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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte KAVE ESHGHI

Appeal 2018-006632
Application 13/873,587
Technology Center 2100

Before JOSEPH L. DIXON, HUNG H. BUI, and JON M. JURGOVAN, *Administrative Patent Judges*.

DIXON, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant[1] appeals under 35 U.S.C. § 134(a) from a rejection of claims 1–20. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

The claims are directed to a method, system, and computer readable storage medium for "building a classification model using a SVM [(support vector machine)] training module" by computing a mean value of a set of training vectors, subtracting the mean value of the set of training vectors from each training vector to obtain a set of difference vectors, applying a hash function to each of the difference vectors to obtain a number of hashed vectors, and applying a linear training formula to the hashed vectors to obtain a classifier model. (Abstract.)

Claim 1, reproduced below, is illustrative of the claimed subject matter:

> 1. A method comprising:
>
> performing, by a computer system comprising a processor:
>
> computing a mean of a plurality of training vectors;
>
> subtracting the mean of the plurality of training vectors from each training vector of the plurality of training vectors to obtain a plurality of difference vectors;
>
> applying a hash function to each of the plurality of difference vectors to obtain a plurality of hashed vectors;
>
> applying linear training to the plurality of hashed vectors to obtain a classifier model; and

[1] Appellant indicates that EntIT Software LLC is the real party in interest. (App. Br. 1.)

classifying a sample vector of input data using the classifier model.

(App. Br. i (Claims Appendix).)

REFERENCES

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Matsui et al. ("Matsui")	US 5,845,016	Dec. 1, 1998
Perronnin et al. ("Perronnin")	US 2011/0040711 A1	Feb. 17, 2011

Kave Eshghi & Shyamsundar Rajaram, *Locality Sensitive Hash Functions Based on Concomitant Rank Order Statistics*, Proceedings of the 14th ACM SIGKDD Int'l Conference on Knowledge Discovery & Data Mining (KDD '08) 221–29 (2008) ("Eshghi").

Rong-En Fan et al., *LIBLINEAR: A Library for Large Linear Classification*, 9 J. OF MACHINE LEARNING RESEARCH 1871–74 (2008) ("Fan")

REJECTIONS

The Examiner made the following rejections:

Claims 1–20 stand rejected under 35 U.S.C. § 101 because the claimed invention is directed to a judicial exception (i.e., a law of nature, a natural phenomenon, or an abstract idea) without significantly more.

Claims 1–3, 5–8, and 10–20 stand rejected under 35 U.S.C. § 103 as being unpatentable over Perronnin in view of Matsui further in view of Eshghi.

Claims 4 and 9 stand rejected under 35 U.S.C. § 103 as being unpatentable over Perronnin in view of Matsui and Eshghi, and further in view of Fan.

ANALYSIS

35 U.S.C. § 101

An invention is patent-eligible if it claims a "new and useful process, machine, manufacture, or composition of matter." 35 U.S.C. § 101. However, the Supreme Court has long interpreted 35 U.S.C. § 101 to include implicit exceptions: "'[l]aws of nature, natural phenomena, and abstract ideas'" are not patentable. *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 70 (2012) (brackets in original) (citing *Diamond v. Diehr,* 450 U.S. 175, 185 (1981)).

In determining whether a claim falls within an excluded category, we are guided by the Supreme Court's two-step framework, described in *Mayo* and *Alice*. *Alice Corp. v. CLS Bank Int'l*, 573 U.S. 208, 217–18 (2014) (citing *Mayo*, 566 U.S. at 75–77). In accordance with that framework, we first determine what concept the claim is "directed to." *See Alice*, 573 U.S. at 218–19 ("On their face, the claims before us are drawn to the concept of intermediated settlement, *i.e.,* the use of a third party to mitigate settlement risk."); *see also Bilski v. Kappos*, 561 U.S. 593, 611 (2010) ("Claims 1 and 4 in petitioners' application explain the basic concept of hedging, or protecting against risk.").

Concepts determined to be abstract ideas, and thus patent ineligible, include certain methods of organizing human activity, such as fundamental economic practices (*Alice*, 573 U.S. at 219–20; *Bilski*, 561 U.S. at 611); mathematical formulas (*Parker v. Flook*, 437 U.S. 584, 594–95 (1978)); and mental processes (*Gottschalk v. Benson*, 409 U.S. 63, 69 (1972)). Concepts determined to be patent eligible include physical and chemical processes,

such as "molding rubber products" (*Diehr*, 450 U.S. at 191); "tanning, dyeing, making water-proof cloth, vulcanizing India rubber, smelting ores" (*id.* at 183 n.7 (quoting *Corning v. Burden*, 56 U.S. 252, 267–68 (1853))); and manufacturing flour (*Benson*, 409 U.S. at 69 (citing *Cochrane v. Deener*, 94 U.S. 780, 785 (1876))).

