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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte TORU YAMAZATO

Appeal 2018-008697
Application 15/136,314
Technology Center 2100

Before JENNIFER S. BISK, LARRY J. HUME, and
JULIET MITCHELL DIRBA, *Administrative Patent Judges*.

DIRBA, *Administrative Patent Judge*.

DECISION ON APPEAL¹

Appellant² seeks our review under 35 U.S.C. § 134(a) of the Examiner's rejection of claims 1, 4–6, 9–11, 14, 15, 18, and 19, which are all claims pending in the application. Although Appellant appeals from a non-final rejection, we have jurisdiction pursuant to 35 U.S.C. §§ 6 and 134

¹ This Decision uses the following abbreviations: “Spec.” for the original specification, filed April 22, 2016, claiming the benefit of an earlier foreign patent application; “Non-Final Act.” for the Non-Final Office Action, mailed August 30, 2017; “Br.” for Appellant’ Appeal Brief, filed April 23, 2018; and “Ans.” for Examiner’s Answer, mailed June 20, 2018. Appellant elected not to file a Reply Brief in response to the findings and conclusions in the Examiner’s Answer.

² According to Appellant, the real party in interest is the inventor, Toru Yamazato. Br. 2.

because the claims have been twice presented and rejected. *See Ex parte Lemoine*, 46 USPQ2d 1420, 1423 (BPAI 1994) (precedential).

We affirm.

BACKGROUND

Appellant's disclosed embodiments and claimed invention relate to a nonlinear optimization routine. Spec. 1–3, 55.

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

1. A computer-implemented method for training an artificial neural network with increased processing speed, comprising:
 - [(1)] executing a search to improve a vector x so that the vector x minimizes or maximizes a value of a function of x , $f(x)$, the vector x corresponding to an error function for training the artificial neural network, the search including:
 - [(2)] assigning a vector g a gradient of $f(x)$;
 - [(3)] executing a plurality of search steps, each search step including:
 - [(4)] a) using the vector g to determine a search direction vector, determining a step size using a parabolic approximation, and updating the vector x based on the determined search direction vector and the determined step size, wherein determining the step size includes a product of the search direction vector as determined and a first derivative of the function $f(x)$, and includes a product of the search direction vector as determined and a second derivative of the function $f(x)$ approximated as a parabolic function;
 - [(5)] b) using the vector g , the search direction vector as determined in a), and the step size as determined in a) to approximate a gradient of $f(x)$, wherein the approximation includes the product of the search

direction vector as determined in a) and the second derivative of the function $f(x)$ approximated as a parabolic function, the approximation increasing the processing speed for training the artificial neural network by minimizing a number of calculations on derivatives of $f(x)$;

[(6)] c) determining if a convergence criterion is satisfied; and

[(7)] d) if the convergence criterion is not satisfied, assigning the gradient of $f(x)$ as approximated in b) to the vector g and returning to step a);

[(8)] if the convergence criterion is satisfied, using the vector x as a value of a parameter of the artificial neural network.

Br. 23–24 (Claims App’x) (numbering added).

THE REJECTION

Claims 1, 4–6, 9–11, 14–15 and 18–19 stand rejected under 35 U.S.C. § 101 as directed to patent-ineligible subject matter.³ Non-Final Act. 2–6.

ANALYSIS

We review the appealed rejections for error based upon the issues identified by Appellant and in light of the arguments and evidence produced thereon. *Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential). To the extent Appellant has not advanced separate, substantive arguments

³ The header for the rejection identifies claims “9–1” (Final Act. 2), but the rejection addresses claims 9, 10, and 11 (*id.* at 5). Appellant acknowledges that independent claim 11 has been rejected (Br. 10, 18–21) and submits that the dependent claims, such as claim 10, stand or fall with the respective independent claims (*id.* at 10). As such, we consider the reference to claims “9–1” to be a typographical error referencing claims 9–11.

for particular claims, or other issues, such arguments are waived. 37 C.F.R. § 41.37(c)(1)(iv).

We have considered all of Appellant's arguments and any evidence presented. We highlight and address specific findings and arguments for emphasis in our analysis below.

