feedback parameter.

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VI. PROSECUTION HISTORY

29. I have reviewed the ’217 patent’s file history and understand that the application that led to the issuance of the ’217 patent was filed on June 2, 2014, along with an Invention Disclosure Statement identifying eight prior art references. EX1012, 1. The original claims recited, among other limitations, “a peripheral configured to be manipulated by the user” and “a position sensor configured to sense a position of the peripheral in free space.” *Id*., 26. As detailed below, the claim scope for the term “peripheral” was later narrowed by amendment to a “manipulatable input device.”

30. On March 25, 2015, the Examiner issued a Non-Final Office Action that included an obviousness-type double patenting rejection, as well as a rejection of the claims under 35 U.S.C. § 102 as anticipated by the Wingman and RumblePad references identified in Applicant’s IDS and under 35 U.S.C. § 103 as obvious over Wingman in view of the Frommer articles, also identified in Applicant’s IDS. EX1012, 62-74. On June 25, 2015, Applicant provided a response to the Office action including the following claim amendment as underlined: a position sensor configured to sense a position of the peripheral in free space, <u>wherein the haptic feedback to the user is based at least in part on the position of the peripheral in free space sensed by the position sensor</u>. *Id*., 87-96.

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31. On October 8, 2015, the Examiner issued a Final Office Action that included an obviousness-type double patenting rejection, as well as a rejection of the claims under 35 U.S.C. § 102 as anticipated by the Wingman and RumblePad references and under 35 U.S.C. § 103 as obvious over Wingman in view of the Frommer articles. *Id*., 101-120. On January 8, 2016, Applicant provided a response to the Office action including a number of claim amendments, one of which is shown here as underlined: "a manipulatable input device ~~peripheral configured to be manipulated by the user~~" and "manipulatable input device ~~peripheral~~ in ~~free space~~ at least three degrees of freedom." *Id*., 337-347.

32. On February 11, 2016, the Examiner issued an Advisory Action Before the Filing of an Appeal Brief. *Id*., 362. On March 8, 2016, Applicant filed a Request for Continued Examination along with additional claim amendments. *Id*., 366-381. On June 17, 2016, the Examiner issued a Non-Final Office Action that included an obviousness-type double patenting rejection, as well as a rejection of the claims under 35 U.S.C. § 102 as anticipated by the Wii Operations Manual reference. *Id*., 402-408. On June 29, 2016, Applicant initiated an interview with the Examiner, in which the Examiner stated that "claims 4, 6, 7, 9, 17, 22, and 23 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and if proper Terminal Disclaimer is filed and approved." *Id*., 423. However, no agreement on the allowability was reached, and

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two additional interviews with the Examiner occurred on August 23, 2016 and September 2, 2016. *Id*., 437.

33. On October 3, 2016, Applicant provided a response to the June 17, 2016 Office Action with additional claim amendments. *Id*., 430-440. On December 30, 2016, the Examiner issued a Final Office Action with an obviousness-type double patenting rejection, indicating that claims 1-9, 11-19, 22, and 23 would be allowable with a proper Terminal Disclaimer. *Id*., 454-458. On March 1, 2017, Applicant provided a response with additional claim amendments for antecedant basis purposes and for clarity along with a terminal disclaimer. *Id*., 480-486.

34. On April 3, 2017, the Examiner issued a Notice of Allowance for all claims in the application. *Id.*, 490. The '217 patent issued on August 8, 2017.

VII. THE ASSERTED PRIOR ART

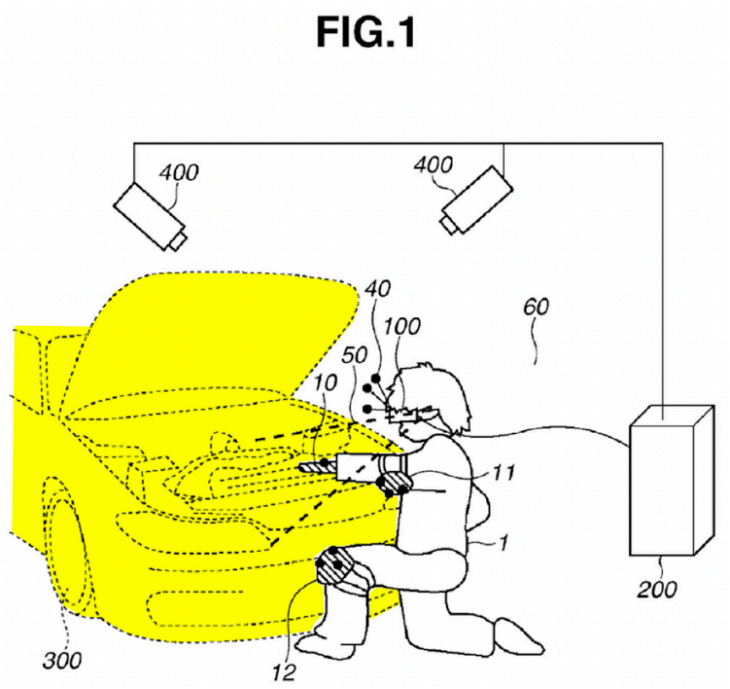
A. The Nogami Reference (Ex. 1003)

35. U.S. Patent Application Publication No. 2009/0066725 to Nogami et al. ("Nogami") discloses an information processing apparatus and method for "implement[ing] an interaction between a virtual space and a user who observes the virtual space." EX1003, ¶ [0002]. Nogami's invention is generally directed to varying the intensity of haptics stimulation provided by vibration motors mounted on wearable accessories such as gloves and elbow pads. *See, e.g.*, EX1003, ¶¶ [0062]-[0072], [0081], [0120]-[0122]. None of these wearable accessories,

however, include an input device as they do not allow active input by way of, for example, buttons, dials, switches, or a touch interface.

36. Nogami addresses the prior art systems' inability to "appropriately adjust the intensity of stimulation to be provided **according to contact of a user with a virtual object based on whether the user is aware of the contact**." EX1003, ¶ [0025]. In prior art systems, when the user *consciously* contacted a virtual object, the user can easily recognize the contact even if the intensity of the stimulation is low. EX1003, ¶ [0022]. However, when the user *unconsciously* contacted the virtual object, the user may not recognize the stimulation if the intensity of the stimulation on a part of the user's body that unconsciously contacted the virtual object is not high enough. *Id*.

37. To address this problem, Nogami is "directed to a method for controlling a stimulation based on a result of a determination as to whether a user has consciously performed contact with a virtual object in the case of notifying, to the user, contact of the user with the virtual object using stimulation." EX1003, ¶ [0026] (emphasis added). Nogami illustrates this concept in the figures below.



EX1003, Fig. 1 (highlighting added by Petitioner at Pet., 18).

38. In Figure 1, user 1 is wearing HMD 100 (head mounted display), knee pad stimulation unit 12, elbow pad stimulation unit 11, and glove stimulation unit 10. *See, e.g.*, EX1003, ¶¶ [0045]-[0051], [0059]-[0060]. In my opinion, glove stimulation unit 10 is ***not*** an input device, as it does ***not*** actively input information by way of, for example, buttons, dials, or a touch interface.

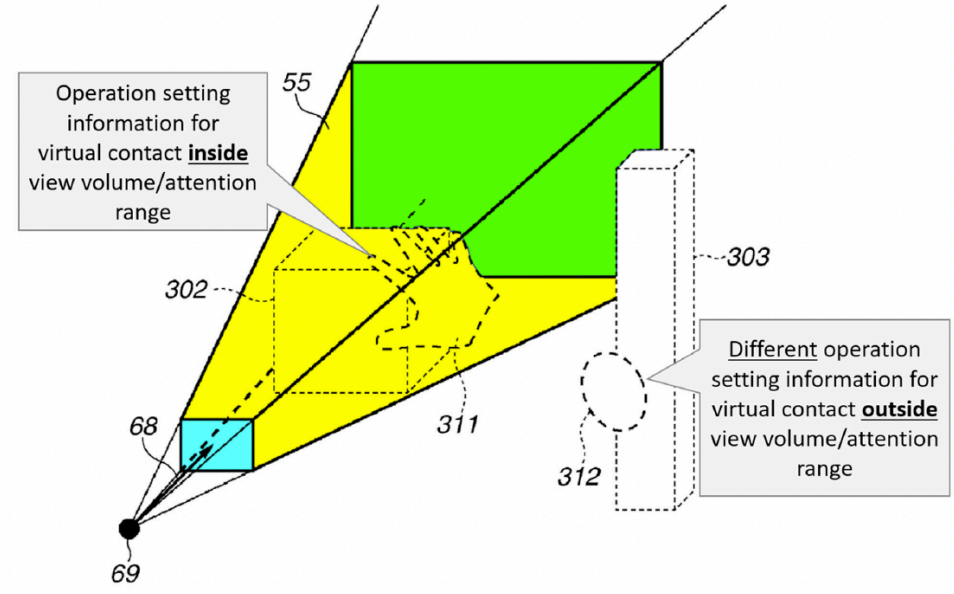
39. Through HMD 100, user 1 is able to view a virtual environment including virtual object 300, which is a "virtually expressed imitation image of an automobile." *Id*., at ¶ [0050]. This virtual viewpoint through HMD 100 is shown in Figure 1 as a view angle with dotted lines and labeled as "attention range 50," an area or range in which the user can visually perceive the virtual object. *Id*., at ¶¶

[0098]-[0101]. On the other hand, range 60 is the area outside of range 50, which Nogami refers to as a "non-attention range" because this area is not within the user's view through HMD 100 *Id*., ¶ [0101].

40. In Figure 1, the glove (or, e.g., a virtual depiction of a hand holding a work tool) is shown making contact with the virtual car 300. *Id*., ¶¶ [0101]-[0102], [0270]. This contact point is located within the attention range 50 (i.e., in the area viewable through HMD 100). (*Id*). But, the contact point of the knee pad and virtual car 300 (or e.g., contact of elbow pad with virtual car 300) is shown as located outside the view angle of attention range 50. *Id*., ¶ [0103]. As such, Nogami teaches that the haptic intensity of glove stimulation unit 10 has a different (lower) intensity than elbow pad stimulation unit 11 because the contact point of the glove with the virtual car is *inside* the attention range while the contact point of the knee or elbow pad with the virtual car is *outside* the attention range. *See, e.g., id*., ¶¶ [0103], [0120] ("operation setting information can differ according to whether region virtual object contacting the background virtual object is located within the virtual range"), ¶¶ [0121]-[0122], ¶¶ [0180]-[0181]. In other words, the level of intensity for the stimulation unit mounted on the elbow pad should be higher because it's contact with the virtual car may be unconscious and outside of the user's attention range such that a sufficiently higher intensity is needed for the user to recognize the stimulation.

41. Another example of an attention range is shown in Figure 6 of Nogami below. Here, attention range 55 is the user's viewpoint of a virtual environment including virtual object 302, as well as region virtual object 311, which is a virtual depiction of a glove stimulation unit 10 generated by imitating a shape of the user's hand. EX1003, ¶¶ [0140]-[0141]. In this illustration, region virtual object 311 representing the user's hand is making contact with the virtual object 302 where the point of contact is inside the attention range. *Id.*, ¶¶ [0148]-[0149]. Conversely, outside of the user's attention range 55 is virtual object 303 making contact with region virtual object 312, which is a virtual depiction of an elbow pad stimulation unit 11 generated by imitating the user's elbow. *Id.*

FIG.6



Pet., 35 (annotations and colored highlights added by Petitioner in IPR2023-00945 at 35).

42. In this example, Nogami teaches that glove stimulation unit 10 depicted by region virtual object 311 is configured to generate a different, lower intensity level than the elbow pad stimulation unit 11 depicted by region virtual object 312. *Id*., ¶¶ [0152]-[0154]. This is because the point where the glove is in contact with the virtual object 302 is inside the attention range, i.e., conscious contact; whereas the point where the elbow pad is in contact with the virtual object 303 is outside the attention range, i.e., is unconscious contact, such that a higher intensity is needed for the user to recognize the contact. *Id.*, ¶¶ [0152]-[0154]; *see also, e.g.*, *id*., ¶¶ [0180] – [0181].

VIII. CLAIM CONSTRUCTION

43. I understand that Petitioner believes none of the claim terms in the challenged claims require express construction at this time. Pet. at 6. I also understand that Patent Owner submits that all claim terms in the challenged claims should be given their plain and ordinary meaning. I further understand that in the parallel litigation, the Western District of Texas has construed the claim term "real space" as having plain and ordinary meaning.

44. In my opinion, however, the term "manipulatable input device" as recited in the independent claims of the '217 patent is understood by a POSITA in

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light of the ’217 patent specification as: “hardware that actively inputs information.”

45. I understand that the specification describes **peripherals** broadly as including “a physical **object**, a physical **device**, and/or a combination thereof that can be manipulated by a user to interact with interactive content.” EX1001, 3:20-22. But, during prosecution, the Applicants of the ’217 patent further clarified and narrowed the scope of the claim by amending the claim limitation from “**peripheral** configured to be manipulated by the user” to “manipulatable **input device**.” EX1012, 338.

46. I understand that the ’217 patent provides examples of physical **objects** including a user’s body parts such as a hand. EX1001, 3:30-32. In contrast, however, it also provides examples of physical **devices** including hardware such as a smartphone, a personal digital assistant, a wearable computer, or a computing/interactive digital media device implanted on a user’s body. *Id*., 3:40-47. The ’217 patent specification distinguishes embodiments of peripherals that include physical objects and embodiments of peripherals that include physical devices. In my opinion, scope of the challenged claims require a device, not an object.

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47. The specification further describes peripherals that are input devices as illustrated in Fig. 3—"peripheral 302 […] configured to enhance the interactivity of the interactive content being conveyed to a user."

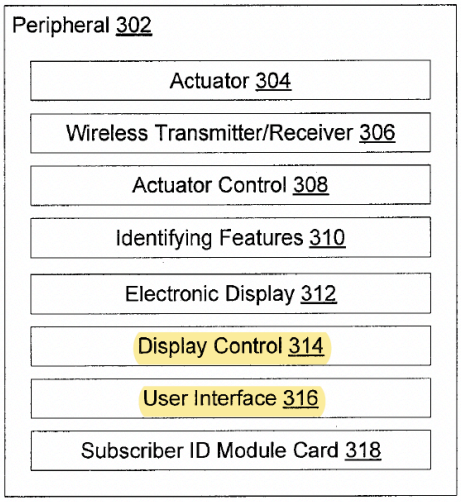

FIG. 3

Id., Fig. 3, 9:33-10:52. Among other components, manipulatable Peripheral 302 includes input device(s) that input information into the system. For example, the specification states peripheral 302 may include an electronic display 312, a display control 314, and a user interface 316 with buttons for a user to input information. *Id.*, Fig. 3, 10:11-17.

48. The specification explains that:

> The user interface 316 may be configured to receive information from the user […] Exemplary ***hardware may include one or more of buttons, dials, touch pads, and/or other hardware***.

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Id., 10:11-17 (emphasis added). The specification also describes:

> some or all of the user interface 316 may be presented to the user via the electronic display 312. In implementations ***where the electronic display 312 includes a touch screen, the user may provide information to the user interface 316*** by manipulating the touch screen.

Id., 10:17-22 (emphases added); *see also id*., 10:1-3 ("electronic display 312 may include a ***touch screen configured to receive information from the user***") (emphasis added).

49. In my opinion, unlike a peripheral that is simply a passive physical object, an input device as claimed includes hardware that actively inputs information into the system by way of, for example, buttons, dials, touch pads, or a touch screen, as detailed above. I understand that this is also demonstrated in other examples of peripheral input devices detailed in the specification's description of mobile devices for gaming:

> the peripheral 302 may include [a] mobile device. The mobile device may be configured for one or more of single player gaming, multi-player gaming, social networking, interaction with virtual and/or augmented reality environments, interactive messaging and/or other communication, confirmation of remote manipulation (e.g., telerobotics, locking/unlocking real and/or virtual locks), interactive responses based on in-story character

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> actions and/or plot developments in text-based and/or video-based stories, and/or other mobile applications.

Id., 10:37-52. In this example of manipulatable peripheral 302, a POSITA would understand that a physical object, such as a user's hand, is not an "input device" and thus, would not be able to achieve these gaming related functions like interactive user messaging and responses, which require active input by the user. Rather, a device or hardware is necessary for a user to input messages, responses, confirmations, etc. *Id*.

50. I also understand that Examiner also understood that the meaning of the claim term "input device" was more than simply a manipulatable physical object, which is not capable of actively inputting information, unlike buttons or touch screens. This is demonstrated by the Examiner's citation of the Wii remote as prior art *after* Applicant had amended the claim to recite a "manipulatable input device." EX1012, 405 (Examiner mapping the Wii remote to the manipulatable input device). In fact, the Examiner understood the Wii remote is an input device that includes buttons for active input by the user.

51. Thus, a POSITA reading the '217 parent would have appreciated the difference between peripherals that are physical objects such as beverage containers, figurines, or body parts of a user (*Id*., 3:25-32) and peripherals that are **input devices** such as computing devices that actively input information by way of

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hardware including touch screens, buttons, or dials. *Id*., 3:34-44, 10:1-52. Based on the specification together with the plain and ordinary meaning of the term, a POSITA would understand an "input device" to mean "hardware that actively inputs information."

IX. NOGAMI DOES NOT DISCLOSE THE CLAIMED "INPUT DEVICE" REQUIRED BY INDEPENDENT CLAIMS 1 AND 17

52. I have reviewed the Petition and Declaration of Dr. Jeremy Cooperstock (Ex. 1002) regarding this claim limitation. My understanding is that Petitioner and Dr. Cooperstock argue that Nogami stimulation generation unit 10 satisfied the claimed manipulatable input device in at least independent claims 1 and 17. As I detail further below, this stimulation generation unit 10 is not a "manipulatable input device" as required by the '217 Patent.

53. Petitioner contends that this limitation is met by Nogami's "stimulation generation unit 10, which is a 'glove-like' unit 'mounted on the hand of the user,' as illustrated in Figures 1 and 3." Pet., 11-12.

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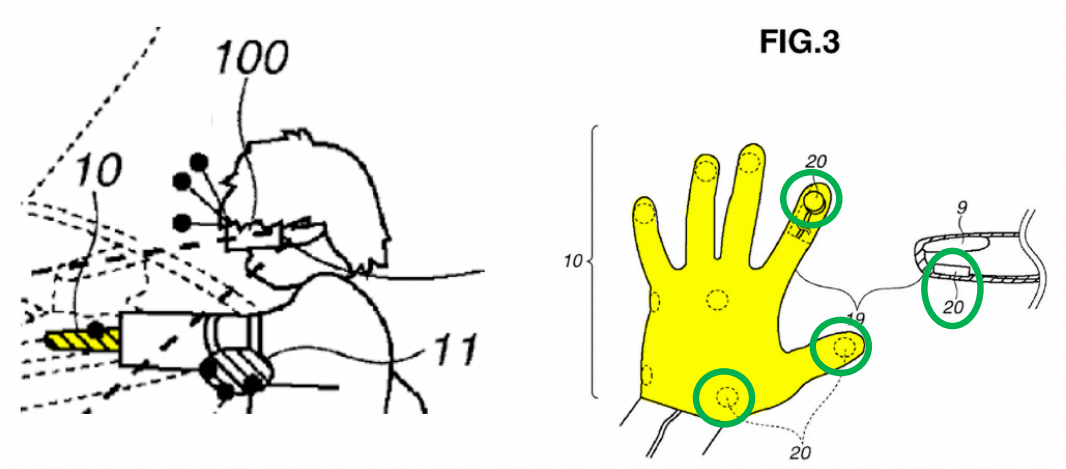
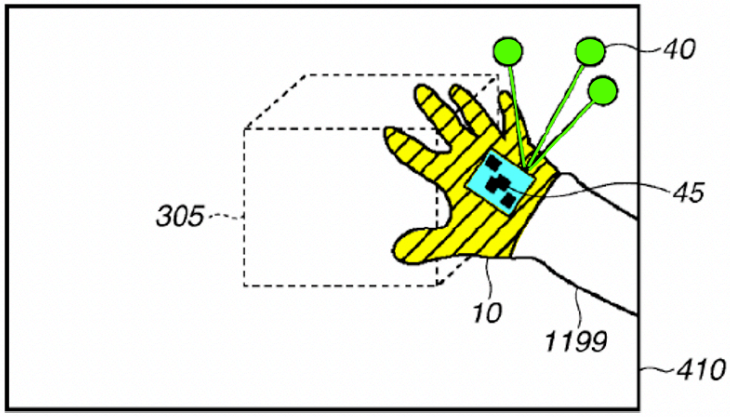


EX1003, Fig. 1 (excerpted and highlighted by Petitioner at Pet., 12), Fig. 3 (highlighted by Petitioner at Pet., 12) (green circles added). Petitioner alleges that stimulation generation unit 10 qualifes as an input device "because it enables input of information in at least two categories in response to user action: (1) device position and orientation information (based on location and movement of the user's hand), as well as (2) device identification information (based on information on the stimulation generation unit worn by the user)." Pet., 12. In my opinion, neither demonstrate active *input* of user information. The only "hardware" included in stimulation generation unit 10 is "stimulation units 20" (highlighted in green circles above), which Petitioners already identify as the haptic ***output*** device. *See* Pet., 47.

54. Nogami's stimulation generation unit 10 does not satisfy the claimed "input device" under the proper meaning of the term as understood by a POSITA in light of the '217 patent specification. As detailed above, a POSITA would understand the term "input device" to mean "hardware for actively inputting

information." I also note that stimulation generation unit 10 does not meet this definition because Petitioner concedes that it provides haptic output, and is not described as accepting input. Petitioner confirms that—without the stimulation units 20—all that remains is a glove that includes passive marker 40 and bar code 45, illustrated below. Pet., 12-13 (citing EX1003, Fig. 11, ¶¶ [0204]-[0213]).

FIG.11



EX1003, Fig. 11 (highlighted by Petitioner at Pet., 13). In my opinion, this glove with its marker 40 and bar code 45 are all merely **physical objects**. Such physical objects are described in the '217 patent specification, which clearly distinguishes these types of physical objects from **physical devices**, which are what the Challenged claims require.

55. The '217 patent provides clear examples of the claimed input devices that actively input information, e.g., physical **devices** including hardware such as a smartphone, a personal digital assistant, a wearable computer, or a

computing/interactive digital media device implanted on a user's body. EX1001, 3:40-47. For example, the '217 patent describes the active input functionality in the peripheral's user interface as follows:

> [t]he user interface 316 may be configured to receive information from the user […] Exemplary ***hardware may include one or more of buttons, dials, touch pads, and/or other hardware***.

EX1001, 10:11-17.

56. In my opinion, the patent specification distinguishes between such class of peripherals that are **input devices** and another class of peripherals that are merely **physical objects**—such as Nogami's glove with marker 40, which does not allow active user input or user interface as contemplated by the '217 patent's input devices. The '217 patent provides examples of **physical objects** including a user's body parts such as a hand. EX1001, 3:30-32. The '217 patent states:

> Examples of physical objects that may constitute the peripheral 102 may include consumer products such as toys, beverage containers, packaging, magazines, figurines, cards (e.g., sports cards, game cards, gift cards, and/or other cards), books, sporting/fitness equipment, collectible items, and/or other consumer products; a body part of a user (e.g., hand, head, face, torso, and/or other body part); a piece of paper and/or cardstock bearing graphics, which may or may not have been printed by a user; and/or other physical objects.