In *Diehr*, the claim at issue recited a mathematical formula, but the Supreme Court held that "[a] claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a mathematical formula." *Diehr*, 450 U.S. at 187; *see also id.* at 191 ("We view respondents' claims as nothing more than a process for molding rubber products and not as an attempt to patent a mathematical formula."). Having said that, the Supreme Court also indicated that a claim "seeking patent protection for that formula in the abstract . . . is not accorded the protection of our patent laws, . . . and this principle cannot be circumvented by attempting to limit the use of the formula to a particular technological environment." *Id.* (citing *Benson* and *Flook*); *see, e.g.*, *id.* at 187 ("It is now commonplace that an application of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection.").

If the claim is "directed to" an abstract idea, we turn to the second step of the *Alice* and *Mayo* framework, where "we must examine the elements of the claim to determine whether it contains an 'inventive concept' sufficient to 'transform' the claimed abstract idea into a patent-eligible application." *Alice*, 573 U.S. at 221 (internal quotation marks omitted). "A claim that recites an abstract idea must include 'additional features' to ensure 'that the [claim] is more than a drafting effort designed to

monopolize the [abstract idea].'" *Id.* (quoting *Mayo*, 566 U.S. at 77). "[M]erely requir[ing] generic computer implementation[] fail[s] to transform that abstract idea into a patent-eligible invention." *Id.*

The PTO recently published revised guidance on the application of § 101. USPTO, *2019 Revised Patent Subject Matter Eligibility Guidance*, 84 Fed. Reg. 50 (Jan. 7, 2019) ("Revised Guidance"). Under that guidance, we first look to whether the claim recites:

> (1) any judicial exceptions, including certain groupings of abstract ideas (i.e., mathematical concepts, certain methods of organizing human activity such as a fundamental economic practice, or mental processes); and
>
> (2) additional elements that integrate the judicial exception into a practical application ("Prong Two") (*see* MPEP § 2106.05(a)–(c), (e)–(h)) (9th ed. 2018).

Only if a claim (1) recites a judicial exception and (2) does not integrate that exception into a practical application, do we then look to whether the claim:

> (3) adds a specific limitation beyond the judicial exception that is not "well-understood, routine, conventional" in the field (*see* MPEP § 2106.05(d)); or
>
> (4) simply appends well-understood, routine, conventional activities previously known to the industry, specified at a high level of generality, to the judicial exception.

See Revised Guidance.

With respect to independent claims 1, 6, and 11, Appellant presents arguments directed to independent claim 1, and Appellant does not set forth separate arguments for patentability of independent claims 6 and 11. (App.

Br. 6, 13; Reply Br. 3, 6.) As a result, we select independent claim 1 as the representative claim for the group and address Appellant's arguments thereto. *See* 37 C.F.R. § 41.37(c)(1)(iv) (2017).

Revised Guidance Step 1

Step 1 of the Revised Guidance asks whether the claimed subject matter falls within the four statutory categories of patentable subject matter identified by 35 U.S.C. § 101: process, machine, manufacture, or composition of matter. *See* Revised Guidance. Claim 1 recites "[a] method." Appellant does not argue the Examiner erred in concluding claim 1 falls within the four statutory categories of patentable subject matter. We agree with the Examiner's conclusion because claim 1 falls within the process category. (Final Act. 4.)

Revised Guidance Step 2A–Prong One
(Does the Claim Recite a Judicial Exception?)

Under *Step 2A, Prong One of the Revised Guidance*, we determine whether the claims recite any judicial exceptions, including certain groupings of abstract ideas (i.e., mathematical concepts, certain methods of organizing human activity such as a fundamental economic practice, or mental processes). *See* Revised Guidance.

The Examiner determines that independent claim 1 is directed to "a mathematical algorithm comprising computing a mean, subtracting the mean, applying a hash function, and applying a linear training formula to obtain a classifier model, and classifying a sample vector," which is an abstract idea "analogous to the other mathematical algorithms that have been

identified by courts as being abstract ideas" in *Diehr*, *Benson*, *Flook*, and *Bilski*. (Final Act. 5 (citing *Diehr,* 450 U.S. at 175; *Benson*, 409 U.S. at 63; *Flook*, 437 U.S. at 584; *Bilski*, 561 U.S. at 593); Ans. 5–6.)

