UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte GEORGE HENRY FORMAN

Appeal 2008-005348
Application 10/354,844
Technology Center 2100

Decided: August 17, 2009


JEFFERY, Administrative Patent Judge.

DECISION ON APPEAL

Appellant appeals under 35 U.S.C. § 134(a) from the Examiner’s rejection of claims 1-35. We have jurisdiction under 35 U.S.C. § 6(b). We affirm-in-part.
STATEMENT OF THE CASE

Appellant invented a method for selecting a predetermined number of features for a set of binary partitions over a set of categories given a dataset of feature vectors associated with the categories. Specifically, the method involves picking a category, selecting a feature based on the ranking for the category, and adding the selected feature to an output list if not already present in the list and removing the selected feature from further consideration for the category.¹

Claims 1 and 4 are illustrative:

1. A computer-implemented feature selection method for selecting a predetermined number of features for a set of binary partitions over a set of categories given a dataset of feature vectors associated with the categories, the method comprising:

   for each binary partition under consideration, ranking features using two-category feature ranking; and

   while the predetermined number of features has not yet been selected: picking a binary partition p;

   selecting a feature based on the ranking for binary partition p; and

   adding the selected feature to an output list if not already present in the output list and removing the selected feature from further consideration for the binary partition p.

4. A method in accordance with claim 1 and further comprising using the selected features in training a classifier for classifying data into categories.

¹ See generally Abstract; Spec. ¶¶ 0021-26; Fig. 1.
The Examiner relies on the following as evidence of unpatentability:

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2. The Examiner rejected claims 1, 4, 7, 10, 12, 13, 15, 16, 19, 22-24, 26, 27, 30, and 32-34 under 35 U.S.C. § 103(a) as unpatentable over Smyth and Kanevsky. Ans. 8-17.

Rather than repeat the arguments of Appellant or the Examiner, we refer to the Briefs and the Answer for their respective details. In this decision, we have considered only those arguments actually made by

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2 Throughout this opinion, we refer to (1) the Appeal Brief filed October 27, 2006; (2) the Examiner’s Answer mailed November 26, 2007; and (3) the Reply Brief filed January 22, 2008.
Appeal 2008-005348  
Application 10/354,844  
Appellant. Arguments which Appellant could have made but did not make in the Briefs have not been considered and are deemed to be waived. See 37 C.F.R. § 41.37(c)(1)(vii).

THE § 101 REJECTION

Regarding representative claim 1, the Examiner finds that the claimed invention is not limited to a practical application that produces a real-world result and is therefore non-statutory subject matter under § 101. Ans. 3-5. According to the Examiner, “[a]n invention that internally picks a partition, selects a feature based on the ranking, and outputs a list has no purpose or use.” Ans. 4.

Appellant argues that the claimed invention provides the useful, concrete, and tangible result of selecting features for a set of binary partitions, and adding the selected features to an output list. App. Br. 5. Appellant emphasizes that this feature selection capability has utility in providing predictive indicators to train a classifier as recited in claim 4. App. Br. 5-6; Reply Br. 2-3.

Regarding claim 6, the Examiner reasons that since the recited random selection is not repeatable, it is not concrete and therefore non-statutory subject matter under § 101. Ans. 4. Appellant, however, argues

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3 Appellant argues the following claim groupings separately with respect to the § 101 rejection: (1) claims 1-3, 5, and 7-14; (2) claim 4; (3) claim 6; (4) claims 15 and 17-25; (5) claim 16; (6) claims 26 and 28-35; and (7) claim 27. See App. Br. 4-9. Accordingly, we treat each grouping separately and select claims 1, 15, and 26 as representative of groups (1), (4), and (6), respectively. See 37 C.F.R. § 41.37(c)(1)(vii).
that the recited random selection is repeatable, and notes the well-known use of random number generators in computers. App. Br. 7; Reply Br. 3.

Regarding claim 15, Appellant argues that (1) the recited memory is statutory under § 101 as an article of manufacture, and (2) the recited computer code produces a useful, concrete, and tangible result. App. Br. 7-8. Appellant adds that claim 16 is likewise statutory for the reasons indicated with respect to claim 4, namely that using the selected features to train a classifier produces a useful, concrete, and tangible result. App. Br. 8.

