**UNITED STATES DISTRICT COURT**
**NORTHERN DISTRICT OF OHIO**
**EASTERN DIVISION**

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| CYBERGENETICS CORP., | ) | CASE NO. 5:19-cv-1197 |
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| PLAINTIFF, | ) | JUDGE SARA LIOI |
| | ) | |
| vs. | ) | |
| | ) | MEMORANDUM OPINION AND ORDER |
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| INSTITUTE OF ENVIRONMENTAL SCIENCE AND RESEARCH, et al., | ) | |
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| | ) | |
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| DEFENDANTS. | ) | |

Plaintiff Cybergenetics Corp. ("plaintiff") brought this action on May 24, 2019, alleging that defendants, Institute of Environmental Science and Research and NicheVision Inc. (collectively, "defendants"), infringe U.S. Patent No. 8,898,021 ("'021 patent") (Doc. No. 21-1) and U.S. Patent No. 9,708,642 ("'642 patent") (Doc. No. 21-2). (See Doc. No. 1 (Complaint).) Plaintiff subsequently filed an amended complaint on October 16, 2019. (Doc. No. 21 ["Am. Compl."].)

Now pending before the Court is a motion to dismiss filed by defendants. (Doc. No. 24 ["Mot."].) Defendants argue that the asserted claims in the '021 patent and the '642 patent are not patent eligible under 35 U.S.C. § 101. (Mot. at 582[1].) Plaintiff opposes the motion (Doc. No. 29 ["Opp'n"]), and defendants filed a reply. (Doc. No. 30 ["Reply"].)

[1] All page number references are to the page identification number generated by the Court's electronic docketing system.

Because the asserted claims of the ‘021 patent and ‘642 patent are ineligible under § 101, as discussed below, defendants’ motion to dismiss is granted.

## I. BACKGROUND

### A. Scientific Background

The basics of DNA testing, as relevant to this motion, are set forth in the amended complaint. First, a laboratory conducts “PCR amplification” to copy a single DNA sample and produce billions of similar molecules. (Am. Compl. ¶ 27.) Because PCR amplification “generates a different chain reaction each time DNA copes [sic] are synthesized … repeated amplification of the same [DNA] … will produce different peak heights and patterns compared to the original, naturally occurring DNA fragment.” (Id. ¶ 42.) In short, PCR amplification copies a DNA sample but introduces variation in the copies. (See id. ¶ 43.)

Second, a laboratory conducts capillary electrophoresis “to separate the [copied] DNA molecules according to their length” and prevalence in the sample. (Id. ¶¶ 30–31.) This quantifies the DNA sample to transform it into data. (Id. ¶ 31.) Third, under the traditional approach, the laboratory would then set a threshold to “eliminat[e] consideration of possible artifacts and low template DNA” to “simplify the DNA for visual human review[.]” (Id. ¶ 38.)

If there is only one person in the DNA sample, the result of the electrophoresis will easily reveal the genotype of that person. (Id. ¶ 34.) But when there are multiple people in the DNA sample, the analysis becomes more difficult. (Id. ¶ 35.) And when there are multiple unknown contributors in the DNA sample, it becomes even harder. (See id. ¶ 36.)

### B. Patents-in-Suit

The '021 and '642 patents ("Patents-in-Suit") are owned by plaintiff and titled "Method and System for DNA Mixture Analysis." (Id. ¶¶ 12–13.) The Patents-in-Suit recite "computer-based systems and methods for analyzing a DNA sample comprising a mixture of DNA from multiple sources in order to determine a likelihood that a particular person's DNA is, or is not, contained within the mixture." (Id. ¶ 14.) The claimed methods use DNA data produced from PCR amplification and electrophoresis, but then "analyze [the data] to determine information about the composition of the mixed DNA sample." (Id. ¶ 15.) These methods replace Step 3 of the traditional approach.

The Patents-in-Suit call this analysis "deconvolution," or separating a multi-person DNA sample to identify the individuals in that sample. (Opp'n at 911.) Deconvolution involves calculating the variance of the DNA data produced by PCR amplification and accounting for that variance in subsequent probability calculations. (Am. Compl. ¶¶ 43–47; Opp'n at 911, 914.) Those probability calculations, in turn, predict the identity of an individual in the sample and calculate the likelihood that the prediction is correct. (Am. Compl. ¶ 44.)

## II. LEGAL STANDARDS

### A. Standard of Review

A complaint must contain "a short and plain statement of the claim showing that the pleader is entitled to relief[.]" Fed. R. Civ. P. 8(a)(2). Although this pleading standard does not require a great deal of detail, the factual allegations in the complaint "must be enough to raise a right to relief above the speculative level." Bell Atl. Corp. v. Twombly, 550 U.S. 544, 555, 127 S. Ct. 1955, 167 L. Ed. 2d 929 (2007) (citing authorities). In other words, "Rule 8(a)(2) still requires a 'showing,' rather than a blanket assertion, of entitlement to relief." Id. at 556 n.3 (criticizing the

Twombly dissent's assertion that the pleading standard of Rule 8 "does not require, or even invite, the pleading of facts").

"To survive a motion to dismiss, a complaint must contain sufficient factual matter, accepted as true, to 'state a claim to relief that is plausible on its face.'" Ashcroft v. Iqbal, 556 U.S. 662, 678, 129 S. Ct. 1937, 173 L. Ed. 2d 868 (2009) (quoting Twombly, 550 U.S. at 570). Rule 8 does not "unlock the doors of discovery for a plaintiff armed with nothing more than conclusions." Id. at 678–79. "While legal conclusions can provide the framework of a complaint, they must be supported by factual allegations. When there are well-pleaded factual allegations, a court should assume their veracity and then determine whether they plausibly give rise to an entitlement to relief." Id. at 679. "The court need not, however, accept unwarranted factual inferences." Total Benefits Planning Agency Inc. v. Anthem Blue Cross & Blue Shield, 552 F.3d 430, 434 (6th Cir. 2008) (citing *Morgan v. Church's Fried Chicken*, 829 F.2d 10, 12 (6th Cir. 1987)).