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Id., 3:25-34. Although the specification explains that peripherals may generally include such manipulatable physical objects, the claims of the ’217 patent are narrower as evidenced in the prosecution history, where the Applicants of the ’217 patent further clarified and narrowed the scope of the claim by amending the claim limitation from “**peripheral** configured to be manipulated by the user” to “manipulatable **input device**.” EX1012, 338.

57. In contrast to a peripheral that is simply a manipulatable physical object such as Nogami’s glove, a peripheral that is an input device includes hardware that actively inputs information into the system by way of buttons or a touch interface as detailed above. This is further demonstrated in the ’217 patent specification’s description of mobile input devices for gaming:

> the peripheral 302 may include [a] mobile device. The mobile device may be configured for one or more of single player gaming, multi-player gaming, social networking, interaction with virtual and/or augmented reality environments, interactive messaging and/or other communication, confirmation of remote manipulation (e.g., telerobotics, locking/unlocking real and/or virtual locks), interactive responses based on in-story character actions and/or plot developments in text-based and/or video-based stories, and/or other mobile applications.

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Id., 10:37-52. A POSITA would understand that a physical object such as Nogami's glove would not be able to achieve these gaming related functions like interactive user messaging and responses. Instead, a hardware input device is necessary for a user to input messages, responses, confirmations, etc.

58. Furthermore, the only "hardware" included in stimulation generation unit 10 is "stimulation units 20" (highlighted in green circles above in Figure 3). But, this is an output device, not an input device. I also note that Petitioners already identify this hardware as the claimed haptic ***output*** device (*see* Pet., 47), and therefore should not be able to rely on this to satisfy both the claimed haptic output device and the manipulatable input device.

59. Nothing in Nogami's glove 10 actively inputs information to the stimulation generation unit. Therefore, in my opinion, Nogami does not disclose an input device as required by the claims of the '217 patent.

X. NOGAMI DOES NOT DISCLOSE "DETERMINE A FEEDBACK PARAMETER BASED AT LEAST IN PART ON THE IDENTIFICATION OF THE MANIPULATABLE INPUT DEVICE" REQUIRED BY INDEPENDENT CLAIMS 1 AND 17

60. I understand that claims 1 and 17 recite "determine a feedback parameter based at least on the identification of the manipulatable input device," consistent with the '217 patent's goal to provide users with enhanced immersive interactions with the virtual world.

61. I understand that the ’217 patent describes key aspects of the invention including a “peripheral configured to enhance the interactivity of interactive content being conveyed to a user” by way of haptic feedback. *See, e.g.*, EX1001, 1:46-2:19. According to the patent specification, a haptics module is configured to determine the **haptic feedback based on identifying the peripheral to distinguish it from a plurality of possible peripherals** and the one or more position parameters of the peripheral. *See, e.g., id*., 1:56-64 (emphases added); *see also, id.*, 5:5-24 (“identify the peripheral 102 from a plurality of other peripherals”), 7:24-27 (“haptic feedback based, at least in part, on the identification of the peripheral 102 as determined by the peripheral identification module 126”). This is also demonstrated below in step 410 of the ’217 patent’s Figure 4.

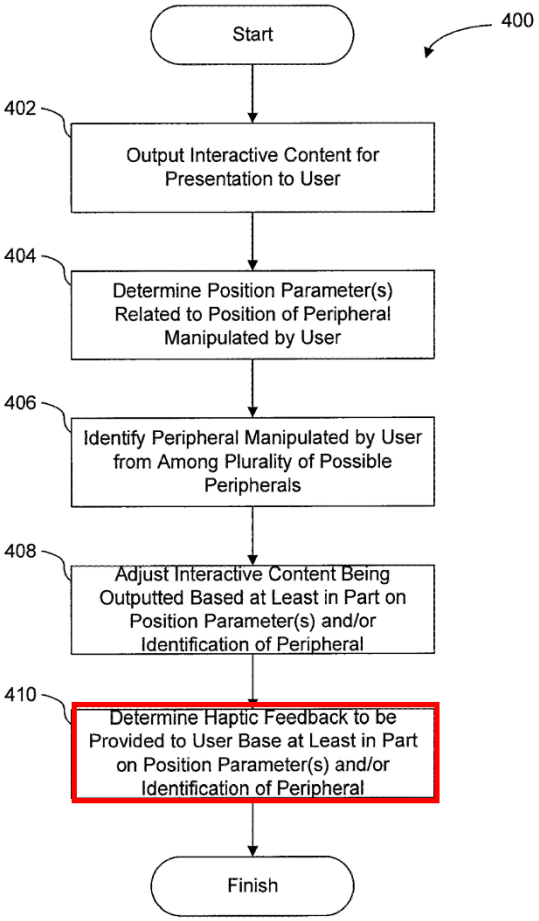


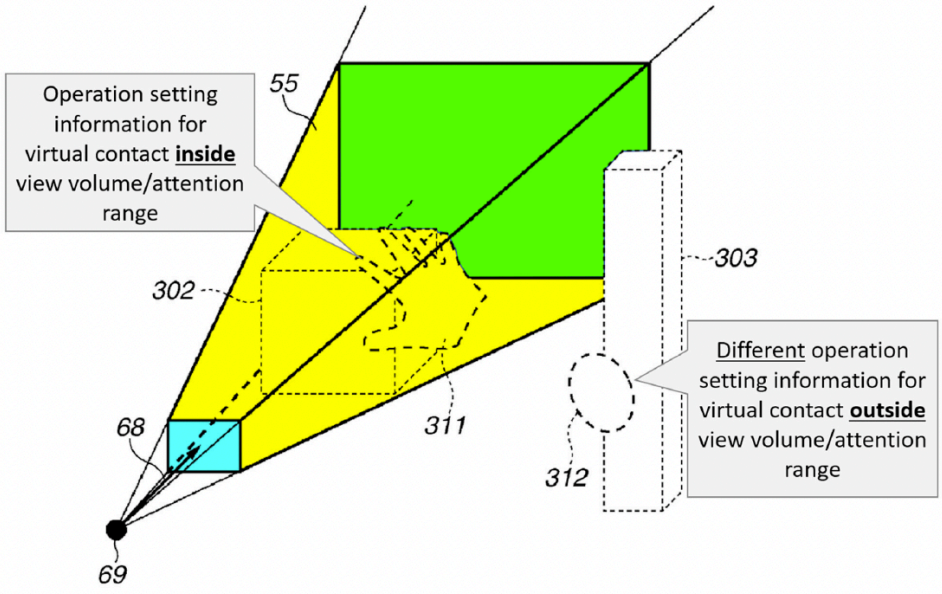
FIG. 4

EX1001, Fig. 4 (red highlight added).

62. I understand that Petitioner argues that this limitation is met by Nogami in two independent ways. Pet., 40. In the first way, Petitioner relies on Nogami's disclosure that haptic feedback intensity can vary based on whether the contact point between the user's body part and a virtual object is *inside* or *outside* the attention range of the user that is viewable through HMD 100. Pet., 40-41. I've

explained this aspect of Nogami in further detail above in § VII.A and illustrated below.

FIG.6

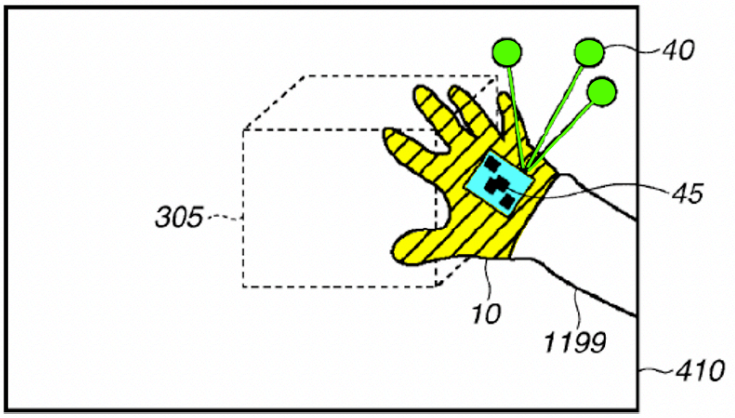


EX1003, Fig. 6 (annotations and colored highlights added by Petitioner in IPR2023-00945 at 35). I understand that Petitioner argues that in accordance with this concept, Nogami's CPU 201 *uses bar code 45* mounted on the glove-like stimulation generation unit 10 to allegedly determine whether the unit is located within the user's attention range.

63. In my opinion, Nogami does not use bar code 45 to "**identify the peripheral from a plurality of possible peripherals**" according to the '217 patent's purpose of identifying the peripheral input device. *See, e.g.*, EX1001, 1:46-2:19, 1:56-64, 5:5-24, 7:24-27. Rather, Nogami purportedly relies on bar code 45

to determine whether the stimulation generation unit 10 is located *inside or outside* the attention range as shown below.

FIG.11



EX1003, Fig. 11. Nogami makes this clear in explaining its use of bar code 45:

> In the example illustrated in FIG. 11, when the two dimensional bar code 45 is detected and recognized, the CPU 201 can determine that the two-dimensional **bar code 45 indicating the stimulation generation unit 10 is located within the real space image 410**. Thus, the CPU 201 sets the operation setting information for the contact within the attention range to the stimulation generation unit 10.

EX1003, ¶ [0029]. In my opinion, the use of bar code 45 is strictly for determining whether the stimulation generation unit is inside or outside the attention range, not to identify the stimulation generation unit to distinguish it from a plurality of other

possible stimulation generation units. This is further demonstrated in Nogami's explanation below:

> For example, in the case where another real object is located between the stimulation generation unit 10 and the imaging unit 101 in FIG. 11, an image of the stimulation generation unit 10 is captured behind the real object. In this case, the two-dimensional bar code 45 is not recognized. **Accordingly, the CPU 201 determines that the stimulation generation unit 10 indicated by the two-dimensional bar code 45 is not located within the attention range**. In this case, the user cannot appropriately verify the position and orientation of the stimulation generation unit 10, which is located behind the real object. **Accordingly, the CPU 201 determines that the stimulation generation unit 10 is located outside the attention range**.

EX1003, ¶ [0213].

64. Therefore, a POSITA would understand that Nogami's use of bar code 45 does not satisfy the claim limitation or its purpose of determining a feedback parameter based at least in part on identifying the input device to distinguish it from a plurality of input devices (nor does Nogami disclose an input device as detailed above). Recognizing bar code 45 for the purpose of determining whether the stimulation generation unit 10 is *inside or outside* the attention range is not the same as identifying the stimulation generation unit from a plurality of possible

stimulation generation units. EX1003, ¶ [0209] ("determine that the two-dimensional bar code 45 indicating the stimulation generation unit 10 *is located within the real space image 410*"), ¶ [0213] ("determines that the stimulation generation unit 10 indicated by the two-dimensional bar code 45 *is not located within the attention range*") (emphasis added).

65. It is also my opinion that Nogami's bar code 45 is not used to ***identify*** the physical objects from a plurality of objects or to distinguish one object from the others because Nogami only discloses that single stimulation generation unit 10 contains bar code 45. EX1003, ¶¶ [0206]-[0213]. In fact, Nogami only discloses a single glove. Based upon my review of Nogami, I did not see any disclosure of stimulation generation unit 11 or 12 or any other peripheral having bar code 45. In my opinion, there would be no need for those other peripheral units to have a bar code 45. This is because, Nogami does not disclose the identification of peripherals to distinguish it from a plurality of other peripherals for the purpose of determining haptic feedback. As I've explained above, Nogami is only concerned with determining whether the single glove-like stimulation generation unit 10 is inside or outside of the attention range by way of detecting bar code 45 on the unit. EX1003, ¶¶ [0209], [0213]. Nogami does not disclose or have the need for identification of the glove to distinguish it from another glove as Nogami only

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discloses a system with a single glove. Therefore, Nogami fails to disclose this claim limitation.

66. In the second way, I understand that Petitioner contends that Nogami discloses this limitation because of Nogami purportedly disclosing the concept of assigning reference intensity levels to different stimulation generation units depending on where on the body the particular stimulation generation unit is worn because the intensity actually felt by the user may differ depending on the location of the stimulation on the user's body (e.g., fingers versus knees or elbows) even when the stimulation of the same intensity is provided. EX1003, ¶¶ [0279]-[0281]; Pet., 43-44. Nogami addresses this by calibrating different stimulation generation units with different reference intensity levels. *Id*.

67. I understand that Petitioner admits that Nogami does not disclose the assignment of such reference intensity levels to different stimulation generation units based on the identification of the units. Pet., 44-45. Petitioner instead suggests that it would have been obvious for a POSITA to use bar code 45 as a way to identify each stimulation generation unit in order to assign the approproiate reference intensity level to the unit based on such purported identification. *Id*. However, in my opinion, Nogami does not provide any enabling disclosure for a POSITA to implement such use of bar code 45 in the manner that Petitioner suggests. Petitioner

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also does not even provide sufficient reasoning for why a POSITA would have been motivated to modify Nogami in this manner proposed.

68. Petitioner contends that although Nogami does not disclose the use of bar code 45 to assign appropriate reference intensity levels, a POSITA could have done so given that this would have been regarded as a "trivial implementation detail." But, Petitioner fails to show why a POSITA would have implemented reference intensity levels in this way. Petitioner merely concludes that a POSITA could have done so, rather than show why a POSITA would have done so.

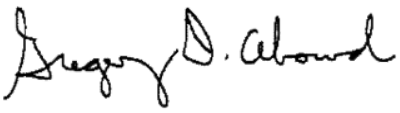
69. In my opinion, a POSITA would have implemented reference intensity levels in a different way without relying on identifying the stimulation generation unit. For example, in my opinion, a POSITA would have implemented an initial calibration procedure in which reference intensity levels would be assigned to each unique stimulation generation unit depending on the body part on which the unit is worn—which would serve as a rough initial proximation of whether the unit is likely inside or outside the attention range; not based on identifying the stimulation unit to distinguish it from a plurality of units. Accordingly, this baseline intensity level would be hard-coded for each stimulation generation unit as part of the initial calibrtion process. After this one-time initialization or set-up procedure, during normal system operation, Nogami's haptic feedback intensity would vary based

only on whether the contact point of the stimulation unit and the virtual object is *inside or outside* the attention range, which is a coarse-grained determination. *Id*.

70. A POSITA would not vary haptic feedback intensity based on repeatedly assigning a reference intensity level every cycle during normal operation much less based on repeatedly identifying the stimulation generation unit. In my opinion, given the problem Nogami addresses, a POSITA would understand that doing so would be highly inefficient and a waste of computing resources when assigning reference intensity levels are only required once during start-up calibration and does not require repeatedly identifying a stimulation unit as to distinguish it from a plurality of units.

I declare under penalty of perjury that the foregoing is true and correct. I acknowledge that willful false statements and the like are punishable by fine and/or imprisonment, that all statements made of my own knowledge are true, and that all statements made on information and belief are believed to be true.

Executed September 12, 2023, in Boston, Massachusetts.

By: 

Gregory D. Abowd

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GREGORY D. ABOWD
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I. EARNED DEGREES

D. Phil., 1991, University of Oxford, United Kingdom, Computation. Thesis: *Formal Aspects of Human-Computer Interaction*, Mr. Bernard Sufrin (advisor).
M.Sc., 1987, University of Oxford, United Kingdom, Computation. Thesis: *Arabic Word Processing*, Dr. Michael Spivey (advisor).
B.S. (*summa cum laude*), 1986, University of Notre Dame, Honors Mathematics.

II. EMPLOYMENT HISTORY

Dean, College of Engineering, Northeastern University, 2021-present.
Professor, Department of Electrical and Computer Engineering, Northeastern University, 2021-present.
Affiliate Professor, Department of Health Sciences, Bouvé College of Health Sciences, Northeastern University, 2021-present.
Affiliate Professor, Khoury College of Computer Sciences, Northeastern University, 2021-present.
Associate Dean of Research and Space, College of Computing, Georgia Institute of Technology, 2019-2021.
Associate Dean of Off Campus and Special Initiatives, College of Computing, Georgia Institute of Technology, 2017 to 2020.
J.Z. Liang Endowed Chair, School of Interactive Computing, Georgia Institute of Technology, 2016-2021.
Regents' Professor, School of Interactive Computing, Georgia Institute of Technology, 2012-2022.
W. George Professor and Director, Health Systems Institute, Georgia Institute of Technology, 2008-2010.
Full Professor and Distinguished Professor, School of Interactive Computing, Georgia Institute of Technology, 2007-2022.
Associate Professor, College of Computing, Georgia Institute of Technology, 2000-2007.
Visiting Faculty, Intel Research Seattle, July 2004-June 2005.
Founding Director, Aware Home Research Initiative, Georgia Institute of Technology, 2000-2003. 2005-2008.
Associate Director for Broadband Institute in charge of Residential Laboratory, 1998-2003.
Assistant Professor, College of Computing, Georgia Institute of Technology, 1994-2000.
Visiting Scientist, Software Engineering Institute, Carnegie Mellon University, 1994–97.
Postdoctoral Research Associate, Computer Science Department and Software Engineering Institute, Carnegie Mellon University, 1992-1994.
Research Associate, Human-Computer Interaction Group, Computer Science Department, University of York, 1989-1992.

III. HONORS AND AWARDS

1993. SIGSOFT'93/FSE-1 conference paper commended for high technical merit and recommended for extension and submission to ACM TOSEM journal.
1994. One of two nominees by Georgia Tech for NSF Presidential Faculty Fellows Program.
1995. Received Georgia Tech nomination for Packard Foundation Fellowship.
1996. MobiCom'96 paper commended as one of top 9 papers in conference and recommended for submission to *ACM Wireless Networks* journal.
1997. Sigma Xi, Georgia Tech Chapter Young Faculty Research Award.
NSF CAREER award recipient.
College of Computing William A. "gus" Baird Outstanding Faculty Teaching Award.
1998. Intelligent User Interface'98 conference paper nominated as one of top papers at conference and recommended for extension and submission to *Knowledge Based Systems* journal.
Georgia Tech, Outstanding Use of Innovative Educational Technology Award.
1999. Georgia Tech, College of Computing, Outstanding Junior Faculty Research Award.
2000. Schlumberger Foundation Technical Fellow, with $35,000 award.
2001. IBM Research Faculty Fellowship, with $20,000 award.
Schlumberger Foundation Technical Fellow, with $25,000 award.
2002. Selected to attend National Academy of Engineering Symposium on Frontiers in Engineering, Irvine, CA.
2005. Best paper award at *Symposium On Usable Privacy and Security (SOUPS)*.
Best of CHI selection for paper presented to *ACM SIGCHI Conference on Human Factors and Computing (CHI 2006)*.
Best paper nominations at *The 4th International Conference on Pervasive Computing*.
Top Technology Idea from *New York Times Magazine*. Awarded to Capture Resistant Environment.
2006. College of Computing Senior Research Award.
Best paper nomination at the *ACM SICHI Conference on Computer Supported Cooperative Work(CSCW 2006)*.
2007. Best paper award and best presentation award at Ubicomp 2007.
ACM SIGCHI Social Impact Award.
Georgia Tech Don Bratcher Human Relations Award.
2008. Best paper award at Pervasive Computing 2008.
Elected to ACM SIGCHI Academy.
Georgia Tech Doctoral Dissertation Advisor Award.
Elected Fellow of the Association of Computing Machinery (ACM).
2009. ACM Eugene Lawler Humanitarian Award.
2017. Georgia Tech College of Computing Senior Faculty Research Award
State of Georgia Outstanding Achievement in Autism
2017. UbiComp conference 10-year Impact Award for 2007 publication [C115].
2018. College of Computing Faculty Mentor Award.
2018. College of Computing Dean's Award.
2018. UbiComp conference 10-year Impact Award for 2008 publication [C120].
2019. ISWC conference 20-year Impact Award for 1999 publication [C56].
2022. UbiComp conference 10-year Impact Award for 2012 publication [C150].
2023. ACM SIGCHI Lifetime Achievement Award for Research.

IV. RESEARCH, SCHOLARSHIP, AND CREATIVE ACTIVITIES

Asterisk (*) indicates work done at Georgia Tech. student co-authors in boldface.

A. PUBLISHED BOOKS, PARTS OF BOOKS, AND EDITED VOLUMES

A1. Books

B1. Dix, Alan J., Janet E. Finlay, Gregory D. Abowd, and Russell Beale. (Principal contributions from Dix, Finlay and Abowd, with assistance from Beale) *Human-Computer Interaction*. Prentice Hall International, 1993. 2nd edition published in November 1997. 3rd edition published in 2004.

A2. Refereed Book Chapters

BC1. Abowd, Gregory D. and Russell Beale. (Significant contributions from both authors) Contextualizing novel research in HCI. In Beale, R. and Finlay, J., editors, *Neural Networks and Pattern Recognition in Human-Computer Interaction*, Chapter 1. Ellis Horwood, 1992.

BC2. Harrison, Michael, Gregory D. Abowd, and Alan J. Dix. (Significant contributions by all authors with Harrison as principal author) Analysing display oriented interaction by means of systems models. In Byerley, Paul F., Barnard, Philip J. and May, Jon, editors, *Computers, Communication and Usability: Design Issues, Research and Methods for Inte- grated Services*, pp. 147–163, Elsevier Science, 1993.

BC3. Bass, Len. Paul Clements, Rick Kazman and Gregory D. Abowd. (significant contributions by all authors, principal authorship by Bass, Clements and Kazman). Analyzing Development Qualities at the Architectural Level: The Software Architecture Analysis Method (SAAM). *Software Architecture in Practice*. Chapter 8. by Addison-Wesley.
March 1997.

BC4. Bass, Len, Paul Clements, Rick Kazman, Gregory D. Abowd, Linda Northrop and Amy Zaremski. (significant contributions by all authors, principal authorship by Bass, Clements and Kazman). Architectural Reviews. *Software Architecture in Practice*.
Chapter 9. Addison-Wesley. March 1997.

BC5. * Abowd, Gregory D. and Elizabeth Mynatt (equal contribution from both authors) Charting past, present and future research in ubiquitous computing. In *HCI in the New Millenium*, edited by Jack Carroll, Chapter 23. Addison-Wesley, 2001. Adapted from [J.12].

BC6. * **Dey, Anind K**., Daniel Salber and Gregory D. Abowd. (principal research by Dey with joint authorship by all) A conceptual framework and a toolkit for supporting the rapid prototyping of context-aware applications. Book chapter adapted from [J.16]. Appears in book adapted from special three-issue Human-

Computer Interaction (HCI) Journal. special issue on Context-Aware Computing, to appear 2002.

BC7. * Abowd, Gregory D. and **Jason Brotherton** (equal contribution by both authors) eClass.
Chapter 6 in Hazemi, Reza, Stephen Hailes and Steve Wilbur (eds.) *The Digital University: Building a Learning Community*, London: Springer Verlag, 2002, pp.252, ISBN 185233-478-9.

BC8. * **Anind K. Dey** and Gregory D. Abowd (principal authorship by Dey) Support for adapting applications and interfaces to context. In Seffah, Ahmed and Homa Javahery (eds.) *Multiple User Interfaces: Engineering and Application Frameworks*. John Wiley and Sons 2003.

