

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORP.,
Petitioner,

v.

HEALTH DISCOVERY CORP.,
Patent Owner.

IPR2021-00553
Patent 8,095,483

Before LYNNE H. BROWNE, GARTH D. BAER, and
FREDERICK C. LANEY, *Administrative Patent Judges*.

Opinion for the Board filed PER CURIAM.

Opinion Dissenting filed by *Administrative Patent Judge* BAER.

PER CURIAM.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. *Background and Summary*

On February 27, 2021, Intel Corp. (“Petitioner”) filed a Petition (Paper 3, “Pet.”) requesting an *inter partes* review of claims 1, 5–7, 13, 18, 22, and 32 (the “challenged claims”) of U.S. Patent No. 8,095,483 (Ex. 1001, “the ’483 patent”). On July 15, 2021, Health Discovery Corp. (“Patent Owner”) filed a Preliminary Response (Paper 9, “Prelim. Resp.”).

Petitioner relies on the declaration of Theodoros Evgeniou, Ph.D. Ex. 1003. Patent Owner relies on the declaration of Hong Zhang, Ph.D. Ex. 2005.

Institution of an *inter partes* review is authorized by statute when “the information presented in the petition filed under [35 U.S.C. §] 311 and any response filed under [35 U.S.C. §] 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a) (2018). For the reasons set forth below, we deny institution of *inter partes* review under 35 U.S.C. § 325(d).

B. *Real Parties-in-Interest*

Petitioner identifies itself as a real party-in-interest. Pet. 84. Patent Owner identifies itself as a real-party-in-interest. Paper 4, 2.

C. *Related Matters*

The parties identify *Health Discovery Corporation v. Intel Corporation*, Civil Action No. 6:20-cv-666 (W.D. Texas July 23, 2020) as related district court litigation. Pet. 84; Paper 4, 2. Patent Owner indicates that the ’483 patent is also at issue in *Intel Corp. v. Health Discovery Corp.*, IPR2021-00554. Paper 4, 2.

Patent Owner indicates that U.S. 7,117,188, U.S. 7,542,959, and U.S. 10,402,685 are patents related to the '483 patent. Paper 4, 2. Patent Owner indicates further that U.S. 7,117,188 is at issue in *Intel Corp. v. Health Discovery Corp.*, IPR2021-00549 and *Intel Corp. v. Health Discovery Corp.*, IPR2021-00550; U.S. 7,542,959 is at issue in *Intel Corp. v. Health Discovery Corp.*, IPR2021-00551 and *Intel Corp. v. Health Discovery Corp.*, IPR2021-00552; and that U.S. U.S. Patent No. 10,402,685 is at issue in *Intel Corp. v. Health Discovery Corp.*, IPR2021-00555. *Id.* at 2–3. In addition, Patent Owner indicates that U.S. Appl. No. 12/994,197, the application leading to related U.S. Pat. No. 10,402,685, was at issue in Pat. Interference No. 106,066, which involved Junior Party Assignee Intel Corp. and Senior Party Assignee Health Discovery Corp. *Id.* at 3.

D. The '483 Patent

The '483 patent is titled “Support Vector Machine—Recursive Feature Elimination (SVM–RFE)” and relates to “the use of learning machines to identify relevant patterns in datasets, and more particularly to a method and system for selection of features within the data sets which best enable classification of the data.” Ex. 1001, code (54), 1:30–34. Figure 2, reproduced below, is a flowchart showing a method for increasing knowledge that may be discovered from data using a SVM. *Id.* at 4:63–65.

