UNITED STATES PATENT AND TRADEMARK OFFICE

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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Ex parte JUN LIU and ZHENG ZHAO

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Appeal 2018-006747
Application 14/571,224[1]
Technology Center 2100

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Before ROBERT E. NAPPI, MICHAEL R. ZECHER, and
MICHAEL T. CYGAN, *Administrative Patent Judges*.

CYGAN, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF CASE

Introduction

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's
Final Rejection of claims 1, 2, 8–10, 20, 28, and 29. App. Br. 1. Claims 3–
7, 11–19, and 21–27 were cancelled during prosecution. App. Br. 42–44.
We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

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[1] According to Appellants, the real party in interest is SAS Institute, Inc.
App. Br. 3.

Disclosed Invention and Exemplary Claim

The disclosed invention relates to improving algorithms for selecting models used to analyze data in various applications. Spec. ¶ 3. In determining a predictive model for a data set, it is assumed that the data set contains many redundant or irrelevant variables. *Id.* ¶ 22. An algorithm is thus used to eliminate the redundant variables to improve the performance of the model. *Id.* The disclosed model selection algorithm is a form of a regression algorithm. *Id.* The regression algorithm applies "regularization parameters" that set a threshold for determining if a variable is redundant. *Id.* ¶ 23. The disclosed invention applies a specific type of algorithm, a "LARS-LASSO" algorithm, which does not require the regularization parameters to be pre-specified. *Id.* ¶ 20. A LASSO algorithm performs model selection by "solving a penalized version of the ordinary least squares regression algorithm," represented by the Lasso Equation ($\min_\beta \frac{1}{2} \|X\beta - y\|_2^2 + \lambda \|\beta\|_1$), where $\min_\beta \frac{1}{2} \|X\beta - y\|_2^2$ is the ordinary least squares regression and $\lambda \|\beta\|_1$ represents the influence of the regularization parameter λ. *Id.* ¶ 35.

Independent claim 1 is exemplary of the disclosed invention, and reads as follows:

> 1. A computer-program product tangibly embodied in a non-transitory machine-readable storage medium, including instructions configured to be executed to cause a data processing apparatus to:
>
> receive, from a user of the computer-program product, information associated with a data set, the data set including a set of variables, the set of variables being related to a linear model for predicting a response variable of the data set;

calculate a regularization parameter indicating a maximum absolute correlation between the set of variables and the response variable;

for each variable of the set of variables,

calculate a removal parameter for the variable;

if the calculated removal parameter is greater than the calculated regularization parameter, include the variable in an active set; and

if the calculated removal parameter is less than the calculated regularization parameter, exclude the variable from the active set;

generate the linear model using the active set and a least angle regression algorithm including a least squares regression algorithm, the least squares regression algorithm constraining a number of absolute regression coefficients utilized in the least angle regression algorithm; and

provide, to the user of the computer-program product, information related to the generated linear model for use as a predictive model.

Independent claims 10 and 20 recite a method and a system, respectively, having limitations commensurate with independent claim 1. By virtue of their dependency, claims 2, 8, 9, 28, and 29 recite or incorporate the limitations of at least one of independent claims 1 and 20.

Examiner's Rejection

The Examiner rejects claims 1, 2, 8–10, 20, 28 and 29 under 35 U.S.C. § 101 as failing to claim eligible subject matter. Final Act. 2–3.[2]

PRINCIPLES OF LAW

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[2] The Final Action withdrew rejections under 35 U.S.C. § 112(b). Final Act. 3.

3

Patent-eligible subject matter is defined in 35 U.S.C. § 101 of the

Patent Act, which recites:

> Whoever invents or discovers any new and useful process,
> machine, manufacture, or composition of matter, or any new
> and useful improvement thereof, may obtain a patent therefor,
> subject to the conditions and requirements of this title.

There is, however, an implicit, longstanding exception to patent-

eligible subject matter in 35 U.S.C. § 101: "[l]aws of nature, natural

phenomena, and abstract ideas." *Alice Corp. Pty. v. CLS Bank Int'l*, 573

U.S. 208, 216 (2014). This exception precludes patenting of "the basic tools

of scientific and technological work" from which all inventions spring. *Id.*

at 216–17. Invention or discovery under § 101 is distinguished as being the

application of such tools to an end otherwise satisfying the requirements of

the patent statutes. *See Gottschalk v. Benson*, 409 U.S. 63, 67 (1972).