Regarding claim 26, Appellant argues that the claim recites a statutory computer-implemented system that performs feature selection for text classification for use in training a text classifier for classifying text into categories. App. Br. 9. The Examiner, however, does not give the text classification limitations any patentable weight by virtue of their presence in the preamble. Ans. 7.

Regarding claim 27, Appellant adds that the selected features are used to train a classifier which produces a useful, concrete, and tangible result. App. Br. 9.

The issues before us, then, are as follows:

**ISSUES**

1. Has Appellant shown that the Examiner erred in finding that claims 1, 4, and 6 fail to recite a statutory process under § 101? This issue turns on whether the claims (a) are tied to a particular machine or apparatus, or (b) transform a particular article into a different state or thing.
2. Has Appellant shown that the Examiner erred in finding that the memory recited in claims 15 and 16 fails to recite statutory subject matter under § 101?

3. Has Appellant shown that the Examiner erred in finding that the system recited in claims 26 and 27 fails to recite statutory subject matter under § 101?

FINDINGS OF FACT

The record supports the following findings of fact (FF) by a preponderance of the evidence:

Appellant’s Disclosure

1. “The term ‘feature selection’ refers to deciding which features are most predictive indicators to use for training a classifier. In some embodiments, ‘feature selection’ refers to which words or features score the highest Information Gain, Odds Ratio, Chi-Squared, or other statistic.” Spec. ¶ 0006.

2. “A classifier is typically constructed using an inducer. An inducer is an algorithm that builds the classifier using a training set comprising records with labels. After the classifier is built, it can be used to classify unlabeled records.” Spec. ¶ 0005.

3. “A record is also known as a ‘feature vector,’ ‘example,’ or ‘case.’” Spec. ¶ 0005.
4. “The memory 108 comprises, in various embodiments, random access memory, read only memory, a floppy disk, a hard drive, a digital or analog tape, an optical device, a memory stick or card, or any other type of memory used with computers or digital electronic equipment.” Spec. ¶ 0047.

PRINCIPLES OF LAW

Under § 101, there are four categories of subject matter that are eligible for patent protection: (1) processes; (2) machines; (3) manufactures; and (4) compositions of matter. 35 U.S.C. § 101. While the scope of patentable subject matter encompassed by § 101 is “extremely broad” and intended to “‘include anything under the sun that is made by man,’” it is by no means unlimited. In re Comiskey, 554 F.3d 967, 977 (Fed. Cir. 2009) (quoting Diamond v. Chakrabarty, 447 U.S. 303, 309 (1980)). For example, laws of nature, abstract ideas, and natural phenomena are excluded from patent protection. Diamond v. Diehr, 450 U.S. 175, 185 (1981).

It is the second exclusion noted above—abstract ideas—that is relevant to the appeal before us. Thus, even if the claimed invention nominally recites subject matter that falls within the enumerated categories under § 101, the claimed invention would still not recite patentable subject matter if the claim as a whole is nonetheless directed to an abstract idea. As the U.S. Supreme Court has noted, “‘[a]n idea of itself is not patentable[’]….‘A principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right.’” Id. at 185 (citations omitted).
In determining whether a claim as a whole is directed to an abstract idea, a key distinction has been drawn between (1) claims that seek to wholly pre-empt the use of a fundamental principle, and (2) claims that are merely limited to foreclosing others from using a particular application of that fundamental principle. See In re Bilski, 545 F.3d 943, 957 (Fed. Cir. 2008) (en banc), cert. granted, 77 U.S.L.W. 3442, 3653, 3656 (U.S. June 1, 2009) (No. 08-964).

Based on U.S. Supreme Court precedents, Bilski restated the U.S. Supreme Court’s “definitive test to determine whether a process claim is tailored narrowly enough to encompass only a particular application of a fundamental principle rather than to pre-empt the principle itself.” Bilski, 545 F.3d at 954. This restatement, embodied as the “machine-or-transformation test,” requires that a claimed process either (1) be tied to a particular machine or apparatus, or (2) transform a particular article into a different state or thing. Id. This test ensures that the claimed process does not pre-empt uses of the principle that do not use the specified machine or apparatus. The test further precludes a claimed process from pre-empting “the use of the principle to transform any other article, to transform the same article but in a manner not covered by the claim, or to do anything other than transform the specified article.” Id.