"Patent eligibility under § 101 is an issue of law," Intellectual Ventures I LLC v. Capital One Bank (USA), 792 F.3d 1363, 1366 (Fed. Cir. 2015) (citing In re BRCA1– & BRCA2–Based Hereditary Cancer Test Patent Litig., 774 F.3d 755, 758 (Fed. Cir. 2014)), and can be resolved at the motion to dismiss stage, SAP Am., Inc. v. InvestPic, LLC, 898 F.3d 1161, 1169 (Fed. Cir. 2018), cert. denied, 139 S. Ct. 2747, 204 L. Ed. 2d 1134 (2019); Genetic Techs. Ltd. v. Merial L.L.C., 818 F.3d 1369, 1373 (Fed. Cir. 2016); Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat*'l Ass'n*, 776 F.3d 1343, 1346, 1351 (2014), cert denied, 136 S. Ct. 119, 193 L. Ed. 2d 208 (2015), so long as "there are no factual allegations that, taken as true, prevent resolving the eligibility question as a matter of law." Aatrix Software, Inc. v. Green Shades Software, Inc., 882 F.3d 1121, 1125 (Fed. Cir. 2018).

## B. The *Alice* Test

Important to the Court's analysis of patent eligibility under § 101 is the Supreme Court's decision in Alice Corp. Pty. Ltd. v. CLS Bank *Int'l.*, 573 U.S. 208, 134 S. Ct. 2347, 189 L. Ed. 2d 296 (2014).

Title 35 U.S.C. § 101 provides that:

> 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 are three exceptions to § 101's broad description of patent eligible subject matter: laws of nature, natural phenomena, and abstract ideas. Alice, 573 U.S. at 216 ("We have long held that this provision contains an important implicit exception: Laws of nature, natural phenomena, and abstract ideas are not patentable.") (quoting *Ass'n* for Molecular Pathology v. Myriad Genetics, Inc., 569 U.S. 576, 589, 133 S. Ct. 2107, 186 L. Ed. 2d 124 (2013)); Bilski v. Kappos, 561 U.S. 593, 601, 130 S. Ct. 3218, 177 L. Ed. 2d 792 (2010). The purpose of the exceptions is to prevent monopolization of the "basic tools of scientific and technological work" that would impede further innovation. Mayo Collaborative Servs. v. Prometheus Labs., Inc., 566 U.S. 66, 71, 132 S. Ct. 1289, 1293, 182 L. Ed. 2d 321 (2012).

But the Supreme Court in Alice recognized that,

> [a]t some level, "all inventions ... embody, use, reflect, rest upon, or apply laws of nature, natural phenomena, or abstract ideas." [Mayo, 566 U.S. at 71]. Thus, an invention is not rendered ineligible for patent simply because it involves an abstract concept. See Diamond v. Diehr, 450 U.S. 175, 187, 101 S. Ct. 1048, 67 L. Ed. 2d 155 (1981). "[A]pplication[s]" of such concepts "'to a new and useful end,'" we have said, remain eligible for patent protection. Gottschalk v. Benson, 409 U.S. 63, 67, 93 S. Ct. 253, 34 L. Ed. 2d 273 (1972).

Alice, 573 U.S. at 217 (alterations in original); see also Diehr, 450 U.S. at 187 ("[A]n application of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection.") (emphasis in original, citation omitted).

In Alice, the Supreme Court utilized the two-part framework set forth in Mayo for distinguishing patents that claim laws of nature, natural phenomena, or abstract ideas from patent eligible claims. Alice, 573 U.S. at 217–18. The first step is to "determine whether the claims at issue are directed to one of those patent-ineligible concepts." Id. at 217. If the claim is not directed to one of the three patent ineligible concepts, no further analysis is required—the claim is patent eligible under § 101. Id. But if the claim is directed to an abstract idea, the Court must undertake the second step of the Mayo analysis to determine whether the elements of a claim, "both individually and as an ordered combination," contain "additional elements" that "transform the nature of the claim into a patent-eligible application" of an abstract idea. Id. (quotation marks and citation omitted).

This second step involves a search 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.'" Id. at 217–218 (quoting Mayo, 556 U.S. at 72–73 (alteration in original). Alice made clear that the mere introduction of a computer into a claim, or the recitation of generic computer functions, to perform an abstract idea does not turn an abstract idea into a patent eligible claim. Id. at 221–24 (collecting cases). "[I]f a patent's recitation of a computer amounts to a mere instruction to [implement the abstract idea on the computer] that addition cannot impart patent eligibility." Id. at 223. (internal quotation marks and citation omitted).

### C. Claim Construction

Here, plaintiff argues that accepting how defendants "boil[] down" the claims "requires the Court to determine that [d]efendants' reformulation is consistent with a proper interpretation of the claims, but without the benefit of the claim construction procedures[.]" (Opp'n at 926.) Therefore, plaintiff argues, the motion to dismiss should be denied. (Id.) But plaintiff does not argue that particular terms should be defined in a particular way or that defendants incorrectly define terms in the claims. Defendants respond that "the dispute between the Motion and Opposition is about the level of abstraction at which to evaluate [step] one of Alice, not a claim construction dispute[.]" (Reply at 946.)

Defendants have the better argument. On a Rule 12(b)(6) motion, a court may determine what a claim is "directed to" for Alice Step 1 analysis without claim construction. See CardioNet, LLC v. InfoBionic, Inc, 955 F.3d 1358, 1364 n.1 (Fed. Cir. 2020); Burnett v. Panasonic Corp., 741 F. App'x 777, 781 (Fed. Cir. 2018) (plaintiff's proposed "construction of [the claim] does not change the fact that the claims are directed to an abstract idea"), cert. denied, 139 S. Ct. 600 (2018); RecogniCorp, LLC v. Nintendo Co., Ltd., 855 F.3d 1322, 1325 (Fed. Cir. 2017). FairWarning IP, LLC v. Iatric Sys., Inc., 839 F.3d 1089, 1098 (Fed. Cir. 2016). Still, in deciding a Rule 12(b)(6) motion, courts must accept the veracity of all well-pleaded factual allegations in the complaint. Iqbal, 566 U.S. at 678. Therefore, the Court will rely on the plaintiff's descriptions of its own claims in deciding the motion to dismiss.

### D. Independent, Dependent, and Representative Claims

In the Amended Complaint, Count 1 alleges an infringement of claim 1 of the '021 patent and Count 2 alleges an infringement of claim 1 of the '642 patent. (Am. Compl. ¶¶ 53–69; ¶¶ 79–90.) Then, in two paragraphs, plaintiff alleges that defendants "also infringe claims 4–6, 9, 12–17, 22, 25, 26, 31–33, 37, 38, 51, 53, 55, 57, 58, 60, 61, 63, and 66–69 of the '021 patent" (Id. at 361 (¶ 70)), and "claims 3, 4, 6, 7, 10, and 14 of the '642 patent." (Id. at 366 (¶ 91)).