Rejection of Claims 1, 4–6, 9–11, 14–15 and 18–19 under 35 U.S.C. §101

Section 101 of the Patent Act provides that “any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof” is patent eligible. 35 U.S.C. § 101. But the Supreme Court has long recognized implicit exceptions to this section: “Laws of nature, natural phenomena, and abstract ideas are not patentable.” *Alice Corp. v. CLS Bank Int’l*, 573 U.S. 208, 216 (2014) (quoting *Ass’n for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576, 589 (2013)). To determine whether a claim falls within one of these excluded categories, the Court has set out a two-part framework. The framework requires us first to consider whether the claim is “directed to one of those patent-ineligible concepts.” *Alice*, 573 U.S. at 217. If so, we then examine “the elements of each claim both individually and ‘as an ordered combination’ to determine whether the additional elements ‘transform the nature of the claim’ into a patent-eligible application.” *Alice*, 573 U.S. at 217 (quoting *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 78, 79 (2012)). That is, we examine the claims for an “inventive concept,” “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 (alteration in original) (quoting *Mayo*, 566 U.S. at 72–73).

The Patent Office recently issued guidance regarding this framework. *See* USPTO, *2019 Revised Patent Subject Matter Eligibility Guidance*, 84 Fed. Reg. 50 (Jan. 7, 2019) (“Revised Guidance”). Under the Revised Guidance, to decide whether a claim is “directed to” an abstract idea, we evaluate whether the claim (1) recites subject matter falling within an abstract idea grouping listed in the Revised Guidance and (2) fails to integrate the recited abstract idea into a practical application. *See* Revised Guidance, 84 Fed. Reg. at 51. If the claim is “directed to” an abstract idea, as noted above, we then determine whether the claim recites an inventive concept. The Revised Guidance explains that when making this determination, we should consider whether the additional claim elements add “a specific limitation or combination of limitations that are not well-understood, routine, conventional activity in the field” or “simply append[] well-understood, routine, conventional activities previously known to the industry.” Revised Guidance, 84 Fed. Reg. at 56.

With these principles in mind, we turn to the Examiner’s § 101 rejection.

The Judicial Exception—Abstract Idea

The Examiner determined the claims are directed to the abstract idea of “a mathematical process to quickly converge a derivative function $f(x)$.” Non-Final Act. 2; *see also* Ans. 2 (“Claim 1 is directed to improvements in

the convergence speed of solving a nonlinear optimization problem.”). For the reasons explained below, we agree that the claims recite an abstract idea.

Limitations (1)–(7) of claim 1, quoted above, under their broadest reasonable interpretation, recite a mathematical algorithm for solving a nonlinear optimization problem.⁴ *See, e.g.*, Spec. 1–2, 4, 8, 12. Specifically, limitations (2), (4), (5), and (7) involve setting, determining, or updating variables—i.e., vector g , a search direction vector, a step size, vector x —using other variables and/or one or more mathematical algorithms—e.g., a gradient of $f(x)$, a parabolic approximation, a first derivative of the function $f(x)$, the second derivative of the function $f(x)$, and an approximation of another function. Limitation (6) determines if a criteria has been satisfied, and limitations (1) and (3) merely recite executing the search specified by the remaining limitations.

When claimed in a manner similar to the claims here, a claim reciting a mathematical algorithm or calculation has been determined to be an abstract idea. *See Parker v. Flook*, 437 U.S. 584, 594 (1978) (“[T]he discovery of [a mathematical formula] cannot support a patent unless there is some other inventive concept in its application.”); *SAP Am., Inc. v. InvestPic, LLC*, 898 F.3d 1161, 1167 (Fed. Cir. 2018) (concluding claims for providing statistical analysis of investment data were directed to the abstract

⁴ The Specification explains that solving the nonlinear optimization problem seeks to find the “optimal values” for a machine learning system. Spec. 1–2. “To optimize the values[,] the systems typically evaluate a function $f(x)$ that represents a degree of optimality or an error from the optimality of x ,” where x is a vector (i.e., a set of values to be used in the system) that is iteratively improved “to maximize or minimize $f(x)$ depending on what it represents.” *Id.* at 2.

idea of “selecting certain information, analyzing it using mathematical techniques, and reporting or displaying the results of the analysis”); *Digitech Image Techs., LLC v. Elec. for Imaging, Inc.*, 758 F.3d 1344, 1350 (Fed. Cir. 2014) (concluding that “a process of organizing information through mathematical correlations and . . . not tied to a specific structure or machine” to be abstract).