“A machine is a ‘concrete thing, consisting of parts, or of certain devices and combination of devices.’ This includes every mechanical device or combination of mechanical powers and devices to perform some function and produce a certain effect or result.” Ferguson, 558 F.3d 1359, 1364 (Fed.
A “‘manufacture’ (in its verb form) is defined as the production of articles for use from raw or prepared materials by giving to these materials new forms, qualities, properties, or combinations, whether by hand-labor or by machinery.” Nuijten, 500 F.3d at 1356 (internal quotation marks omitted). “An ‘article’ is a particular substance or commodity. . . .” Id. (internal quotation marks omitted).

The Federal Circuit has recognized that the Court’s precedent suggests “the ‘mathematical algorithm’ exception [, an example of the abstract idea judicial exception,] applies to true apparatus claims.” In re Alappat, 33 F.3d 1526, 1542 (Fed. Cir. 1994). Thus, the mathematical exception analysis used in “[Gottschalk v.] Benson, [409 U.S. 63 (1972)] . . . applies equally whether an invention is claimed as an apparatus or process, because the form of the claim is often an exercise in drafting.” Id. (quoting In re Johnson, 589 F.2d 1070, 1077 (CCPA 1978) (internal quotation marks omitted)).

If a claimed machine (or article of manufacture) involves a mathematical algorithm, then we must determine whether the scope of the

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4 Notwithstanding the court’s statement in Nuijten, 500 F.3d at 1356 n.7 (“We have never held that a manufacture is ever required to produce any result.”), if an applicant chooses to claim the manufacture in terms of applying a mathematical algorithm (e.g., Appellants’ claim 19), then this two-part inquiry applies to determine if the claim is directed to eligible subject matter under § 101.
claimed invention encompasses one of the judicially-created exceptions. This determination of claim scope requires that we make two inquiries:

1. Is the claim limited to a tangible practical application, in which the mathematical algorithm is applied, that results in a real-world use (e.g., “not a mere field-of-use label having no significance”)?
2. Is the claim limited so as to not encompass substantially all practical applications of the mathematical algorithm either “in all fields” of use of the algorithm or even in “only one field?”

If the machine (or article of manufacture) claim involves a mathematical algorithm and fails either prong of this two-part inquiry, then the claim is not directed to patent-eligible subject matter under § 101.

ANALYSIS

*Claims 1-3, 5, and 7-14*

Interpreting representative claim 1 as a whole, we find the recited steps are not tied to a particular machine or apparatus, nor do they transform a particular article into a different state or thing. We address each prong of the machine-or-transformation test in turn.

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5 “Real-world” is not sufficient alone to establish patent-eligible subject matter absent tangibility. See Nuijten, 500 F.3d at 1356.
6 See Benson, 409 U.S. at 68 (noting that the claim at issue was “so abstract and sweeping as to cover both known and unknown uses . . . .”).
7 See Alappat, 33 F.3d at 1544 (noting that the claim’s recitation of “a rasterizer for creating a smooth waveform is not a mere field-of-use label having no significance.”).
8 Benson, 409 U.S. at 71-72.
9 See Bilski, 545 F.3d at 957 (citing Diehr, 450 U.S. at 193 n.14) (“[I]neligibility under § 101 ‘cannot be circumvented by attempting to limit the use of the formula to a particular technological environment.’”).
Claim 1 Is Not Tied To a Particular Machine or Apparatus

Claim 1 calls for, in pertinent part, a computer-implemented feature selection method including (1) picking a binary partition; (2) selecting a feature based on a ranking for the binary partition; (3) adding the selected feature to an output list; and (4) removing the selected feature from further consideration for the binary partition. In essence, the claim merely manipulates data that ultimately adds a selected “feature” to a list based on a ranking. Although this result may be useful, it is merely the result of an algorithm that manipulates data.