Appellant argues "[t]he Examiner has erred in characterizing claim 1 as directed to improving math rather than a relevant technology" and "failed to recognize that claim 1 is directed to improving the relevant technology (machine classification technology) or computer functionality (functionality of a computer in perform[ing] machine classification)." (Reply Br. 4, 6.) Appellant also argues claim 1 is not directed to an abstract idea because the claim is similar to the claims in *Enfish* and *McRO*. (App. Br. 7–8, 10–11 (citing *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1335–36 (Fed. Cir. 2016); *McRO, Inc. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299 (Fed. Cir. 2016)); Reply Br. 2.) Particularly, Appellant argues that similar to *McRO*, "claim 1 of the present application also involves the use of 'rules, rather than [human] artists,' to perform the classification of input data using the trained classifier model," the claimed "rules" including "computing of the mean, the substracting [sic] of the mean from the training vectors to obtain difference vectors, the applying of a hash function to each of the difference vectors to obtain hashed vectors, and the applying of linear training to the hashed vectors to obtain a classifier model." (App. Br. 10.) Appellant argues the claimed "rules" "improve the functioning of a computer system (by speeding up the training and classification processes while being accurate) when classifying data." (App. Br. 7–8, 10 (citing Spec. ¶ 10).)

Appellant's arguments are not persuasive. Although the Specification mentions speeding up training and classification by a computer, claim 1 is

not directed to such a computer or to improved computer functionality for training and classification. (*See* Spec. ¶ 10.) Claim 1 only recites a mathematical algorithm for building a classifier model using mathematical quantities of "training vectors," "difference vectors," and "a hash function." Claim 1 does not recite "using concomitant rank order hash functions" to perform "a relatively faster training and classification of input data, with all the same accuracy as a non-linear SVM" as described in the Specification. (*See id.*) Claim 1 also does not recite or require "improv[ing] computer functionality when classifying data," "speeding up the training and classification processes while being accurate," or "faster training and classification of input data with high accuracy" as Appellant asserts. (*See* App. Br. 7–8, 10; Reply Br. 5.) Rather, claim 1 recites mathematical concepts and operations of an algorithm for building and using a classifier model. (Ans. 5.) Although claims are interpreted in light of the Specification, limitations from the Specification are not read into the claims. *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

More specifically, representative claim 1 recites the following limitations: (1) "computing a mean of a plurality of training vectors"; (2) "subtracting the mean of the plurality of training vectors from each training vector of the plurality of training vectors to obtain a plurality of difference vectors"; (3) "applying a hash function to each of the plurality of difference vectors to obtain a plurality of hashed vectors"; (4) "applying linear training to the plurality of hashed vectors to obtain a classifier model"; and (5) "classifying a sample vector of input data using the classifier model." (App. Br. i (Claims Appendix).) These limitations, under their broadest reasonable

interpretation, recite steps that perform a mathematical algorithm for creating a classifier model and classifying data.

Each of the recited (1) and (2) limitations ("computing a mean of a plurality of training vectors" and "subtracting the mean of the plurality of training vectors from each training vector of the plurality of training vectors to obtain a plurality of difference vectors") carries out one or more mathematical concepts. The Specification discloses a mean computation involves "adding a number of training vectors together and dividing the resulting vector by the number of training vectors used during the building of the classification model," and determining difference vectors involves "normalizing the feature vectors" by "[s]ubtracting the population mean from all the features vectors" to obtain a number of difference vectors. (*See* Spec. ¶¶ 21, 30, 34.)

The recited limitation (3) ("applying a hash function to each of the plurality of difference vectors to obtain a plurality of hashed vectors") carries out a mathematical concept by which a "hash function may . . . be applied . . . to each of the difference vectors" where "[i]n one example, the hash function is a concomitant rank order (CRO) hash function. . . . [that] maps k dimensional real vectors to sparse U dimensional vectors." (*See* Spec. ¶¶ 19–20, 28.)

The remaining recited limitations (4) and (5) ("applying linear training to the plurality of hashed vectors to obtain a classifier model" and "classifying a sample vector of input data using the classifier model") similarly carry out mathematical concepts to (i) apply "a linear training routine. . . . [that] may be a linear SVM that takes the hash vectors and creates a classifier model," where "[o]ne example of a linear training routine

is Liblinear," such that (ii) a "hashed sample vector may then be classified . . . using the classifier model obtained during the building of [the] classification model." (*See* Spec. ¶¶ 20–22, 24, 29, 32.)