BC9. * Ann L. Horgas and Gregory D. Abowd. (shared authorship). The Impact of Technology on Living Environments for Elderly Adults. In National Research Council report *Workshop on Adaptive Aging*. March 2003, pp. 230-252, ISBN 0-309-09116-0.

BC10. * Gregory D. Abowd and Elizabeth D. Mynatt (principal authorship by Abowd) Designing for the Human Experience in Smart Environments. In *Smart Environments: Technologies, Protocols and Applications*, Diane Cook and Sajal Das (editors), John Wiley. 2004.

BC11. * **Giovanni Iachello** and Gregory D. Abowd, Emerging Ubiquitous Computing Technologies and Security Management Strategy, in *Information Security: Policy, Processes, and Practices*, D.W. Straub, S. Goodman, R.L. Baskerville eds., M.E.Sharpe 2007.

BC12. * **Shwetak N. Patel, Khai N. Truong, Gillian R. Hayes, Giovanni A. Iachello, Julie A. Kientz**, and Gregory D. Abowd (principal research and authorship by all) The Personal Audio Loop: A Ubiquitous Audio-Based Memory Aid. *Handbook of Research on User Interface Design and Evaluation for Mobile Technology*, Joanna Lumsden, Editor.

BC13. * Mynatt, E.D., Abowd, G.D., **Mamykina, L., Keintz, J.A**., (principal authorship by all) Understanding the Potential of Ubiquitous Computing for Chronic Disease Management, in *Health Informatics: A patient-centered approach to diabetes*, (Asprey, W., Hayes, B., editors), Chapter 2, pp. 85-106. MIT Press, Cambridge, MA, 2010.

BC14. Abowd, Gregory D., Hayes, Gillian R., Kientz, Julie A., Arriaga, Rosa I., and **Nazneen** (principal research and authorship shared by all) Tools to Support Simplified Capture of Activities in Natural Environments. In Goodwin and Boser (eds.) *Technology and Autism*.

BC15. N Nazneen, A Rozga, GD Abowd, CJ Smith, R Oberleitner, RI Arriaga, & JS Suri. Behavior Imaging. *Autism Imaging and Devices*, Chapter 16, pp. 345-353. CRC Press, Taylor & Francis Group, Boca Raton, FL. 2017.

BC16. Thomaz, Edison & Essa, Irfan & Abowd, Gregory. (2017). Challenges and Opportunities in Automated Detection of Eating Activity. *Mobile Health: Sensors, Analytic Methods, and Applications*. J. Rehg, S.A. Murphy, and S. Kumar (eds). Chapter 26, pp. 151-174. 10.1007/978-3-319-51394-2_9.

A3. Other Parts of Books

None

A4. Edited Volumes

IEEE Pervasive Computing magazine, Volume 1, Issue 3, July-September 2002. Guest Editor for special issue on Context-Aware with Maria Ebling, Guerney Hunt, Hui Lei and Hans Gellersen.
IEEE Pervasive Computing magazine, Volume 4, Issue 2, April-June 2005. Guest Editor for special issue on The Smart Phone: A First Platform for Pervasive Computing with Liviu Iftode and Helena Mitchell.
IEEE Pervasive Computing, Special Issue on Pervasive Computing for Successful Aging (with Sumi Helal and Andrew Sixsmith), vol. 3, no. 2, Apr–June 2004.
IEEE Computer, Special Issue 21st Century User Interface Design (with A. Oulasvirta), vol. 49. no. 7, July 2016.

B. REFEREED PUBLICATIONS AND SUBMITTED ARTICLES

B1. Published and Accepted Journal Articles

J1. Abowd, Gregory D. and Kozak, John J. (Abowd is principal author, based on research work directed by Kozak) Pattern Development in Cellular Automata Triggered by Site- Specific Reactive Processes, *Physics Letters A*, **127**(3), February 15, 1988.

J2. Abowd, Gregory D. and Dix, Alan J. (Equal contribution by both authors) Giving undo attention, *Interacting with Computers*, **4**(3):317:342, 1992.

J3. Abowd, Gregory D., Robert Allen, and David Garlan. (Significant contribution by all authors with Abowd as principal author) Formalizing style to understand descriptions of software architecture. *ACM Transactions on Software Engineering and Methodology*.
4(4):319-364, October 1995.

J4. Abowd, Gregory D., Jonathan Engelsma, Luigi Guadagno and Okonon Okon. (Significant contribution from all authors, principal authorship by Engelsma and Abowd) Architectural Analysis of Object Request Brokers. *Object Magazine* special issue on distributed systems, March 1996, pp. 44-51.

J5. Kazman, Rick., Abowd, Gregory D., Bass, Len. and Clements, Paul. (Significant contributions and authoring by all) Scenario-based analysis of software architecture, *IEEE Software*. **13**(6):47–56, November 1996.

J6. Dix, Alan and Gregory D. Abowd. (Significant contribution from both authors, principal authorship by A. Dix) Moelling status and event behaviour of interactive systems.
Software Engineering Journal. **11**(6)334–346, November 1996.

J7. * Abowd, Gregory D. Software Engineering and Programming Language Considerations for Ubiquitous Computing. Computing Surveys, 28A(4). in *Computing Surveys*, Vol. 28A, No. 4.

J8. * Abowd, Gregory D., Christopher G. Atkeson, **Anind Dey, Jason Hong, Sue**

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C111. * **Moritz Köhler, Shwetak Patel, Jay Summet, Erich Stuntebeck** and Gregory D. Abowd (principal research and authorship by Köhler, Patel and Summet) TrackSense: Infrastructure-free precise indoor positioning using projected patterns. *Proceedings of The 5th International Conference on Pervasive Computing*. Toronto, Canada, May 13-16, 2007 Springer-Verlag LNCS Volume 4480, pp. 334-350.

C112. * **Julie A. Kientz**, Rosa I. Arriaga, **Marshini Chetty, Gillian R. Hayes, Jahmeilah Richardson, Shwetak N. Patel** and Gregory D. Abowd (principal research and authorship by Kientz) Grow and Know: Understanding record-keeping needs for the development of young children. *Proceedings of the ACM Human Factors in Computing Systems (CHI 2007)*, San Jose, California April 29-May 3, 2007, ACM Press.

C113. * Gillette, D. R., **Hayes, G. R**., Abowd, G. D., Cassell, J., el Kaliouby, R., Strickland, D., and Weiss, P. Interactive technologies for autism. In *CHI '07 Extended Abstracts on Human Factors in Computing Systems* (San Jose, CA, USA, April 28 - May 03, 2007).

C114. * **Dounia Berrada, Mario Romero**, Gregory D. Abowd, Marion Blount and John Davis (principal research and authorship by Berrada and Romero) "Automatic administration of the get up and go test." International Conference On Mobile Systems, Applications And Services. Proceedings of the *1st ACM SIGMOBILE International Workshop on Systems and Networking Support for Healthcare and Assisted Living Environments*. ACM, July 2007.

C115. * **Shwetak N. Patel**, Tom Robertson, Julie A. Kientz, Matthew S. Reynolds, and Gregory D. Abowd (principal research by Patel and Robertson, authorship by all) At the flick of a switch: detecting and classifying unique electrical events on the residential power line. *International Symposium on Ubiquitous Computing*

(Ubicomp 2007), Innsbruck, Austria, September 16-19, 2007, Springer-Verlag LNCS Volume 4717, pp 271-288. **Best paper and Best presentation awards and 2017 Ten Year Impact Award Winner.**

C116. * **Shwetak N. Patel** and Gregory D. Abowd (principal research and authorship by Patel) BLUI: Low-cost Localized Blowable User Interfaces. In the *Proceedings of the ACM Symposium on User Interface Software and Technology (UIST 2007)*. Newport, RI. 2007.

C117. **Erich Stuntebeck**, John Davis II, Gregory D. Abowd, Marion Blount. (principal research and authorship by Stuntebeck and Davis) HealthSense: Classification of Health-related Sensor Data through User-Assisted Machine Learning, *Workshop on Mobile Computing Systems and Applications (HotMobile '08)*, Napa, California, February 2008.

C118. * **Gillian R. Hayes, Lamar M. Gardere**, Gregory D. Abowd, and **Khai N. Truong** (principal research and authorship by Hayes) CareLog: a selective archiving tool for behavior management in schools. In *Proceeding of the Twenty-Sixth Annual SIGCHI Conference on Human Factors in Computing Systems (CHI 2008)*, Florence, Italy, April 05 - 10, 2008, ACM, New York, NY, pp. 685-694.

C119. * **Julie A. Kientz** and Gregory D. Abowd. (principal research and authorship by Kientz) When the Designer Becomes the User: Designing a System for Therapists by Becoming a Therapist. *In CHI '08 Extended Abstracts on Human Factors in Computing Systems* (Florence, Italy, April 05 - 10, 2008). ACM, New York, NY, 2071-2078.

C120. * **Shwetak N. Patel**, Mathew S. Reynolds, and Gregory D. Abowd (principal research by Patel, authorship by all) Detecting Human Movement by Differential Air Pressure Sensing in HVAC System Ductwork: An Exploration in Infrastructure Mediated Sensing. *Proceedings of The 6th International Conference on Pervasive Computing (Pervasive Computing 2008)*. Sydney, Australia May 19-22, 2008 Springer-Verlag LNCS Volume 5013, pp. 1-18. **Best paper award and 2018 Ten Year Impact Award Winner.**

C121. **Gillian R. Hayes**, Gregory D. Abowd, Maria Ebling, John Davis, Marion Blount and Elizabeth Mynatt (principal research and authorship by Hayes) Opportunities for pervasive computing in chronic cancer care. *Proceedings of The 6th International Conference on Pervasive Computing (Pervasive Computing 2008)*. Sydney, Australia May 19-22, 2008 Springer-Verlag LNCS Volume 5013, pp. 262-279.

C122. * Jaeseok Yun, **Shwetak Patel**, Matthew Reynolds and Gregory D. Abowd (principal research by Yun authorship by Yun, Reynolds and Abowd) A quantitative investigation of inertial power harvesting for human-powered devices. *International Symposium on Ubiquitous Computing (Ubicomp 2008)*, Seoul, Korea, September 21-24, 2008, ACM, New York, pp 74-83.

C123. * **Erich Stuntebeck**, Tom Robertson, **Shwetak N. Patel**, Matthew S. Reynolds and Gregory D. Abowd (principal research by Stuntebeck, authorship by all) Wideband powerline positioning for indoor localization. *International Symposium on Ubiquitous Computing (Ubicomp 2008)*, Seoul, Korea, September 21-24, 2008, ACM, New York, pp 94-103.

C124. * **Sunyoung Kim, Julie A. Kientz, Shwetak N. Patel** and Gregory D. Abowd (principal research and authorship by Kim and Kientz) Are you sleeping? Sharing

portrayed sleeping status within a social network. *Proceedings of Computer Supported Cooperative Work (CSCW '08)*, San Diego, CA, November, 2008, ACM, New York, pp. 619-628 .

C125. * **Mario Romero, Jay Summet**, John Stasko and Gregory D. Abowd (principal research by Romero, authorship by all) Viz-a-Vis: Toward visualizing video through computer vision. *Proceedings of IEEE InfoVis 2008*, Columbus, OH, October 19-24, 2008, pp. 1261- 1268. Appears in *IEEE Transactions on Visualization and Computer Graphics.*

C126. * **Julie A. Kientz**, Rosa Arriaga and Gregory D. Abowd (principal research and authorship by Kientz) Baby Steps: Supporting Better Record-Keeping and Decision-Making for Parents of Young Children. In *Proceeding of the Twenty-Seventh Annual SIGCHI Conference on Human Factors in Computing Systems (CHI 2009)*, Boston, MA, April 04 - 9, 2009, ACM, New York, NY, pp. 1713-1722.

C127. * **Julie A. Kientz** and Gregory D. Abowd (principal research and authorship by Kientz) Experiences of participant observation when dealing with children with special needs. In *Proceedings of the Twenty-Seventh Annual SIGCHI Conference on Human Factors in Computing Systems (CHI 2009)*, Experience report. Boston, MA, April 04 - 9, 2009, ACM, New York, NY, pp. xxx-yyy.

C128. * **Julie A. Kientz**, Rosa Arriaga and Gregory D. Abowd (principal research and authorship by Kientz) KidCam. In *Proceedings of Pervasive Computing*, Nara, Japan, May 2009.

C129. * **Svetlana Yarosh**, S. Cuzzort, H. Mueller and G. D. Abowd. (principal research and authorship by Yarosh) Developing a Media Space for Remote Synchronous Parent-Child Interaction. *In Proceedings of the 8th International Conference on Interaction Design and Children (IDC 2009)*. ACM, June 3-5, 2009, Cuomo, Italy.

C130. * **Ping Wang**, Gregory D. Abowd and James M. Rehg. (principal research by Wang and Rehg, principal authorship by Wang and Rehg) Quasi-Periodic Event Analysis for Social Game Retrieval. In *Proceedings of the Twelfth IEEE International Conference on Computer Vision (ICCV 2009)*, Kyoto, Japan, September 29-October 4, 2009. One of 5% of submissions selected for oral presentation.

C131. * **Yi Han, Erich P. Stuntebeck**, John T. Stasko, Gregory D. Abowd (principal research by Yi Han, authorship by all) A Visual Analytics System for Radio Frequency Fingerprinting- based Localization. *IEEE Symposium on Visual Analytics Science and Technology (IEEE VAST 2009)*, pages 35-42, Atlantic City, NJ, October 2009.

C132. * **Fatima A. Boujarwah, Hwajung Hong**, Jackie Isbell, Rosa I. Arriaga, and Gregory D. Abowd (principal research and authorship by all) Training social problem solving skills in adolescents with high-functioning autism. In *Proceedings of the 4th International Conference on Pervasive Computing Technologies for* Healthcare, March 22-25, 2010, Munich, Germany.

C133. * **Tae-Jung Yun, Hee Young Jeong, Hee Rin Lee**, Rosa I. Arriaga, and Gregory D. Abowd (principal research and authorship by Yun, Jeong, Rin and Arriaga) Assessing asthma management practices through in-home technology probes. In *Proceedings of the 4th International Conference on Pervasive Computing Technologies for* Healthcare, March 22-25, 2010, Munich, Germany.

C134. * **Matthew Bonner, Jeremy Brudvik**, Gregory D. Abowd, and W. Keith

Edwards (principal research and authorship by Bonner and Brudvik) No Look Notes: Accessible Eyes-Free Multi-Touch Text Entry. In *Proceedings of Pervasive Computing*, Helsinki, Finland, Springer-Verlag LNCS Volume 6030, pp. 409-426, May 2010.

C135. * **Karthir Prabhakar, Ping Wang, Sangmin Oh**, Gregory D. Abowd, and James M. Rehg. (principal research by Prabhakar and Rehg) Temporal Causality for the analysis of visual events. In IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2010). Oral presentation.

C136. * **Gabe Cohn, Erich Stuntebeck, Jagdish Pandey**, Brian Otis, Gregory D. Abowd, and Shwetak N. Patel. 2010. SNUPI: sensor nodes utilizing powerline infrastructure. In Proceedings of the 12th ACM international conference on Ubiquitous computing (UbiComp '10). ACM, New York, NY, USA, 159-168. DOI=10.1145/1864349.1864377 http://doi.acm.org/10.1145/1864349.

C137. * **Nazneen, Fatima A. Boujarwah, Shone Sadler, Amha Mogus**, Gregory D. Abowd, and Rosa I. Arriaga (principal research by Nazneen, Boujarwah, Sadler and Mogus, principal authorship by Nazneen and Boujarwah) Understanding the challenges and opportunities for richer descriptions of stereotypical behaviors of children with ASD: A concept exploration and validation. In *Proceedings of the 13th International ACM SIGACCESS Conference on Computers and Accessibilty (ASSETS 2010)*, October 25-27, 2010, Orlando, FL, pages 19-26.

C138. * **Svetlana Yarosh** and Gregory D. Abowd (principal research and authorship by Yarosh) Mediated parent-child contact in work-separated families. In *Proceedings of the 2011 annual conference on Human factors in computing systems* (CHI '11). ACM, New York, NY, USA, pages 1185-1194.

C139. * **Mario Romero, Alice Vialard**, John Peponis, John Stasko, and Gregory D. Abowd. (principal research and authorship by Romero). Evaluating video visualizations of human behavior. In *Proceedings of the 2011 annual conference on Human factors in computing systems* (CHI '11). ACM, New York, NY, USA, pages 1441-1450.

C140. * **Hee Young Jeong, Gillian R. Hayes, Tae-Jung Yun, Ja-Young Sung**, Gregory D. Abowd and Rosa Arriaga (principal research by all, primary authorship by Jeong, Hayes, Abowd and Arriaga). Act Collectively: Opportunities for technologies to support low-income children with asthma. In *Proceedings of the 25th BCS Conference on Human-Computer Interaction*, Newcastle-upon-Tyne, UK, 4-8 July 2011.

C141. * **Fatima A. Boujarwah, Jennifer Kim**, Gregory D. Abowd and Rosa I. Arriaga (principal research and authorship by Boujarwah and Arriaga) Developing scripts to teach social skills: Can the crowd assist the author? *AAAI 2011 Workshop on Human Computation (WS-11-11)*, August 8-11, 2011, San Francisco, CA.

C142. * **Fatima A. Boujarwah, Nazneen, Hwajung Hong**, Gregory D. Abowd, and Rosa I Arriaga (principal research by Boujarwah, Nazneen and Hong, authorship by all) Towards a framework to situate assistive technology design in the context of culture. In *Proceedings of the 13th International ACM SIGACCESS Conference on Computers and Accessibilty (ASSETS 2011)*, October 24-26, 2011, Dundee, Scotland, pages 19-26.

C143. * **Tae-Jung Yun, Hee Young Jeong**, Tanisha Hill, Bert Lesnick, Randall Brown, Gregory D. Abowd, and Rosa I. Arriaga (principal research and authorship by all) Using SMS to provide continuous assessment and improve health outcomes for children with asthma. In *2012 ACM SIGHIT International Health Informatics Symposium (IHI 2012)*, Orlando, FL, January 28-30, 2012.

C144. * **Hwajung Hong, Jennifer Kim**, Gregory D. Abowd, and Rosa I. Arriaga (principal research and authorship by all) Designing a Social Network to Support the Independence of Young Adults with Autism. In *Proceedings of Computer Supported Cooperative Work (CSCW '12)*, pages 627–636 Seattle, WA, February 11-15, 2012.

C145. * **Fatima A. Boujarwah**, Gregory D. Abowd and Rosa I Arriaga (principal research by Boujarwah, primary authorship by all) Socially computed scripts to support social problem solving skills. In *Proceedings of the Twenty-Seventh Annual SIGCHI Conference on Human Factors in Computing Systems (CHI 2012)*, Austin, TX, May April 5-10, 2012, ACM, New York, NY.

C146. * **Nazneen**, Gregory D. Abowd, Rosa I. Arriaga (principal research and authorship by Nazneen) Towards in-home collection of behavior specimens within the cultural context of autism in Pakistan. *Proceedings of the 6th International Conference on Pervasive Computing Technologies for Healthcare*, May 21-24, 2012, San Diego, CA.

C147. * **Caleb Southern, James Clawson, Brian Frey** Gregory D. Abowd, and Mario Romero, M. (principal research by Southern and Romero, principal writing by Southern and Romero) An evaluation of BrailleTouch: mobile touchscreen text entry for the visually impaired.
Proceedings of the 14th International Conference on Human-computer interaction with mobile devices and services (MobileHCI). September 24-27, 2012, pages 317-326, ACM, New York, NY.

C148. * **Edison Thomaz, Vinay Bettadapura, Gabriel Reyes, Megha Sandesh**, Grant Schindler, Thomas Ploetz, Gregory D. Abowd, and Irfan A. Essa. (principal research and authorship by Thomaz) Recognizing water-based activities in the home through infrastructure- mediated sensing. *International Symposium on Ubiquitous Computing (Ubicomp 2012)*, Pittsburgh, PA, USA, September, 2012, ACM, New York, pp 85-94.

C149. * Thomas Ploetz, **Nils Hammerla**, Agata Rozga, Andrea Reavis, Nathan Call and Gregory D. Abowd. (principal research and authorship by all). Automatic Assessment of Problem Behavior in Individuals with Developmental Disabilities. *International Symposium on Ubiquitous Computing (Ubicomp 2012)*, Pittsburgh, PA, USA, September, 2012, ACM, New York, pp. 391-400. (**best paper honorable mention)**

C150. * Gregory D. Abowd. What next, Ubicomp? Celebrating an intellectual disappearing act.
International Symposium on Ubiquitous Computing (Ubicomp 2012), Pittsburgh, PA, USA, September, 2012, ACM, New York, pp 31-40.

C151. * **Svetlana Yarosh, Anthony Tang, Sanika Mokashi** and Gregory D. Abowd (principal research and authorship by Yarosh) Almost Touching: Parent-Child Remote Communication Using theShareTable System. *Proceedings of Computer Supported Cooperative Work (CSCW '13)*, pages 181-192, San Antonio, TX,

February 23-27, 2013.

C152. * **Hwajung Hong, Svetlana Yarosh, Jennifer G. Kim**, Gregory D. Abowd and Rosa I. Arriaga (principal research and authorship by Hong, Abowd and Arriaga) Investigating the Use of Circles in Social Networks to Support Independence of Individuals with Autism. In *Proceedings of the Twenty-Eighth Annual SIGCHI Conference on Human Factors in Computing Systems (CHI 2013)*, Paris, France, May April 27-May 2, 2013, ACM, New York, NY.

C153. * **Sanika Mokashi, Svetlana Yarosh** and Gregory D. Abowd (principal research and authorship by Mokashi and Yarosh) Exploration of Videochat for Children with Autism. In *Proceedings of the International Conference on Interaction Design and Children (IDC 2013).* Short paper. June 24-27, 2013, New York, NY, pp. 320-323.

C154. * Rehg, James M., Gregory D. Abowd, Agata Rozga, Mario Romero, Mark A. Clements, Stan Sclaroff, Irfan Essa, Opal Ousley, **Yin Li, Chanho Kim, Hrishikesh Rao, Jonathan Kim, Liliana Lo Presti, Jianming Zhang, Denis Lantsman, Jonathan Bidwell, Zhefan Ye**, (principal research by all, principal authorship by Rehg, Abowd and Rozga) "Decoding Children's Social Behavior," *2013 IEEE Conference on Computer Vision and Pattern Recognition (CVPR),* pp.3414,3421, 23-28 June 2013. doi: 10.1109/CVPR.2013.438.

C155. * Yoshihiro Kawahara, Steve Hodges, Benjamin Cook, **Cheng Zhang**, Gregory D. Abowd (principal research and authorship by Kawahara) Instant Inkjet Circuits: *Lab-based Inkjet Printing to Support Rapid Prototyping of UbiComp Devices*. *2013 ACM International Joint Conference on Pervasive and Ubiquitous Computing* (*UbiComp '13)*, pp. 363-372, Sep 8- 12, 2013, Zurich, Switzerland. **Best Paper Award winner (one of 5 awarded).**

C156. * **Edison Thomaz, Aman Parnami, Jonathan Bidwell**, Irfan Essa and Gregory D. Abowd (principal research by Thomaz and Parnami, authorship by all) Technological Approaches For Addressing Privacy Concerns When Recognizing Eating Behaviors With Wearable Cameras. *2013 ACM International Joint Conference on Pervasive and Ubiquitous Computing* (*UbiComp '13)*, pp. 739-748, Sep 8-12, 2013, Zurich, Switzerland.