Although the preamble calls for this method to be “computer-implemented,” the claim is nevertheless not tied to a particular machine as Bilski requires. See Bilski, 545 F.3d at 961-62. At best, such a nominal structural recitation would be a tantamount to a general purpose computer and would therefore not tie the process to a particular machine or apparatus.10 Indeed, such a nominal recitation of physical structure tantamount to a general purpose computer is analogous to storing binary coded decimal signals in a shift register that the U.S. Supreme Court found to be unpatentable in Benson. See Benson, 409 U.S. at 73 (listing claim 8 which calls for, in pertinent part, “storing the binary coded decimal signals in a reentrant shift register”) (emphasis added). In any event, “[n]ominal recitations of structure in an otherwise ineligible method fail to make the method a statutory process.” Ex parte Langemyr, App. No. 2008-1495, slip

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10 In Gottschalk v. Benson, 409 U.S. 63 (1972), the Court held that claims directed to a method for converting binary-coded-decimal (BCD) numerals into pure binary numerals for use with a general-purpose digital computer were nonstatutory under § 101.
For the foregoing reasons, we find that claim 1 is not tied to a particular machine or apparatus.

*Claim 1 Does Not Transform a Particular Article Into a Different State or Thing*

Nor does claim 1 transform a particular article into a different state or thing. The steps of (1) picking a binary partition; (2) selecting a feature based on a ranking for the binary partition; (3) adding the selected feature to an output list; and (4) removing the selected feature from further consideration for the binary partition are tantamount to an algorithm that manipulates data. As such, the article to be transformed would, at best, comprise electronically-manipulated data. Apart from this data, however, there are simply no physical objects or substances recited that would constitute an article to be transformed.

*Bilski* does, however, recognize that certain types of data can be transformed to meet the transformation test. For example, the court cites the X-ray attenuation data in *In re Abele*, 684 F.2d 902 (CCPA 1982) which not only represented physical and tangible objects, but was also transformed into a particular visual depiction of a physical object on a display. *Bilski*, 545 F.3d at 962-63. But the data recited in claim 1 hardly rises to this level of physical representation, let alone transformation into a different state or thing (e.g., a particular visual depiction on a display) as *Bilski* requires. The
claim is simply devoid of any such transformation. Therefore, the process of claim 1 does not transform a particular article into a different state or thing.

Lastly, Appellant’s arguments (App. Br. 4-6; Reply Br. 2-3) regarding the claimed process being statutory in that it produces a useful, concrete, and tangible result are unavailing. The “useful, concrete, and tangible result” test pronounced in *State Street Bank & Trust Co. v. Signature Financial Group*, 149 F.3d 1368, 1373 (Fed. Cir. 1998) is no longer adequate. *In re Ferguson*, 558 F.3d at 1364 n.3 (Fed. Cir. 2009) (“[T]he ‘useful, concrete and tangible result test’ ‘is insufficient to determine whether a claim is patent-eligible under § 101’ . . . and ‘is inadequate.’” (quoting *Bilski*, 545 F.3d at 959-60 (internal quotation marks omitted)).

For the foregoing reasons, Appellant has not persuaded us of error in the Examiner’s rejection of representative claim 1 under § 101. Therefore, we will sustain the Examiner’s rejection of that claim, and claims 2, 3, 5, and 7-14 which fall with claim 1.

**Claim 4**

We reach the opposite conclusion regarding claim 4 which calls for using the selected features in training a classifier for classifying data into categories. While this claim presents us with a close question, we nonetheless find that the claim meets the machine-or-transformation test.

A “classifier” is built via an algorithm using a training set comprising labelled records such that it can then classify unlabeled records. FF 2. A “classifier” is therefore a particular machine in that it performs a particular data classification function that is beyond mere general purpose computing. Since the claim recites using the selected features in training this classifier, the claim is therefore tied to a particular machine, namely the classifier.
Claim 4 also transforms a particular article into a different state or thing, namely by transforming an untrained classifier into a trained classifier.

For the foregoing reasons, Appellant has persuaded us of error in the Examiner’s rejection of claim 4 under § 101. Therefore, we will not sustain the Examiner’s rejection of that claim.