Thus, Appellant's method for building and using a classifier model recites mathematical operations of a mathematical algorithm, similar to mathematical concepts identified by the courts as abstract ideas. That is, like the decimal to binary conversion in *Benson*, the mathematical hedging formula in *Bilski*, the Arrhenius equation in *Diehr*, the alarm limit formula in *Flook*, and the algorithm for determining abnormal conditions in *Grams*, Appellant's mathematical algorithm for creating a classifier model is an abstract mathematical concept comprising mathematical operations and calculations (Final Act. 5). *See Benson*, 409 U.S. at 63–64, 67 (a "method for converting numerical information from binary-coded decimal numbers into pure binary numbers . . . is merely a series of mathematical calculations or mental steps, and does not constitute a patentable 'process'"); *Bilski*, 561 U.S. at 611–12 ("Claims 1 and 4 in petitioners' application explain the basic concept of hedging, or protecting against risk."); *Diehr*, 450 U.S. at 176, 188 ("Arrhenius' equation is not patentable in isolation, but when a process for curing rubber is devised which incorporates in it a more efficient solution of the equation, that process is at the very least not barred at the threshold by § 101"); *Flook*, 437 U.S. at 585, 594–96 (rejecting as ineligible claims directed to the use of an algorithm to calculate an updated "alarm-limit value" for a catalytic conversion process variable, and updating the limit with the new value.); *In re Grams*, 888 F.2d 835, 837 (Fed. Cir. 1989) ("[M]athematical algorithms join the list of non-patentable subject matter not within the scope of section 101."). We, therefore, conclude

representative claim 1, and grouped claims 6 and 11, recite mathematical operations and calculations, which is one of the judicial exceptions of an abstract idea identified in the Prong One of Step 2A of the Revised Guidance. *See* Revised Guidance, 84 Fed. Reg. at 52 (describing an abstract idea category of "Mathematical concepts—mathematical relationships, mathematical formulas or equations, mathematical calculations."). Thus, representative claim 1, and grouped claims 6 and 11, not separately argued, recites an abstract idea.

We are unpersuaded by Appellant's argument that claim 1 does not recite an abstract idea because "none of the listed mathematical algorithms [of *Diehr*, *Benson*, *Flook*, and *Bilski*] are analogous to what is recited in claim l" and "[n]one of the foregoing algorithms relate to classifying a sample vector." (App. Br. 11.) Mathematical operations (such as building a classifier model and classifying a vector as recited in the claims) involve mathematical concepts, which are abstract ideas. As recognized by the Examiner, the claimed limitations recite "specific mathematical algorithms/formulas **to create a classifier model** which is a mathematical model," and although "the math may be improved . . . math is still an abstract idea." (Ans. 5.)

Revised Guidance Step 2A–Prong Two
(Integration into a Practical Application)

Under *Step 2A, Prong Two of the Revised Guidance*, we discern no additional element (or combination of elements) recited in Appellant's representative claim 1 that integrates the judicial exception into a practical application. *See* Revised Guidance, 84 Fed. Reg. at 54–55 ("Prong Two").

For example, Appellant's claimed additional elements ("a computer system," "processor," and "storage medium") do not: (1) improve the functioning of a computer or other technology; (2) are not applied with any particular machine (except for a generic computer); (3) do not effect a transformation of a particular article to a different state; and (4) are not applied in any meaningful way beyond generally linking the use of the judicial exception to a particular technological environment, such that the claim as a whole is more than a drafting effort designed to monopolize the exception. *See* MPEP §§ 2106.05(a)–(c), (e)–(h). Appellant's claim 1 does not describe technological improvements, and is not directed to an improvement in computer-related technology. Nor has Appellant demonstrated that the claim recites a specific improvement to the way computers operate or to the way computers store and retrieve data in memory. (Ans. 5–6; *see Enfish*, 822 F.3d at 1336, 1339.)

The additional elements in claim 1 are broadly claimed to cover a processor that is recited in such a general, generic, and functional manner that the claim fails to capture how the processor's functionality is improved when classifying data. (*See* Reply Br. 3.) Thus, claim 1's hardware elements do not evince integration into a practical application, such as a non-abstract improvement in "the functioning of a computer system (by speeding up the training and classification processes while being accurate) when classifying data." (App. Br. 7–8.) Rather, Appellant's claimed invention uses existing technology to perform a mathematical algorithm. *See Bancorp Servs., L.L.C. v. Sun Life Assurance Co. of Can. (U.S.)*, 687 F.3d 1266, 1278 (Fed. Cir. 2012) ("[T]he fact that the required calculations could be performed more efficiently via a computer does not materially alter the

patent eligibility of the claimed subject matter."); *Ultramercial, Inc. v. Hulu, LLC*, 772 F.3d 709, 715–16 (Fed. Cir. 2014) ("Adding routine additional steps such as . . . use of the Internet does not transform an otherwise abstract idea into patent-eligible subject matter.").