C157. * **Edison Thomaz, Aman Parnami**, Irfan Essa, and Gregory D Abowd (principal research and authorship by Thomaz) Feasibility of identifying eating moments from first-person images leveraging human computation. *Proceedings of the 4th International SenseCam & Pervasive Imaging Conference*, pp. 26-33, San Diego, CA, November 2013.

C158. * **Svetlana Yarosh**, Panos Markopoulos and Gregory D. Abowd (principal research and authorship by Yarosh) Towards a Questionnaire for Measuring Affective Benefits and Costs of Communication Technologies. *Proceedings of Computer Supported Cooperative Work (CSCW 2014*), **Best Paper Award winner (one of 4 awarded at conference out of 134 accepted papers)**.

C159. * **Yangfen Ji, Hwajung** Hong, Rosa Arriaga, Agata Rozga, Gregory D. Abowd and Jacob Eisenstein (principal research and authorship by Ji, Hong, and Eisenstein) Mining themes and interests in the Asperger's and Autism community. *Proceedings of Association of Computational Linguistics (ACL 2014)*, June 2014.

C160. * Javier Hernandez, **Ivan Riobo**, Agata Rozga, Gregory D. Abowd, and Rosalind Picard (principal research by Hernandez and Riobo, principal authorship by all)

Using electrodermal activity to recognize ease of engagement in children during social interactions. *2014 ACM International Joint Conference on Pervasive and Ubiquitous Computing* (*UbiComp '14)*, pp. 307-317, September 2014, Seattle, USA.

C161. * **Jonathan Bidwell**, Irfan A. Essa, Agata Rozga and Gregory D. Abowd (principal research by Bidwell, principal authorship by Bidwell, Rozga and Abowd) Measuring child visual attention using markerless head tracking from color and depth sensing cameras. *Proceedings of the 16th International Conference on Multimodal Interaction (ICMMI 2014)*, pp. 447-454, November 12, 2014, Istanbul, Turkey.

C162. * **Vinay Bettadapura, Edison Thomaz, Aman Parnami**, Irfan A. Essa, and Gregory D. Abowd (principal research and authorship by Bettadapura and Thomaz) Leveraging context to support automated food recognition in restaurants. *Proceedings of the Workshop on Applications of Computer Vision (WACV 2015).*

C163. * **Hwajung Hong**, Gregory D. Abowd, and Rosa I. Arriaga *(*principal work by Hong, authorship by all*)* Towards designing social question-and-answer systems for behavioral support of individuals with autism. *Proceedings of the 2015 9th International Conference on Pervasive Computing Technologies for Healthcare (Pervasive Health 2015), pp. 17-24, IEEE.*

C164. * **Edison Thomaz, Cheng Zhang**, Irfan Essa and Gregory D. Abowd. Inferring Meal Eating Activities in Real World Settings from Ambient Sounds: A Feasibility Study. *Proceedings of the 20th ACM International Conference on Intelligent User Interfaces (IUI 2015),* pp. 427-431. Atlanta, GA. **Best paper awardee**

C165. * **Cheng Zhang, Anhong Guo, Caleb Southern** and Gregory D. Abowd BeyondTouch: Extending the Input Language with Built-in Sensors on Commodity Smartphones.
Proceedings of the 20th International Conference on Intelligent User Interfaces (IUI 2015), pp. 67-77. Atlanta, GA.

C166. * **Felicia Cordero, Daniel A. Epstein, Edison Thomaz**, Elizabeth Bales, Arvind Jagannathan, Gregory D. Abowd and James Fogarty (principal authorship by all, principal research by all) Barriers and Negative Nudges: Exploring Challenges in Food
Journaling, *International ACM Conference on Human Factors in Computing Systems (CHI 2015*), Seoul, Korea, May 2015. To appear. **Best paper honorable mention.**

C167. * **Hwajung Hong**, Eric Gilbert, Gregory D. Abowd, and Rosa Arriaga (principal research and authorship by Hong) In-group Questions and Out-group Answers: Crowdsourcing Information and Advice for Individuals with Autism to Navigate Everyday Life**.**
International ACM Conference on Human Factors in Computing Systems (CHI 2015), pp. 777-786 Seoul, Korea, May 2015.

C168. * **Yi Han**, Agata Rozga, Nevena Dimitrova, Gregory D. Abowd and John Stasko, "Visual Analysis of Proximal Temporal Relationships of Social and Communicative Behaviors", Computer Graphics Forum, Volume 34, Issue 3, pages 51-60. Proceedings of EuroVis 2015.

C169. * **Arpita Bhattacharya, Mirko Gelsomini**, Patricia Perez-Fuster, Gregory D.

Abowd and Agata Rozga (principal research and authorship by Bhattacharya, Gelsomini and Rozga) Designing motion-based activities to engage students with autism in classroom settings. In *Proceedings of the International Conference on Interaction Design and Children (IDC 2015)*. Pp. 69-78, ACM, June 21-24, 2015, Boston, MA, USA.

C170. * **Edison Thomaz**, Irfan Essa and Gregory D. Abowd (principal research and authorship by Thomaz) A practical approach for recognizing eating moments with wrist-mounted inertial sensing. In *2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing* (*UbiComp '15)*, pp. 1029-1040, September 2015, Osaka, Japan.

C171. * **Daniel Castro, Steven Hickson, Vinay Bettadapura, Edison Thomaz**, Gregory D. Abowd, Henrik Christensen, and Irfan A. Essa (principal research by Castro, Hickson, Bettadapura and Thomaz) Predicting daily activities from egocentric images using deep learning. *Proceedings of the 2015 ACM International Symposium on Wearable Computing (ISWC 2015)*, pp. 75-82, September 2015, Osaka, Japan.

C172. * **Cheng Zhang**, Mitesh Patel, Senaka Buthpitiya, Kent Lyons, Beverly Harrison, and Gregory D. Abowd (principal research by Zhang, Patel, Buthpitiya, authorship by all) Driver classification based on driving behaviors. *Proceedings of the 21st International Conference on Intelligent User Interfaces (IUI 2016),* Sonoma, CA, March 7-10, 2016. pp. 80-84. DOI: 10.1145/2856767.2856806.

C173. * **Cheng Zhang**, **AbdelKareem Bedri**, **Gabriel Reyes**, **Bailey Bercik**, Omer T. Inan, Thad E. Starner, and Gregory D. Abowd. 2016. TapSkin: Recognizing On-Skin Input for Smartwatches. *Proceedings of the 2016 ACM International Conference on Interactive Surfaces and Spaces* (ISS '16), pp. 13-22. ACM, New York, NY, USA, 13-22. DOI: 10.1145/2992154.2992187.

C174. **Aman Parnami**, **Apurva Gupta**, **Gabriel Reyes**, **Ramik Sadana**, Yang Li, and Gregory Abowd. 2016. Mogeste: mobile tool for in-situ motion gesture design. *Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing: Adjunct* (UbiComp '16). ACM, New York, NY, USA, pp. 345-348. DOI: 10.1145/2968219.2971395.

C175. * **Aman Parnami**, **Apurva Gupta**, **Gabriel Reyes**, **Ramik Sadana**, Yang Li, and Gregory D. Abowd. 2016. Mogeste: A Mobile Tool for In-Situ Motion Gesture Design. *Proceedings of the 8th Indian Conference on Human Computer Interaction (IHCI '16)*. ACM, New York, NY, USA, 35-43. DOI: 10.1145/3014362.3014365.

C176. *** Gabriel Reyes**, **Dingtian Zhang**, **Sarthak Ghosh**, **Pratik Shah**, **Jason Wu**, **Aman Parnami**, **Bailey Bercik**, Thad Starner, Gregory D. Abowd and W. Keith Edwards (principal work and authorship by Reyes) Whoosh: Non-voice acoustics for low-cost, hands-free, and rapid input on smartwatches. In *Proceedings of the 2016 ACM International Symposium on Wearable Computers* (ISWC '16). ACM, New York, NY, USA, 120-127. DOI: 10.1145/2971763.2971765.

C177. *** Weiren Wang**, **M Park**, **Y Fan**, T Starner, & GD Abowd. Face Card: An Information- sharing Framework on Google Glass. *CoRR*. 2016, abs/1606.08065.

C178. *** Cheng Zhang**, **Junrui Yang**, **Caleb Southern**, Thad E. Starner, and Gregory D. Abowd. (principal research by Zhang and Yang; principal authorship by Zhang).

WatchOut: extending interactions on a smartwatch with inertial sensing. In *Proceedings of the 2016 ACM International Symposium on Wearable Computers* (ISWC '16). ACM, New York, NY, USA, 136-143. DOI: http://dx.doi.org/10.1145/2971763.2971775.

C179. * Gregory D. Abowd. 2016. Hot or Not?: Moving Forward from Weiser's Vision of Ubiquitous Computing. *Proceedings of the 17th International Workshop on Mobile Computing Systems and Applications (HotMobile '16)*. ACM, New York, NY, USA, 1-1. DOI: 10.1145/2873587.2873606.

C180. *** Y. Han**, G.D. Abowd, & J. Stasko. Requirements for Visual Interaction Analysis Systems. *IEEE VIS 2016 Conference LIVVIL: Logging Interactive Visualizations & Visualizing Interaction Logs*. October 23, 2016.

C181. *** Yi Han**, Gregory D. Abowd, and John Stasko. Flexible Organization, Exploration, and Analysis of Visualization Application Interaction Events using Visual Analytics. *Proceedings of the IEEE VIS 2016 Workshop on Temporal & Sequential Event Analysis*. October 24, 2016. Baltimore, MD.

C182. *** J. Alcaidinho**, **G. Valentin**, G. Abowd, & M. Jackson. Training Collar-sensed Gestures for Canine Communication. *Proceedings of the Third International Conference on Animal Computer Interaction (ACI 2016)*. December 20, 2016.

C183. *** Caleb Southern**, **Yunnuo Cheng**, **Cheng Zhang**, and Gregory D. Abowd. (principal research all; principal authorship by Southern) Understanding the cost of driving trips. *International ACM Conference on Human Factors in Computing Systems (CHI 2017*), Denver, Colorado, pp. 430-434. DOI: 10.1145/3025453.3025686.

C184. * Blake Wagner, III, **Elaine Liu**, Steven D. Shaw, Gleb Iakovlev, **Linlu Zhou**, **Christina Harrington**, Gregory Abowd, Carolyn Yoon, Santosh Kumar, Susan Murphy, Bonnie Spring, and Inbal Nahum-Shani. 2017. *e*wrapper: operationalizing engagement strategies in mHealth. *Proceedings of the 2017 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2017 ACM International Symposium on Wearable Computers (UbiComp '17)*. Workshop proceedings. ACM, New York, NY, USA. pp.790-798.

C185. * **Cheng Zhang**, **Xiaoxuan Wang**, **Anandghan Waghmare**, **Sumeet Jain**, Thomas Ploetz, Omer T. Inan, Thad E. Starner, and Gregory D. Abowd. 2017. FingOrbits: interaction with wearables using synchronized thumb movements. *Proceedings of the 2017 ACM International Symposium on Wearable Computers* (ISWC '17). ACM, New York, NY, USA, 62-65. DOI: 10.1145/3123021.3123041.

C186. * Edison Thomaz, Abdelkareem Bedri, Temiloluwa Prioleau, Irfan Essa, and Gregory D. Abowd. 2017. Exploring Symmetric and Asymmetric Bimanual Eating Detection with Inertial Sensors on the Wrist. *Proceedings of the 1st Workshop on Digital Biomarkers (DigitalBiomarkers '17)*. ACM, New York, NY, USA, 21-26. DOI: 10.1145/3089341.3089345.

C187. * **Cheng Zhang**, **Qiuyue Xue**, **Anandghan Waghmare**, **Ruichen Meng**, **Sumeet Jain**, **Yizeng Han**, **Xinyu Li**, Kenneth Cunefare, Thomas Plötz, Thad Starner, Omer Inan, Gregory D Abowd. FingerPing: Recognizing Fine-grained Hand Poses using Active Acoustic On-body Sensing. In the *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. Montreal QC, Canada, April 2018.

C188. * **Hyeokhyen Kwon**, Gregory D Abowd, Thomas Plötz. Adding structural characteristics to distribution-based accelerometer representations for activity recognition using wearables. In the *Proceedings of the 2018 ACM International Symposium on Wearable Computers (ISWC 2018)*. pp. 72-75. Singapore, October 2018. DOI: https://doi.org/10.1145/3267242.3267258.

C189. * **Hong Li**, Gregory D Abowd, Thomas Plötz. On specialized window lengths and detector based human activity recognition. In the *Proceedings of the 2018 ACM International Symposium on Wearable Computers Computers (ISWC 2018)*. pp. 68-71. Singapore, October 2018. DOI: https://doi.org/10.1145/3267242.3267246.

C190. * **Hong Li**, **Shishir Chawla**, **Richard Li**, **Sumeet Jain**, Gregory D Abowd, Thad Starner, **Cheng Zhang**, Thomas Plötz. Wristwash: towards automatic handwashing assessment using a wrist-worn device. In the *Proceedings of the 2018 ACM International Symposium on Wearable Computers (ISWC 2018)*. pp. 132, 139 Singapore, October 2018. DOI: https://doi.org/10.1145/3267242.3267247.

C191. * **Nivedita Arora** and Gregory D. Abowd) ZEUSSS: Zero Energy Ubiquitous Sound Sensing Surface Leveraging Triboelectric Nanogenerator and Analog Backscatter Communication. In the Adjunct *Proceedings of the ACM Symposium on User Interface Software and Technology (UIST 2018)*. Poster. Berlin, Germany 2018. **Best poster award.**

C192. * **Fereshteh Shahmiri**, Chaoyu Chen, **Anandghan Waghmare**, **Dingtian Zhang**, **Shivan Mittal**, Steven Zhang, Yi-Cheng Wang, Zhong Lin Wang, Thad E. Starner, Gregory D. Abowd. Serpentine: A self-powered reversibly deformable cord sensor for human input. *International ACM Conference on Human Factors in Computing Systems (CHI 2019*), Glasgow, Scotland. May 2019. To appear.

C193. ***Mehrab Bin Morshed**, **Koustuv Saha**, **Munmun De Choudhury**, Gregory D Abowd, Thomas Plötz. Measuring Self-Esteem with Passive Sensing. *PervasiveHealth '20: Proceedings of the 14th EAI International Conference on Pervasive Computing Technologies for Healthcare*, May 18-20 2020. Pp. 363-366. DOI: https://doi.org/10.1145/3421937.3421952. Atlanta, GA.

C194. ***Vedant Das Swain**, **Koustuv Saha**, Gregory D Abowd, **Munmun De Choudhury**. Social Media And Ubiquitous Technologies For Remote Worker Wellbeing And Productivity In A Post-pandemic World. *IEEE International Conference on Cognitive Machine Intelligence (CogMI)*, October 28-31 2020. DOI: 10.1109/CogMI50398.2020.00025. Atlanta, GA.

C195. ***Vanessa Oguamanam**, Taneisha Lee, Tom McKlin, **Zane Cochran**, Gregory D Abowd, Betsy DiSalvo. Cultural Clash: Exploring How Studio-based Pedagogy Impacts Learning For Students In Hci Classrooms. *DIS '20: Proceedings of the 2020 ACM Designing Interactive Systems Conference*, July 6-10 2020. Pp. 1131-1142. DOI: https://doi.org/10.1145/3357236.3395544. Eindhoven, Netherlands.

C196. Julie A Kientz, Gillian R Hayes, Matthew S Goodwin, Mirko Gelsomini, Gregory D Abowd. Interactive Technologies And Autism, Second Edition. *Synthesis Lectures on Assistive, Rehabilitative, and Health-Preserving Technologies*, May 2020. 229 pages. DOI: https://doi.org/10.2200/S00988ED2V01Y202002ARH013.

C197. Yogesh K Meena, Xing-Dong Yang, Marcus Löchtefeld, Matt Carnie, Niels Henze, Steve Hodges, Matt Jones, Nivedita Arora, Gregory D. Abowd. Selfsustainablechi:

Self-powered Sustainable Interfaces And Interactions. *CHI'20 Extended Abstracts: CHI Conference on Human Factors in Computing Systems Extended Abstracts*, April 2020. DOI: https://doi.org/10.1145/3334480.3375167. Honolulu, HI.

C198. *__Vedant Das Swain__, Koustuv Saha, __Manikanta D Reddy__, __Hemang Rajvanshy__, Gregory D Abowd, Munmun De Chowdhury. Modeling Organizational Culture With Workplace Experiences Shared On Glassdoor. *ACM CHI Conference on Human Factors in Computing Systems*, April 2020. DOI: 10.1145/3313831.3376793. Honolulu, HI.

C199. ***Christopher Chen**, **David Howard**, **Stephen L Zhang**, **Youngwook Do**, **Sienna Sun**, **Tingyu Cheng**, **Zhong Lin Wang**, Gregory D. Abowd, Hyunjoo Oh. Spin (Self-powered Paper Interfaces): Bridging Triboelectric Nanogenerator With Folding Paper Creases. *TEI '20: Proceedings of the Fourteenth International Conference on Tangible, Embedded, and Embodied Interaction*. February 2020. Pp. 431-442. DOI: https://doi.org/10.1145/3374920.3374946. Sydney, NSW, Australia.

C200. ***Youngwook Do**, **Siddhant Singh**, **Zhouyu Li**, **Stephen R Craig**, **Phoebe J Welch**, **Chengzhi Shi**, **Thad Starner**, Gregory D Abowd, Sauvik Das. Bit Whisperer: Enabling Ad-hoc, Short-range, Walk-up-and-share Data Transmissions Via Surface-restricted Acoustics. *UIST '21: The 34th Annual ACM Symposium on User Interface Software and Technology*, October 10-14, 2021. Pp. 1345-1357. DOI: https://doi.org/10.1145/3472749.3477980. New York, NY.

C201. ***Nivedita Arora**, **Ali Mirzazadeh**, **Injoo Moon**, **Charles Ramey**, **Yuhui Zhao**, **Daniela C Rodriguez**, Gregory D Abowd, **Thad Starner**. Mars: Nano-power Battery-free Wireless Interfaces For Touch, Swipe And Speech Input. *UIST '21: The 34th Annual ACM Symposium on User Interface Software and Technology*, October 10-14, 2021. Pp. 1305-1325. DOI: https://doi.org/10.1145/3472749.3474823. New York, NY.

C202. ***Youngwook Do**, **Linh Thai Hoang**, **Jung Wook Park**, Gregory D Abowd, Sauvik Das. Spidey Sense: Designing Wrist-mounted Affective Haptics For Communicating Cybersecurity Warnings. *DIS '21: Designing Interactive Systems Conference 2021*, June 28-July 2 2021. Pp. 125-137. DOI: https://doi.org/10.1145/3461778.3462027. New York, NY.

B3. Other refereed material

B4. Submitted Journal Articles (with date of submission)

C. OTHER PUBLICATIONS

List all other publications that are not otherwise included in Sections IV. A. and B.

Harrison, M. D., Gregory D. Abowd and Alan J. Dix. (Significant contribution by all three authors, presented by Harrison) State of the art: Formal aspects of user interfaces. Invited presentation at Eurographics'90 conference, May 1990.

Abowd, Gregory D. (extended abstract reviewed by program committee) Using formal methods for the specification of user interfaces. In Selby, R., editor, Proceedings of the 2ndAnnual Irvine Software Symposium — ISS'92, pp. 109– 130. Irvine Research Unit in Software, University of California, Irvine, 1992.

Abowd, Gregory D. Using formal methods of software engineering in HCI. Position

paper for Basic Research Symposium at INTERCHI'93 conference, Amsterdam, April 1993.

Abowd, Gregory D. and Bonnie E. John. (Significant contribution by Abowd through research directed by John) Using formal methods to improve the usability of Soar. Poster presented at HCI Consortium Winter Workshop, Fraser, Colorado, February 1994.

Abowd, Gregory D. and Bonnie E. John. (Significant contribution by Abowd through research directed by John) Using formal methods to improve the usability of Soar. Paper presented at Soar-13 Workshop, Columbus, Ohio, March 1994.

Abowd, Gregory D. Interface refinement. Position paper for Basic Research Symposium at CHI'94 conference, Boston, MA, April 1994.

Abowd, Gregory D. Defining reference models and software architectural styles for cooperative systems. Position paper for CSCW'94 workshop on software architectures for cooperative systems, October 1994.

Abowd, Gregory D. Automated dialogue verification. Position paper for Basic Research Symposium at CHI'95 conference, Denver, CO, May 1995.

Dey, Anind and Gregory Abowd. (principal contributions and authorship by Dey) Position paper on wearable computing. Submitted to CHI'97 Workshop on Wearable Computing, January 1997.

Dey, Anind and Gregory D. Abowd (Significant contributions from Dey, principal authorship by Dey). Cyberdesk demonstration. Presented at the User Interface Software Technology Symposium — UIST'97. October 1997.

Appelbe, B. and Abowd, G.D. (Equal contributions by both authors) Beyond objects: A response. *Software Engineering Notes,* **20**(3):45–48.

Abowd, Gregory D. What's in a name? Article in Beyond the Desktop: considering the future of interaction. In *SIGCHI Bulletin*, 2000.

Dey, Anind K. and Gregory D. Abowd (principal research and authorship by Dey and Abowd) Towards a Better Understanding of Context and Context-Awareness. Presented at the CHI 2000 Workshop on The What, Who, Where, When, Why and How of Context-Awareness, April 1-6, 2000.

Dey, Anind K. and Gregory D. Abowd (principal research and authorship by Dey) The Context Toolkit: Aiding the Development of Context-Aware Applications. In Workshop on Software Engineering for Wearable and Pervasive Computing, workshop affiliated with ICSE 2000 conference, Limerick, Ireland, June 6, 2000.

O'Connell, Thomas, Peter Jensen, Anind Dey and Gregory D. Abowd. Location in the Aware Home. Position paper for Workshop on Location Modeling for Ubiquitous Computing, at Ubicomp 2001 conference, September 30, 2001. See http://www.teco.edu/locationws.

Richter, Heather and Gregory D. Abowd. Evaluating capture and access through authentic use. Position paper for Workshop on Evaluation Methodologies for Ubiquitous Computing, at Ubicomp 2001 conference, September 30, 2001. See http://zing.ncsl.nist.gov/ubicomp01.

Abowd, Gregory D. Challenges to construction beyond the desktop. Article in Beyond the Desktop: considering the future of interaction. In *SIGCHI Bulletin*, 2001.

Scholtz, Jean, Heather Richter and Gregory D. Abowd.. Report from Ubicomp 2001 Workshop: Evaluation methodologies for ubiquitous computing. Article in Beyond the Desktop: considering the future of interaction. In *SIGCHI Bulletin*,

2001.

Abowd, Gregory D. A search is a search… The impact of awareness technologies on privacy litigation. Article in Beyond the Desktop: considering the future of interaction. In *SIGCHI Bulletin*, 2001.

Abowd, Gregory D. Is that a PDA in your pocket, or are you just happy to see me? Article in Beyond the Desktop: considering the future of interaction. In *SIGCHI Bulletin*, 2002.