Defendants argue that the only independent claims are claim 1 and claim 66 of the '021 patent and claim 1 of the '642 patent. (Mot. at 591.) And because only Claim 1 of the '021 patent and Claim 1 of the '642 patent were discussed in the Amended Complaint, according to defendants, plaintiff concedes that those are the representative claims. (Id.) Still, defendants argue that the dependent claims are not patent eligible under § 101. (Mot. at 601–604; Reply at 952.)

In opposition to the motion, plaintiff responds that defendants make a "conclusory assertion that the independent claims are representative of the dependent claims[.]" (Opp'n at 932.) But then plaintiff concedes that it "does not contend that all of the dependent claims merit separate consideration for purposes of the § 101 analysis, but at least some of them add detailed, substantive limitations to the methods recited in the corresponding independent claims." (Id. at 933.) Plaintiff then lists claim 4 of the '021 patent and claims 3, 4, and 7 of the '642 patent as adding such limitations. (Id.)

Given the parties' contrary positions, the Court finds the most prudent course is to evaluate each claim under the Alice Test.

## III. *ALICE* STEP 1

### A. Plaintiff's Arguments

Plaintiff argues that "the [a]sserted [c]laims are not directed to any mathematical formula or algorithm itself, but rather to a specific improvement in a particular computer-based method for solving a technological problem, namely, how to effectively "deconvolute" a mixture of DNA from multiple people." (Opp'n at 924.) Therefore, according to plaintiff, the claims, as a whole, are directed to an improvement in existing technology, which is not an abstract idea. (Id. 924–25.)

In support, plaintiff relies on cases like Thales. At issue in that case was a patent that "disclose[d] an inertial tracking system for tracking the motion of an object relative to a moving reference frame." Thales Visionix Inc. v. United States, 850 F.3d 1343, 1344 (Fed. Cir. 2017). The patent claimed that:

> [T]he platform … inertial sensors directly measure the gravitational field in the platform frame. The object … inertial sensors then calculate position information relative to the frame of the moving platform. By changing the reference frame, one can track the position and orientation of the object within the moving platform without input from a vehicle attitude reference system or calculating orientation or position of the moving platform itself.

Id. at 1345 (internal citations omitted). The court held that the claims were "directed to systems and methods that use inertial sensors in a non-conventional manner to reduce errors in measuring the relative position and orientation of a moving object on a moving reference frame." Id. at 1348–49. The court recognized that "the claims utilize mathematical equations to determine the orientation of the object relative to the moving reference frame," but because "the equations … serve only to tabulate the position and orientation information in this configuration" the claims were "not merely directed to the abstract idea of using mathematical equations for determining the relative position of a moving object to a moving reference frame." Id. at 1348 (internal quotation omitted). For that reason, the court concluded "[t]hat a mathematical equation is required to complete the claimed method and system does not doom the claims to abstraction." Id. at 1349.

Likewise, in McRO, the claims included mathematical algorithms as part of a larger process. The plaintiff sought to patent a process "to automate a 3-D animator's tasks, specifically, determining when to set keyframes and setting those keyframes. This automation [was] accomplished through rules that are applied to the timed transcript" of dialogue. McRO, Inc. v. Bandai Namco Games Am. Inc., 837 F.3d 1299, 1307 (Fed. Cir. 2016). "[T]hese rule sets aim to produce more realistic speech by taking into consideration the differences in mouth positions for similar phonemes based on context." Id. (internal quotation omitted). The defendant challenged the patent's eligibility under § 101, arguing that the rule sets were merely unpatentable mathematical algorithms. Id. at 1310. The court held that the claims were not directed to mathematical algorithms, but instead "were directed to the creation of something physical—namely, the display of lip synchronization and facial expressions of animated characters on screens." SAP, 898 F.3d at 1167 (describing McRO).

The court in McRO reasoned that the claims went "beyond merely organizing existing information into a new form" because "[t]he claimed process uses a combined order of specific rules [algorithms] that renders information into a specific format that is then used and applied to create … a sequence of synchronized animated characters." McRO, 837 F.3d at 1315 (quotation marks and citations omitted). "[T]he claimed improvement was to how the physical display operated (to produce better quality images), unlike … a claimed improvement in a mathematical technique with no improved display mechanism." SAP, 898 F.3d at 1167 (describing McRO).

Similarly in CardioNet, the patent was not directed to an abstract idea because it was "directed to an improved cardiac monitoring device[.]" CardioNet, 955 F.3d at 1368. The patented "device detects beat-to-beat timing of cardiac activity, detects premature ventricular beats … and determines the relevance of the beat-to-beat timing to atrial fibrillation or atrial flutter, taking into account the variability in the beat-to-beat timing caused by premature ventricular beats." Id. at 1364–65. The court reasoned that "the claims 'focus on a specific means or method that improves' cardiac monitoring technology; they are not 'directed to a result or effect that itself is the abstract idea and merely invoke generic processes and machinery.'" Id. at 1368 (quoting McRo, 837 F.3d at 1314). Likewise, "[t]he dependent claims [were] similarly directed to patent-eligible subject matter, as they further specify the physical features of operation of the device of [the independent] claim." Id. at 1369.

And the Federal Circuit overturned the district court's holding that the claims were "directed to collecting, analyzing, and reporting data" because it was an oversimplification that "fail[ed] to account for the specific requirements of the claims." Id. at 137 (quotation marks and citation omitted). "[T]he claims … [did] not merely collect electronic information, display information, or embody mental processes …. Rather, … [they] focus on an improvement in computers and other technologies as tools." Id. (internal quotations omitted); see also Koninklijke KPN N.V. v. Gemalto M2M GmbH, 942 F.3d 1143, 1150–51 (Fed. Cir. 2019) (holding that a claim reciting an algorithm, which "generat[es] check data that enables the detection of persistent systematic errors in data transmissions," improved how a computer "detect[s] systematic errors" and was not abstract); Enfish, LLC v. Microsoft Corp., 822 F.3d 1327, 1336–39, 1344 (Fed. Cir. 2016) (holding that claims for a "data storage and retrieval system for computer memory, comprising means for configuring said memory according to a logical table … and means for indexing data stored in said table" were directed to self-referential tables, which was "an improvement in the functioning of a computer" and therefore non-abstract).