Further, even though claim 1 may be for a specific purpose (e.g., "improving the machine classification technology" or "training and classification processes of classifiers," (*see* Reply Br. 4–5)), this does not transform the claim into statutory subject matter. As the Supreme Court has stated, "'if a claim is directed essentially to a method of calculating, using a mathematical formula, even if the solution is for a specific purpose, the claimed method is nonstatutory.'" *Flook*, 437 U.S. at 595 (quoting *In re Richman*, 563 F.2d 1026, 1030 (CCPA 1977)).

Additionally, we note the functions performed by the processor recited in claim 1 automate mathematical operations that can be performed by humans using pen and paper. (Ans. 4–5.) For example, the claimed computing a mean, subtracting the mean, applying a hash function, and training and applying the classifier model can be performed manually, without a computer or other machine. *See CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1372–73 (Fed. Cir. 2011) ("[A] method that can be performed by human thought alone is merely an abstract idea and is not patent-eligible under § 101."); *see also In re Comiskey*, 554 F.3d 967, 979 (Fed. Cir. 2009) ("[M]ental processes—or processes of human thinking—standing alone are not patentable even if they have practical application."); *Benson*, 409 U.S. at 67 ("Phenomena of nature . . . , *mental processes*, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work" (emphasis added)). Additionally, mental

processes remain unpatentable even when automated to reduce the burden on the user of what once could have been done with pen and paper. *CyberSource*, 654 F.3d at 1375 ("That purely mental processes can be unpatentable, even when performed by a computer, was precisely the holding of the Supreme Court in *Gottschalk v. Benson*.").

We are also not persuaded that Appellant's claim 1 is similar to the claim in *McRO*. (*See* App. Br. 7, 9–10.) Appellant's claim 1 does not describe *technological process improvements* similar to *McRO*. In *McRO*, the claim was not directed to an abstract idea because it "uses the limited rules in a process specifically designed to achieve an improved technological result" over "existing, manual 3–D animation techniques." *See McRO*, 837 F.3d at 1316. That is, *McRO*'s claim was not directed to an abstract idea because it "allow[ed] computers to produce 'accurate and realistic lip synchronization and facial expressions in animated characters' that previously could only be produced by human animators." *See id.* at 1313. In contrast, Appellant's claim 1 employs broadly claimed quantities ("training vectors," "difference vectors" and "a hash function") to obtain a classifier model and classify a sample vector. The claim is not tied to a real-world application or to an improved "functionality of a computer in perform[ing] machine classification" (*see* Reply Br. 5); rather, the claim merely requires a mathematical algorithm computing difference and hashed vectors and training and using a classifier model, as discussed *supra*. Additionally, the claim does not indicate how its obtained results (e.g., the classifier model and the classified sample vector) provide any improvement to computer functionality or to machine classification technology. Thus, claim 1 does not integrate the judicial exception into a practical application.

With respect to preemption, Appellant argues the claim is not directed to an abstract idea because "claim 1 is not attempting to cover all possible ways of input data classification[, r]ather, claim 1 recites a very specific set of rules, like the rules applied in *McRO*." (App. Br. 11.)

As recognized by the Examiner, however, although the claimed mathematics may be improved or specific, but "math is still an abstract idea." (Ans. 5.) We agree with the Examiner. As the *McRO* court further explicitly recognized, "the absence of complete preemption does not demonstrate patent eligibility." *See McRO*, 837 F.3d at 1315 (quoting *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371, 1379 (Fed. Cir. 2015)). Furthermore, "[w]here a patent's claims are deemed only to disclose patent ineligible subject matter" under the *Alice/Mayo* framework, "preemption concerns are fully addressed and made moot." *Ariosa*, 788 F.3d at 1379.

For these reasons, we agree with the Examiner that claim 1, and grouped claims 6 and 11, are directed to performing a mathematical algorithm for creating a classifier model and classifying data, which is a mathematical concept identified as an abstract idea in the Revised Guidance, constituting a judicial exception to patentability and not integrating the abstract idea into a practical application.

Revised Guidance Step 2B (Inventive Concept)

Under the Revised Guidance, only if a claim (1) recites a judicial exception and (2) does not integrate that exception into a practical application, do we then look to whether the claim:

(3) adds a specific limitation beyond the judicial exception that is not

"well-understood, routine, conventional" in the field (*see* MPEP § 2106.05(d)); or

(4) simply appends well-understood, routine, conventional activities previously known to the industry, specified at a high level of generality, to the judicial exception.

Here, the Examiner maintains "the current claims only have an abstract idea plus a general process computer. Thus, the claims do not have anything that have [sic] been found by courts to be significantly more" than a judicial exception. (Ans. 7.)