Patent-eligible subject matter is, therefore, present, except where a

claim would be coextensive with a law of nature, natural phenomena, or

abstract idea, or where the claim represents no more than a drafting effort in

furtherance of that purpose. *Alice*, 573 U.S. at 216, 226–27. Such drafting

efforts, which have been recognized by limitations having the "practical

effect" of claiming a law of nature, natural phenomena, or abstract idea, thus

fail to be inventive "practical applications" of the same. *Benson*, 409 U.S. at

71–72.

The Supreme Court has established a framework for this eligibility

determination. Where a claim is directed towards a law of nature, natural

phenomena, or abstract idea, the elements of the claim, as a whole, must

ensure that the claim, in practice, amounts to significantly more than a patent

on the law of nature, natural phenomena, or abstract idea itself. *Alice*, 573

U.S. at 217–18. In applying this eligibility analysis, our reviewing court has stated, "the decisional mechanism courts now apply is to examine earlier cases in which a similar or parallel descriptive nature can be seen . . . the classic common law methodology for creating law when a single governing definitional context is not available." *Amdocs (Israel) Ltd. v. Openet Telecom, Inc.*, 841 F.3d 1288, 1294 (Fed. Cir. 2016) (citation omitted).

To address the growing body of precedent, the USPTO recently published revised examination guidance on the application of § 101. 2019 Revised Patent Subject Matter Eligibility Guidance, 84 Fed. Reg. 50, 50 (Jan. 7, 2019) (hereinafter, "2019 Guidance"). The 2019 Guidance seeks to improve the clarity of the subject matter eligibility analysis and improve consistency of this analysis across the USPTO. *Id.*

Under the 2019 Guidance, we first look to whether the claim is directed to a judicial exception because:

> (1) the claim recites a law of nature, natural phenomenon, or abstract idea; the latter of which includes certain groupings, identified as mathematical concepts, certain methods of organizing human activity and mental processes; and

> (2) the claim, as a whole, fails to recite additional elements that integrate the judicial exception into a practical application (*see* MPEP § 2106.05(a)–(c), (e)–(h)).

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 are 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 2019 Guidance, *passim.*

ANALYSIS

We have reviewed the Examiner's subject matter eligibility rejections (Final Act. 2–4) in light of Appellants' contentions that the Examiner has erred (App. Br. 10–39; Reply Br. 10–51). Further, we have reviewed the Examiner's response to Appellants' arguments (Ans. 4–21). We disagree with Appellants' contention that the Examiner erred in rejecting the pending claims.

"Directed to an Abstract Idea"

The Examiner finds the claim to be directed to "the abstract idea of calculating a linear model which is a data manipulation using a mathematical algorithm." Final Act. 2. Appellants do not specifically contest the existence of, or the Examiner's characterization of, the abstract idea recited in the claims; instead, Appellants contend that the claims are not directed to the abstract idea, but are instead directed to an improvement to computer processing. App. Br. 20; Reply Br. 10.

We agree with the Examiner's uncontested finding that the claims recite an abstract idea. Each of the claims under appeal require a series of calculations ("calculating a regularization parameter," "calculating a removal parameter," comparing the values of removal parameter and regularization parameter to create an active data set of variables for which "the calculated removal parameter is greater than the calculated

regularization parameter," and "generat[ing] the linear model using the active set and a least angle regression algorithm including a least squares a regression algorithm," wherein the "least squares regression algorithm [is] constraining a number of absolute regression coefficients utilized in the least angle regression algorithm,") on a data set. This series of calculations is the type of mathematical concept found to be abstract by the courts. *See* 2019 Guidance, 84 Fed. Reg. at 52; *SAP America, Inc. v. InvestPic, LLC*, 898 F.3d 1161, 1163 (Fed. Cir. 2018) (holding that claims to a "series of mathematical calculations based on selected information" are directed to abstract ideas); *Digitech Image Techs., LLC v. Elecs. for Imaging, Inc.*, 758 F.3d 1344, 1350 (Fed. Cir. 2014) (holding that claims to a "process of organizing information through mathematical correlations" are directed to an abstract idea); *Bancorp Servs., LLC v. Sun Life Assurance Co. of Can.* (U.S.), 687 F.3d 1266, 1280 (Fed. Cir. 2012) (identifying the concept of "managing a stable value protected life insurance policy by performing calculations and manipulating the results" as an abstract idea).