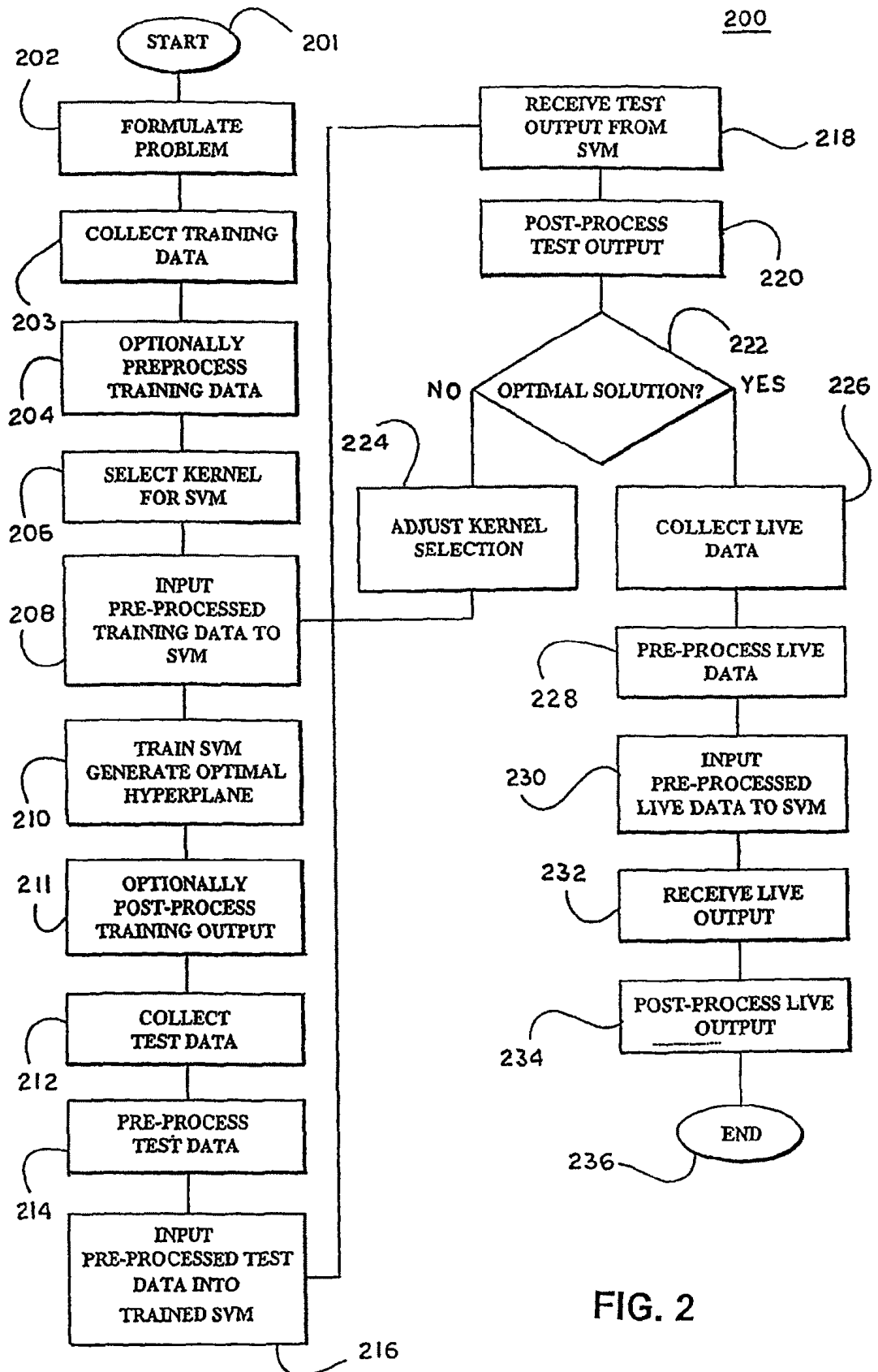


FIG. 2

The flowchart shown in Figure 2 has a number of boxes representing each of the 19 steps in the method, with ovals labeled “START” 201 and “END” 236, respectively, representing the beginning and end of the method.

