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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|----------------------|------------------|
| 13/052,733 | 03/21/2011 | Robert D. Bremel | IOGEN-31239/US-3/ORD | 7001 |
| 72960 | 7590 | 05/22/2019 | EXAMINER | |
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| | | | ART UNIT | PAPER NUMBER |
| | | | 1631 | |
| | | | NOTIFICATION DATE | DELIVERY MODE |
| | | | 05/22/2019 | ELECTRONIC |

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ROBERT D. BREMEL and JANE HOMAN

Appeal 2018-007657
Application 13/052,733
Technology Center 1600

Before JEFFREY N. FREDMAN, JOHN G. NEW, and JAMIE T. WISZ,
Administrative Patent Judges.

WISZ, *Administrative Patent Judge.*

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellants¹ seek review of claims 1, 9–16, 18–31, and 37–50.² The Examiner rejected the claims as directed to patent-ineligible subject matter. We have jurisdiction under 35 U.S.C. § 6(b).

For the reasons set forth below, we AFFIRM.

¹ Appellants identify the Real Party in Interest as ioGenetics, LLC. App. Br. 3.

² Claims 2–8, 17, and 90–98 have been cancelled. Claims 32–36 and 51–89 have been withdrawn.

STATEMENT OF THE CASE

The specification describes “processes for identifying peptide and polypeptide ligands for a binding partner” through the use of “principal component analysis of amino acids to derive vectors describing amino acid subsets corresponding to peptides with known binding affinities.” Spec. 153. This information is then used in a “neural network modeling process to derive binding prediction equations.” *Id.* “These binding prediction equations are then used in the analysis of subsets of amino acids from a target source to identify peptides or polypeptides ligands in the target source that have affinity for a binding partner.” *Id.*

Claim 1, the only independent claim, is set forth below:

1. A computer implemented process of identifying peptide and polypeptide ligands for a MHC-I or MHC-II binding partner comprising:
 - (a) obtaining an amino acid sequence for a target polypeptide;
 - (b) providing peptide binding prediction equations for a MHC-I or MHC-II binding partner polypeptide derived by:
 - (i) assembling experimentally derived data from a plurality of experiments comprising a multiplicity of measurements of amino acid physicochemical properties;
 - (ii) producing a correlation matrix of the experimentally derived data;
 - (iii) deriving by Principal Component Analysis multiple uncorrelated dimensionless, weighted and ranked proxy descriptors to describe at least 80% of the variance in said physicochemical properties of individual amino acids,
 - (iv) using said proxy descriptors to describe individual amino acids in peptides with known binding affinities thereby creating vectors which describe said peptides with known binding affinities, and

- (v) via neural network modeling, deriving said binding prediction equations for said MHC-I or MHC-II binding partner by comparing said vectors with said known binding affinities of said peptides, wherein said principal components of said amino acids are utilized as the input layer of a multilayer perceptron neural network;
- (c) in-putting said amino acid sequence from said target polypeptide into a computer;
- (d) applying said proxy descriptors from said Principal Component Analysis to describe individual amino acids in said target polypeptide sequence;
- (e) deriving vectors to describe a plurality of peptides of defined length in said target polypeptide;
- (f) via said neural network, applying said peptide binding prediction equations to said plurality of peptides of defined length from said target polypeptide to predict the ability of said plurality of peptides of defined length from said target polypeptide to bind to said binding partner, wherein said neural network determines the permuted average binding of a peptide to at least 20 MHC-I or MHC-II binding regions; and
- (g) displaying the binding affinity of said peptides of defined length in said target polypeptide to said binding partner.

App. Br. 20 (Claims Appendix).

The Examiner rejected claims 1, 9–16, 18–31, and 37–50 under 35 U.S.C. § 101 as directed to an abstract idea. Final Act. 3–7.

PRINCIPLES OF LAW

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: “[I]aws of nature, natural phenomena, and abstract

ideas” are not patentable. *See, e.g., Alice Corp. v. CLS Bank Int’l*, 573 U.S. 208, 216 (2014).

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*. *Id.* at 217–18 (citing *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 75–77 (2012)). In accordance with that framework, we first determine what concept the claim is “directed to.” *See Alice*, 573 U.S. at 219 (“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” (*Diamond v. Diehr*, 450 U.S. 175, 192 (1981)); “tanning, dyeing, making waterproof cloth, vulcanizing India rubber, smelting ores” (*id.* at 184 n.7 (quoting *Corning v. Burden*, 56 U.S. 252, 267–68 (1854))); 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 176, 192 (“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*), 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 (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 United States Patent and Trademark Office published revised guidance on the application of 35 U.S.C. § 101. USPTO’s *2019 Revised Patent Subject Matter Eligibility Guidance* (“Guidance”).³ Under the

³ *2019 Revised Patent Subject Matter Eligibility Guidance*, 84 Fed. Reg. 50–57 (January 7, 2019).