Abowd, Gregory D. Sometimes we aim too high. Article in Beyond the Desktop: considering the future of interaction. In *SIGCHI Bulletin*, 2002.

Edwards, Keith, Beki Grinter and Gregory D. Abowd. Smart Homes or homes that smart? Article in Beyond the Desktop: considering the future of interaction. In *SIGCHI Bulletin*, 2002

Nagel, Kristine S. and Gregory D. Abowd (principal research and authorship by Nagel). Developing a Context-Aware Audio System Supporting Interpersonal Communication Presented at the HCI Consortium Annual Workshop, January, 2002, Fraser, Colorado.

Iachello, Giovanni and Gregory D. Abowd (principal research and writing by Iachello) Security requirements for environmental sensing technology, 2nd Workshop on Ubicomp Security, in conjunction with Ubicomp 2003. Oct. 2003, Seattle, WA, USA.

White, David R., Jose Antonio Camacho-Guerrero, Khai N. Truong, Gregory D. Abowd, Michael J. Morrier, Pooja C. Vekaria and Diane Gromala (principal research by White and Camacho-Guerrero, principal authorship by White and Abowd) Mobile capture and access for assessing language and social development in children with autism. Ubicomp 2003 companion proceedings. Demo paper. Oct. 2003, Seattle, WA, USA.

Abowd, Gregory D., Gaetano Borriello and Gerd Kortuem (equal contributions by all authors). Report from the Ubicomp education workshop. In *IEEE Pervasive Computing Magazine*, Volume 3, Number 1, January-March 2004, pp. 94-98.

Gillian R. Hayes, and Gregory D. Abowd. Assessment of Children with Autism Spectrum Disorders through Data Collection in the Natural Environment Worskhop on Health Issues in HCI at *CHI'05* (April 2-7, Portland, OR, USA), 2005.

Sebastian Boring, Julie A. Kientz, Gregory D. Abowd, and Gillian R. Hayes. Abaris: Capture and Access for Structured One-on-One Educational Settings. In the Extended Abstracts of *UBICOMP 2005: The 7th International Conference on Ubiquitous Computing*, September 11-14, Tokyo, Japan, 2005.

Julie A. Kientz, and Gregory D. Abowd. Collective Remembering in Evidence-Based Care. Workshop on Collective Remembering at *CHI 2006* (April 22-27, Montreal, Canada), 2006.

Gillian R. Hayes, Juane Heflin, Gregory D. Abowd, Lamar M. Gardere, Ellen Matthews, Julie A. Kientz, Ron Oberleitner (principal work by Hayes and Gardere) Evaluating a Selectively Archived Video Recording System for Functional Behavior Assessment in Schools. Poster abstract presented at *International Meeting for Autism Research (IMFAR 2006)*, Montreal, Canada, June 2006.

Ron Oberleitner, Uwe Reischl, James Ball, John Harrington, Suhas Pharkute, and Gregory Abowd (principal writing by Ron Oberleitner) Remote autism evaluation through telehealth technology. Poster abstract presented at *International*

Meeting for Autism Research (IMFAR 2006), Montreal, Canada, June 2006.

Hayes, G.R., Gardere, L.M., de Fazio, C., Abowd, G.D., Oberleitner, R. ABA Autism 2007 CareLog. In 2007 Progress and Challenges in the Behavioral Treatment of Autism Conference. Boston, Massachusetts. 2007.

Kientz, J.A. and G.D. Abowd. Abaris: Technology to Support Collaboration and Decision Making for Discrete Trial Training. In 2007 Progress and Challenges in the Behavioral Treatment of Autism Conference. Boston, Massachusetts. 2007.

Kientz, J.A., Hayes, G.R., Arriaga, R., Abowd, G.D. Designing and Developing Technology for Caregivers of Individuals with Autism CHI 2008 Workshop on Technology in Mental Health. Florence, Italy. April 2008.

Svetlana Yarosh and G. D. Abowd. Segmented Institutionalism as a Perspective for Understanding Family Technologies. *Designing for Families Workshop. Ext. Abst. Of CSCW*. ACM (2008).

Yarosh, S., & Abowd, G. D. Embodied Interaction for Mediated Communication between Children and Parents. *Children and Embodied Interaction Workshop. Ext. Abst. of Interaction Design and Children*. ACM (2009).

Ping Wang, Gregory D. Abowd and James M. Rehg (principal research and authorship by Wang) Automatic retrieval of mother-infant social games from unstructured videos. *International Meeting for Autism Research (IMFAR)*, poster presentation, Chicago, IL, 2009.

Matthew N. Bonner, Jeremy T. Brudvik, Hee Young Jeong, H.A. Mohamed, and Gregory D. Abowd (principal research and authorship by Bonner, Brudvik, Jeong and Mohamed) MEW: Coping with pediatric transplants. *Supplemental Proceedings of the 11th International Conference on Ubiquitous Computing (Ubicomp 2009)*, Poster presentation, Orlando, FL.

Ping Wang, Tracy Westeyn, Gregory D. Abowd and James M. Rehg (principal research and authorship by Wang and Westeyn) Automatic classification of parent-infant social games from video. *International Meeting for Autism Research (IMFAR)*, Philadelphia, PA, poster presentation, 2010.

Fatima A. Boujarwah, Hwajung Hong, Jackie Isbell, Rosa I. Arriaga, and Gregory D. Abowd (principal research and authorship by Boujarwah, Hong, and Isbell) Training social problem solving skills in adolescents with high-functioning autism. *International Meeting for Autism Research (IMFAR)*, May 20-22, 2010, Philadelphia, PA, poster presentation.

Nazneen, Fatima A. Boujarwah, Amha Mogus, Shone Sadler, Mohammed Habibula, Rosa I. Arriaga, and Gregory D. Abowd (principal research and authorship by Nazneen, Boujarwah, Mogus, Sadler and Habibula) Understanding the context of stereotypical behaviors. *International Meeting for Autism Research (IMFAR)*, May 20-22, 2010, Philadelphia, PA, poster presentation.

Fatima A. Boujarwah, Mark O. Riedl, Gregory D. Abowd, Rosa I. Arriaga (principal research and authorship by Boujarwah) REACT: Intelligent authoring of social skills instructional modules for adolescents with high-functioning autism. *SIGACCESS Newsletter*, Spring 2011.

Fatima A. Boujarwah, Nazneen, Hwajung Hong, Gregory D. Abowd, and Rosa I. Arriaga (principal research and authorship by Boujarwah, Nazneen, and Hong) Cross-cultural comparisons of social expectations of individuals with autism. *International Meeting for Autism Research (IMFAR)*, May 12-14, 2011, San

Diego, CA, poster presentation.

Fatima A. Boujarwah, Jennifer G. Kim, Mark O. Riedl, Rosa I. Arriaga, and Gregory D. Abowd (principal research and authorship by Boujarwah, and Kim) Building a knowledge base to support the authoring of social skills instructional modules. *International Meeting for Autism Research (IMFAR)*, May 12-14, 2011, San Diego, CA, poster presentation.

Fatima A. Boujarwah, Nazneen, Hwajung Hong, Rosa I. Arriaga, and Gregory D. Abowd (principal research and authorship by Boujarwah, Nazneen and Hong) Cross-cultural comparisons of social expectations of individuals with autism and other intellectual disabilities. *40th Annual Meeting of the Society for Cross- Cultural Research*, February 16-19, 2011, Charleston, SC.

Aisling Ann O'Kane, Amy Hurst, Gerrit Niezen, Nicolai Marquardt, Jon Bird, and Gregory Abowd. 2016. Advances in DIY Health and Wellbeing. *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA '16)*. ACM, New York, NY, USA, pp.3453-3460. DOI: 10.1145/2851581.2856467.

D. PRESENTATIONS

List all conference presentations (separate keynote and invited from submitted), testimony before legislative committees or other public bodies, invited seminars, performances of creative works, etc. (Do not list a presentation here if it is listed elsewhere.)

D1. Keynotes and Invited Distinguished Lectures

K1. The Impact of New Technology in Education: Classroom 2000 and Beyond. Keynote presentation at Mobility Foundation Annual Conference, Los Angeles, CA. March 1, 1998.

K2. Building Software for Mobile and Ubiquitous Computing Applications. Invited presentation at IEEE CS Annual Workshop on VLSI: System Level Design. Orlando, FL, April 16, 1998.

K3. Building a digital library of captured experiences. International Conference on Digital Libraries. Invited keynote address, Kyoto, Japan, November, 2000.

K4. Designing and Building Living Laboratories for Ubiquitous Computing Research: Opportunities for Software Engineering Research. Keynote address for Promodis (Programming of Modular and Distributed Systems) Swedish National conference, December 11, 2000.

K5. Computing in living laboratories: Beyond dreaming beyond the desktop. State of Louisiana Center for Advanced Computing Studies Distinguished Lecture, Lafayette, March 8, 2002.

K6. Computing in living laboratories: A grand challenge. Invited keynote address at the High Performance and Distributed Computing Conference (HPDC 2002), Edinburgh, Scotland, July 22-24, 2002.

K7. Research challenges in ubiquitous computing. Invited keynote speaker at National Academy of Engineering Joint North America/Japan Frontiers in Engineering Symposium, Japan October 2002.

K8. Abowd, Gregory D. Programming environments…literally: Ubicomp's grand challenge for software engineering. Opening keynote at ACM SIGSOFT Foundations of Software Engineering conference, Charleston, S.C., Nov. 20-22, 2002.

K9. Challenges for applications research in ubiquitous computing. University of California, Irvine Institute for Research on Software (IROS) Distinguished Lecture, Irvine, CA, Jan. 17, 2003.

K10. Ubiquitous computing: Information technology challenges for the next 40 years. Invited keynote at 40th anniversary of the Chicago chapter of ACM, Chicago, IL, April 23, 2003.

K11. Programming Environments: A grand challenge for ubiquitous computing. Invited keynote address at ENC 2003, the Fourth Mexican International Conference on Computer Science, September 10, 2003.

K12. Programming Environments: A grand challenge for ubiquitous computing. Invited keynote address to UCS 2003, the first national Japanese conference on ubiquitous computing, Kyoto, Japan, Nov. 17, 2003.

K13. Realizing the dreams of ubiquitous computing: It's all in the family. Invited keynote address at *Graphics Interface* 2004, London, Ontario, Canada, May 19, 2004.

K14. The Aware Home Research Initiative: Balancing technology and applications research.

Invited keynote address to ICOST 2004, Singapore, September 17, 2004.

K15. Technologies to Support the Care of Children With Autism. Invited keynote at Idaho Conference on Telehealth and Autism, March 10, 2006.

K16. From Whimsical to Medical: Why I care about automating the capture of everyday experiences. Distinguished Lecture for Department of Computer Science, University of Illinois at Urbana-Champaign. April 3, 2006.

K17. Hold That Thought: Why I care about automating the capture of everyday experiences. Distinguished Lecture, Faculty of Information Science, Cornell University, September 27, 2006.

K18. Hold That Thought: Why I care about automating the capture of everyday experiences.

Technology and Social Behavior Series, Northwestern University, October 12, 2006. K19. Make IT Matter. Keynote talk at Ambient Intelligence 2007, Darmstadt, Germany,

November 7-10, 2007.

K20. Measuring behavior in the home. Keynote talk at Measuring Behavior 2008, Maastricht, The Netherlands, August 26-29, 2008.

K21. Make IT Matter: How Computing Can Make a Difference. Closing lunch plenary at SIGCSE 2009, Chattanooga, TN, March 7, 2009.

K22. Make IT Matter: The opportunities and responsibilities of pervasive computing research.

Keynote talk at IEEE PerCom 2009, Galveston, TX, March 10, 2009.

K23. Make IT Matter: We Can Be Clever and Make a Difference. Keynote at ETC'09, Emerging Technologies Conference, Iowa State University, April 2, 2009.

K24. Ubiquitous Care: Case studies in human-centered technology for health and education.

Virginia Tech Department of Computer Science Distinguished Lecture. February 19, 2010.

K25. Computing and Autism: An odyssey borne of passion. The 2010 International Symposium on Collaborative Technology and Systems (CTS 2010). Keynote, Chicago, May 17, 2010.

K26. Computing and Autism. Invited Distinguished Lecture, University of Newcastle, September 2010.

K27. Computing and Autism. Stanford University, HCI Distinguished Lecture Series, October 15, 2010.

K28. Computing and Autism, Emory University, Department of Computer Science Distinguished Lecture, October 25, 2010.

K29. Computing and Autism. Distinguished lecture, Arizona State University, February 2011.

K30. Computing Where IT Matters: Reflections on the Relevance of HCI Research. Invited closing keynote address for British HCI Conference, July 2011, Newcastle, United Kingdom.

K31. Pervasive Healthcare: The role of ubiquitous computing in chronic conditions Xi'an Northwestern Polytechnical University Distinguished Lecture, Xi'an, China, September 2011.

K32. Oh, the Ubiquity! Don't look back, but there is a LOT of data headed your way! Keynote address, 2011 American Medical Informatics Association, October 2011, Washington, D.C.

K33. Using Computing Technologies to Support the Challenges of Autism: How can a computational approach impact DIR? International Council on Developmental and Learning Disorders invited keynote address and panelist, November 2011, Washington, D.C.

K34. Computing and Autism: How Computer Science and Personal Passion Influence Each Other Keynote, SwSTE 2012 (IEEE CS International Conference on Sofware Science, Technology,and Engineering) 12 June 2012 in Herzliya Israel. Lecture delivered remotely.

K35. Computing and Autism: How a real-world challenge drives a computing research agenda. Invited distinguished lecture, Microsoft Research Cambridge, November 27, 2012.

K36. Computing and Autism: How a real problem can drive research in a different field, Swansea (Wales) University Distinguished Lectures in Computer Science, November 29, 2012.

K37. Computing and Autism: How real-world challenges drive a research agenda. Invited keynote lecture at Kuwaiti e-Systems International Conference, December 18, 2012, Kuwait City, Kuwait.

K38. Computing and Autism: How a real problem drives multimodal activity recognition research. Invited keynote address for 2013 IEEE Face and Gesture Conference, April 23, 2013, Shanghai, China.

K39. Ubicomp and the Home. Invited keynote for HomeSys 2013 workshop, collocated with Ubicomp 2013 conference. Zurich, Switzerland, Sep. 9, 2013.

K40. Ubicomp and Health: Merging Research Agendas. Cornell University School of Information Sciences Distinguished Lecture, October 28, 2013, Ithaca, NY.

K41. Computing and Autism: How a real-world challenge drives a computing research agenda. ACM Distinguished Speakers talk for American University of Athens, Athens, Greece, December 13, 2013.

K42. Ubicomp and Health: Merging Research Agendas. ACM Distinguished Speakers talk for ACM SIGCHI Greek chapter, University of Athens, Athens, Greece, December 13, 2013.

K43. Approaches to Ubiquitous Computing Research. Keynote talk at Broadening Participation in Computing workshop at Ubicomp 2014 conference. September 14, 2014, Seattle, WA.

K44. On being an applied computer scientist. University of Wisconsin-Madison Computer Science Department Distinguished Lecture, October 16, 2014.

K45. Beyond ubiquitous computing: The fourth generation of computing is already here! University of Wisconsin WHCI+D Distinguished Lecture, October 17, 2014.

K46. HCI: What does the future hold for the human experience? Invited keynote address for IEEE Rebooting Computing meeting in Santa Clara, CA, October 23, 2014

K47. On being an applied computer scientist. College of William and Mary Distinguished Lecture, Nov. 18, 2014.

K48. Health and technology: How to balance the research agendas effectively. Invited keynote address to Workshop on Interactive Systems for Health 2014, held in conjunction with the AMIA Annual Meeting, Washington, DC, Nov. 15, 2014.

K49. Beyond Ubicomp: Recognizing the next generation of computing technologies and applications. Distinguished Lecture at SMU Department of Computer Science, Dallas, TX, March 18, 2015.

K50. Autism and Technology: An autobiographical account. Invited keynote and tutorial at the Irvine Thompson Center for Autism, March 23, 2015.

K51. On being an applied computer scientist. Distinguished Lecture, CalTech Department of Computer Science. March 24, 2015.

K52. A new generation of computing and its potential for PATCH. Invited keynote address to PATCH workshop at the Intelligent User Interface conference, March 29, 2015.

K53. Applied computing research: Challenges and opportunities in a world of ubiquitous computing and beyond. Distinguished lecture at University of Texas Department of ECE, April 27, 2015.

K54. Computing and health: An interdisciplinary approach in an era of mobile and ubiquitous computing. Invited keynote address at Symposium on Patient Safety with Interactive Medical Devices, Reading, England, June 24, 2105.

K55. A new generation of computing and the promise for new social interactions. Keynote address for Mobile Systems for Computational Social Science workshop, in conjunction with the Ubicomp conference, Osaka, Japan, September 7, 2015.

K56. Beyond ubiquitous computing: Technology advances and applications. ACM Distinguished Speaker address at the College of New Jersey, October 20, 2015.

K57. Technology and autism: An autobiographical account. Geisinger-Bucknell Autism Center Distinguished Lecture, December 8, 2015.

K58. Beyond Weiser's ubiquitous computing: 2 hopeful ideas. Toronto User Experience (TUX) Sanders Series Distinguished Lecture, January 12, 2016.

K59. Hot or Not? Moving forward from Weiser's vision of ubiquitous computing. Invited keynote address for HotMobile, St. Augustine, FL, February 23, 2016.

K60. On being an applied computer scientist. University of Michigan CSE Distinguished Lecture, April 19, 2016.

K61. Interactive Computing Beyond Weiser's Ubicomp. University of Michigan School of Information Distinguished Lecture, April 20, 2016.

K62. On Being an Applied Computer Scientist. University of Michigan School of Information Distinguished Lecture, April 20, 2016.

K63. On being an applied computer scientist. University of Newcastle Doctoral Summer School keynote lecture, July 20, 2016.

K64. Today's and tomorrow's interactive technologies: Collective computing and computational skins. University College London Symposium on HCI Grand Challenges, September 12, 2016.

K65. Mental health: A driving application for 4th generation computing. Closing keynote for Ubicomp 2016 Mental Health workshop, Sep. 13, 2016.

K66. Beyond Weiser: From ubiquitous computing to collective computing. University of Notre Dame Dept. of Computer Science Distinguished Lecture, Nov. 18, 2016.

K67. Moving Beyond Weiser's Ubiquitous Computing. Keynote address at the 11th International Conference on Ubiquitous Computing and Ambient Intelligence, Nov. 8, 2017. Villanova University, Philadelphia.

K68. The COSMOS Conjecture: Dreaming and doing in a post-Moore's Law era, January 16, 2018. Distinguished Lecture at Milan Politecnico.

K69. The Material of the 21st Century: Moving beyond Moore and Weiser. March 21, 2018.
MIT Media Lab

K70. The Material of the 21st Century: Moving beyond Moore and Weiser. Dartmouth University, Department of Computer Science Distinguished Lecture. Hanover, NH. September 28, 2018.

K71. The Material of the 21st Century. Distinguished lecture at Nanyang Technological University, Singapore. October 8, 2018.

K72. The Material of the 21st Century. Refereed and invited vision talk. ACM Symposium on User Interface Software Technology (UIST 2018). October 16, 2018. https://www.youtube.com/watch?v=cNIZBtgceS4.

K73. The Material of the 21st Century. Distinguished Lecture, Tianjin University, Tianjin, China. December 13, 2018.

K74. The Material of the 21st Century: Towards self-sustainable computational materials. Google X Tech Talk. January 30, 2019.

D2. Other presentations

P1. Harrison, Michael D. and Gregory D. Abowd. (Significant contribution by both

authors and equal presentation) Formal methods in human-computer interaction: a tutorial. Tutorial presentation for CHI'91 conference, New Orleans, LA, April 1991.

P2. Dix, Alan J. and Gregory D. Abowd. (Significant contributions by both authors and equal presentation) Applying formal methods to HCI research. Tutorial presentation for HCI'92 conference, York, England, September 15, 1992.

P3. Abowd, Gregory D. Evaluating user interface tools. Tutorial presented at HCI'94 conference, Glasgow, Scotland, August 23, 1994.

P4. Dix, Alan J. and Gregory D. Abowd. (Significant contributions by both authors and equal presentation) Formal methods and HCI. Tutorial presented at HCI'94 conference, Glasgow, Scotland, August 23, 1994.

P5. Abowd, Gregory D. Models and notations for interactive systems design and analysis.
Tutorial presented at SIGSOFT'94 conference, New Orleans, LA, December, 1994.

P6. Abowd, Gregory D., Colin Potts and Spencer Rugaber. MORALE: Integrating techniques to support the evolution of software systems. Tutorial presented at the *International Conference on Software Maintenance — ICSM'99*. Oxford, England, August 30, 1999.

P7. (with Jason A. Brotherton) Classroom 2000: An experiment in automated capture and access in an educational environment. Invited lecture at Microsoft Research, January 15, 1999.

P8. Classroom 2000: An experiment in automated capture and access in an educational environment. Distinguished Lecture, Computer Science Department, Brown University. March 12, 1999.

P9. Research experiences in automated capture applied to an educational environment.
Distinguished Lecture Vassar University, April 15, 1999.

P10. (with Barry Boehm, John Knight and David Parnas) Panel: The relevance to industry of software engineering research in academia. Motorola Software Engineering Symposium— SES'99, Ft. Lauderdale, FL, June 23, 1999.

P11. (with Richard N. Taylor) Panel: Software Architecture trends. Motorola Software Engineering Symposium — SES'99, Ft. Lauderdale, FL, June 23, 1999.

P12. Gregory D. Abowd. Panel: Technology Enhanced Learning. Internet2 Sociotechnical Summit. Ann Arbor, MI, Sept. 13-15, 1999.

P13. Gregory D. Abowd and Anind Dey (moderators); Peter J. Brown, Nigel Davies, Mark Smith and Pete Steggles (panelists). Panel: Towards a better understanding of context and context-aware computing. International Symposium on Handheld and Ubiquitous Computing — HUC'99. Karlsruhe, Germany, September 27-29, 1999.

P14. Classroom 2000: Investigating automated capture in an educational setting. Carnegie Mellon HCI Institute Seminar, Pittsburgh, PA, October 13, 1999.

P15. Computing Beyond Your Dreams: Opportunities and Challenges for Cyberenvironments. Georgia Tech College of Computing John P. Imlay Dean's Lecture, November 4, 1999.

P16. Automated capture in a living laboratory: Classroom 2000. University of Washington

Computer Science Seminar, Seattle, WA, November 22, 1999.

P17. Ubiquitous computing environments: Research accomplishments and future visions. Oregon Graduate Institute Center for Human-Computer Communication Distinguished Lecture Series on the Future of Human-Computer Interaction, February 4, 2000.

P18. Examining ubiquitous computing and automated capture and access in a living laboratory. Michigan-Ohio SIGCHI Chapter, invited lecture, February 11, 2000.

P19. Future Computing Environments Research. Invited talk to Andersen Consulting (now Accenture) Center for Strategic and Advanced Research (CSTaR), June 5, 2000. Joe McCarthy host.

P20. Research Challenges in Ubiquitous Computing. Invited lecture as Schlumberger Technical Fellow, September 15, 2000. Meyer Bengio host.