**B. Defendants' Arguments**

Defendants argue that claims which "take[] information and appl[y] mathematical calculations to that information" are directed to abstract ideas. (Mot. at 593.)

Defendants look to cases, such as Flook, to support their position. In Flook the plaintiff sought to patent a multi-step method: "measur[ing] the present value of the process variable," using "an algorithm to calculate an updated alarm-limit value[,]" and adjusting the actual alarm limit to the updated value. Parker v. Flook, 437 U.S. 584, 585, 98 S. Ct. 2522, 57 L. Ed. 2d 451 (1978). The Court noted that the claims only "provide … a formula for computing an updated alarm limit" without any relation to "the chemical processes at work, the monitoring of process variables, or the means of setting off an alarm or adjusting an alarm system." Id. at 585–86. In other words, the claims pertained to the algorithm alone and not any additional process or device. Id. at 585–86. The algorithm was "[t]he only difference between the conventional methods of changing alarm limits and that described in" the claims. Id. at 587. The Court held that the method was directed to a mathematical algorithm, which was an abstract idea. Id. at 594.

Likewise in SAP, the patent proposed a technique that "utilize[d] resampled statistical methods for the analysis of financial data[.]" SAP, 898 F.3d at 1164. The court held that the patent was directed to "selecting certain information, analyzing it using mathematical techniques, and reporting or displaying the results of the analysis. That is all abstract." Id. at 1167. The patent's specification clarified "that off-the-shelf computer technology is usable to carry out the analysis." Id. at 1168. Therefore, the court held, "the claims of the [] patent thus fit into the familiar class of claims that [focus] on certain independently abstract ideas that use computers as tools." Id. (citing Elec. Power Grp., LLC v. Alstom S.A., 830 F.3d 1350, 1354 (Fed. Cir. 2016)). The court distinguished claims directed toward "improv[ing] mathematical analysis," which are abstract, from claims directed toward "improv[ing] [a] computer or network," which is patent eligible. Id. Further that "a process of collecting and analyzing information is 'limited to particular content' or a particular 'source' … does not make the collection and analysis other than abstract." Id. The court noted that SAP was distinct from McRO and Thales because the claims were directed to the mathematical result, "not a physical-realm improvement[.]" Id.

Indeed, the Supreme Court and the Federal Circuit have repeatedly held that claims for calculating mathematical algorithms to produce a numerical output are directed toward an abstract idea. See e.g., Gottschalk, 409 U.S. at 64 (holding that a method for existing computers to execute a mathematical algorithm that "convert[ed] binary coded decimal … numerals into pure binary numbers" was directed to an abstract idea); Bilski, 561 U.S. at 609–11 (holding that claims which were directed to hedging, which is "a mathematical formula," was "an unpatentable abstract idea"); Digitech Image Techs., LLC v. Elecs. for Imaging, Inc., 758 F.3d 1344, 1350–51 (Fed. Cir. 2014) (holding that a method which organized two data sets "into a new form" was abstract because it merely "employs mathematical algorithms to manipulate existing information to generate additional information" and that "organizing information through mathematical correlations [that] is not tied to a specific structure or machine" was directed to an abstract idea); RecogniCorp, 855 F.3d at 1327 (holding that a method in which "[a] user starts with data, codes that data using at least one multiplication operation, and ends with a new form of data" was directed to an abstract idea) (internal quotation omitted); Coffelt v. NVIDIA Corp., 680 F. App'x 1010, 1011 (Fed. Cir. 2017) (holding that a method to "calculate[e] a … region of space is purely an arithmetic exercise" whose "claims thus recite nothing more than a mathematical algorithm" was directed to an abstract idea); In re Gopalan, No. 2019-2070, 2020 WL 1845308, at *3–4 (Fed. Cir. Apr. 13, 2020) (holding that claims "directed to the abstract idea of using algorithms or mathematical relationships to devise a measurement strategy for spectrally based measurements" were directed to an abstract idea).

**C. Analysis**

According to plaintiff, the "claims are … directed to … how to effectively 'deconvolute' a mixture of DNA from multiple people." (Opp'n at 924.) As previously discussed, "deconvolution" refers to calculating a variance from PCR-generated data, using that variance and a linear model to predict the identity of a person in a DNA sample that contains multiple people, and calculating the likelihood that the prediction is correct. (Am. Compl. ¶ 48; Opp'n at 924 n.8.) That prediction, and its likelihood of correctness, take the form of computed, numerical results. ('021 patent at 390 (17:22–38).)

The claims center on the use of a "linear combination" (a particular type of equation) to calculate probabilities. (Opp'n at 931 ["nearly all of the [a]sserted [c]laims … require the application of statistical linear modeling (i.e., a mathematical fundamental building block of science")].). The equation is below, where d is the quantitative genotype data (the DNA data generated from the DNA sample), G is the genotype matrix where each column corresponds to a contributor in the DNA sample and each row corresponds to an allele, w is the vector of weight values (indicating what portion of the sample is attributed to each individual in the sample), and e is the error term. ('021 patent at 384 (5:22–5:30).)

$$d = G*w + e$$

The claims also recite computing various likelihood ratios. A likelihood ratio is merely the ratio of two probabilities. Likelihood Ratio, SCIENCE DIRECT, https://www.sciencedirect.com/topics/earth-and-planetary-sciences/likelihood-ratio (last visited September 29, 2020). A likelihood ratio can be expressed as the equation:

$$Likelihood\ Ratio = \frac{Probability\ of\ A}{Probability\ of\ B}$$

The claims call for calculating variance. Variance is a mathematical term that measures "how much [the values]" in a distribution "differ from each other" or how close the values in a distribution are to the mean of the distribution. David M. Lane, et al. *Introduction to Statistics*, ONLINESTATBOOK.COM http://onlinestatbook.com/Online_Statistics_Education.pdf, at 689–90 (last visited September 29, 2020).