Guidance, in determining what concept the claim is “directed to,” 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) (Guidance Step 2A, Prong 1); and

(2) additional elements that integrate the judicial exception into a practical application (*see* MPEP § 2106.05(a)–(c), (e)–(h)) (Guidance Step 2A, Prong 2).

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 contains an “‘inventive concept’ sufficient to ‘transform’” the claimed judicial exception into a patent-eligible application of the judicial exception. *Alice*, 573 U.S. at 221 (quoting *Mayo*, 566 U.S. at 82). In so doing, we thus consider whether the claim:

(3) adds a specific limitation beyond the judicial exception that are not “well-understood, routine and 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. (Guidance Step 2B). *See* Guidance, 84 Fed. Reg. at 54–56.

ANALYSIS

Applying the Revised Guidance to the facts on this record, we find that Appellants’ claims are directed to patent-ineligible subject matter.

A. Guidance Step 2A, Prong 1

The Revised Guidance instructs us first to determine whether any judicial exception to patent eligibility is recited in the claim. The Revised Guidance identifies three judicially-expected groupings identified by the courts as abstract ideas: (1) mathematical concepts, (2) certain methods of organizing human behavior such as fundamental economic practices, and (3) mental processes.

The Examiner finds that the claims are directed to “a computational method of characterizing peptides as having a putative binding ability to bind to a binding partner molecule.” Final Act. 3. Specifically, the Examiner finds that the claimed method “is drawn to deriving binding prediction equations using neural network modeling computational technique, wherein the neural network uses vectors of mathematical expressions obtained by Principal Component analysis.” *Id.* The Examiner concludes that:

As such, the claims are directed to processing information, converting one form of numerical representation into another, and extracting and categorizing information by organizing information through mathematical concepts such as mathematical algorithms; all of these concepts relate to organization and processing information which can be performed mentally and is an idea of itself. Therefore, the claims are directed to an abstract idea which is a judicial exception.

Id.

Appellants argue that the asserted abstract ideas are not directed to a judicial exception because “the claims define specific steps where information is rendered into a specific format (i.e., PCA (Principal Component Analysis) is used to describe amino acids and then that

information is used to generate vectors representing peptides with known binding affinities).” App. Br. 8. Appellants assert that this information “is then used to create desired results (i.e., neural network modeling is used to derive binding prediction equations which are in turn used to predict binding by MHC-I and MHC-II binding partners to specific peptide sequences within a target protein).” *Id.*

We agree with the Examiner that claim 1 recites patent-ineligible subject matter. More specifically, claim 1, reproduced above, recites the following steps: (b) “providing peptide binding prediction equations,” (b)(ii) “producing a correlation matrix,” (b)(iii) “deriving by Principal Component Analysis multiple...proxy descriptors,” (b)(iv) “using said proxy descriptors ...thereby creating vectors,” (b)(v) “via neural network modeling, deriving said binding prediction equations,” (d) “applying said proxy descriptors from said Principal Component Analysis,” (e) “deriving vectors to describe a plurality of peptides of defined length,” and (f) “via said neural network, applying said peptide binding prediction equations to said plurality of peptides...to predict the ability of said plurality of peptides...to bind to said binding partner.” These limitations, under their broadest reasonable interpretation, recite the mathematical concept of applying peptide binding prediction equations (derived by Principal Component Analysis and neural network modeling) to amino acid sequences, in order to determine the binding affinity of peptides to a MHC-I or MHC-II binding partner.

The claimed invention is described in the specification as a “computer implemented system[] and process[] for analyzing all or portions of target proteome(s)” comprising “a series of mathematical and statistical processes.” Spec. 46–47. The specification explains that this analysis can

be done “on a personal computer, using commercially available statistical software and database tools.” Spec. 46. Furthermore, “Principal Component Analysis,” the use of which is recited in the claims, is described in the specification as “a mathematical process that is used in many different scientific fields and which reduces the dimensionality of a set of data.” Spec. 48. In addition, a “neural network,” which is also recited in the claims, is described as “a powerful data modeling tool that is able to capture and represent complex input/output relationships” and is constructed via a computer. Spec. 6, 54.