Having found the claims to recite an abstract idea, we next determine if the claims are directed to that abstract idea. The Examiner finds the claims to contain elements additional to the abstract idea; namely, selecting information for collection and for display/output in a digital form, and generically claimed computer elements. Final Act. 2–3; Ans. 7. The Examiner finds that these do not improve the general functioning of the computer itself. Ans. 5, 7. The Examiner further finds that these additional elements do not provide a meaningful limitation such that the claims are not directed to the abstract idea because they "amount to generic computer components performing generic computing functions and/or tasks." Ans. 9.

The Examiner further finds that the claims do not result in a physical transformation of an article. Ans. 11–12. The Examiner further finds that neither the problem nor the solution addressed by the claims is rooted in computer technology because "[t]here is nothing in the claim to suggest that, once generating/providing a linear model is performed, the computer functionalities [] improved"; rather, the purported advance is "in uses for existing computer capabilities, not new or improved computer capabilities." Ans. 12–13.

Appellants contend that the disclosed subject matter acts to "improve the overall performance of the regression algorithm by reducing the number of variables on which to conduct the regression analysis." App. Br. 21 (emphasis omitted) (quoting Spec. ¶ 22). Appellants further cite the Specification for the proposition that, "[s]ince a larger number of irrelevant or redundant variables can be discarded with safe screening, the LASSO computation can be significantly accelerated." *Id.* (emphasis omitted) (quoting Spec. ¶ 25). Appellants contend that the "claimed subject matter does make better use of the computer hardware" because it "computes an optimal solution substantially faster." App. Br. 23. Appellants further state that the claimed subject matter improves the functioning of the computer because "the computer can generate a predictive model significantly faster without a predefined regularization parameter that the user may or may not understand how to define effectively." *Id.* at 32–33.

Appellants cite to various authorities to support the proposition that a mathematical formula, even if well known, can improve the function of a computer or another technology. *See* App. Br. 23–37 (citing *Enfish, LLC v. Microsoft Corp.,* 822 F.3d 1327 (Fed. Cir. 2016); *McRO, Inc. v. Bandai*

Namco Games Am. Inc., 837 F.3d 1299 (Fed. Cir. 2016); *Diamond v. Diehr*, 450 U.S. 175 (1981); *Cal. Inst. of Tech. v. Hughes Commc'ns, Inc.*, 59 F. Supp. 3d 974 (C.D. Cal. 2014); *Amdocs (Isr.) Ltd. v. Openet Telecom, Inc.*, 841 F.3d 1288 (Fed. Cir. 2016); *BASCOM Global Internet Servs. Inc. v. AT&T Mobility LLC*, 827 F.3d 1341 (Fed. Cir. 2016).

We are not persuaded of error in the Examiner's finding that the claims are directed to an abstract idea. Appellants' primary contention is that the claimed subject matter provides an improvement to the functioning of the computer. App. Br. 20; Reply Br. 10. However, the evidence provided by Appellants, at best, points to an improvement in the mathematical algorithm itself. The claimed subject matter "improve[s] the overall performance of the regression algorithm"; "the LASSO computation can be significantly accelerated"; and the computer "computes an optimal solution substantially faster." App. Br. 21, 23. Appellants' characterization of the claimed subject matter is of one that is directed essentially to a method of calculating, using the mathematical LASSO formula for an improved mathematical analysis, which is the type of subject matter the courts generally have held to be directed to an abstract idea. *Digitech*, 758 F.3d at 1351 (finding that without more, "a process that employs mathematical algorithms to manipulate existing information to generate additional information" is directed to an abstract idea); *SAP*, 898 F.3d at 1168 (stating "the focus of the claims is not any improved computer or network, but the improved mathematical analysis").