P21. Research in Future Computing Environments. Invited presentation at Sony Computer Science Labs, Tokyo, Japan, November 13, 2000. Jun Rekimoto host.

P22. Research in Future Computing Environments. Invited presentation at ATR MIC Labs, Kyoto, Japan, November 17, 2000. Kenji Mase host.

P23. Research in Future Computing Environments. Invited presentation at NEC Research Labs, Kyoto, Japan, November 17, 2000. Mikiya Tani and Yoshihide Ishiguro hosts.

P24. Research in Future Computing Environments. Invited presentation at the Interactive Institute, Gothenberg, Sweden, December 12, 2000. Lars-Erik Holmquist host.

P25. Abowd, Gregory D. Beyond Dreaming Beyond the Desktop: Challenges in Building and Evaluating Ubiquitous Computing Applications. Invited talk at IBM Research, Watson talk, May 2001.

P26. Abowd, Gregory D. Beyond Dreaming Beyond the Desktop: Challenges in Building and Evaluating Ubiquitous Computing Applications. Invited talk at Lucent Labs, Illinois, June 11 2001.

P27. (with James Rowan). Intel Smart Home Forum invited talk: As We May Live: Building an Aware Home. August 2, 2001.

P28. As We May Live: The Georgia Tech Broadband Institute Residential Laboratory and the Aware Home Research Initiative. Invited 45-minute presentation as part of panel for American Society of Interior Designers meeting, New Orleans, LA, Feb. 16, 2002.

P29. If a classroom could listen, would anyone care? Experiences with eClass. Invited lecture at University of Toronto Knowledge Media Design Institute Spring 2002 Seminar Series, March 6, 2002.

P30. Building a research program on ubiquitous computing in the home. Invited lecture at University of Texas, Arlington, March 25, 2002.

P31. Applications research in ubiquitous computing. Invited talk for National Academy of Engineering Joint Japan America Frontiers of Engineering Symposium, Nov. 2002.

P32. (joint with T. Rodden, W. Gaver, J. Wejchert) Panel on ubiquitous computing in the home. At Ubicomp 2002 conference, Gothenberg,

Sweden, October 2002.

P33. As we may live. Invited talk to Michigan-Ohio ACM SIGCHI Special Interest Group (MOCHI), Ann Arbor, MI, Feb. 12, 2003.

P34. As we may live. Invited talk to Microsoft Research, Seattle, WA, March 3, 2003.

P35. As we may live. Invited talk to Intel Research, Seattle, WA, March 4, 2003.

P36. The Role of Technology for Healthy Aging. Statement prepared and presented by Gregory D. Abowd to U.S. Senate Special Committee on Aging, hearing on Baby Boomers at the Gate: Enhancing Independence through Innovation and Technology. May 20, 2003. Full statement available at http://aging.senate.gov/hearings/hr101ga.pdf

P37. The Role of Technology for Healthy Aging. Presentation to the National Governor's Association annual meeting, New Orleans, October 11, 2003.

P38. Ubiquitous Computing: An overview of research accomplishments and challenges. Delivered to Samsung Electronics Research, Seoul, Korea, Nov. 18, 2003.

P39. eClass: A retrospective. Invited presentation to Web Group at University of Notre Dame, Indiana, March 2, 2004.

P40. Realizing the dream of ubiquitous computing: It's all in the family. Invited seminar to CSE Department, University of Notre Dame, Indiana, March 2, 2004.

P41. Progress update on the Aware Home Research Initiative. Invited presentation to Intel, Hillsborough, OR, March 11, 2004.

P42. Pervasive Technologies and applications for a Smart Home. Invited presentation and panel participation at George Washington University, May 20, 2004.

P43. Technologies to Track Interventions for Autism. Invited presentation to Cure Autism Now Innovative Technologies for Autism Think Tank, June 11-13, 2004, San Francisco, CA.

P44. Application-led research in ubiquitous computing. Panel presentation in UbiApp workshop, held in conjunction with Pervasive Computing Conference, May 11, 2005. Munich, Germany. Other panelists included Gaetano Borriello, William Newman, and Abigail Sellen.

P45. Better living through technology for persons with disabilities: The Aware Home. Lunch speaker at 11th Annual Georgia Epilepsy Symposium, November 11, 2006.

P46. Abowd, Gregory D. Evaluation of real deployments in ubicomp. Tutorial presented at the *International Conference on Pervasive Computing (Pervasive 2007),* Toronto, Canada, May 16, 2007.

P47. Abowd, Gregory D. Pervasive computing: Introduction to research in the area. Tutorial presented at the *International Conference on Pervasive Computing (Pervasive 2008),* Sydney, Australia, May 22, 2008.

P48. Panel on the history and future of Ubicomp, *International Symposium on Ubiquitous Computing (Ubicomp 2008), Seoul, Korea,* September 21-24, 2008.

P49. HCI Research: Does it really matter? Carnegie Mellon University HCI Institute Seminar Series, Wednesday, October 1, 2008.

P50. Computing and Autism. Newcaste University Creative Play Group Lecture

series, October 1, 2010.

P51. Computing and Autism. Stanford University Distinguished HCI Lecture series, October 15, 2010.

P52. Career Assistance for Autism Through High Technology and Science. American Academy of Pediatrics Georgia Chapter 2010 Annual Fall meeting. October 21, 2010.

P53. Computing and Autism. Emory University Computer Science Lecture series, October 22, 2010.

P54. Computational Approaches to Measuring Behavior, Autism Speaks Workshop on Outcome Measures for Clinical Trials with Individuals with ASD:Challenges and Opportunities, Washington, DC, January, 2011.

P55. Reflection on 20 years after Mark Weiser's Scientific American article. At Ubicomp 2011, Beijing, China.

P56. TEDxGeorgiaTech talk, April 2011.

P57. Center for Discovery talk, April 2011

P58. The COSMOS Conjecture: Dreaming and doing in a post-Moore's Law era. GVU Center Brown Bag talk, November 10, 2016.

P59. The Future of Computing: Interesting challenges facing mobile computing. RADIO Atlanta: VMWare/AirWatch internal research and development Conference, September 21, 2017, Atlanta, Georgia.

P60. Autism and Technology: An autobiographical account. March 21, 2018. MIT Media Lab. Lecture in course taught by Rosalind Picard on autism and technology.

P61. There is more than one way to expand on computing. Georgia Tech IEN Technical Exchange Conference keynote for The Promises and Challenges of High Performance Electronics Everywhere. May 22, 2018.

P62. Short course on Ubiquitous Computing and HCI. July 13 – July 21, 2018. Peking University, Beijing, China.

P63. Confessions of an Applied Computer Scientist. GVU Center Brown Bag talk, January 10, 2019.

E. GRANTS AND CONTRACTS

E1. AS PRINCIPAL INVESTIGATOR

List all funded grants and contracts as principal and co-principal investigator. List PI and Co-PI for each grant, with total grant funding followed by sub amount allocated to candidate. Proposals pending may be included, but must be listed separately. Do not include grants and contracts not funded.

Title of Project: An architectural case study in telecommunications
Agency/Company: Bell Northern Research
Total Dollar Amount: $20,000
Role: PI
Period of Contract: 6/1995-5/1996

Title of Project: Software architectures for global information systems
Agency/Company: Motorola University Partnerships in Research Program
Total Dollar Amount: $27,389
Role: PI
Period of Contract: 9/1996-8/1997

Title of Project: Classroom 2000
Agency/Company: NEC
Gregory Abowd and Christopher Atkeson
GVU Industrial Affiliates Program funding from NEC
Amount awarded: $30,000 for one year, beginning January 1996.

Title of Project: Ubiquitous Computing
Agency/Company: FX-PAL
Total Dollar Amount: $25,000
Role: PI
Collaborators: Christopher Atkeson (co-PI)
Period of Contract: 9/1996-8/1997

Title of Project: Applications of Java to the monitoring and control of physical systems
Agency/Company: Siemens
Total Dollar Amount: $30,000
Role: PI
Collaborators: Christopher Atkeson (co-PI)
Period of Contract: 4/1997-3/1998

Title of Project: Future Computing Environments
Agency/Company: Mitsubishi Electronic Research Laboratory
Total Dollar Amount: $30,000
Role: PI
Period of Contract: 1/1997-12/1997

Title of Project: Service creation and development environments for audio interfaces.
Agency/Company: Motorola Cellular Infrastructure Group
Total Dollar Amount: $100,000
Role: PI
Collaborators: Colin Potts (co-PI)
Period of Contract: 1/1997-12/1997

Title of Project: Research in Mobile and Ubiquitous Computing
Agency/Company: Mobility Foundation
Total Dollar Amount: $38,000
Role: PI
Collaborators: C. Atkeson (co-PI)
Period of Contract: 3/1997-2/1998

Title of Project: NSF IRI-9703384 CAREER: Investigating research issues in ubiquitous computing: The capture, integration, and access problem Agency/Company: National Science Foundation
Total Dollar Amount: $438,376
Role: PI
Period of Contract: 9/1997-8/2002

Title of Project: Classroom 2000 infrastructure
Agency/Company: Sun Microsystems
Total Dollar Amount: $270,000 in kind equipment
Role: PI
Period of Contract: 1997

Title of Project: Research in capture, integration and access
Agency/Company: Corporation for National Research Initiatives
Total Dollar Amount: $25,000 cash and $8000 equipment
Role: PI
Period of contract: 1998

Title of Project: ESS: Automated Understanding of Captured Experience
Agency/Company: National Science Foundation
Total Dollar Amount: $850,000
Role: PI
Collaborators: C. Atkeson and I. Essa
Period of Contract: 7/1998-6/2001

Title of Project: Future Computing Environments research
Agency/Company: Hitachi Corporation
Total Dollar Amount:
Role: PI
Period of Contract: 8/1998-7/1999

Title of Project: Future Computing Environments research
Agency/Corporation: NEC Corporation
Total Dollar Amount: $50,000
Role: PI
Period of Contract: 10/1998-9/1999

Title of Project: Augmenting the Capture and Understanding of Everyday Experiences
Agency/Corporation: National Science Foundation CISE Infrastructure Grant
Total Dollar Amount: $120,000
Role: PI
Collaborators: Atkeson, Essa,MacIntyre, Mynatt, Potts, Ramachandran, Ribarsky, Rugaber and Starner (co-PIs)
Period of Contract: 1/1999-12/2001

Title of Project: Inter-Agency Workshop on Smart Environments

Agency/Corporation: National Science Foundation
Total Dollar Amount: $27,496
Role: PI
Period of Contract: August-December 1999

Title of Project: Development and Understanding of Automated Capture Environments to Support Long-Term Use
Agency/Company: National Science Foundation and CNPq Brazil
Total Dollar Amount: $201,670
Role: PI
Collaborators: Maria da Graca Pimentel (co-PI through CNPq in Brazil)
Period of Contract: 7/2000-6/

Title of Project: Handling sensed context in a ubiquitous computing setting
Agency/Company: DARPA ITO Ubiquitous Computing/Expeditions
Total Dollar Amount: $200,000
Role: PI
Period of Contract: 1/2000-12/2000

Title of Project: Battlefield Visualization System
Agency/Company: Army Research Labs
Total Dollar Amount: $100,000 subcontract to GTRI
Role: PI
Collaborators: Kirk Pennywitt co-PI
Period of Contract: 1/2000-12/2000

Title of Project: The Aware Home Research Initiative
Agency/Company: Intel, HP, MERL, Motorola, Accenture CSTAR, Visteon Total Dollar Amount: $705,000
Role: PI
Collaborators: Aaron Bobick, Irfan Essa, Blair MacIntyre, Elizabeth Mynatt,Thad Starner (co-PIs)
Period of Contract: 5/2000-12/2003

Title of Project: ITRI: The Aware Home: Sustaining the Quality of Life for an Aging Population
Agency/Company: National Science Foundation Information Technology Research Initiative
Total Dollar Amount: $1,600,000
Role: PI
Collaborators: Aaron Bobick, Irfan Essa, Elizabeth Mynatt and Wendy Rogers (Psyhology) (co-PIs)
Period of Contract: 9/2001-8/2006

Title of Project: Developing automated capture applications for the Personal Server.
Agency/Company: Intel Research
Total Dollar Amount: $50,000 PI:

Gregory Abowd
Period of Contract: 12/2003-11/2004

Title of Project: Using Visual Analytics to Support Data Analysis at the Center for Discovery
Agency/Company: Center for Discovery
Total Dollar Amount: $130,000
Role: PI:
Collaborators: John Stasko (co-PI), Johanna Lantz (co-PI)
Period of Contract: 3/1/2014-12/31/2015

Title of Project: Autism Center of Excellence award from State of New York
Agency/Company: State of New York through Center for Discovery subcontract
Total Dollar Amount: $30,000
Role: PI for subcontract
Collaborators: John Stasko (co-PI), Terry Hamlin (PI for total award at CfD)
Period of Contract: 1/2016-9/2017

Title of Project: Atlanta Autism Consortium
Agency/Company: Federal earmark subcontract from Children's Healthcare of Atlanta
Total Dollar Amount: $75,000
Role: PI
Period of Contract: 3/1/2011-12/2011

Title of Project: Intel Science and Technology Center on Pervasive Computing
Agency/Company: Intel
Total Dollar Amount: $800,000
Role: PI
Collaborators: James M. Rehg (PI)
Period of Contract: 2011-2016
Candidates' Share: $400,000

Title of Project: Using visual analytics to support data analysis at CfD
Agency/Company: Center for Discovery
Total Dollar Amount: $800,000
Role: PI
Collaborators: John Stasko (GT co-PI), Johanna Lantz (CfD), Matthew Northrop (CfD), Terry Hamlin (CfD)
Period of Contract: 2015-2016
Candidates' Share: $70,000

Title of Project: Applying a maker philosophy to teaching computer science
Agency/Company: VMWare Foundation
Total Dollar Amount: $25,000
Role: PI
Period of Contract: January 2017-

Candidates' Share: $25,000

Title of Project: Exploring notification feedback in VR systems
Agency/Company: HP Labs
Total Dollar Amount: $30,000
Role: PI
Period of Contract: 2016-2017
Candidates' Share: $30,000

Title of Project: Wearable approaches to eating detection
Agency/Company: Semiconductor Research Corporation
Total Dollar Amount: $300,000
Role: PI
Period of Contract: Jan 1, 2018-Dec. 2020
Candidate's Share: $300,000

E2. AS CO-PRINCIPAL INVESTIGATOR

Title of Project: MORALE: Mission Oriented Architectural Legacy Evolution
Agency/Company: DAPRA BAA #95–05 Evolutionary Design of Complex Software Total Dollar Amount: $1,226,108
Role: co-PI
Collaborators: Ashok Goel, W. Michael McCracken, Melody Moore, Colin Potts, Spencer Period of Contract: 7/1996-4/2000

Title of Project: The Home Information Infrastructure Lab
Agency/Company: Intel
Total Dollar Amount: $60,000
Role: co-PI
Collaborators: K. Calvert (PI), D. Howard (co-PI)
Period of Contract: 1/1997-12/1997

Title of Project: Educational innovation
Agency/Company: Hewlett-Packard
Total Dollar Amount: $1.3 million deep-discounted equipment
Role: co-PI Collaborators: Tom Barnwell (PI) Period of Contract: 1997
Candidate's Share: $289,360

Title of Project: Collaborative environments for capturing military tactics
Agency/Company: Army Research Laboratory
Total Dollar Amount: $135,000 subcontract with GTRI
Role: co-PI
Collaborators: Kirk Pennywitt
Period of Contract: 5/1998-9/1999

Title of Project: NMI: Exploration of Middleware Technologies for Ubiquitous Computing with Applications to Grid Computing
Agency/Company: National Science Foundation Middleware Initiative
Role: co-PI
Collaborators: Umakishore Ramachandran (PI), Raj Kumar (HP Labs, co-PI), Sujoy Basu (HP Labs, co-PI)
Period of Contrac: 9/2003-8/2006

Title of Project: Development of a home-based system for biobehavioral recording or individuals with autism
Agency/Company: Simons Foundation Autism Research Initiative
Total Dollar Amount: $1,065,607
Role: co-PI
Collaborators: PI: Matthew Goodwin (Northeastern); co-PI: James Rehg (Georgia Tech)
Period of Contract: 4/2013-3/2016
Candidate's Share: $204,029

Title of Project: Designing and studying maker oriented learning to transform advanced computer science education
Agency/Company: National Science Foundation
Total Dollar Amount: $718,753
Role: co-PI
Collaborators: PI: Betsy DiSalvo Period
of Contract: 9/1/2014-8/31/2016

Title of Project: Expeditions: Computational Behavioral Science: Modeling, Analysis and Visualization of Social and Communicative Behavior
Agency/Company: National Science Foundation
Total Dollar Amount: $10,000,000
Role: co-PI
Collaborators: PI: James Rehg, co-PIs: Gregory D. Abowd, Mark Clements, Agata Rozga with collaborators from Northeastern (Goodwin), Boston U. (Sclaroff), MIT (Picard), Illinois (Forsyth, Karahalios) CMU (Dey, Kanade), USC (Narayanan)
Period of Contract: 9/2010-8/2015
Candidate's Share: $3.6M to Georgia Tech

E3. AS SENIOR PERSONNEL OR CONTRIBUTOR

List all funded grants and contracts on which you were not Principal or Co-Principal investigator but were listed as senior personnel. Proposals pending may be included, but do not include grants and contracts not funded.

Title of Project: Research Infrastructure Grant

Agency/Company: National Science Foundation
Total Dollar Amount: $2,000,000
Role: Key Personnel
Collaborators: Ramachandran (PI)
Period of Contract: 7/1999-
8/2002

Title of Project: DARPA ASSIST
Agency/Company: DARPA ITO Total
Dollar Amount: $2,000,000 Role: Key
Personnel
Collaborators: PI: Starner (GT) Pentland (MIT); Co-Pis: Essa, Isbell, Picard (MIT)
Period of Contract: 6/2005-11/2006

Title of Project: Using Selective Archiving to support Functional Behavior Assessment in Schools
Agency/Company: NICHD SBIR Phase 1
Total Dollar Amount: $100,000
Role: Consultant
Collaborators: Ron Oberleitner, eMerge Medical Systems (PI)
Period of Contract: 1/2006-6/2006

Title of Project: Using Selective Archiving in telehealth settings
Agency/Company: NICHD SBIR Phase II
Total Dollar Amount: $2,400,000
Role: Consultant
Collaborators: Ron Oberleitner (Behavior Imaging Solutions, Inc.), co-PI: Agata Rozga (GT),
Period of Contract: 6/2007-5/2009

Title of Project: Using smartphones to support naturalistic diagnostic and monitoring services for autism
Agency/Company: NIMH SBIR Phase II renewal Total
Dollar Amount: $3,000,000
Role: Consultant
Collaborators: Ron Oberleitner (Behavior Imaging Solutions, Inc.), co-PI: Agata Rozga (GT),
Period of Contract: 6/2013-5/2016

Title of Project: Center for Excellence for Mobile Sensor Data-to-Knowledge (MD2K)
Agency/Company: NIH
Total Dollar Amount: $10,800,000
Role: Budgeted collaborator
Collaborators: PI: S. Kumar (Memphis), co-PI: J. Rehg (Georgia Tech) Period of Contract: 9/29/2014-5/31/2018

E3. **PROPOSALS SUBMITTED BUT NOT FUNDED** (last two years)

Title of Project: Expeditions: Self-Sustaintable Computing: The Material for the 21st Century
Agency/Company: National Science Foundation
Total Dollar Amount: $10,000,000/year for 5 years
Role: PI
Collaborators: GT: Tom Conte (co-PI), Thad Starner (co-PI), Zhong Lin Wang (co- PI), Sauvik Das, Gregory Durgin, Vivek Sarkar, Manos Tentzeris, Cane, Fuentes-Hernandez, Michael Filler, Eric Vogel, Omer Inan, Jennifer Hasler, Arijit Raychowdhary; UW: Joshua Smith (PI), Shyam Gollakota, Shwetak Patel, Matthew Reynolds

F. OTHER SCHOLARLY ACCOMPLISHMENTS

List all other scholarly accomplishments such as software, patents, invention disclosures, start-up companies, etc.

Intellectual Property

IP1. Shwetak N. Patel, Gregory D. Abowd, Khai N. Truong, Jay Summet. Systems and Methods for Disabling Recording Features of Cameras. US Patent Application US2007013552 A1. Publication date: May 10, 2007. Priority date: Nov. 10, 2005. Pending.

IP2. Gillian R. Hayes, Khai N. Truong, Lamar M. Garder and Gregory D. Abowd. Systems and Methods for Archiving of Continuous Capture Buffers. US Patent application US20070214292 A1. Publication date: Sep. 13, 2007, Priority date: Feb. 24, 2006.
Pending.

IP3. Julie Kientz, Sebastian Boring, Gregory D. Abowd. Method and computer program product for synchronizing, displaying and providing access to data collected from various media. US Patent 8,275,243 B2. Publication date: September 25, 2012. Priority date: August 31, 2006.

IP4. Shwetak N. Patel Thomas Robertson, Matthew Reynolds, Gregory D. Abowd. Detecting actuation of electrical devices using electrical noise over a power line. US Patent 8,094,034 B2. Publication date: January 10, 2012. Priority date: September 18, 2007.
Also published as US 8334784 B2.

IP5. James M. Rehg, Karthir Prabhakar, Sangmin Oh, Ping Wang, Gregory D. Abowd. Systems and methods for retrieving causal set of events from unstructured signals. US Patent application US201220301105 A1. Publication date: Nov. 29, 2012. Priority date: Mar 22, 2011. Pending.

IP6. Shwetak Patel, Gregory D. Abowd, Matthew S. Reynolds, Thomas Robertson, Erich Stuntebeck. Sub room level indoor location system using wideband power line positioning. US Patent 8,494,762 B2. Publication date: July 23, 2013. Priority date: June 28, 2006.

IP7. Shwetak N. Patel, Matthew S. Reynolds, Gregory D. Abowd. Motion Detecting Device, Method of Providing the Same, and Method of Detecting Movement.

US Patent application US20130289930 A1. Publication date: Oct 31, 2013. Priority date: May 12, 2009. Pending.

IP8. Gregory D. Abowd, Peter S. Abowd, Wesley Horner, Steven Tengler, Yi Han, and Chen Chen. Systems and methods for utilizing micro-interaction events on computing devices to administer questions. Pending US patent application US20140298260 A1. Patent not granted.

IP9. EP Stuntebeck, TM Robertson, GD Abowd, SN Patel. Method and apparatus for using in- home power lines to support lower power wireless sensors and to extend the range of low-power wireless devices. US Patent 9,385,783.

IP10. *__Cheng Zheng__, Gregory D Abowd, Junrui Yang. Extending Interactions Of A Portable Electronic Device. US patent application US10684694B2. Publication date: August 3, 2018. Priority date: August 29, 2016.

IP11. ***Nivedita Arora**, Gregory D Abowd, **Mohit Gupta**, **Diego Osorio**, **Seyedeh F Shahmiri**, Thad Starner, Yi-Cheng Wang, Zhengjun Wang, Zhong Lin Wang, Steven L Zhang, Peter McAughan, Qiuyue Xue, Dhruva Bansal, Ryan Bahr, Emmanouil Tentzeris. Thin And Flexible Self-powered Vibration Transducer Employing Triboelectric Nanogeneration. US application US20190373375 A1. Publication date: December 5, 2019. Priority date: May 29, 2019.