Variance is expressed in the formula below, where x is a given observation in the distribution, $\mu$ is the mean of the distribution, and n is the number of observations in the distribution.

$$Variance = \frac{\sum(X-\mu)^2}{n}$$

"A confidence interval is a range of scores likely to contain the parameter being estimated." Lane, at 662. It is expressed as a range. In the below equations, x is the particular value (typically the sample mean), t is a standardized value, s is the standard error of the observations, and n is the number of observations in the distribution. Lane, 343–47. The confidence interval is calculated as:

$$Lower\ Bound = x - t * \frac{s}{\sqrt{n}}$$

$$Upper\ Bound = x + t * \frac{s}{\sqrt{n}}$$

As is evident from the plain language of plaintiff's claims, the claims are directed to using mathematical algorithms—variance ('021 patent at 405 (47:13–14); 406 (49:31–33); '642 patent at 440 (48:45–46)), a linear equation and model ('021 patent at 405 (47:7–12), (47:33–47), (47:52–55), (47:60–63), (48:1–3), (48:31–33); '642 patent at 440 (48:43–44), (48:65–67); 441 (49:1–7)), likelihood ratios ('021 patent at 406 (50:43–54); '642 patent at 440 (48:52–62)), probabilities ('021 patent at 405 (47:17–25), (47:64–67), (48:45–48); 406 (49:43–45), (49:49–51), (49:56–58); '642 patent at 440 (48:47–51); 441 (49:12–14)), and other statistical tools (Markov chain Monte Carlo simulation ('021 patent at 406 (49:49–51)), confidence interval ('021 patent at 405 (48:4–6)), and bootstrapping (0'21 patent at 389 (16:47)))—to predict the likelihood that a given person is included in a multi-person DNA sample.

Just as in Flook, the use of and accounting for variance by mathematical algorithms is "[t]he only difference between the conventional methods … and that described" in the claims and is, therefore, abstract. Flook, 437 U.S. at 585–86. Like in Flook, the claims are directed to using a computer to execute mathematical equations, which is abstract. Id. at 586. And as the court in SAP reasoned, claims are abstract if they are directed to "selecting certain information, analyzing it using mathematical techniques, and reporting or displaying the results of the analysis." SAP, 898 F.3d at 1167. Therefore, plaintiff's claims are directed to abstract ideas.

Plaintiff's reliance on Thales, McRO, and CardioNet is misplaced. In those cases, the mathematical algorithms were used as part of a non-mathematical process. In Thales, the mathematical algorithms were not merely used to produce a numerical output. Thales, 850 F.3d at 1345. Rather, the claims used the numerical output to inform how other elements of the claim were to be done—how to track the position and orientation of the object within the moving platform. Id. Similarly, in McRO, the numerical result generated from the mathematical algorithms was used to "generate a tangible product, namely a video of a 3-D character speaking the recorded audio." McRO, 837 F.3d at 1309 (record cite omitted). The claims were non-abstract despite including mathematical algorithms because the claims used the numerical result to animate. SAP, 898 F.3d at 1167 (describing McRO). And in CardioNet, the claims were not abstract because the mathematical algorithm improved how computers and other technology functioned. CardioNet, 955 F.3d at 1371.

Comparatively, plaintiff's claims recite mathematical algorithms to produce a numerical output as the entirety of the method. "Deconvolution" is the alleged improvement. But deconvolution merely describes the process of calculating a variance (a numerical result) and then accounting for that variance in subsequent statistical calculations (also numerical results). (Opp'n at 919, 929–930.) The calculated, numerical result is the "improvement." The Patents-in-Suit are directed toward the mathematical results themselves rather than "to improvements in the way computers and networks carry out their basic functions." SAP, 898 F.3d at 1168. The difference in how the claims use mathematical algorithms renders the cited cases inapposite.

Because the claims are directed to the use of mathematical algorithms to produce a numerical result, the claims are directed to abstract ideas. It, therefore, is necessary to proceed to the second step in the Alice analysis.

## IV. *ALICE* STEP 2

### A. Case Law

In Mayo, the Supreme Court compared Flook and Diehr to determine if the claims included an inventive concept. Mayo, 566 U.S. at 80–82.

In Diehr, the claims were patentable despite "the fact that in several steps of the process a mathematical equation and a programmed digital computer are used." Diehr, 450 U.S. at 185. The mathematical formula was used in conjunction with many other steps in the patented process: "installing rubber in a press, closing the mold, constantly determining the temperature of the mold, constantly recalculating the appropriate cure time through the use of the formula and a digital computer, and automatically opening the press at the proper time." Id. at 187. The Court recognized that the equation used in the rubber-curing process "is not patentable in isolation." Id. But because the claim was a process for curing rubber, which included the equation, "the process is at the very least not barred at the threshold by §101." Id. at 188; see also Alice, 573 U.S. at 223 ("the[] additional steps … transformed the process into an inventive application of the formula."); Mayo, 566 U.S. at 79–80.

But in Flook, "the claimed process … [did] nothing other than provid[e] an unpatentable formula for computing an updated alarm limit." Mayo, 566 U.S. at 81 (describing Flook). More specifically, "[t]he claimed process amounted to an improved system for updating … alarm limits [in the catalytic conversion of hydrocarbons] through the steps of: (1) measuring the current level of the variable, e.g., the temperature; (2) using an apparently novel mathematical algorithm to calculate the current alarm limits; and (3) adjusting the system to reflect the new alarm-limit values." Id. (describing Flook).

The Court held that the method was unpatentable because it was merely a mathematical algorithm without "an inventive application of the principle" since the non-mathematical components of the claim were all well-known. Flook, 437 U.S. at 594. While "a process is not unpatentable simply because it contains … a mathematical algorithm," "[t]he process itself, not merely the mathematical algorithm, must be new and useful" in order to be eligible for a patent. Id. at 591–92. And this is true even if there is a "specific post-solution activity" such that the claim's formula is used "for a specific purpose." Id. at 590. Therefore, a limited application does not render the formula non-abstract. See also Bilski, 561 U.S. at 612 ("[L]imiting an abstract idea to one field of use or adding token postsolution components did not make the concept patentable."); In re Gitlin, 775 F. App'x 689, 691 (Fed. Cir. 2019) ("[M]erely calling for a mathematical concept to be performed more efficiently or with a particular input does not amount to an application of the mathematical concept that is patent-eligible.")

In Mayo itself, the patent claims instructed doctors to: (1) administer a drug and take a blood sample, (2) calculate the current toxicity limit based on the blood sample, and (3) "reconsider the drug dosage in light of the" result of the calculation. Mayo, 566 U.S. at 82. The Supreme Court held that the claims "present[] a case for patentability that is weaker than the (patent-eligible) claim in Diehr and no stronger than the (unpatentable) claim in Flook" because the claims included no inventive concept beyond the use of the mathematical formula. Id. An ineligible idea under Alice Step 1 cannot serve as the inventive concept to make the claim patent eligible under Alice Step 2. "If a law of nature is not patentable, then neither is a process reciting a law of nature[.]" Id. at 77. For that reason, "Einstein … could not have patented his famous law by claiming a process consisting of simply telling linear accelerator operators to refer to the law to determine how much energy an amount of mass has produced[.]" Id. at 78.