By contrast, the cases cited by Appellants illustrate improvements to a computer technology or to another technology or technical field, which have been found to be characteristic of patent-eligible subject matter. *See Alice*,

9

573 U.S. 208, 225. The former category includes those in which improvements are made to the basic functions of a computer itself. *See Enfish,* 822 F.3d 1327, 1337, 1339 (finding the claimed invention is "specifically directed to a self-referential table for a computer database," reflected in, e.g., a "'means for configuring' algorithm" such that the table "functions differently than conventional database structures" so as to "improve the way a computer stores and retrieves data in memory"). Unlike the invention in *Enfish,* Appellants' purported invention improves the performance of a task that may be performed on a computer and not an improvement to computer technology, such as data storage and retrieval. We concur with the Examiner's finding that the involvement of the computer is limited to use of existing computer capabilities, and not new or improved computer capabilities. Ans. 12–13. Accordingly, we do not find the claims to be integrated into a practical application through improving the technology of a computer.

The latter category of cases cited by Appellants demonstrate an improvement to a technology or technical field. *See McRO,* 837 F.3d 1299, 1314–16 (finding the claimed invention does not "simply use a computer as a tool to automate conventional activity" but instead uses the computer to "perform a distinct process" that, unlike the tasks in *Parker v. Flook,* 437 U.S. 584 (1978), *Bilski v. Kappos,* 561 U.S. 593 (2010), and *Alice,* is carried out in a different way than the prior non-computer method to improve the technology of 3-D animation techniques); *Diehr,* 450 U.S. 175, 191 (viewing the claimed invention as "a process for molding rubber products and not as an attempt to patent a mathematical formula"). However, Appellants do not identify a non-computer technology or technical field that

its purported invention allegedly improves. Nor are we persuaded that improving the performance of a mathematical algorithm, as contended by Appellants, is sufficiently similar to the type of improvement to a technology or technical field previously found by the courts to be eligible. Accordingly, we do not find the claims to be integrated into a practical application through improving a non-computer technology or technical field.

Still other cases cited by Appellants were found to be directed to an abstract idea, or were decided without resolving that inquiry. *Cal. Inst. of Tech.*, 59 F. Supp. 3d at 993 ("[E]ncoding and decoding data for error correction . . . is abstract"); *Amdocs*, 841 F.3d 1288, 1306 ("For argument's sake we accepted the district court's view of the disqualifying abstract ideas" i.e., as the claims being directed to an abstract idea); *BASCOM.*, 827 F.3d at 1348 ("filtering content is an abstract idea"). These cases do not support a contention that a claimed invention is not directed to an abstract idea, but are relevant instead to the question of whether a claimed invention provides "significantly more" than the judicial exception to which the claim is directed. Accordingly, Appellants' contentions regarding these cases are addressed with regards to the "significantly more" inquiry of the second step of *Alice*, *infra*.

Furthermore, Appellants have not persuaded us of error in the Examiner's finding that the additional elements in the claims amount to anything more than a general-purpose computer. Ans. 7. The passages of the Specification discussing the underlying computer support the Examiner's finding. Spec. ¶¶ 82 ("computer includes a central processing unit that interprets and executes instructions; input devices . . . ; memory that enables the computer to store programs and data; and output devices"), 83. These

types of computer hardware performing basic computing functions of calculation, storage, and transmissions have been found to be merely generic computer functions. *Alice*, 573 U.S. at 226.

Additionally, the passages of the Specification relied upon by Appellants in the Appeal Brief (App. Br. 20–22) show that the participation of the generic computer components is limited to the performance of repetitive calculations, which the courts have found not to impose meaningful limits on the scope of claims reciting mathematical calculations. *Bancorp*, 687 F.3d at 1278. Finally, Appellants have not contested the Examiner's finding that the claims do not result in a physical transformation of an article.

With respect to dependent claims 8, 9, 28, and 29, Appellants contend that these claims "include further detailed instructions . . . for providing a predictive model much faster with equal accuracy." App. Br. 38–39. However, this amounts to a contention that these claims further define and improve the mathematical calculations. Appellants do not provide reasoning as to why these claims would provide an improvement to computer functionality beyond that in the independent claims. Accordingly, we do not find the claims under appeal to be integrated into a practical application.