Claim 6

We will, however, sustain the Examiner’s § 101 rejection of claim 6 for reasons similar to those indicated with respect to claim 1. While a random selection may be repeatable as Appellant argues (App. Br. 7), this step is nonetheless not tied to a particular machine or apparatus, nor does it transform a particular article into a different state or thing. As we indicated previously, we see no reason why such a data manipulation step could not be performed on a general purpose computer. As such, we fail to see how this step satisfies Bilski’s machine-or-transformation test for the reasons previously discussed.

For the foregoing reasons, Appellant has not persuaded us of error in the Examiner’s rejection of claim 6 under § 101. Therefore, we will sustain the Examiner’s rejection of that claim.

Claims 15 and 17-25

We will also sustain the Examiner’s § 101 rejection of representative claim 15 which calls for a memory embodying computer program code for feature selection. In reaching this conclusion, we acknowledge that the recited “memory” is a machine—one of the statutory categories of subject matter under § 101.
The Specification explains that memory used in connection with the invention comprises “random access memory, read only memory, a floppy disk, a hard drive, a digital or analog tape, an optical device, a memory stick or card, or any other type of memory used with computers or digital electronic equipment.” FF 4.

Based on this functionality, we find that the recited computer-readable medium fully comports with the definition of a “machine,” namely “a concrete thing, consisting of parts, or of certain devices and combination of devices. . . [that] includes every mechanical device or combination of mechanical powers and devices to perform some function and produce a certain effect or result.” Ferguson, 558 F.3d at 1364.

We also acknowledge that the recited memory of claim 15 can also be a “manufacture” under § 101 when the claim is interpreted in light of the Specification. The memory devices disclosed in the Specification (e.g., random access memory, read only memory, a floppy disk, a hard drive, a digital or analog tape, an optical device, a memory stick or card, etc.) (FF 4) constitute manufactures since these devices are particular commodities produced for use from materials that are given “new forms, qualities, properties, or combinations, whether by hand-labor or by machinery” under the definitions noted above. See Nuijten, 500 F.3d at 1356

While we find that claim 15 is directed to the “machine” and “manufacture” categories of § 101, this does not end the patent-eligibility analysis. See Ferguson, 558 F.3d at 1363. If a claimed machine (or article of manufacture) involves a mathematical algorithm, then we must determine
whether the scope of the claimed invention encompasses one of the judicially-created exceptions. This determination of claim scope requires that we make two inquiries:

(1) Is the claim limited to a tangible practical application, in which the mathematical algorithm is applied, that results in a real-world use (e.g., “not a mere field-of-use label having no significance”)?

(2) Is the claim limited so as to not encompass substantially all practical applications of the mathematical algorithm either “in all fields” of use of the algorithm or even in “only one field?”

If the machine (or article of manufacture) claim involves a mathematical algorithm and fails either prong of our two-part inquiry, then the claim is not directed to patent-eligible subject matter under § 101.

Here, claim 15 is not limited to a tangible practical application in which the algorithm is applied that results in a real-world use. Although the preamble recites that the program code is “for feature selection for a plurality of categories,” this nominal intended use recitation falls well short of reciting a tangible practical application that results in a real-world use. Moreover, the remainder of the claim merely recites data manipulation steps that are performed by the processor upon execution of the program code. These limitations, likewise, fail to recite a tangible practical application that results in a real-world use. Furthermore, the sheer breadth of claim 15 encompasses substantially all practical applications of the algorithm. In essence, claim 15 merely recites a general purpose computing device

11 Benson, 409 U.S. at 71-72.
12 See Bilski, 545 F.3d at 957 (citing Diehr, 450 U.S. at 193 n.14) (“[I]neligibility under § 101 ‘cannot be circumvented by attempting to limit the use of the formula to a particular technological environment.’”).
intended to facilitate the future execution of the recited data manipulation functions—manipulations similar to those in claim 1 that we found to be unpatentable under § 101.

For the foregoing reasons, Appellant has not persuaded us of error in the Examiner’s rejection of representative claim 15 under § 101. Therefore, we will sustain the Examiner’s rejection of that claim, and claims 17-25 which fall with claim 15.