Ex. 1001, Fig. 2. Each step flows directly from the preceding step until the twelfth step 220, which is followed by decision step 222 represented by a diamond with the word “NO” to the left side of the diamond and the word “YES” to the right side of it. *Id.*

Specifically, the method starts by formulating the problem 202, collecting training data 203, optionally preprocessing the training data 204, and selecting a kernel for SVM 205. Ex. 1001, Fig. 2. The method then inputs the pre-processed training data to the SVM 208, trains the SVM to generate an optimal hyperplane 210, optionally post-processing the training output 211, and collects test data 212. *Id.* Next, the method pre-processes the test data 214, inputs the pre-processed test data into a trained SVM 216, receives test output from the SVM 218, and post-processes the test output 220. *Id.* At decision step 222 the method determines if an optimal solution has been achieved. *Id.* If no, the method adjusts the kernel selection 224 and restarts the process as step 208. *Id.* If yes, the method continues by collecting live data 226, pre-processing the live data, 228, inputting the pre-processed live data to the SVM 230, receiving live output 232, and post-processing the live output 236. *Id.*

As described in the '483 patent using the method shown in Figure 2, the SVM is trained using training data to generate an optimal hyperplane. Ex. 1001, 10:2–4. Test data is input into the trained SVM “to determine whether the SVM was trained in a desirable manner.” *Id.* at 10:11–13. If not, the kernel selection is adjusted at step 224 and the training process is repeated from step 208. *Id.* at 10:48–57. After the optimal kernel is

selected, the SVM is further optimized through feature selection. *See id.* at 14:32–47.

E. Illustrative Claim

Claim 1, reproduced below, is representative of independent claims 1, 7, 13, 18, and 22 challenged in the Petition:

1. A computer-implemented method comprising:
 - (a) inputting into a computer processor programmed to execute a support vector machine a set of training examples having known labels with regard to two or more classes, each training example described by a vector of feature values for a plurality of features, the support vector machine comprising a decision function having a plurality of weights, wherein each feature has a corresponding weight;
 - (b) training the support vector machine by optimizing the plurality of weights so that a cost function is minimized and support vectors comprising a subset of the training examples are defined, wherein the decision function is based on the support vectors;
 - (c) computing ranking criteria using the optimized plurality of weights, wherein the ranking criterion estimates for each feature the effect on the cost function of removing that feature, and wherein features having the smallest effect on the cost function have the smallest ranking criteria;
 - (d) eliminating one or more features corresponding to the smallest ranking criteria to yield a reduced set of features;
 - (e) repeating steps (c) through (d) for the reduced set of features for a plurality of iterations until a subset of features of predetermined size remains, wherein the subset of features comprises determinative features for separating the set of training examples into the two or more classes; and
 - (f) generating at a printer or display device an output comprising a listing of the determinative features.

Ex. 1001, 70:27–57.

F. Prior Art and Asserted Grounds

Petitioner asserts that claims 1, 5–7, 13, 18, 22, and 32 would have been unpatentable on the following grounds (Pet. 4):

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 5, 7, 13, 18, 22, 32	103	Mukherjee ¹ , Platt ²
1, 5–7, 13, 18, 22, 32	103	Mukherjee, Platt, Kohavi ³

G. Asserted Prior Art

1. Mukherjee

Mukherjee, titled “Support Vector Machine Classification of Microarray Data” describes applying Support Vector Machines (SVMs) to a classification of DNA microarray data samples. Ex. 1005, Abstract. In addition to its SVM disclosure, Mukherjee describes performing feature selection using an iterative algorithm that is based in part on optimized pattern weight values. *Id.* at 5; *see* Ex. 1003 ¶ 94 n.14.

2. Platt

Platt is titled “Methods and Apparatus for Building a Support Vector Machine Classifier.” Ex. 1006, code (54). Platt describes classifying objects using support vector machines. *Id.* at 1:17–18.

3. Kohavi

Kohavi is titled “Wrappers for feature subset selection.” Ex. 1007. Kohavi describes forwards and backwards, iterative feature-selection techniques. *Id.* at 285.