Software Systems

SW1. Zen-Star 1.0. Software system for automated capture, integration and access of university lectures. Produced as part of the Classroom 2000 project. Designers: Gregory Abowd, Jason Brotherton, Christopher Atkeson and Janak Bhalodia.

SW2. The Context Toolkit 1.0. Software framework for the development of context-aware computing applications. Designers: Gregory Abowd, Anind Dey and Daniel Salber.

SW3. StuPad 1.0. Software system that works with Zen-Star system [S/W.1], to provide personalized note-taking by students in Classroom 2000.

SW4. OOPS toolkit. Software system that supports reusable mediation strategies to handle ambiguity in recognition-based interfaces. Designers: Jennifer Mankoff, Scott E. Hudson (CMU) and Gregory D. Abowd.

SW5. INCA toolkit. Software framework for development of automated capture and access applications. Designers: Khai Truong and Gregory D. Abowd.

SW6. TeamSpace. Software for distributed meeting capture. Designers: Heather Richter, Khai Truong, Ludwin Fuchs (Boeing), Werner Geyer (IBM/Lotus) and Gregory Abowd

SW7. The Location Service. System to support fusion of separate location-sensing technologies. Designers: Thomas O'Connell and Agathe Battestini and Gregory Abowd.

SW8. The Walden automated tracking system prototype. Prototype capture application for mobile analysis of behaviors of children with autism. Designers: David White,

SW9. The Family Video Archive. System to support annotation and browsing of digital home movies. Designers: Gregory Abowd, Matthias Gauger, Andreas Lachenmann and Shwetak Patel.

SW10. The Personal Audio Loop. Application developed for Motorola i-series handheld phones to support near-term audio remindes. Designers: Khai

Truong, Shwetak Patel, Gillian Hayes, Julie Kientz, Giovanni Iachello, Rob Farmer and Gregory Abowd.

SW11. Abaris. An automated capture application to support the discrete trial intervention therapy of ABA. Designers: Gregory Abowd. David White, Julie Kientz and 3911 Senior Design team (Aldrian Harjati, Mark Bernardi, Pavel Kremer, Chris Widjaja). Version 2.0 developed in Fall 2004 by Gregory D. Abowd, Julie Kientz and Sebastian Boring.

SW12. CareLog. A system using the Intel Personal Server to support monitoring, diagnosis and intervention treatments of behavioral and learning disabilities in children. Designers: Gillian Hayes, Gregory Abowd and Trevor Pering (Intel).

SW13. GT Sound Source Location system An indoor 16-microphone array system to deliver location of sound sources. Designers: Xuehai Bian, Jim Rehg and Gregory Abowd.

SW14. The ContextCam. Automated video annotation system. Designers: Shwetak Patel and Gregory Abowd.

SW15. Multi-user Card Game Engine for the DiamondTouch. Designers: Shwetak Patel. Gregory D. Abowd and 3911 Senior Design team (John Bunch, Kyle Forkner, Logan Johnson, Tiffany Johnson, Michael Rosack).

SW16. LoCoL: a multiplayer location-aware game for mobile phones. Designers: Julie Kientz, Shwetak Patel and Jose Zagal.

SW17. GVU Procams Toolkit. Designers: James Rehg, Jay Summet and Matt Flagg. Offers a programming interface designed to allow programmers quickly build projector/camera applications on a Win32 platform. Virtual Rear Projection system variants have been produced with this toolkit, under the advisement of Rehg and Abowd.

SW18. The Capture Resistant Environment: Khai Truong, Jay Summet, Shwetak Patel and Gregory D. Abowd. Camera-projector system that prevents CCD-CMOS based phones and camcorders from being able to capture sensitive information in the environment. Selected as New York Times Magazine 2005 Top Idea of the Year and patent pending.

SW19. Experience Buffers, Bufferware, CareLog FBA: Gillian Hayes, Khai Truong, Lamar Gardere, Ellen Matthews. Selective archiving infrastructure used to support informal sensor data capture with annotation. Subject of pending utility patent.

SW20. Powerline positioning system: Shwetak N. Patel, Khai N. Truong and Gregory D. Abowd. Indoor positioning system leveraging domestic powerline infrastructure and fingerprinting. Invention disclosure April 2006 and provisional patent filed 2006.

SW21. TrackSense: Moritz Köhler, Shwetak Patel, Jay Summet, Erich Stuntebeck, Gregory D. Abowd. Infrastructure-free indoor localization system. Invention disclosure November 2006.

SW22. Continuous Flagging and Recording Technology (CRAFT): Nazneen, Yi Han. 2008 SW23. Refl-ex and REACT system. Fatima A. Boujarwah, 2011

SW24. Quedget: Lockscreen interaction to obtain quick answers to simple questions. Part of commercialization effort.

Startup Companies

DominINC LLC, technical co-founder 2006, working on camera-blocking technologies
uSenso/Zensi LLC, technical co-founder 2009, infrastructure-mediated sensing technologies. Acquired by Belkin in 2010.
BrailleTouch LLC, technical co-founder 2012, Braille input on smartphones.
Behavior Imaging Technologies, Inc. (originally Caring Technologies), Chief Research Office 2006-2015, telehealth solutions for the autism market
LSQ (dba Quedget), technical co-founder 2013, input techniques on smartphones

Consulting

Behavior Imaging Solutions, Inc. (formerly Caring Technologies, Inc.) 2005-2015. I serve as Chief Research Officer for this start-up company and direct activities for grant funding of research involving information technologies and autism. Several successful SBIR grants (NICHD, Phase 1 and Phase 2, NIMH, Phase 2 renewal) have been received and executed upon.
Ultra Large Scale Software Systems panel, Carnegie Mellon University Software Engineering Institute, August 2005-April 2006.
NICTA, Sydney Australia. Visiting researcher teaching a course on HCI and Ubiquitous Computing, June 2005.
External member of Board of Directors, HomeCom Communications, Inc. 1997-1999.
Motorola Satellite Communications Division, Software architecture evaluation, April 10–11, June 28–29 1995.
Ford Motor Company, Electronics Division, Software architecture evaluation, April 28, 1995.
Motorola Cellular Infrastructure Group, Software architecture evaluation, August 22, 1995.
Software Engineering Institute, Software architecture evaluation report for Sandia Labs, two days consulting over summer 1995.
HomeCom Communications, Inc., Future interests in the Internet, May 6, 1995.
HomeCom Communications, Inc. Board of directors, September 1996–present.
Schlumberger, architecture consulting, January 1999.
Intel Microprocessor Research Labs (MRL) Board of Advisors, September 2000-present.
National Science Foundation Science and Technology Center at UCLA (Deborah Estrin, PI), Architectural Advisory Board, 2001--present.
University of Florida, consulting on development of laboratory for home technologies, September 2003.
Samsung Electronics, consulting on commercial potential of automated capture applications, Sep-Dec. 2003.
University of Florida CREATE Center academic advisory board, 2004-2008.
Advisory Board for Autism Speaks (formerly Cure Autism Now) Innovative Technologies for Autism (ITAB), 2004-2010.
Intel Research Seattle Visiting Faculty, July 2004-June 2005.
Center for Discovery, IT consulting for supporting research and educational practices,

January 2012-2015. 1-6 hours per week.
LSQ Mobile LLC, Technical co-founder advising on mobile market research activities, April 2013-present.
Disney Research Pittsburgh, consulting

Expert Witness experience

Since 2008, I have assisted numerous clients in intellectual property litigation. I have prepared declarations and expert reports in support of various trials. I have been deposed (3 times) and testified in court (1 time) in the US.

2008 Consulting expert witness for Sidley Austin LLP, Microsoft v. Tom-Tom. Summer 2008. Did claims analysis for a set of patents relating to navigation interfaces and services. Attorneys: Douglas Lews and John McBride.
2008-2010 Georgia Bureau of Investigation, request to provide an expert witness account on a case against former Georgia Tech faculty members accused of inappropriate use of sponsored research funds. 2008-2010.
2010 Subpoenaed by the International Trade Commission as an expert witness in a case between Nokia and Apple and I was deposed by lawyers representing both sides for about 90 minutes. I was brought in to discuss details of some of my work from the 1990's that was being claimed as prior art. July 2010. Uncompensated.
2011 For Nokia with Alston & Bird LLP to assist in evaluating certain claims and issues Nokia had against Apple Inc. relating to Apple's iPhones, iPads, Macs, and other electronic devices This case was settled. Attorney contact: Adam Swain.
2011 For Openwave with Alston & Bird LLP in case against RIM/Google/Android/LG. Attorney contact: David Ben-Meir. Letter of engagement signed on July 15, 2011. Openwave decided in November 2011 to change representation, and I completed no work.
2011-2012 For Samsung with Quinn Emmanuel in International Trade Commission Investigation No. 337-TA-794. Attorneys: Alan Whitehurst, Anthony Zappin, Marissa Ducca. Wrote expert reports, was deposed and testified in court.
2012 For Samsung with Quinn Emmanuel in United States District Court, Northern District of California, San Jose Division, case number 11-CV-01846-LHK . Wrote expert reports. Attorney: Kenneth Suh. Patent dropped from case before deposition.
2013 For CooTek with Finnegan, Henderson, Farabow, Garrett and Dunner in International Trade Commission Investigation No. 337-TA-864 . Nuance Communications, Inc., Swype, Inc., Tegic Communications, Inc., and ZI Corporation of Canada, Inc., (collectively, "Nuance") v. Shanghai HanXiang (CooTek). Prepared expert reports and rebuttals and was deposed and prepared written expert testimony for trial. Case settled prior to court date. Attorneys: Aidan Skoyles and Qingyu Yin.
2014 For Learner's Digest International with Perkins Cole LLP in Astute Technology vs. Learner's Digest International, Eastern District of Texas case. Prepared evidence for invalidity arguments. Case settled. Attorney: David R. Pakarek Krohn.
2016 For Immersion Corp. with Irell & Manelli LLP vs. Apple Corp and AT&T Mobility in International Trade Commission Investigation Nos. 337-TA-1004 and 337-TA-990 (Consolidated) "Certain mobile and portable electronic devices

incorporating haptics (including smartphones and laptops) and components thereof". Preparing expert reports, deposition and witness statement. Attorneys: Gavin Snyder and Rich Birnholz. Went to trial with cross examination.

2017 For ARRIS Enterprises LLC with Fish & Richardson P.C. in Sony Corp. v. ARRIS Enterprises LLC, IPR2017-01695 and IPR2017-01803. Preparing expert reports. Attorneys: Erin Alper and Noah Graubart. Client dropped law firm prior to submission of IPR preliminary reports.

2018 For Samsung Electronics with Arnold& Porter Kaye Scholer LLP in KEYnetik, Inc. v. Samsung Electronics Co., Ltd. et al., Case No. 17-cv-2794-JLL (District of New Jersey). Retained as expert witness for invalidity of 2 patents. Also involved in related IPR case with Paul Hastings as counsel.

2019 For Google with Wolf and Greenfield Google v. ZipIt. Details of case withheld by request of counsel. Retained as expert witness for IPR case.

2021 For T-Mobile. Details of case currently withheld.

2021 Apple v. Maxell. Retained as fact witness by DLA Piper

2022 For Cisco and HP with Winston & Strawn and in BillJCo v. Cisco and HP Case No. 2:21-cv-0081-JRG (Eastern District of Texas). Attorneys David Lin and Krishnan Padmanabhan.

G. SOCIETAL AND POLICY IMPACTS

Present a brief list of the broader impacts of your scholarship, and elaborate on them in your personal statement.

I started the Aware Home project in 1998 with funding from the Georgia Research Alliance. This effort has greatly influenced national and international efforts on aging in place, i.e., technologies for an aging population, as well as technologies for health in general. Many other universities followed Georgia Tech's lead by creating their own living home laboratories. I was invited to testify before the U.S. Senate Special Committee on Aging, hearing on baby Boomers at the Gate on May 20, 2003 (http://aging.senate.gov/hearings/hr101ga.pdf). I was also invited to write a chapter for the National Research Council on Technologies for Aging (see book chapter BC9).

In 2008, I founded the Atlanta Autism Consortium, a non-profit organization that facilitates broader understanding and communication between the research community and all stakeholder communities related to autism in the Greater Atlanta area. This effort started as an off-shoot of my own research in technology and autism. I received the 2017 State of Georgia Outstanding Achievement in Autism Award for my efforts in leading the Consortium and the overall impact it has had on the community.

V. TEACHING

A. COURSES TAUGHT

List course taught at Georgia Tech. (Most recent first and include the last six years)

Fall, 2018	CS/PSYC 3750	User Interface Design	70
Spring, 2018	CS/PSYC 3750	User Interface Design	70
Spring, 2017	CS 4605/7470	Mobile and Ubiquitous Computing	73
Fall, 2016	CS/PSYC 3750	User Interface Design	68
Fall, 2015	CS/PSYC 3750	User Interface Design	67
Fall, 2015	CS 6452	Prototyping Interactive Systems	22
Spring, 2015	CS 4605	Mobile and Ubiquitous Computing	40
Fall, 2014	CS 6452	Prototyping Interactive Systems	28
Fall, 2013	CS 4911 C4G	Computing for Good	60 (w/Zegura)
Spring, 2013	CS 4605/7470	Mobile and Ubiquitous Computing	85 (w/ Starner)
Fall, 2012	CS 4911 C4G	Computing for Good	45 (w/Vempala)
Fall, 2011	CS/PSYC 6750	Human-Computer Interaction	40
Fall, 2011	CS 4605/7470	Mobile and Ubiquitous Computing	65
Fall, 2010	CS 7001	Introduction to Graduate Studies	40 (w/Feamster)
Fall, 2010	CS 4605/7470	Mobile and Ubiquitous Computing	65
Spring, 2010	CS 8803 TAU	Technology and Autism	15 (w/Arriaga)
Fall, 2009	CS 4605/7470	Mobile and Ubiquitous Computing	60
Spring, 2009	CS/PSYC 6750	Human-Computer Interaction	35

B. INDIVIDUAL STUDENT GUIDANCE

List all Postdoctoral Fellows, Ph.D. students, M.S. Thesis students, and undergraduate students supervised/advised. Explicitly indicate any co-advisement relationships. For Ph.D. and M.S. Thesis students, include date of graduation and title of thesis and, if known, the current position of the graduate students. For graduate students currently supervised, indicate the semester advisement began, their progression through appropriate exams, title of their project/dissertation, and current position if available. Provide any indicators you have of the quality of your mentorship.

B1. Postdoctoral Fellows

1. Daniel Salber, October 1997-September 1999. Worked on ubiquitous computing and context-aware computing. Work has resulted in conference publications. Work resulted in Context Toolkit software system. Formerly a Research Scientist at IBM T.J. Watson Labs, currently back in France.
2. Jaeseok Yun, 2006-2009. Postdoctoral research scientist. Working on sensing in a home environment.
3. Mario Romero, 2009-2012. Postdoctoral research scientist. Working on visualization of human behavior. Currently Associate Professor at KTH in Sweden.
4. Thomas Ploetz, 2011-2012, Visiting Research Scientist from Germany. Work on behavior imaging and pattern recognition of on-body sensing. Currently Senior

Lecturer at University of Newcastle.

B2. Ph.D. Students

Graduated

1. Richard Kurt Stirewalt, (co-advised with S. Rugaber) 1994-1997. Thesis "Automatic Generation of Interactive Systems from Declarative Models." Computer Science Ph.D. program, College of Computing, Georgia Tech. NSF CAREER Award winner 2000. Formerly Associate Professor (with tenure) at Michigan State University. Currently VP Application Architecture at LogicBlox.
2. Anind Dey, 1995-2000. Thesis: "Providing Architectural Support for Building Context-Aware Applications." Named 2000 College of Computing Outstanding Graduate Research Assistant. Was Professor and Charles M. Geschke Director of the Human-Computer Interaction Institute at Carnegie Mellon University. Currently Dean and Professor University of Washington iSchool.
3. Jennifer Mankoff, 1996-2001. Thesis: "An architecture and interaction techniques for handling ambiguity in recognition-based input." Named 2001 College of Computing Outstanding Graduate Research Assistant. Sloan Fellow. IBM Faculty Fellow. Was Assistant Professor in Computer Science at UC Berkeley. Was Professor in the Human-Computer Interaction Institute at Carnegie Mellon University. Currently Richard E. Ladner Endowed Professor in Computer Science and Engineering at the Allen School of Computer Science and Engineering at the University of Washington.
4. Jason Brotherton, 1996-2001. Thesis: "Enriching Everyday Activities through the Automated Capture and Access of Live Experiences: eClass: Building, Observing and Understanding the Impact of Capture and Access in an Educational Domain." Working on automated capture and access for live experiences. Was Assistant Professor at Ball State University, 2001-2002. Awarded British Society Postdoctoral Fellowship 2002-2006. Now living as Clio Soleil.
5. Robert Waters, 1997-2004. Thesis: "Obtaining Architectural Descriptions from Legacy Systems: The Architectural Synthesis Process (ASP)." Currently a full-time instructor in the College of Computing at Georgia Tech.
6. Heather (Richter) Lipford, 1997-2005. Thesis: "Designing and Evaluating Meeting Capture and Access Services." Currently a Full Professor in Dept. of Information Science at University of North Carolina Charlotte.
7. Khai Truong, 1998-2005. Thesis: "INCA: An Infrastructure to Support the Generation, Preservation & Use of Memories from Everyday Life." Currently a tenured Associate Professor and Associate Chair of Computer Science at University of Toronto.
8. Lonnie Harvel, 1999-2005. Thesis: "Using Student Generated Notes as an Interface to a Digital Repository." Formerly Vice President of Educational Technology, Georgia Gwinnett College. Deceased: November 4, 2010.
9. Giovanni Iachello, 2003-2006. Thesis: "Privacy and Proportionality." NSF Graduate Fellow, 2003-2006. Currently Head of International & New Markets at LinkedIn.

10. Kris Nagel, 2000-2006. Thesis: “Using Availability Indicators to Enhance Context-Aware Family Communication Applications.” 2005 Google Anita Borg Fellowship. Formerly a tenured Associate Professor at Georgia Gwinnett College. Currently Academic Professional in the School of Electrical and Computer Engineering at Georgia Tech.
11. Jay Summet, 2002-2007. (co-advisor Jim Rehg) Thesis: “Virtual Rear Projection: Improving the User Experience with Multiple Redundant Projectors.” Currently a full-time instructor with the College of Computing, Georgia Institute of Technology.
12. Gillian Hayes, 2003-2007. Thesis: “Documenting and Understanding Everyday Activities through the Selective Archiving of Live Experiences.” Awarded IBM Research Fellowship and Anita Borg Fellowship in 2006. Currently a Professor and Robert A. and Barbara L. Kleist Chair in Informatics at University California, Irvine.
13. Julie Kientz, 2004-2008. Thesis: “Supporting Data-based Decision-Making for Caregivers through Embedded Capture and Access.” NSF Graduate Fellow, 2004-2007. Google Anita Borg Fellowship in 2007. PEO Fellow 2007. Currently a tenured Associate Professor in the Department of Human-Centered Design and Engineering, University of Washington.
14. Shwetak Patel, 2003-2008. Thesis: “Infrastructure Mediated Sensing.” 2007 College of Computing Outstanding GRA. NSF Graduate Fellow, 2005-2008. MacArthur Genius Grant awardee, 2011. Currently Washington Research Foundation Entrepreneurship Endowed Professor in the Computer Science and Electrical Engineering Departments, University of Washington.
15. Mario Romero, 2006-2009. Thesis: “Supporting Human Interpretation and Analysis of Activity Capture Through Overhead Video.” School of Interactive Computing CS Ph.D. program. Currently Associate Professor in Computing at KTH in Sweden.
16. Ping Wang, co-advisor with Jim Rehg, 2006–2010, Thesis: “Social Game Retrieval from Unstructured Videos.” School of Interactive Computing CS Ph.D. program. Currently working as Research Scientist at ObjectVideo.
17. Tracy Westeyn, co-advisor (with Thad Starner), 2006–2010. Thesis: “Child's Play: Activity Recognition for Monitoring Children's Developmental Progress with Augmented Toys.” School of Interactive Computing CS Ph.D. program. Currently working for NSA.
18. Erich Stuntebeck, 2006–2010. Thesis: “An Analysis of the Domestic Power Line Infrastructure to Support Indoor Real-Time Localiza1on.” School of Electrical and Computer Engineering PhD student. Currently a VP of Research for AirWatch in Atlanta, GA a division of VMWare.
19. Fatima Boujarwah, co-advisor (with R. Arriaga), 2009–2012. Thesis: “Facilitating the Authoring of Multimedia Social Problem Solving Skills Instructional Modules.” School of Interactive Computing CS Ph.D. program. Currently Assistant Professor at Kuwait University.
20. Lana Yarosh, 2007–2012. Thesis: “Supporting Remote Synchronous Communication Between Parents and Young Children.” School of Interactive Computing Human-

Centered Computing Ph.D. program. 2010 recipient of IBM Graduate Research Fellowship. Currently Assistant Professor at University of Minnesota.

21. Tae-Jung Yun, co-advisor (with R. Arriaga) 2007– 2012. Thesis: "Using Ubiquitous Communication Technology to Improve Pediatric Asthma Management." School of Interactive Computing Human-Centered Computing Ph.D. program. Currently Research Scientist with Samsung Electronics.
22. Nazneen, co-advisor (with R. Arriaga) 2009–2014, Thesis: "Supporting in-home collection and sharing of behavior specimens for diagnostic assessment of children with Autism." School of Interactive Computing Computer Science Ph.D. program. Currently User Experience Researcher at Google.
23. Hwajung Hong, co-advisory (with R. Arriaga) 2010-2015, Thesis: "Specializing Social Networking Services to Support the Independence of Adolescents and Adults with Autism." School of Interactive Computing Human-Centered Computing Ph.D. program. Currently Assistant Professor at Seoul National University, Korea.
24. Edison Thomaz, (with I. Essa), 2011-2015, Thesis: "Automatic Eating Detection in Real-World Settings with Commodity Sensing." School of Interactive Computing, Human Centered Computing Ph.D. program. Work on heath informatics and the home. Currently Assistant Professor at University of Texas, Austin.
25. Arri Ciptadi, (with J. Rehg), 2010-2016, Thesis: "Interactive Tracking and Action Retrieval to Support Human Behavior Analysis." School of Interactive Computing Computer Science Ph.D. program. Machine Learning Research Scientist at Amazon Lab126.
26. Yi Han, (with J. Stasko), 2011-2016, Thesis: "Understanding Visual Analysis Processes from User Interactions using Visual Analytics." School of Interactive Computing, Computer Science Ph.D. program. Currently working for Delta Electronics.
27. Aman Parnami, (with B. DiSalvo) 2013-2017, Thesis: "Enabling In Situ & Context-Based Motion Gesture Design." School of Interactive Computing, Computer Science Ph.D. program. Currently Assistant Professor IIIT Delhi.
28. Joelle Alcaidinho, (with M. Jackson) 2016-2017, Thesis: "The Internet of Living Things: Enabling Increased Information Flow In Dog–Human Interactions." School of Interactive Computing, Human Centered Computing Ph.D. program. Currently a Research Scientist at Intel Labs.
29. Gabriel Reyes, (with K. Edwards), 2010-2017, Thesis: "Enabling One-Handed Input for Wearable Computing." School of Interactive Computing, Computer Science Ph.D. program. Currently Research Scientist at Thalmic Labs.
30. Cheng "Allen" Zhang, (with O. Inan in ECE) since August 2012-2018, Thesis: "Novel gestures for wearables." School of Interactive Computing, Computer Science Ph.D. program. Currently Assistant Professor at Cornell University.