Claim 16

We will not, however sustain the Examiner’s § 101 rejection of claim 16 essentially for the reasons indicated with respect to claim 4 which recites commensurate limitations. First, claim 15 is limited to a tangible practical application in which the algorithm is applied that results in a real-world use, namely using the selected features in training a classifier for classifying data into categories. Nor does this claim encompass substantially all practical applications of the mathematical algorithm in this field of use.

For the foregoing reasons, Appellant has persuaded us of error in the Examiner’s rejection of claim 16 under § 101. Therefore, we will not sustain the Examiner’s rejection of that claim.

Claims 26 and 28-35

We will, however, sustain the Examiner’s rejection of representative claim 26 essentially for the reasons indicated previously with respect to claim 15. Even if we assume, without deciding, that the recited system nominally recites a machine under § 101, the claim recites nothing more than a general purpose computing device that merely performs data
manipulations tantamount to an unpatentable abstract idea. And while the system may be intended to be used for classifying text, this intended use is recited only in the preamble as the Examiner indicates (Ans. 7). Notably, this intended use does not otherwise limit the claim or otherwise add any structural limitation that would transform the general purpose computing device to a special purpose computing device so as to pass muster under § 101. See Alappat, 33 F.3d at 1545.

As such, claim 26 is not limited to a tangible practical application in which the algorithm is applied that results in a real-world use. Moreover, the sheer breadth of the claim encompasses substantially all practical applications of the algorithm.

For the foregoing reasons, Appellant has not persuaded us of error in the Examiner’s rejection of representative claim 26 under § 101. Therefore, we will sustain the Examiner’s rejection of that claim, and claims 28-35 which fall with claim 26.

Claim 27

We will, not, however, sustain the Examiner’s rejection of claim 27 essentially for the reasons indicated above and with respect to claim 16 which recites commensurate limitations.

For the foregoing reasons, Appellant has persuaded us of error in the Examiner’s rejection of claim 27 under § 101. Therefore, we will not sustain the Examiner’s rejection of that claim.
THE OBVIOUSNESS REJECTION OVER SMYTH AND KANEVSKY

Regarding independent claim 1, the Examiner finds that Smyth discloses a computer-implemented feature selection method that ranks features via a statistical discriminant function with two categories: (1) “interest” and “no-interest” responses. According to the Examiner, Smyth discloses all claimed limitations except for (1) adding the selected feature to an output list if not already present in the list, and (2) removing the selected feature from further consideration for the binary partition. The Examiner, however, relies on Kanevsky for these features in concluding the claim would have been obvious. Ans. 8-10.

Appellant argues that Smyth refers to two-category classifying—not ranking features using two-category feature ranking as claimed. App. Br. 10-11; Reply Br. 4-5. Appellant adds that Kanevsky does not cure this deficiency since the quality of the set of predictors is computed based on the entire set and does not rank individual features. App. Br. 11-12. Appellant further contends that there is no reason why skilled artisans would have applied Smyth’s two-category classification technique to Kanevsky’s system as the Examiner proposes since, among other things, Kanevsky selects a set of predictors for a target of interest. App. Br. 12; Reply Br. 4.

The issues before us, then, are as follows:

ISSUES

1. Under § 103, has Appellant shown that the Examiner erred by finding that Smyth and Kanevsky collectively teach or suggest ranking features using two-category feature ranking, selecting a feature based on the
ranking for a binary partition, and adding the selected feature to a list as recited in claim 1?

2. Is the Examiner’s reason to combine the teachings of Smyth and Kanevsky supported by articulated reasoning with some rational underpinning to justify the Examiner’s obviousness conclusion?

FINDINGS OF FACT

The record supports the following additional findings of fact (FF) by a preponderance of the evidence:

Smyth

5. Smyth discloses a system that estimates a mental decision to activate a task-related function that is selected by a visual cue to control machines visually. Smyth, col. 1, ll. 6-9.

6. To this end, digital computer 18 (1) receives inputs from an eye tracker 10 and an electronic biosignal processor 14, and (2) outputs a decision estimate and workspace coordinates of the viewer’s eye gaze point. Smyth, col. 4, ll. 30-39; Fig. 1.