¹ Mukherjee et al., “Support Vector Machine Classification of Microarray Data,” Technical Report C.B.C.L. Paper No. 182, A.I. Memo No. 1677, M.I.T. (1998) (Ex. 1005, “Mukherjee”).

² US 6,327,581, Dec. 4, 2001 (Ex. 1006, “Platt”).

³ Kohavi et al., “Wrappers for Feature Subset Selection,” *Artificial Intelligence* 97, 273–324 (1997) (Ex. 1007, “Kohavi”).

II. ANALYSIS

A. Level of Skill in the Art

Petitioner contends a person of ordinary skill in the art at the time of the alleged invention of the '483 patent (a "POSITA") would have had "at least a Master's degree in electrical engineering, computer science, or the equivalent with three years of experience in machine learning and data-analysis techniques." Pet. 19 (citing Ex. 1003 ¶ 15). Further, Petitioner asserts that "[a]dditional education could substitute for professional experience, and vice versa." *Id.* Patent Owner does not contest that a skilled artisan would have this kind of background knowledge and experience; nor does Patent Owner suggest that Petitioner's proposed level of skill leads to an improper understanding of the prior art or an improper patentability analysis. *See generally* Prelim. Resp. At this stage in the proceeding, we adopt Petitioner's articulation of the level of ordinary skill in the art, which is supported by Dr. Evgeniou's testimony and appears commensurate with the level of ordinary skill as reflected in the asserted prior art and the '483 patent.

B. Claim Construction

We find no claim terms require express construction for us to determine whether or not to institute *inter partes* review. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy.'" (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

C. Challenges

1. Obviousness Over Mukherjee and Platt

Petitioner asserts that claims 1, 5, 7, 13, 18, 22 and 32 would have been obvious over Mukherjee and Platt. Pet. 20–68. As explained below, we find Petitioner has not shown a reasonable likelihood that it would prevail in its obviousness challenge based on Mukherjee and Platt.

Independent claims 1, 7, 13, 18, 22, and 32 recite the iterative calculation and use of feature weights. Ex. 1001, 70:27–57, 71:15–38, 71:57–72:9, 72:28–57, 73:5–35, 74:10–28. Claim 1, for example, recites “(a) . . . wherein each feature has a corresponding weight . . . c) computing ranking criteria using the optimized plurality of weights; (d) eliminating at least one feature corresponding to the smallest ranking criterion; [and] (e) repeating steps (c) through (d) for a plurality of iterations.” *Id.* at 70:34–50. Claims 7, 13, 18, 22, and 32, the other challenged independent claims, have similar language requiring the iterative calculation and use of feature weights.

According to Petitioner, Mukherjee teaches feature weight calculation because “Mukherjee’s decision function includes variables x (i.e., training patterns) [and] α (weight value for each pattern).” Pet. 30 (quoting Ex. 1003 ¶ 133) (footnote omitted). Petitioner asserts further that “[i]n comparison to the decision function in primal form, $D(x) = \mathbf{w} \cdot \mathbf{x} + b$, Mukherjee’s decision function is presented in ‘dual’ space, where the ‘primal’ space weight vector $\mathbf{w}$ is replaced by the summation of individual patterns (observations/samples) x_k with corresponding pattern weight values α_k .” *Id.* Thus, according to Petitioner, “Mukherjee’s linear SVM therefore either (a) discloses ‘a decision function having a plurality of weights, wherein each feature has a corresponding weight’ or (b) renders the limitation obvious to

try as there are only two known alternative representations (‘primal’ and ‘dual’) for the decision function.” Pet. 31.