Further, the Court reasoned that "implementing a mathematical principle on a … computer, [is] not a patentable application of that principle." Mayo, 566 U.S. at 84; see also Alice, 573 U.S. at 225 ("[T]he relevant question is whether the claims here do more than simply instruct the practitioner to implement the abstract [mathematical algorithm] … on a generic computer."); In re Gopalan, 2020 WL 1845308, at *4 ("performing the steps of the optimization technique [an abstract idea] on a generic processor does not transform it into a patentable apparatus" by providing the inventive concept) (internal quotation omitted); Burnett, 741 F. App'x at 781–82 (holding that the claims "instruct[ing] a user to implement the abstract idea" by using a computer did "not transform the abstract idea into a patent eligible concept"); SAP, 898 F.3d at 1170 ("[A]n invocation of already-available computers that are not themselves plausibly asserted to be an advance, for use in carrying out improved mathematical calculations, amounts to a recitation of what is well-understood, routine, [and] conventional.") (quotation marks and citation omitted); Coffelt, 680 F. App'x at 1011 (holding that claims which "merely implement[ed] the algorithm on a generic computer" were not inventive); Elec. Power Grp., 830 F.3d at 1355 ("performance of [abstract ideas] on a set of generic computer components" did not provide an inventive concept); DDR Holdings, LLC v. Hotels.com, LP, 773 F.3d 1245, 1256 (Fed. Cir. 2014) ("[R]ecitation of generic computer limitations does not make an otherwise ineligible claim patent-eligible.") (citing Alice, 573 U.S. at 223–24); Bancorp Servs., L.L.C. v. Sun Life Assur. Co. of Canada (U.S.), 687 F.3d 1266, 1279–80 (Fed. Cir. 2012) (holding that claims which included mathematical computations performed by a computer did not supply an inventive concept because "without the computer limitations nothing remains in the claims but the abstract idea of … performing calculations and manipulating the results"); Datatrak *Int'l,* Inc. v. Medidata Sols., Inc., No. 1:11 CV 458, 2015 WL 6870109, at *7 (N.D. Ohio Nov. 6, 2015) (holding that a claim directed to an abstract idea and "requir[ing] the use of a computer" was not inventive even though the computer would "undoubtedly speed up the process").

**B. Analysis**

Plaintiff's arguments can be understood as an analogy to Diehr:

> [T]he inventive concept in the [a]sserted [c]laims is not the arguably abstract concept of calculating a variance arising from the amplification process. Rather it is the technological improvement achieved by accounting for that variance in processing data associated with the man-made product of the amplification process … [and] applying statistical linear modeling to the DNA mixture.

(Opp'n at 929–30.) The "improved technology" is one "in which the DNA mixture is analyzed using a statistical linear model that includes an error term accounting for variance[.]" (Id. at 919.) Like in Diehr, then, according to plaintiff, the inventive concept is the technological improvement in DNA testing.

The two cases plaintiff relies on to support this argument are inapposite. In Cellspin, the claims recited elements other than the abstract idea of "collect[ing], transfer[ing], and publishing of data" by "separat[ing] the steps of capturing and publishing data so that each step would be performed by a different device," "establishing a paired connection between the mobile device and the data capture before data is transmitted," and "us[ing] HTTP, by an intermediary device … while the data is in transit." Cellspin Soft, Inc. v. Fitbit, Inc., 927 F.3d 1306, 1315-17 (Fed. Cir. 2019), cert. denied sub nom. Garmin USA, Inc. v. Cellspin Soft, Inc., 140 S. Ct. 907, 205 L. Ed. 2d 459 (2020). Comparatively, the Patents-in-Suit do not recite elements other than the computation of mathematical algorithms and reporting the numerical results. And in Aatrix, "the claimed invention [was] directed to an improvement in the computer technology itself and not directed to generic components performing conventional activities." Aatrix, 882 F.3d at 1127.

Defendants' arguments, in turn, can be understood as making an analogy to Flook: steps (d)–(f) of claim 1 of the '642 patent and steps (e)–(k) of claims 1 and 66 '021 patent do not provide an inventive concept because an "ineligible abstract idea … cannot provide the inventive concept," even when implemented using a generic computer, and "limiting the claims to a particular field of use or technological environment is insufficient to transform them into patent-eligible applications of their core abstract idea[.]" (Mot. at 599–601.) And steps (a)–(c) of claim 1 of the '642 patent and steps (a)–(d) of claims 1 and 66 of the '021 patent do not provide an inventive concept either because they merely "describe well-understood, routine, and conventional steps that would be taken by any forensic laboratory when analyzing DNA samples." (Id. at 599, 601.)

The Court agrees with defendants that the Patents-in-Suit are more like those in Flook than Diehr. The claims can be divided into three categories, all of which capture patent-ineligible ideas: (1) claims that are mathematical algorithms, (2) claims that use a generic computer to calculate the mathematical algorithms or display the results of the calculations, and (3) claims that describe the transformation of a DNA sample into DNA data.

Category 1 includes the ‘021 patent claims 1(e)–(k), 4, 6, 9, 12, 13, 14, 15, 16, 26, 31, 32, 33, 51, 53, 55, 57, 60, 66(e)–(k), 67, 68, 69 and the ‘642 patent claims 1(d)–(f), 2, 3, 4, 5, 7, 8, 9, 12, 14. These claims are all directed to an abstract idea that cannot serve as the inventive concept. Alice, 573 U.S. at 221–24; Mayo, 566 U.S. at 77–78. And plaintiff concedes that these claims are for "a known mathematical technique." (Opp'n at 919.) The "innovation," then is "a specific application of this mathematical technique to … computer-based DNA analysis," (id. at 932) (emphasis omitted), "to overcome the problems … specifically arising in the realm of probabilistic genotyping." (Am. Compl. ¶ 52.) Courts have consistently rejected finding a claim provides an inventive concept simply because it is limited "to one field of use." See e.g., Bilski, 561 U.S. at 612; Flook, 437 U.S. at 590; Gitlin, 775 F. App'x at 691.