Appellant contends the Examiner erred, and claim 1 recites significantly more than a judicial exception for the reasons that: (1) claim 1 recites "subject matter **that improves upon the relevant technology and computer functionality**" and "improves another technology or technical field" particularly by "improving . . . machine classification technology . . . [and] functionality of a computer in perform[ing] machine classification;" and (2) "claim 1 is clearly inventive over the cited art." (App. Br. 13; Reply Br. 5.)

Appellant's arguments are not persuasive. Under Federal Circuit precedent, an "inventive concept" under *Alice* step 2 and the Revised Guidance can be established by showing, for example, that the patent claims:

(1) provide a technical solution to a technical problem unique to the Internet, e.g., a "solution . . . necessarily rooted in computer technology in order to overcome a problem specifically arising in the realm of computer networks" (*see DDR Holdings, LLC v. Hotels.com, L.P.*, 773 F.3d 1245, 1257 (Fed. Cir. 2014));

(2) transform the abstract idea into "a particular, practical application of that abstract idea," e.g., "installation of a filtering tool at a specific location, remote from the end-

users, with customizable filtering features specific to each end user" (*see Bascom Glob. Internet Servs., Inc. v. AT&T Mobility LLC*, 827 F.3d 1341, 1350, 1352 (Fed. Cir. 2016)); or

(3) "entail[] an unconventional technological solution ([e.g.,] enhancing data in a distributed fashion) to a technological problem ([e.g.,] massive record flows [that] previously required massive databases)" and "improve the performance of the system itself" (*see Amdocs (Isr.) Ltd. v. Openet Telecom, Inc.*, 841 F.3d 1288, 1300, 1302 (Fed. Cir. 2016)).

Similarly, as recognized by the Revised Guidance, an "inventive concept" under *Alice* step 2 can also be evaluated based on whether an additional element or combination of elements:

(1) "[a]dds a specific limitation or combination of limitations that are not well-understood, routine, conventional activity in the field, which is indicative that an inventive concept may be present;" or

(2) "simply appends well-understood, routine, conventional activities previously known to the industry, specified at a high level of generality, to the judicial exception, which is indicative that an inventive concept may not be present."

See Revised Guidance, 84 Fed. Reg. at 56.

In this case, however, we find no element or combination of elements recited in Appellant's representative claim 1 that contains any "inventive concept" or adds anything "significantly more" to transform the abstract concept into a patent-eligible application. *Alice*, 573 U.S. at 222. For example, Appellant's claimed invention does not recite additional elements that are rooted in computer technology, as the claims in *DDR Holdings*. Nor do any of the additional elements provide any technical solution to a technical problem as required by *DDR*. Appellant also has not demonstrated

their claimed computer system and processor are able to perform *functions that are not merely generic*, as the claims in *DDR*. *See DDR Holdings*, 773 F.3d at 1258.

As discussed *supra*, Appellant's claim 1 merely recites mathematical operations that can be performed manually or automated by Appellant's generically claimed processor. (Ans. 4, 7; *see also* Spec. ¶ 33 (providing a "computer usable program code [that] may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus" to implement the invention.).) Appellant's mathematical algorithm does not effect a technological improvement and does not provide any particular practical application as required by *BASCOM*, or entail an unconventional technological solution to a technological problem as required by *Amdocs*. Particularly, Appellant's claim is not tied to a real-world application of classified results, or to an actual improvement in machine classification technology or an improvement to the "functionality of a computer in perform[ing] machine classification." (*See* Reply Br. 6.) Rather, Appellant's claim uses generic technology to perform the mathematical algorithm. As our reviewing court has observed, "after *Alice*, there can remain no doubt: recitation of generic computer limitations does not make an otherwise ineligible claim patent-eligible." *DDR Holdings*, 773 F.3d at 1256 (citing *Alice*, 134 S. Ct. 2347, 2358 (2014)).

Appellant's additional argument that "claim 1 is clearly inventive over the cited art" (*see* App. Br. 13) is not persuasive because it improperly conflates the test for § 101 with the separate tests for §§ 102 and 103. *See, e.g.*, *Genetic Techs. Ltd. v. Merial L.L.C.*, 818 F.3d 1369, 1376 (Fed. Cir.