Accordingly, we conclude the claims recite a mathematical concept, and thus, an abstract idea. Revised Guidance, 84 Fed. Reg. at 52, 53 (listing “[m]athematical concepts—mathematical relationships, mathematical formulas or equations, mathematical calculations” as one of the “enumerated groupings of abstract ideas”).

Integration of the Judicial Exception into a Practical Application

If a claim recites a judicial exception, we determine whether the recited judicial exception is integrated into a practical application of that exception by: (a) identifying whether there are any additional elements recited in the claim beyond the judicial exception(s); and (b) evaluating those additional elements individually and in combination to determine whether they integrate the exception into a practical application. If the recited judicial exception is integrated into a practical application, the claim is not directed to the judicial exception.

Here, claim 1 recites the additional element of “using the vector x as a value of a parameter of the artificial neural network” (limitation (8)).

Br. 23–24 (Claims App’x). Considering claim 1 as a whole, this additional element does not apply or use the abstract idea in a meaningful way such that the claim as a whole is more than a drafting effort designed to monopolize the exception. The Supreme Court guides that the “prohibition

against patenting abstract ideas ‘cannot be circumvented by attempting to limit the use of the formula to a particular technological environment’ or [by] adding ‘insignificant postsolution activity.’” *Bilski*, 561 U.S. at 610–11 (quoting *Diamond v. Diehr*, 450 U.S. 175, 191–92 (1981)).

The Specification describes the artificial neural network as a generic component. *See* Spec. 44 (neural network is “control system 10,” which includes programs and data), 46. The Specification does not address *how* a vector is used as a parameter of an artificial neural network, indicating that this is a generic function. Moreover, the Specification describes the nonlinear optimization method as being performed by a generic computer. *See, e.g.*, Spec. 37 (“[T]he processing system 1 that performs nonlinear optimization includes a computer 11 having a processing unit (CPU) 12, an input device 13, an output device 14, and a processing program 16a and processing data 16b that are stored in a memory 15.”), Figs. 5–7 (identifying generic computer components); *see also* Non-Final Act. 3 (“[N]either the claim nor the specification require any specific architecture not already known and used in the art.”).

Moreover, the claim’s requirement of “using the vector x as a value of a parameter of the artificial neural network” (limitation (8)) is the type of extra-solution activity (i.e., in addition to the judicial exception) the courts have determined insufficient to transform judicially excepted subject matter into a patent-eligible application. *See* MPEP § 2106.05(g); *see also Alice*, 573 U.S. at 223 (“Stating an abstract idea while adding the words ‘apply it with a computer’” is not sufficient to confer patent eligibility.). Indeed, in *Parker v. Flook*, the claimed algorithm was an abstract idea, even though the last step of the algorithm adjusted an alarm limit on a variable involved in

the catalytic chemical conversion of hydrocarbons. 437 U.S. at 594 (The “process is unpatentable under § 101, not because it contains a mathematical algorithm as one component, but because once that algorithm is assumed to be within the prior art, the application, considered as a whole, contains no patentable invention.”); see *Diamond v. Diehr*, 450 U.S. 175, 191 (1981) (“[T]his principle cannot be circumvented by attempting to limit the use of the formula to a particular technological environment.”).

Appellant argues that claim 1 is not abstract because it “improve[s] the function of the computer.” Br. 11–12. In support, Appellant points to *Enfish* and submits that claim 1 “solves a problem specific to computer-related technology” by training a neural network “with an increased processing speed.” *Id.* at 12 (citing *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327 (Fed. Cir. 2016)). We are not persuaded by Appellant’s argument. The claimed self-referential table in *Enfish* was a specific type of data structure designed to improve the way a computer stores and retrieves data in memory. *Enfish*, 822 F.3d at 1339. Unlike the claims in *Enfish*, claim 1 does not recite an improved *computer* (or an improved data structure or neural network); rather, claim 1 recites an allegedly improved mathematical *algorithm* for selecting a parameter of a neural network. See *id.* at 1338 (“[U]nlike the claims [in *Enfish*] that are directed to a specific improvement to computer functionality, the patent-ineligible claims at issue in other cases recited use of an abstract mathematical formula on any general purpose computer.”).