Therefore, the limitations described above require mathematical calculations, which, without more, are abstract ideas. *Intellectual Ventures I LLC v. Capital One Financial Corp.*, 850 F.3d 1332, 1340 (Fed. Cir. 2017); *see also Digitech Image Techs., LLC v. Elecs. For Imaging, Inc.*, 758 F.3d 1344, 1351 (Fed. Cir. 2014) (“Without additional limitations, a process that employs mathematical algorithms to manipulate existing information to generate additional information is not patent eligible”). Accordingly, we conclude that these steps of claim 1 recite the judicial exception of a mathematical concept.

B. Guidance Step 2A, Prong 2

Having determined that the claims are directed to a judicial exception, the Revised Guidance directs us to next consider whether the claims integrate the judicial exception into a practical application. Guidance Step 2A, Prong 2. “Integration into a practical application” requires that the claim recite an additional element or a combination of elements, that when considered individually or in combination, “apply, rely on, or use the

judicial exception in a manner that imposes a meaningful limit on the judicial exception, such that the claim is more than a drafting effort designed to monopolize the judicial exception.” Guidance at 54

We begin by observing that Appellants’ claims do not require that anything be done with the information generated by the claimed method. The output of the final step, *i.e.*, “displaying the binding affinity of said peptides...to said binding partner,” simply recites the providing of information to the user. In this regard, the claims here are unlike those in *Vanda* that required the administration of a treatment in response to a diagnostic determination. *See Vanda Pharm. Inc. v. West-Ward Pharm. Int’l Ltd.*, 887 F.3d 1117, 1133–36 (Fed. Cir. 2018). Indeed, we conclude Appellants’ claims are more similar to those held ineligible in *Mayo* because they merely “tell doctors to gather data from which they may draw an inference” of binding affinities. *See* 566 U.S. at 79–80.

We also determine that the additional steps recited in claim 1 do not integrate the judicial exception into a practical application. Claim 1 includes the additional steps of (a) “obtaining an amino acid sequence for a target polypeptide,” (b)(i) “assembling experimentally derived data from a plurality of experiments,” (c) “in-putting said amino acid sequence...into a computer,” and (g) “displaying the binding affinity of said peptides.” Steps (a), (b)(i), and (c) are data collection steps that do not amount to significantly more than the abstract idea because they are insignificant pre-solution activities. *See Mayo*, 566 U.S. at 79 (quoting *Flook*, 437 U.S. at 590) (“Purely ‘conventional or obvious’ ‘[pre]-solution activity’ is normally not sufficient to transform an unpatentable law of nature into a patent-eligible application of such a law”); *see also* Guidance, 55, n.31.

Furthermore, the “displaying” limitation of step (g) also does not integrate the judicial exception into a practical application because it is an insignificant post-solution activity. The “prohibition against patenting abstract ideas ‘cannot be circumvented’ [by] adding ‘insignificant post-solution activity.’” *Bilski*, 561 U.S. at 610–11 (quoting *Diehr*, 450 U.S. at 191-92).

Appellants argue that the instant claims are similar to those in *McRo, Inc. dba Planet Blue v. Bandai Namco Games America Inc.*, 837 F.3d 1299 (Fed. Cir. 2016). App. Br. 11–13. Specifically, Appellants assert that:

Thus, like in *McRO*, the claims define specific steps where information is rendered into a specific format (i.e., PCA is used to describe amino acids and then that information is used to generate vectors representing peptides with known binding affinities) that is then used to create desired results (i.e., neural network modeling is used to derive binding prediction equations which are in turn used to predict binding by MHC-I and MHC-II binding partners to specific peptide sequences within a target protein). Thus, when considered as a whole as an ordered combination of steps, the claims are directed to a specific method that improves the relevant technology.

Id. at 13.

Appellants argue that the claimed invention represents a substantial improvement in the field of immunology and cite to declarations from Dr. Splitter, Dr. Malone, and Dr. Bremel to support this proposition. *Id.* at 14–16. Appellants also argue that the invention provides a substantial improvement to the “functioning of a computer” in that it improves computational efficiency by using amino acid principal components as proxies for physical properties of amino acids. *Id.* at 16–18.

The Examiner responds to these contentions by stating that:

[T]he claims are drawn to data analysis, calculation of a value (binding affinity) and displaying the value. Mere data analysis is not an improvement, and no improvement is readily apparent in the claim language. Applicant argues that the claims determine whether the peptides in the target protein have a binding affinity for MHC-I or MHC-II binding regions and then displaying the binding affinity, and by this, the claims go far beyond merely retrieving and combining data. In response, as previously discussed, the claimed steps result in generating numbers that, presumably, reflect binding affinity of peptide fragments of a polypeptide. There are no meaningful limitations in the claims, beyond generally linking the use of an abstract idea to a particular technological environment, that transform the judicial exception into a patent-eligible application such that the claim amounts to significantly more than the exception itself.