2016) ("under the *Mayo/Alice* framework, a claim directed to a newly discovered law of nature (or natural phenomenon or abstract idea) cannot rely on the novelty of that discovery for the inventive concept necessary for patent eligibility."). As the Supreme Court emphasizes, "[t]he 'novelty' of any element or steps in a process, or even of the process itself, is of **no relevance** in determining whether the subject matter of a claim falls within the § 101 categories of possibly patentable subject matter." *Diehr*, 450 U.S. at 188–89 (emphasis added). Our reviewing court further guides that "[e]ligibility and novelty are separate inquiries." *Two-Way Media Ltd. v. Comcast Cable Commc'ns, LLC*, 874 F.3d 1329, 1340 (Fed. Cir. 2017); *see also Affinity Labs of Tex., LLC v. DIRECTV, LLC*, 838 F.3d 1253, 1263 (Fed. Cir. 2016) (holding that "[e]ven assuming" that a particular claimed feature was novel does not "avoid the problem of abstractness."). Although the second step in the *Alice/Mayo* framework is termed a search for an "inventive concept," the analysis is not an evaluation of novelty or non-obviousness, but rather, a search for "an element or combination of elements that is 'sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself.'" *Alice*, 573 U.S. at 217–18 (quoting *Mayo* 566 U.S. 72–73). A novel and nonobvious claim directed to a purely-abstract idea is, nonetheless, patent-ineligible. *See Mayo*, 566 U.S. at 89–91.

Because Appellant's representative claim 1 is directed to a patent-ineligible abstract concept and does not recite something "significantly more" under the second step of the *Alice* analysis, we sustain the Examiner's rejection of representative claim 1, and grouped claims 6 and 11 under 35 U.S.C. § 101.

No separate arguments are presented for dependent claims 2–5, 7–10, and 12–20, which fall with independent claims 1, 6, and 11. 37 C.F.R. § 41.37(c)(1)(iv). We, therefore, sustain the rejection under 35 U.S.C. § 101 of claims 2–5, 7–10, and 12–20.

35 U.S.C. § 103

With respect to claim 1, the Examiner finds the combination of Perronnin, Matsui, and Eshghi teaches "applying a hash function to each of the plurality of difference vectors to obtain a plurality of hashed vectors" and "classifying a sample vector of input data using . . . [a] classifier model" obtained by "applying linear training to the plurality of hashed vectors," as claimed. (Final Act. 8–10; Ans. 10–11.) Particularly, the Examiner finds Perronnin obtains a classifier model by applying linear training to a plurality of training vectors, and Matsui obtains difference vectors by subtracting a vectors' mean from each vector, as claimed. (Final Act. 8–9 (citing Perronnin ¶¶ 11, 49, 64, 70, Abstract; Matsui, col. 2, ll. 38–40, col. 3, ll. 30–32, 60–61, col. 4, ll. 43–44); Ans. 8–10.) The Examiner recognizes Perronnin and Matsui do not teach "applying a hash function to each of the plurality of difference vectors to obtain a plurality of hashed vectors" as claimed, but finds Eshghi teaches "*applying a hash function to vectors*." (Final Act. 8, 10 (citing Eshghi 222 (§ 2), 227 (ll. 15–30), Title); Ans. 11 (citing Eshghi 224 (§ 4.1)).) Based on these factual findings, the Examiner concludes "[i]t would have been obvious . . . to a person having ordinary skill in the art to modify **Perronnin-Matsui**'s teaching to include **Eshghi**'s teaching of '*applying a hash function to vectors*' to approximate near

neighbor problems in high dimensional spaces." (Final Act. 10 (citing Eshghi, Abstract).) We do not agree.

We agree with Appellant that the Examiner has shown portions of the claimed invention, but none of Perronnin, Matsui, and Eshghi nor the proffered combination of Perronnin, Matsui, and Eshghi, teach or suggest applying a hash function to difference vectors to obtain hashed vectors to which linear training is applied for obtaining a classifier model, as required by claim 1. (App. Br. 17–19; Reply Br. 12–13.) As recognized by Appellant, "there is absolutely no mention or hint in Eshghi of applying a hash function to each of a plurality of **difference vectors**," and "[t]here is no mention of difference vectors anywhere in Eshghi, such that a person of ordinary skill in the art would not have been led by Eshghi to applying a hash function to difference vectors" as recited in claim 1. (App. Br. 17–18.) For example, portions of Eshghi cited by the Examiner (i.e., Eshghi 222 (§ 2), 227 (ll. 15–30), Title) do not teach or suggest "applying a hash function to each of the plurality of difference vectors to obtain a plurality of hashed vectors" as the Examiner asserts. (*See* Final Act. 8.) Rather, Eshghi's pages 222 and 227 disclose hash functions are applied to original data (e.g., images in an image repository) to match similar images in the repository. (*See* Eshghi 222, 227.) Particularly, Eshghi applies a hash function to image features in multiple images and then "identif[ies] matching hashes from different images," thereby "identifying matching image pairs with their corresponding matching hash count" and labeling "[i]mage pairs with matching count > a threshold T . . . as similar image pairs." (*See* Eshghi 227–228.) Thus, Eshghi does not apply a *hash function* to *difference vectors* (obtained by subtracting a mean of a plurality of

vectors from each vector) to obtain hashed vectors for training a classifier model, as required in claim 1. (App. Br. 17–19.) Eshghi also does not apply its hash function to *training* difference vectors as claimed, as Eshghi does not use hash functions for *training*. (*Id.* at 18–19; Reply Br. 12.) As explained *supra*, Eshghi uses a hash function to determine data similarity between items/images, and match images.