7. Digital computer 18 includes an expert system routine 66 that performs a classifying function by computing an estimate of the task-related selector decision from eye gaze fixation properties and parametric coefficients. Smyth, col. 16, ll. 1-6; Figs. 4 and 7.

8. The expert system routine includes (1) expert front end routine 66a, and (2) classification network 66b. The classification network serves as a two-category classifying statistical discriminant function that divides a parametric feature set space into two regions: (1) region 100 for the “interest” decision response, and (2) region 102 for the “no interest”
response. The two regions are separated by a decision surface 104 defined by the discriminant function. Smyth, col. 16, ll. 6-26; Figs. 4 and 7. These regions are shown in Figure 7 reproduced below:

Reproduction of Figure 7 Showing “Interest” and “No Interest” Response Regions 100 and 102 of Statistical Discriminant Function

9. A mapping function maps evoked signal features and eye fixation properties to the discriminant dimension where the mapped value is compared to a threshold value. The decision is in one class if the function is greater than the threshold, and in the other class if not. Smyth, col. 16, ll. 28-33.

10. In one embodiment, the classification network 66b is an artificial neural network with a multiple node input that acts as a two-node output classification machine. The classification network outputs the decision estimate as interest or disinterest. Accordingly, the output of computer routine 66 represents an estimate of a mental decision for selecting the gaze point. Smyth, col. 16, l. 58 – col. 17, l. 4.
11. The data set including, among other things, interest designations for each designation case is used to train the artificial neural network representing the interest level. The network is trained by adjusting the weights using the difference in the actual output to the desired output for each training input set. Smyth, col. 18, ll. 46-62.

12. The artificial neural network is a data processing structure containing processing nodes that are fully integrated with one-way signal connections. Each processing node can accept data from many other processing nodes, but can only send data out in one direction. Smyth, col. 16, ll. 37-41.

13. Each input to a processing node is multiplied by a weight, and all of the weighted inputs are summed to determine the activation level of the processing node. Smyth, col. 16, ll. 44-46.

Kanevsky

14. Kanevsky discloses a method for performing network reconstruction\(^\text{13}\) that (1) selects a predictor set (k) of features; (2) adds a complement to the predictor set based on a quality of prediction; (3) checks to see if all of the features of the predictor set are repeated; and (4) removes one feature from the predictor set. This process is repeated until the features of the predictor set are repeated. The set is then output as a result. Kanevsky, Abstract; ¶¶ 0008, 0054-55; Figs. 1 and 2.

\(^{13}\) The term “network reconstruction” means the process, apparatus, steps, and algorithms used to determine associated and/or non-associated pathways in a data set. Kanevsky, ¶ 0023.
15. Kanevsky notes that the first step in network reconstruction entails the search for strong linear dependencies among associated data. The quality of a linear prediction of a target G 120 associated with a set of features (“g” 140, “h” 150) is defined by a quality function. Kanevsky, ¶¶ 0042-44 (Equation (3)); Fig. 1.

Appellants’ Disclosure

16. Appellants’ Specification notes that “for each category C (or binary partition p), all potential features may be ranked according to how useful each is for discriminating between category C (binary partition p) and all other categories.” Spec. ¶ 0022.

PRINCIPLES OF LAW

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the Examiner to establish a factual basis to support the legal conclusion of obviousness. See In re Fine, 837 F.2d 1071, 1073 (Fed. Cir. 1988). In so doing, the Examiner must make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17 (1966) (noting that 35 U.S.C. § 103 leads to three basic factual inquiries: (1) the scope and content of the prior art; (2) the differences between the prior art and the claims at issue; and (3) the level of ordinary skill in the art). Furthermore, the Examiner’s obviousness rejection must be based on

“some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness” . . . . [H]owever, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.
If the Examiner’s burden is met, the burden then shifts to the Appellant to overcome the prima facie case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. See In re Oetiker, 977 F.2d 1443, 1445 (Fed. Cir. 1992).

ANALYSIS

Based on the record before us, we are persuaded of error in the Examiner’s obviousness rejection of representative claim 1 which calls for, in pertinent part, ranking features using two-category feature ranking.