Category 2 includes the ‘021 patent claims 5, 17, 22, 58, 61, 63. Category 3 includes the ‘021 patent claims 1(a)–(d), 25, 37, 38, 66(a)–(d) and ‘642 patent claims 1(a)–(c), 6, 10, 11, 13. Categories 2 and 3 are, according to plaintiff, well-known, routine, and conventional. (Am. Compl. ¶ 26) ["The advent of short tandem repeat (STR) polymerase chain reaction (PCR)-based amplification processes in the early 1990s]; Opp'n at 916 ["both PCR amplification and capillary electrophoresis were well-known in early 2001."]; ‘021 patent at 386 (9:64–66) ["This search can be done … using standard minimization procedures on an inexpensive personal computer."]; ‘642 patent at 421 (10:9–10) [same]; ‘021 patent at 393 (24:61–65) ["implemented in MatLAB … on a Macintosh PowerBookG3[]"]; ‘642 patent at 429 (25:34–40) [same].) If the non-mathematical components of the claims are well known, there is no inventive concept. Flook, 437 U.S. at 594.

*Detailed Analysis of Claims*

To further illustrate the nature of these claims, a comparison chart is provided below. Relying exclusively on the language of claims, themselves, the chart highlights the absence of any inventive concepts.

**Patent '021** (' 021 patent at 404–406 (46:60–50:57).)

| Claim Number | Claim Language | Analysis | Category |
|---|---|---|---|
| 1(a)–(d) | … obtaining a DNA mixture that contains genetic material from at least two contributing individuals, amplifying the DNA mixture in a DNA amplification process to produce an amplification product comprising DNA fragments; producing from the amplification product a signal comprising signal peaks from the DNA fragments; detecting signal peak amounts in the signal; and quantifying the amounts to produce DNA lengths and concentrations from the mixture to form quantitative genotyping data; | Transform a DNA sample into DNA data. | DNA data |
| 1(e) | … assuming a genotype value of alleles for a contributor to the quantitative genotyping data at a genetic locus; | Define vector *G*, which the genotype of a person in the DNA sample. | Algorith m |
| 1(f) | … setting a mixture weight value for a relative proportion of the contributors to the quantitative genotyping data; | Define w, where $w_i = \frac{amount\ of\ person\ i\ in\ DNA\ sample}{DNA\ sample}$ | Algorith m |
| 1(g) | … forming a linear combination of the genotype values based on the mixture weight value; | Create the linear equation: $d = G*w + e$. | Algorith m |
| 1(h) | … deriving with a computer a data variance of the amplification process from a model that includes both the quantitative genotyping data and the linear combination; | Use a generic computer to calculate variance. | Algorith m |

| | | | |
|---|---|---|---|
| 1(i) | … determining with the computer a probability of the quantitative genotyping data corresponding to a set of suspects form the DNA mixture at the locus using both the linear combination and the data variance value; | Use a generic computer to calculate a probability. | Algorith m |
| 1(j) | … computing a probability of a genotype for one of the contributing individuals using the determined probability of the quantitative genotyping data; | Calculate a probability. | Algorith m |
| 1(k) | … comparing the genotype probability with a set of suspect genotypes to identify a likely suspect. | Compare the numerical result from claim 1(j) with a set of suspects. | Algorith m |
| 4 | The method as described in claim 1 wherein the forming step includes a mathematical operation based on a linear model that relates the quantitative genotyping data to a product of a genotype matrix multiplied by a weight vector that describes the relative contribution of each individual that is considered in the DNA mixture. | Create the linear equation: $d = G*w + e,$ where $G$ is a matrix of multiple people and $w$ is a column vector with weight values corresponding to each person. | Algorith m |
| 5 | The method as described in claim 4 wherein after the determining step there is the step of using a computing device to generate a visualization that shows the genotype matrix and the weight vector. | Use a generic computer to generate a visual depiction of $G$ and $w$. | Generic Computer |
| 6 | The method as described in claim 4 wherein the forming step includes iteratively determining the genotype matrix based on the weight vector, and the weight vector based on the genotype matrix. | Use iterative calculations to solve for $G$ and $w$. | Algorith m |
| 9 | The method as described in claim 4 wherein the mathematical operation computes a genotype of an individual by subtracting from the data genotypes of other individuals in the mixture in proportion to the | Calculate a column of $G$ by subtracting from the other columns of matrix $G$ in proportion to the values in vector $w$. | Algorith m |

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|---|---|---|---|
| | weight vector. | | |
| 12 | The method as described in claim 4 wherein the data variance is a parameter of the linear model. | Include variance in the linear equation. | Algorith m |
| 13 | The method as described in claim 4 wherein the linear combination of genotypes is represented in a linear model. | Use a linear model to represent the linear equation. | Algorith m |
| 14 | The method as described in claim 1 wherein the computing step includes determining a probability of each genotype in a set of genotypes of an individual whose DNA is in the DNA mixture. | Calculate a probability. | Algorith m |
| 15 | The method as described in claim 1 wherein the computing step includes determining a relative weight of an individual's DNA in the DNA mixture. | Calculate the *w* value that corresponds to each column in *G*. | Algorith m |
| 16 | The method as described in claim 1 wherein the computing step includes determining a statistical confidence in the genotype of the DNA mixture. | Calculate a confidence interval. | Algorith m |
| 17 | The method as described in claim 1 wherein the computing step includes recording a genotype likelihood or probability of an individual in a report. | Record the result in a report. | Generic Computer |
| 20 | The method as described in claim 1 wherein the determining step can determine a genotype using a computing device with memory. | Use a generic computer with memory to calculate a probability. | Algorith m |
| 22 | The method as described in claim 20 wherein the determining step is performed entirely by computer, without any human intervention during the determining step. | Use a generic computer with memory to calculate a probability without human involvement | Generic Computer |
| 25 | The method as described in claim 1 wherein the DNA mixture contains genetic material from more than two individuals. | Use a DNA sample that contains more than two people. | DNA data |