We further find the Examiner's proffered reason to combine Eshghi with Perronnin and Matsui to be insufficient to establish the obviousness of claim 1 over Eshghi, Perronnin, and Matsui. Particularly, the Examiner asserts "**Eshghi** is added to teach another well-known way to process vectors, using hash function" and "[i]t would have been obvious . . . to a person having ordinary skill in the art to modify **Perronnin-Matsui**'s teaching to include **Eshghi**'s teaching of '*applying a hash function to vectors*' *to approximate near neighbor problems in high dimensional spaces*." (Ans. 11 (citing Eshghi 224, § 4.1); Final Act. 10 (citing Eshghi Abstract) (emphasis added).) However, the Examiner has not explained how or why Eshghi's *approximating near neighbor problems in high dimensional spaces* would be useful for vector *training* or *building of a classifier model* as in Perronnin. Rather, Eshghi's hash functions for approximating near neighbor problems in high dimensional spaces enable faster scans of items (e.g., images) for finding similar items in a repository. (*See* Eshghi 221 (§ 1), 228, Abstract.) That is, Eshghi teaches its hash functions enable faster algorithms for determining data similarity, but Eshghi does not disclose that a hash function's application could be useful for linear vector training or for building a classifier model and classifying vectors, as in claim 1. (*See* Eshghi 227–228, Abstract; Reply Br. 12–13.) The Examiner also has not

explained what perceived benefit would prompt a skilled artisan to apply a *hash function* (such as that of Eshghi) to Matsui's difference component vector that is intended to provide luminance levels (of an object) created in photo diodes. (*See* Matsui, col. 8, ll. 50–55, Figs. 1–2.) As Appellant explains:

> The issue is not whether Eshghi discloses applying hash functions to vectors in general, but whether Eshghi, in combination with Perronnin and Matsui, would have provided any teaching or hint of applying a hash function to each of a plurality of difference vectors, where each difference vector is produced by substracting [sic] a mean of the plurality of training vectors from each training vector.

(App. Br. 19; Reply Br. 12–13.) We do not find the Examiner has provided sufficient evidence to support the finding that the skilled artisan would apply Eshghi's hash function to Perronnin's training vectors or to Matsui's luminance signals. *In re Chaganti*, 554 Fed. App'x 917, 922 (Fed. Cir. 2014) ("It is not enough to say that . . . to do so would 'have been obvious to one of ordinary skill.' . . . Such circular reasoning is not sufficient—more is needed to sustain an obviousness rejection.")

In conclusion, we agree with Appellant that the Examiner does not set forth a persuasive motivation to combine the disclosure of Eshghi with Perronnin and Matsui. (Reply Br. 12–13; App. Br. 19.) Additionally, the Examiner has not identified how the additional reference of Fan remedies the above-noted deficiencies of Eshghi, Perronnin, and Matsui.

Thus, for the reasons set forth above, we do not sustain the Examiner's rejection of independent claim 1, and claims 2–5 and 16–18 dependent therefrom. We also do not sustain the Examiner's rejection of independent claim 6 (reciting the application of "a hash function to each of

the plurality of difference vectors to obtain a plurality of hashed vectors" for training a classifier model) and claim 11 (reciting "apply[ing] a hash function to the sample difference vector to obtain a hashed sample vector" and "classify[ing] the hashed sample vector using a classifier model trained based on the plurality of SVM training vectors"), argued for substantially the same reasons as claim 1, and dependent claims 7–10, 12–15, 19, and 20. (App. Br. 19, 22.) Because the above-discussed issue is dispositive as to the obviousness rejections of all claims on appeal, we do not reach additional issues raised by Appellant's arguments as to the rejections of claims 2, 7, 14, 18, and 20.

CONCLUSIONS

The Examiner did not err in rejecting claims 1–20 based upon a lack of patent eligible subject matter under 35 U.S.C. § 101, but the Examiner erred in rejecting claims 1–20 based upon obviousness under 35 U.S.C. § 103.

DECISION

For the above reasons, we affirm the Examiner's patent eligibility rejection of claims 1–20 under 35 U.S.C. § 101, but we reverse the Examiner's obviousness rejection of claims 1–20 under 35 U.S.C. § 103.

Because we have affirmed at least one ground of rejection with respect to each claim on appeal, we affirm the Examiner's decision rejecting claims 1–20. *See* 37 C.F.R. § 41.50(a)(1).

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv) (2016).

AFFIRMED