Current

1. Dingtian "Alan" Zhang, since January 2016, School of Interactive Computing, Computer

Science Ph.D. program. Work on computational materials.

2. Jung Wook Park, (with R. Arriaga) since August 2016, School of Interactive Computing, Computer Science Ph.D. program. Work on collaborative sensing.
3. Hyeokhyen "Allen" Kwon, (with T. Plötz) since August 2016, School of Interactive Computing, Computer Science Ph.D. program. Working on behavior imaging.
4. Nivedita Arora, since August 2016, School of Interactive Computing, Computer Science Ph.D. program. Working on computational materials.
5. Hong Li, (with T Plötz) since August 2017, School of Interactive Computing, Computer Science Ph.D. program. Working on deep learning for activity recognition.
6. Eui Min Jung, (with M. Tentzeris in ECE) since May 2017, School of Electrical and Computer Engineering, ECE PhD program. Working on computational materials.
7. Fereshteh Shahmiri, since January 2018, School of Interactive Computing, Computer Science Ph.D. program. Working on computational materials.
8. Mehrab Bin Morshed, since January 2018, School of Interactive Computing, Computer Science Ph.D. program. Working on mental wellness and activity recognition.
9. Richard Li, since August 2018, School of Interactive Computing, Computer Science Ph.D. program. Working on eating detection and wearable technologies.
10. Anandghan Waghmare School of Interactive Computing, Computer Science Ph.D. program. Working on computational materials.
11. Vedant Das Swain (with M. De Choudhury) School of Interactive Computing, Computer Science Ph.D. program. Working on data analytics for group behavior understanding.
12. Dong Whi Yoo (with M. De Choudhury) School of Interactive Computing, Human-Centered Computing Ph.D. program. Working on design for social media analytics in mental health.
13. Youngwook Do (with S. Das) School of Interactive Computing, Computer Science Ph.D. program. Working on ubicomp and privacy.

B3. M.S. Students (Indicate thesis option for each student)

2018-2019 Madhuri Bhavana (MS HCI project), Xiaomeng (Michelle) Ma (MS HCI project), Peter McAughan (MS CS independent research), Yuhui Zhao (MS CS independent research)

2017-2018 Caleb Southern (MS CS with HCC specialization), Yilin Liu (MS HCI project), Ruichen Meng (MS HCI project), Linlu Zhou (MS HCI project), Kshitish Milind (MS CS project), Qiuyue Xue (MS CS project), Vedant das Swain (MS HCI project), Anandghan Waghmare (MS CS project), Yuhui Zhao (MS CS), Richard Li (MS CS), Diego Osorio (MS HCI)

2016-2017 Shao-Yu Chen (MS HCI project), Yunnuo Cheng (MS HCI project), Sarthak Ghosh (MS HCI project), Aakanksha Mirdha (MS HCI project), Yiming Pu (MS HCI project), Tara Ramanan (MS HCI project), Felix Tener (MS HCI project), Sumeet Jain

(MS independent study), Nikita Juneja (MS independent study), Pranav Kundra (MS independent study), Wei Yang Quek (MS independent study), Pratik Pravinkumar Shah (MS independent study), Vedant Das Swain (MS independent study), Anandghan Waghmare (MS CS project)

2015-2016 Manasvi Llalwani (MS HCI project), Abdelkareem Bedri (MS CS project), Nivedita Arora (MS HCI project), Jonathan Shaw (MS HCI project), John Hinkel (MS HCI project), Sarthak Ghosh (MS CS project), Lawrence Chan (MS HCI project), Apoorva Verleker (MS HCI project)

2013-2015 Arpita Bhattacharya (MS CS project), Rushil Khurana (MS HCI project)

2012-2013 Anhong Guo (MS HCI project)

2012 Aman Parnami (MS HCI project)

2012 Ravi Karkar (MS CS project)

2011- Alex Lynch (MS CS project)

2010-2012 Jennifer Kim (MS HCI project)

2010-2011 Gregory Garrett (MS CS project)

2010 Dani Rayan (MS CS project)

2007-2009 Sidhant Gupta (MS CS project), Mayank Garg (MS CS project), Mayank Goel (MS CS project), Hyorim Park (MS HCI project), Yi Han (MS CS project), Sumit Savla (MS InfoSec project), Sidarsun Kannan (MS CS project), Hwajung Hong (MS HCI project)

2008 Jan Gillesen, Roel Hendrikx and Bart van den Boogard. Visiting masters students from Technical University Eindhoven.

2007-2008 Alicia Nachmann (MS HCI project).

2006-2008 Sunyoung Kim (MS HCI project), Dounia Berrada

2006 Moritz Köhler, Visiting student from Technical University of Munich

2005 Jennifer Wiley (MS HCI project) Ja-Young Sun (MS HCI project), Janna Kimmel (MS HCI project), Yelena Nakhimovsky (MS HCI project)

Sebastian Boring, 2004-2005. Visiting student from LMU, Munich Germany

2004-2005 Lamar Gardere (MS CS project)

2004 Michael Biebl. Visiting student from Karlsruhe University, Germany.

2004-2005 Jeremy Johnson (MS CS project), Peter Jensen (MS CS)

2003 Matthias Gauger and Andreas Lachenmann, Visiting students from Germany

2002-2003 David White (MS HCI project), Molly Stevens (MS IDT thesis), Palavi Garg (MS CS project)

2001-2003 Ramswaroop Somani (MS CS project), Gabe Hoffman (MS CS project), Venkataswaraman Ramachandran (MS CS project), Arpit Agarwal (MS CS project), Agathe Battestini (CS MS project)

2000-2002 Kuleen Mehta (MS CS project), Thomas O'Connell (MS CS project)

1999-2000 Gregory Krohne (MS CS project)

1998-1999 Vishal Dalal (MS CS project)

1997-1998 Roy Rodenstein (MS CS project)

1996-1997 Wasim Khan (MS CS project), James Seymour (MS CS project)

1996-1997 Mike Pinkerton, (MS CS Thesis: "Ubiquitous Computing: Extending Access To Mobile Data". GVU Technical Report GIT-GVU-97-09.)

1996-1997 Lein Ton, Visiting master's student from Delft University.

1995-1996 Sue Long (MS CS project), Rob Kooper (MS CS project), Savita Chandran (MS CS project), Yoosuf Goolamabbas (MS CS project), Ami Feinstein (MS CS project)

1995-1996 Nitin Sawhney (MS IDT project), Kipp Jones (MS CS project), Harinarayanan Balakrishnan (MS CS project)
1995-1996 Dietmar Aust, Visiting master's student from Germany

B4. Undergraduate Students

2018-2019 Ruixan Sun (undergraduate thesis), Anmol Lal (research capstone), Ruihan Xu (undergraduate thesis), Dhruva Bansal (undergraduate research), Shivan Mittal (undergraduate research)
2017-2018
2016-2017 Victor Chen (independent study), Anmol Lai (independent study), Saqib Ali (undergrad research), Casey Barnette (undergrad research), Bailey Bercik (undergrad research), Beiwen Liu (undergrad research), Joshua Morton (undergrad research), Jatin Nanda (undergrad research), James Park (undergrad research), Jason Wu (undergrad research), Jinming Yu (undergrad research).
2010-2011. Alex Lynch
2009. Pamela Overman, Jason Bennett
2008. Caitlin East.
2006. Roman Savaryn, Kate Rosier, Arwa Tyebkhan.
2005. Tejesh Patel, Ellen Matthews, Roman Savaryn, Ping Taing, Tina Chou, Asif Ladak, Jonathan McAbee Reher, Sunil Venkataram, Lauren Griffin, Forest Andrew Skaggs, Derek DeRaps, Tim Dorr, Kevin Kane , Nate Padgett, Eric Derenne, Axel Molina, Ping Taing, In Jae yi, Robert, Soe Htet, Will Clarke, Akash Shah, and Jarvis Greene, Shamsuddim Lakha
2004. Brian Adle, Patrick Jarrett, John Ndukuba, Forest Andrew Skaggs, Carlo Tambuatco, Jaime Yap, Irfan Kassam. Matt Balaun, Ray Cole, James Gaythwaite, Cory Jacobsen, William Allen, James Robert Farmer, Trevor Mann, Abiodun Otolorin, Ian Port, T. Scott Saponas, John Bunch, Kyle Forkner, Logan Johnson, Tiffany Johnson and Michael Rosack.
2003. Mohammad Ashraf, Meghan Byrne, Adam Gent, Christopher Gooley, Pavel Kremer, T. Scott Saponas, Wen Tian, Timothy Morton, Jonathan Razza, David Sharpe, Kevin Wong, William Allen, Kanishk Kapur, Ian Port, John Woehler, Mark Bernardi, Aldrian Harjati, Pavel Kremer and Christianto Widjaja, Shwetak Patel, Jesse Shieh, Nasir Barday, Tim Hardcastle, Scott Saponas, Trayton Otto, Adrian Abraham, Branden Hughes, Robert Martoncik, Dino Tufekcic.
2002. Shwetak Patel, Jesse Shieh, Nasir Barday, Scott Saponas, Trayton Otto, Samir Kaushal, Harold Owen Noll, Borna Safabaksh, Shuo Wang, Johnny S. Yen, Mohammed Ashraf, Lloyd Engebretsen, Lev Parnas, Randall Hutchison, Kamal Patel, Shwetak Patel, Jesse Shieh, Shuo Wang, Liang Wen, Johnny Yen, Gooley, Seth Lilavivat, Belinda Nambooze, T. Scott Saponas, Timothy Bethea, Logan Hauenstein, Branden Hughes, Robert Martoncik, James McDuffie, Tali Padan, Hossein Sharifi, Maxwell Speyer, Andrew Wightwick, Christopher Geisler, Peter Jensen.
1999. Cheryl Kay Holifield and Jamonica DeRamus, Cory Kidd,Mark Chapman. 1998.
Gregor Altvater, John Desetto, Colin Waters, Holloway, Thinh To, Lynn Bacher and Jimmy Nesmith.

1997. Janak Bhalodia, Ahmad Aslami, Khai Truong, Dale Everett, Vergilia Chin and Paul Gulley, Darin Heuerman, Jonathan Somers, Jason Anderson, Jason Pierce, Kristin, Chris Reynolds,

Caleb Billingsley, Tristan Jackson,Stephen Rushton, Thierry Ways, Kyle Phillips, Yonatan Feldman, Paul Gulley, Jonathan Somers, Jason Hong.

1996. David Chow, Darin Heurmann, Jason Hong, Gulley, Dale Everett, Scott Campbell.

1995. Greg Hankins, Casey Powell, DiIorio and John Lindsey.

B5. Service on thesis or dissertation committees

Georgia Tech

Annie Anton, Krishna Bharat, Erika Poole, Elaine Huang, Michael Terry, Kent Lyons, James Clawson, Andrea Forte, Temiloluwa Olubanjo (ECE), Maia Jacobs

External

Micah Rye, MIT Media Lab. Advisors: Mitchell Resnick and Rosalind Picard. Thesis topic: collaborative story creation and the impact on children with autism. External committee member, Defended December 2014.

João Sousa, Carnegie Mellon University School of Computer Science. Advisor: David Garlan. Thesis topic: Saving users from the distractions of ubiquity: an architectural framework. External committee member. Fall 2002-2005.

Antti Aaltonen, University of Groningen, Finland. 2007.

Remi Emoney, University of Grenoble, France. 2009. Advisor: James Crowley.

Andrea Tartaro, Northwestern University, 2010. Advisor: Justine Cassell.

Saunya Williams, Georgia Tech, School of Electrical and Computer Engineering. 2011. Advisor: Nikil Jayant.

Joshua Hailpern, University of Illinois, Department of Computer Science, 2012. Advisor: Karrie Karahalios.

B6. Mentorship of research scientists and visiting scholars

Mikiya Tani, September 1996-August 1997. Visiting Scientist from NEC in Japan. Work on retrieval interfaces for Classroom 2000.

Masayasu Futakawa, August 1998-August 1999. Visiting Scientist from Hitachi, Ltd. in Japan. Working on context-aware computing.

Yoshihide Ishiguro, since October 1998-September 1999. Visiting Scientist from NEC in Japan. Working on content-based retrieval for Classroom 2000.

Maria da Graca Pimentel, October 1998-January 2000. Visiting Scientist from University of San Paolo at Sao Carlos, Brazil. Working in automated support for capture and access to live experiences in the Classroom 2000 project.

Renata Fortes, January 2000-January 2001. Visiting Scientist from University of San Paolo, Brazil. Working in automated support for capture and access to meetings.

Collaboration has also led to a joint NSF/CNPq grant from July 2000 – June 2003.

Cory D. Kidd, May 2000-May 2001. Research Scientist in charge of managing Residential Laboratory.

Thomas O'Connell, May 2001-August 2003. Research Scientist in charge of managing Residential Laboratory.

Annie Jacobs, January 2001-September 2002. Research Scientist examining socio-legal implications of research in the Aware Home.

Lamar Gardere, June 2005-January 2006. Research programmer employed to develop CareLog FBA system for use in schools.

Hideyuki Nakanishi, 2005. Visiting faculty from Keio University. Work on wearable computing and language support.

Rosa Arriaga, 2006-2007. Research Scientist in developmental psychology. Work on technologies for developmentally delayed and caregivers. Currently Senior Research Scientist in School of Interactive Computing at Georgia Institute of Technology.

Tom Robertson, 2006-2009. Research Scientist working on sensing solutions on the powerline.

Rongheng Lin, 2008-2009. Visiting Ph.D. student from Chinese Academy. Work on data collection techniques for center-based special education.

Jong Choi, 2010-2011, Visiting Research Scientist from Korea. Worked jointly with Rosa Arriaga on collaboration technologies for chronic health and location-aware social networking.

Agata Rozga, 2010-2015, Research Scientist II. Work on technology to support analysis of children with autism. Currently Senior Research Scientist in School of Interactive Computing at Georgia Institute of Technology.

Kaya de Barbaro, 2015-2017, Research Scientist II. Working on Computational Behavioral Science associated with the CampusLife project. Currently Assistant Professor at University of Texas Austin.

C. OTHER TEACHING ACTIVITIES

I co-authored the textbook, *Human-Computer Interaction*, published by Prentice-Hall in 1993. Second edition published in November 1997. Third edition published in 2004. This text is one of the most popular HCI textbooks in the world, and has currently been translated into German, Chinese, Italian and Greek. A complete companion Web site has been developed for the book at http://www.hcibook.com, including answers to all exercises, overhead slides for every chapter, additional case studies, and project suggestions.

I have designed a course on Mobile and Ubiquitous Computing jointly with Thad Starner. The first instance of this course was given in the Spring Quarter of 1999 and it is now part of the regular undergraduate/graduate curriculum as CS 4605/7470. In Spring 2003, I taught this course jointly with Kishore Ramachandran, bringing in much more influence from the systems perspective. I have also been involved over the past year with efforts within the Ubiquitous and Pervasive Computing research

communities to assemble and understand best practices for teaching these topics to undergraduates and graduates. This effort has resulted in the book *Foundations of Ubiquitous Computing*.

In Spring 2007, I designed a new course on the topic of technology and autism. This course was sponsored by the Cure Autism Now Foundation. The course has been offered twice, and is now merging into a more Atlanta-wide teaching and practicum experience.

In collaboration with Prof. Betsy DiSalvo in the School of Interactive Computing at Georgia Tech as part of a NSF-funded project, I have begun to redesign senior undergraduate computing classes to include more active learning materials through hands-on studio-style lectures. I have applied this model of learning to three different courses in the School of Interactive Computing CS 6452 (*Prototyping Interactive Systems*), CS 4605 (*Mobile and Ubiquitous Computing*) and CS 3750 (*User Interface Design*).

I have taught a 3-4 day summer course on Ubiquitous Computing and HCI at the University of Peking in Beijing, China in July 2015 and July 2018.

VI. SERVICE

A. PROFESSIONAL CONTRIBUTIONS

List all national and international contributions of service and positions of leadership in the profession.

Professional society membership

Member, IEEE Computer Society, 1992-present.
Member, ACM SIGSOFT, 1993-present. Member, ACM SIGCHI, 1994-present.
Member, IFIP Working Group 2.7 (User Interface Engineering), 1990-1998, elected position.
Member, Phi Beta Kappa, 1985-present, elected position.

Conference committee activities

Chair, CHI'94 Basic Research Symposium, 1994
Panels review committee, CHI'94, 1994.
Program committee, IFIP 2.7 Working Conference on Engineering for Human-Computer Interaction, 1992, 1995.
External reviewer, Design, Specification and Verification of Interactive Systems—DSV-IS'95.
External reviewer CSEE'96.
Workshop organizer, CHI'96 workshop on formal methods for interactive systems.
Program committee, BCS Formal Aspects of Human–Computer Interaction, BCS-FAHCI, 1996.
Program committee, Design, Specification and Verification of Interactive Systems—DSV-IS'96.
SIGSOFT'96 Symposium on Foundations of Software Engineering (FSE-4), Tutorials and

Panels Chair.
ICSE'97 International Conference on Software Engineering, Student Volunteers co-chair.
1st International Symposium for Wearable Computing, program committee, 1997.
CHI'97 Workshop on Ubiquitous Computing, co-organizer, 1997.
NSF Program on Experimental Systems, grant reviewer, 1997.
SIGGRAPH'98 paper reviewer.
UIST'98 and UIST'99 panels committee.
AAAI 1998 Spring Symposium on Intelligent Environments, program committee. British HCI'98 conference, paper reviewer.
Foundations of Software Engineering, FSE'98, program committee.
ICSE'99, program committee and doctoral consortium committee.
DARPA/NSF/NIST Inter-Agency Workshop on Smart Environments. Atlanta, GA July 25-26, 1999. Local organizer.
CHI'2000, papers and panels reviewer.
Program chair for First International Workshop on Software Engineering Issues for Wearable and Pervasive Computing, held in conjunction with ICSE'2000 in Limerick, Ireland, June 2000.
Handheld and Ubiquitous Computing Symposium (HUC'2000) program committee, September 2000.
IEEE Workshop on Mobile Computing Systems and Applications (WMCSA 2000), program committee, December 2000.
Ubicomp 2001 (formerly HUC conference series), General Chair, September 2001.
CHI 2002 Associate Papers chair, Doctoral Consortium faculty panel, 2002.
IEEE Workshop on Perceptive User Interfaces (PUI 2001), program committee, November 2001
IEEE Workshop on Mobile Computing Systems and Applications (WMCSA 2002), program committee, 2002.
AAAI 2002 conference, program committee, 2002. UIST
2003, Program Chair (joint with Blair MacIntyre)
Workshop on Mobile Computing Systems and Applications (WMCSA '03) program committee, 2003.
Pervasive Computing 2004 conference program committee.
MobiSys 2004 program committee
Ubicomp conference series, Chair and Founding member of Executive Steering Committee, October 2003-present.
Ubicomp 2005 conference program committee.
Pervasive Computing 2006 conference program committee.
Ubicomp 2006 conference program committee, Doctoral Consortium Chair, Open Session Chair.
CHI 2007 Associate Papers chair.
Ubicomp 2007 co-Program Chair.
Pervasive Computing 2007 program committee
Ubicomp 2008 program committee
Pervasive Computing 2008 Doctoral Colloquium co-Chair.
CHI 2009 Subcommittee program chair

Editorial positions

ACM SIGCHI Bulletin editor for Beyond the Desktop column on challenges of future computing technologies, 2001-present. Write a column for bi-monthly publication.
HCI Journal, Associate Editor 2001-present
IEEE Pervasive Computing Magazine, founding editorial board member and Associate Editor, 2001-2005.
Foundations and Trends in HCI, founding editor in chief, 2005-2009.
Proceedings of the ACM on Interactive, Mobile, Wearable, and Ubiquitous Technologies (IMWUT), Founding Editor-in-Chief, 2016-present.

B. PUBLIC SERVICE

List all public service activities that are professionally related.

C. COMMUNITY SERVICE

List all community contributions that are professionally related.

Presentation on GVU Center for Parents Weekend, Fall 1996.
FOCUS program speaker, January 16, 1997.
Co-organizer of Georgia Tech College of Computing weekly Hack Fest, Fall 1996 to present.
Georgia Tech Battle of the Bands judge, October 1997.
Rhodes Foundation, Georgia State Selection Committee, 1998-2000
Autism Society of America, Greater Georgia Chapter. Elected board of directors May 2006.
Founding President, Atlanta Autism Consortium, 2008-present
Marcus Autism Center, Board of Trustees, 2013-2017
Emory Autism Center, Board of Advisors, 2014-present
State of Georgia Autism Advisory Council, 2014-present

D. INSTITUTE CONTRIBUTIONS

List all committee involvement and leadership, and other activities within Georgia Tech. Internal contributions to other organizations for which you were previously employed, if any, may be included. Do not list service on thesis or dissertation committees (should be listed under IV.B5).

College of Computing, Ph.D. Review Committee, 1994–5. College of Computing, Ph.D. Admissions Committee, 1995–6.
College of Computing, Undergraduate advising Committee, 1996–7.
GVU Center, Associate Director for External Affairs, 1996–8.
Broadband Telecommunications Center, Applications Area co-leader, 1996–present.
Georgia Tech, Selection committee for Research Author Award, 1997.
College of Computing Faculty Hiring Committee, 1998.

Georgia Tech, Selection committee for Sigma Xi Junior Faculty Research award, March 1998.
College of Computing, Dean's Advisory Council, 1998-99.
Georgia Tech Student Computer Ownership Committee, January 1999-2002. Chair in 2001-2002 academic year.
College of Computing, Faculty recruiting committee, 1999-2003. Acted as co-chair in 2002 and vice-chair in 2003.
College of Computing HCI Area advisory, 2000-1 academic year.
Georgia Tech Prestigious Scholarships committee, September 2001-present.
Georgia Tech, Student Activities Committee, elected to 3-year term 2002-2005.
Executive RPT committee, Fall 2002-2005.
College of Computing, Human-Centered Computing Ph.D. program 2003. Member of sub-committee for HCC PhD in charge of defining core computing competency requirements for candidates.
College of Computing Interactive Computing Division (ICD), faculty recruiting committee.
Georgia Tech Honors Committee, August 2005-present.
Georgia Tech Provost special committee on Undergraduate Experience, 2007-08.
School of Interactive Computing Graduate Coordinator, 2014-2016
Georgia Tech Service Learning Associate Director Search Committee, 2016
Georgia Tech School of Computer Science Chair 5-year review committee (chair), 2016
Georgia Tech College of Computing Steering Committee for Strategic Planning (co- chair) 2016-2017.
Georgia Tech MS HCI Associate Director representative for School of Interactive Computing, 2016-present.
Georgia Tech College of Computing PhD Seminar coordinator, 2014-2016.
Georgia Tech College of Computing PhD to Academia mentoring program, 2018-present.