For the foregoing reasons, Appellants have failed to show error in the Examiner's finding that the claims are directed to a mathematical concept. Nor are we persuaded that the claims, as a whole, recite additional elements that integrate the mathematical concept into a practical application.

"Significantly More"

Appellants contend that their purported invention is eligible because they provide a particular, new, and non-obvious solution as opposed to

merely claiming the idea of a solution or outcome, citing *Amdocs* and
BASCOM. App. Br. 34–37. However, the question of whether a claim is
new and non-obvious is separate from the question of eligibility. *Diehr*, 450
U.S. at 190.

Furthermore, the inventions at issue in *Amdocs* and *BASCOM* were
not eligible simply because they claimed a solution with particularity.
Instead, those inventions were eligible because the claim limitations,
considered as an ordered combination, provided significantly more than the
claimed abstract idea. *Amdocs*, 841 F.3d at 1300–01 (providing an
"unconventional technological solution" in which "generic components
operate in an unconventional manner" through the use of network devices
and "gatherers" that permit data to "reside in the peripheries of the system,"
but are still "accessible from a central location"); *BASCOM*, 827 F.3d at
1350 (providing "the installation of a filtering tool at a specific location,
remote from the end-users, with customizable filtering features specific to
each end user" by "taking advantage of the ability of at least some ISPs
[internet service providers] to identify individual accounts that communicate
with the ISP server, and to associate a request for Internet content with a
specific individual account").

Nor does Appellants' invocation of *California Institute of Technology*
provide a basis for finding Appellants' claims to provide significantly more
than the recited abstract idea. Although not binding precedent, we consider
the reasoning presented in *California Institute of Technology* for any
persuasive value it may have. In *California Institute of Technology*, the
district court described the claimed invention as solving a problem particular
to computers, i.e., "the corruption of data during transmission," using "error

13

correction codes [that] were not conventional activity that humans engaged in before computers." *Cal. Inst. of Tech.*, 59 F. Supp. 3d at 995. The district court described the claimed invention as "solv[ing] a problem unique to computing (data corruption due to noise)." *Id.* at 1000.

Appellants have not persuasively explained how the additional elements of their purported invention solve a problem particular to computers or another technology or technical field, or are otherwise unconventional in combination, similar to that in *Amdocs*, *BASCOM*, or *Cal. Inst. of Tech.* Instead, the additional generic computer elements of Appellants' purported invention are used merely for their ability to perform repetitive calculations to solve a problem relating to inefficiencies in a particular mathematical modeling technique.

With respect to dependent claims 8, 9, 28, and 29, Appellants do not contend that any additional elements are added such that they amount to significantly more than the mathematical concept itself, but instead contend that these claims further define and improve the mathematical calculations. App. Br. 38–39. Appellants have not persuaded us that these claims recite additional elements that do more than further refine the mathematical concept, and therefore do not provide subject matter eligibility. *See Bilski*, 561 U.S. at 611. Accordingly, Appellants have not persuaded us that the Examiner erred in finding the claims did not provide significantly more than the mathematical concept to which the claims are directed.

Preemption

Appellants further contend that the claims do not impermissibly preempt. App. Br. 37–38. We are not persuaded by Appellants' preemption argument because preemption concerns are addressed by the Supreme

Court's eligibility framework, which, as applied here, has resulted in a finding of patent ineligible subject matter. *Ariosa Diagnostics, Inc. v. Sequenom, Inc.*, 788 F.3d 1371, 1379 (Fed. Cir. 2015) (stating "[w]here a patent's claims are deemed only to disclose patent ineligible subject matter under the *Mayo* framework, . . . preemption concerns are fully addressed and made moot"). A lack of complete preemption does not make the claims any less abstract. *OIP Techs., Inc. v. Amazon.com, Inc.*, 788 F.3d 1359, 1362–63 ("[T]hat the claims do not preempt all price optimization or may be limited to price optimization in the e-commerce setting do not make them any less abstract.").

DECISION

For the above-described reasons, we affirm the Examiner's rejection of claims 1, 2, 8–10, 20, 28, and 29 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