Patent Owner contends that Mukherjee does not teach the claimed feature weights because Mukherjee instead “only computes pattern weights, expressed as α s.” Prelim Resp. 25. We agree with Patent Owner that Petitioner has not adequately bridged the gap between the claimed feature weight and Mukherjee’s pattern weight. Although Petitioner’s expert contends that feature weight and pattern weight “are [] equivalent,” he implicitly concedes they are not in his additional assertion that they are “related and can be derived from one another.” See Ex. 1003 ¶ 92 n.14. We are also not persuaded by Petitioner’s argument that “a relationship exists between feature weight vectors, $\mathbf{w}$, and pattern weight vectors, α , such that one can be mathematically derived and calculated from the other.” Pet. 30. Even if correct, Petitioner’s argument falls short because Petitioner offers no explanation as to why a skilled artisan would have done so. As Patent Owner notes, “a conclusion of obviousness is not dependent upon what a person of ordinary skill in the art *could* do, but rather what the hypothetical individual *would* do, and there was no motivation for Mukherjee or any person of ordinary skill in the art to [compute feature weights].” Prelim. Resp. 26. In short, we find that Petitioner has not produced the required “articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” See *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). Therefore, Petitioner has not shown a reasonable likelihood that it would prevail in establishing independent claims 1, 7, 13, 18, 22, or 32 (or claims 5 and 6 which depend from claim 1) would have

been obvious over the asserted combinations involving Mukherjee and Platt.⁴

2. *Obviousness Over Mukherjee, Platt, and Kohavi*

Petitioner asserts that claims 1, 5–7, 13, 18, 22, and 32 would have been obvious over combinations involving Mukherjee, Platt, and Kohavi. Pet. 68–81. Petitioner’s alternative inclusion of Kohavi in its prior art combination does not remedy the deficiency outlined above related to the claimed feature weight. *See id.* at 68 (explaining that Petitioner includes Kohavi only to address “the ‘repeating’ limitations”). Therefore, Petitioner has also not shown a reasonable likelihood that it would prevail in establishing claims 1, 5–7, 13, 18, 22, and 32 would have been obvious over combinations involving Mukherjee, Platt, and Kohavi.

D. Conclusion

For the foregoing reasons, we determine that the information presented in the Petition does not establish a reasonable likelihood that Petitioner would prevail in showing claims 1, 5–7, 13, 18, 22, and 32 are unpatentable. We therefore do not institute an *inter partes* review of these claims.

III. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is *denied* as to all challenged claims, and no trial is instituted.

⁴ Petitioner argues (briefly) that claims 1 and 22 “cover pattern weights and feature weights.” Paper 13, Prelim. Reply 5. We disagree because independent claims 1 and 22 include a limitation requiring “each feature has a corresponding weight.”

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Patent Owner.

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Patent 8,095,483 B2

Before LYNNE H. BROWNE, GARTH D. BAER, and FREDERICK C.
LANEY, *Administrative Patent Judges*.

BAER, *Administrative Patent Judge*, dissenting.

I respectfully dissent from the majority’s decision denying institution of *inter partes* review. Although Mukherjee uses pattern weight instead of the claimed feature weight, Petitioner’s expert, Dr. Evgeniou, explains that pattern weight and feature weight are related—feature weight ($\mathbf{w}$), used in primal space, is replaced with pattern weight (α) in dual space representations. Ex. 1003 ¶¶ 48, 54, 149. Dr. Evgeniou further explains that “there exists an easy to see relationship (there is always a relationship) between the feature weight vectors, $\mathbf{w}$, and the pattern weight vectors, α , such that one can be mathematically derived and calculated from the other.” *Id.* ¶ 134. Last, according to Dr. Evgeniou, “there are only two known

alternative representations (‘primal’ and ‘dual’) for the decision function.”

Id. In light of that uncontested testimony, *see* Prelim. Resp. 21–37, I agree with Petitioner that “Mukherjee’s linear SVM . . . renders the [feature-weight] limitation obvious to try.” Pet. 34 (citing Ex. 1003 ¶¶ 134); *see KSR*, 550 U.S. at 402 (explaining that “[w]hen there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp”).

For the foregoing reasons, in my opinion, Petitioner has shown a reasonable likelihood of prevailing in showing the unpatentability of at least one of the challenged claims of the ’188 patent.

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