Final Act. 6. The Examiner also finds that the use of amino acid principal components as proxies “is not an improvement to functioning of a compute[r]” and concludes that, “the claims as a whole do not provide significantly more than a generic computer upon which the claimed method steps are executed.” Final Act. 4.

“We may assume that the techniques claimed are ‘[g]roundbreaking, innovative, or even brilliant,’ but that is not enough for eligibility.” *SAP America, Inc., v. INVESTPIC, LLC*, 898 F.3d 1161, 1163 (Fed. Cir. 2018). We agree with the Examiner and find no evidence of record here to support the argument that the present situation is like the one in *McRO* where the method integrated specific process steps of phenome analysis to obtain facial expression control of animated characters, thereby integrating the improvement into the animation process. *See McRO*, 837 F.3d at 1315. As found by the Examiner, “[o]ther than the manipulation of data, there is no evidence for an improvement[] to another technology or to the functioning

of the computer itself, or for applying the judicial exception with, or by use of, a particular machine.” Ans. 3–4. We also agree with the Examiner that, although Applicants discuss improvements in the field of immunology, the claims do not recite a particular improvement in this technology but, rather, recite deducing the binding affinity of certain peptides. *Id.* at 4.

We find the instant claims similar to those in *SmartGene*, where the Federal Circuit held that claims directed to “comparing new and stored information and using rules to identify medical options” did not satisfy *Alice* step one. *See SmartGene, Inc. v. Advanced Biological Labs., SA*, 555 F. App'x 950, 951–52, 955–56 (Fed. Cir. 2014) (nonprecedential). As in *Smartgene*, the instantly claimed steps do not rely on an inventive device or technique for displaying information or new techniques for analyzing information, but rather constitute a generic recitation of steps for mathematically manipulating data. *See SmartGene*, 555 Fed. Appx. at 954 (holding claims were patent ineligible because they did “no more than call on a ‘computing device,’ with basic functionality for comparing stored and input data and rules, to do what doctors do routinely.”).

Therefore, on this record, we conclude that the ineligible subject matter in Appellants’ claim 1 is not integrated into a practical application.

C. Guidance Step 2B

Having determined that the judicial exception is not integrated into a practical application, the Revised Guidance requires us to evaluate the additional elements individually and in combination to determine whether they provide an inventive concept, such as a specific limitation beyond the judicial exception that is not well-understood, routine, conventional in the

field, or simply appends well-understood, routine, conventional activities previously known to the industry, specified at a high level of generality, to the judicial exception. *See* 84 Fed. Reg. 51.

Appellants argue that the claim, taken as a whole, does not just simply describe the generation of proxy descriptors and binding equations via mathematical operations and sending and receiving data, but combine these steps with steps for describing peptide sequences to determine whether the peptides in the target protein have a binding affinity. App. Br. 17–8. In response, the Examiner finds that Appellants are discussing the limitations that are drawn to the judicial exception rather than “a combination of elements which are in addition to the elements drawn to the judicial exception and which either individually or as an ordered combination are not well understood, routine, or conventional.” Ans. 4–5.

We are not persuaded by Appellants’ arguments. There is nothing in the specification indicating that any steps or components recited in the claims are not generic or conventional. The use of Principle Component Analysis and neural network modeling is admittedly known. *See, e.g.*, Spec. 48, 54. Furthermore, the invention can be performed on a “personal computer, using commercially available statistical software and database tools.” Spec. 46. Appellants point to no additional steps that could not be performed mentally or without using a generic computer. The use of a generic computer to perform generic computer functions that are “well-understood, routine, conventional activities” previously known in the industry is not enough to transform the abstract idea into a patent-eligible invention. *See Alice*, 573 U.S. at 225–26.

Appellants' claims do not require anything other than the use of conventional and well understood techniques and equipment to gather and process data according to the recited judicial exception. Accordingly, the preponderance of evidence of record supports the Examiner's finding that Appellants' claimed invention is directed to patent-ineligible subject matter. The rejection of claim 1 under 35 U.S.C. § 101 is affirmed. Claims 9–16, 18–31, and 37–50 are not separately argued and fall with claim 1. *See* 37 C.F.R. § 41.37(c)(1)(iv).

CONCLUSION

We affirm the Examiner's rejection of claims 1, 9–16, 18–31, and 37–50 under 35 U.S.C. § 101. 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).

AFFIRMED