We begin by construing the key disputed term “ranking.” Since this term is not defined in the Specification, we construe the term with its plain meaning (i.e., the ordinary and customary meaning given to the term by those of ordinary skill in the art). See Brookhill-Wilk, 334 F.3d 1294, 1298 (Fed. Cir. 2003).

The term “rank” is defined, in pertinent part, as “[t]o range in a particular class, order, or division; to class; also, to dispose methodically; to place in suitable classes or order; to classify.”14 The last definition is most telling in this appeal since the gravamen of Appellant’s argument is the purported distinction between classifying and ranking. Indeed, Appellant admits that Smyth refers to

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14 Webster's Revised Unabridged Dictionary, 1913 (emphasis added), available at http://machaut.uchicago.edu/?resource=Webster%27s&word=rank&use1913=on&use1828=on.
two-category classifying, but nonetheless contends that this classification does not rank features using two-category feature ranking as claimed. App. Br. 10-11; Reply Br. 4-5.

But this argument is belied by the very definition of “rank” which explicitly includes classifying as noted above. As such, we agree with the Examiner (Ans. 11) that mapping the features into the two categories in Smyth (i.e., “Interest” and “No Interest” responses) (FF 8-9) reasonably constitutes ranking these features using two-category feature ranking as claimed.\(^\text{15}\) That the categories themselves convey a relative degree of importance (i.e., “Interest” and “No Interest”) only bolsters this conclusion.

Nevertheless, the Examiner’s combining Kanevsky with Smyth to arrive at the claimed invention is, at best, problematic. The Examiner cited Kanevsky to show that adding a selected feature to an output list is well known in view of Kanevsky’s outputting a set. Ans. 9. Kanevsky, however, pertains to a completely different type of system which performs an iterative network reconstruction process that ultimately outputs a predictor set of features when the features of the predictor set are repeated. \textit{See} FF 14.

Even assuming, without deciding, that this outputted predictor set corresponds to an “output list” as claimed, we still fail to see how the references collectively teach selecting features based on the ranking for the binary partition, and adding the selected features to such an output list as claimed. At best, Smyth’s classification network outputs a decision estimate in accordance with the classification (i.e., “interest” or “no interest”). \textit{See}\[\text{15}\]

\textit{Notably, the claim is silent regarding the particular aspect of the ranking described in the Specification, namely that the features are ranked according to how useful each is for discriminating between a particular category (or binary partition) and all other categories. \textit{See} FF 16.}
FF 6. There is simply nothing to suggest that features that are used to arrive at this estimate (or any other features in Smyth) would be added to an output list, let alone that the selected features would be removed from further consideration for the binary partition or category. Therefore, not only do we find the Examiner’s combining the teachings of Kanevsky with Smyth problematic as Appellant indicates (App. Br. 12; Reply Br. 4), we also find that all limitations of independent claim 1 are not taught or suggested by these references even if the references were properly combinable.

For the foregoing reasons, Appellant has persuaded us of error in the Examiner’s obviousness rejection of independent claim 1. Therefore, we will sustain the Examiner’s rejection of that claim, and independent claims 15 and 26 which recite commensurate limitations. We will also reverse the Examiner’s rejection of dependent claims 4, 7, 10, 12, 13, 16, 19, 22-24, 27, 30, and 32-34 for similar reasons.

We reach a similar conclusion regarding the other obviousness rejections. Since the disclosures of Cahill, Richter, and Lavi do not cure the deficiencies of Smyth and Kanevsky noted above with respect to the independent claims, we likewise reverse the obviousness rejections of (1) claims 2, 9, 14, 21, 25, 31, and 35 over Smyth, Kanevsky, and Cahill; (2) claims 5, 17, and 28 over Smyth, Kanevsky, and Richter; and (3) claims 8, 11, 18, 20, and 29 over Smyth, Kanevsky, and Lavi.

**CONCLUSIONS**

Appellant has not shown that the Examiner erred in rejecting claims 1-3, 5-15, 17-26, and 28-35 under § 101.
Appellant, however, has shown that the Examiner erred in rejecting (1) claims 4, 16, and 27 under § 101, and (2) claims 1, 2, 4, 5, and 7-35 under § 103.

ORDER

The Examiner’s decision rejecting claims 1-35 is affirmed-in-part. 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-IN-PART