Finally, Appellant contends that “claim 1 is directed to a specific implementation” and “is not attempting to preempt all uses of the recited algorithm across all technologies.” Br. 14. This argument does not alter our

§ 101 analysis. Rather than preemption, the Federal Circuit instructs that the Alice two-step analysis is the test for whether claims are statutory. “While preemption may signal patent ineligible subject matter, the absence of complete preemption does not demonstrate patent eligibility.” *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371, 1379 (Fed. Cir. 2015). “Where a patent’s claims are deemed only to disclose patent ineligible subject matter under the Mayo framework, as they are in this case, preemption concerns are fully addressed and made moot.” *Id.*

Accordingly, even in combination with all the other recited elements, the addition of “a neural network” does not integrate the abstract idea into a practical application because it does not impose any meaningful limits on practicing the abstract idea. For these reasons, we determine that claim 1 does not integrate the recited abstract idea into a practical application.

Inventive Concept

Because we agree with the Examiner that claim 1 is “directed to” an abstract idea, we consider whether an additional element (or combination of elements) adds a limitation that is not well-understood, routine, conventional (“WURC”) activity in the field or whether the additional elements simply append WURC activities previously known to the industry, specified at a high level of generality, to the judicial exception. Revised Guidance, 84 Fed. Reg. at 23. The Examiner’s finding that an additional element (or combination of elements) is WURC activity must be supported with a factual determination. *Id.* (citing MPEP § 2106.05(d), as modified by the

Berkheimer Memorandum⁵). Whether additional elements (i.e., “a neural network”) are WURC activity is a question of fact. *See Berkheimer v. HP Inc.*, 881 F.3d 1360, 1369 (Fed. Cir. 2018) (“Whether something is well-understood, routine, and conventional to a skilled artisan . . . is a factual determination.”).

On the record before us, Appellant has not shown that the claims on appeal add a specific limitation beyond the judicial exception that is not “well-understood, routine, and conventional” in the field (*see* MPEP § 2106.05(d)). The Examiner found that “neither the claim nor the specification require any specific architecture not already known and used in the art.” Non-Final Act. 3 (citing Spec. 38). Although Appellant argues that the “invention is not merely the routine or conventional use of a computer” (Br. 13), Appellant neither responds to the Examiner’s finding nor points to a particular claimed element that does not qualify as WURC. *See id.* at 13–14. In fact, Appellant’s Specification demonstrates the WURC nature of the claimed elements because it indicates they may be implemented with generic devices. Spec. 36–39, 41–42, 45–46, Figs. 5–7.

For these reasons, we conclude that claim 1, considered as a whole, does not include an inventive concept.

Therefore, we sustain the Examiner’s § 101 rejection of independent claim 1. We also sustain the Examiner’s § 101 rejection of claims 6 and 11, for which Appellant relies on the same arguments made with respect to

⁵ Robert W. Bahr, *Changes in Examination Procedure Pertaining to Subject Matter Eligibility, Recent Subject Matter Eligibility Decision (Berkheimer v. HP, Inc.)* (2018) (hereinafter “*Berkheimer* Memorandum”).

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claim 1. Br. 14–21. The dependent claims (i.e., claims 4, 5, 9, 10, 14, 15, 18, and 19) fall with their respective independent claim. *See* Br. 10.

CONCLUSION

We conclude Appellant have *not* demonstrated the Examiner erred in rejecting claims 1, 4–6, 9–11, 14, 15, 18, and 19 under 35 U.S.C. § 101.

DECISION

We affirm the Examiner’s decision rejecting claims 1, 4–6, 9–11, 14, 15, 18, and 19.

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). *See* 37 C.F.R. § 41.50(f).

AFFIRMED