| | | | |
|---|---|---|---|
| 26 | The method as described in claim 1 wherein the assuming step includes a candidate genotype selected from a database of previously determined genotypes. | Define matrix *G*, where one of the columns is chosen from a database of known genotypes. | Algorith m |
| 31 | The method as described in claim 1 wherein the probability of the quantitative genotyping data is combined with a genotype prior distribution to form a posterior genotype probability distribution. | Calculate a conditional probability. | Algorith m |
| 32 | The method as described in claim 31 wherein the prior distribution is computed from population allele frequency information. | Use a particular data source to calculate the prior distribution for claim 31's conditional probability calculation. | Algorith m |
| 33 | The method as described in claim 31 wherein the prior distribution is uniformly distributed. | Define the prior distribution. | Algorith m |
| 37 | A method as described in claim 1, where the quantitative genotyping data obtained in Step (d) is derived from allele peak height or area. | Transform the DNA sample into DNA data. | DNA data |
| 38 | A method as described in claim 1, where the quantitative genotyping data obtained in Step (d) is derived from repeated experiments. | Transform the DNA sample into DNA data using repeated PCR amplification. | DNA data |
| 51 | A method as described in claim 1, where the data variance value derived in Step (h) is obtained from a calibration. | Calculate a variance. | Algorith m |
| 53 | A method as described in claim 1, where the data variance value derived in Step (h) scales with peak height or area. | Calculate a variance. | Algorith m |
| 55 | A method as described in claim 1, where the probability of the quantitative genotyping data determined in Step (i) uses a function with continuous, rather than binary, values. | Calculate a probability. | Algorith m |
| 57 | A method as described in claim 1, where the probability of the quantitative genotyping data determined in Step (i) uses Markov | Calculate a probability. | Algorith m |

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|---|---|---|---|
| | chain Monte Carlo methods. | | |
| 58 | A method as described in claim 1, where a computer draws a visualization of the computed genotype probability. | Use a generic computer to visualize the probability result. | Generic Computer |
| 60 | A method as described in claim 1, where DNA mixture data is separated into component genotypes having computed probability. | Isolate each column of *G* and calculate a probability. | Algorith m |
| 61 | A method as described in claim 1, where a computer generates a genotype report from the computed probability that includes a figure or a table. | Use a generic computer to generate a report of the probability results. | Generic Computer |
| 63 | A method as described in claim 1, where separated genotypes of contributors to a mixture are stored on a DNA database, along with their computed probability. | Save each column of *G* and the corresponding probability calculation on a generic computer. | Generic Computer |
| 66(a)–(i) | Repeating claim 1 steps (a)–(i) | (see above) | |
| 66(j) | … calculating a likelihood ratio of a hypothesis using the determined probability of the quantitative genotyping data; | Calculate a likelihood ratio. | Algorith m |
| 66(k) | … comparing with a set of suspect genotypes using the likelihood ratio to identify a likely suspect. | Compare likelihood ratios. | Algorith m |
| 67 | A method as described in claim 66 where the likelihood ratio is calculated from a plurality of genetic loci. | Calculate a likelihood ratio. | Algorith m |
| 68 | A method as described in claim 66 where the likelihood ratio hypothesis is related to identifying an individual. | Calculate a likelihood ratio. | Algorith m |
| 69 | A method as described in claim 66, where the likelihood ratio is calculated on genotypes on a DNA database to find genotype association strength. | Calculate a likelihood ratio. | Algorith m |

**Patent '642** ('642 patent at 440–441 (48:36–49:24).)

| Claim Number | Claim Language | Analysis | Category |
|---|---|---|---|
| 1(a)–(c) | … obtaining a biological sample that contains DNA; amplifying the DNA to produce a product; detecting the product to generate data, where the data can be explained by more than one genotype value; | Transform DNA sample into DNA data. | DNA data |
| 1(d) | … assuming a genotype value which is stored in a non-transient memory; | Create a matrix *G* and save it to a generic computer. | Algorithm |
| 1(e) | … deriving with a computer a variance of the amplification; | Calculate the variance of *d*. | Algorithm |
| 1(f) | … determining a likelihood using a computer in communication with the memory, where the likelihood is defined as a probability of observing the generated data, and said probability depends on the genotype value and variance. | Use a generic computer to calculate a probability. | Algorithm |
| 2 | A method as described in claim 1 where after the likelihood determining step there is the step of calculating a likelihood ratio of a hypothesis using the determined likelihood. | Calculate a likelihood ratio. | Algorithm |
| 3 | A method as described in claim 2 where the hypothesis involves an individual contributing their DNA to the biological sample. | Calculate a likelihood ratio. | Algorithm |
| 4 | A method as described in claim 3 where the hypothesis is related to an identity of the individual. | Calculate a likelihood ratio. | Algorithm |
| 5 | A method as described in claim 4 where the likelihood ratio is calculated for two different hypotheses. | Calculate a likelihood ratio. | Algorithm |
| 6 | A method as described in claim 5 where the biological sample is a mixture of DNA from two or more individuals. | Use a DNA sample that includes two or more people to calculate a likelihood ratio. | DNA data |
| 7 | A method as described in claim 6 where after the genotype assuming step there is the step of forming a linear combination of the genotype values. | Form a linear equation of the *G* matrix. | Algorithm |

| | | | |
|---|---|---|---|
| 8 | A method as described in claim 7 where after the product detecting step there is the step of setting a quantity value relative to how much DNA an individual contributed to the mixture. | Calculate $w$, where $w_i = \frac{amount\ of\ person\ i\ in\ DNA\ sample}{DNA\ sample}$ | Algorithm |
| 9 | A method as described in claim 8 where the linear combination of genotype values is weighted by the quantity values. | Include the quantity vector in the equation: $d = G*w$ | Algorithm |
| 10 | A method as described in claim 9 where the data relates to a short tandem repeat (STR) genetic locus. | Use a particular type of data. | DNA data |
| 11 | A method as described in claim 10 where the data contains polymerase chain reaction (PCR) stutter. | Use a particular type of data. | DNA data |
| 12 | A method as described in claim 11 where the determined likelihood includes as a conditional parameter a number of contributors to the biological sample. | Include the number of people in the DNA sample when calculating a likelihood ratio. | Algorithm |
| 13 | A method as described in claim 12 where the amplification step is repeated to obtain additional data for determining the likelihood. | Repeat PCR amplification. | DNA data |
| 14 | A method as described in claim 13 where the likelihood is used in making a comparison with a DNA database. | Compare a column of $G$ (a genotype from the DNA sample) with a genotype from a DNA database. | Algorithm |

As the above tables show, plaintiff's patents claim mathematical algorithms executed by generic computers and transformation of a DNA sample into DNA data. Because plaintiff's claims are directed to abstract ideas or are well-known, routine, and conventional, there is no inventive concept.

## V. CONCLUSION

At Alice Step 1, the claims in the Patents-in-Suit are directed to using mathematical algorithms to compute variance and then account for that variance in other mathematical algorithms to identify a particular person in a mixed-person DNA sample. This is an abstract idea. At Alice Step 2, the claims do not recite an inventive concept, as abstract mathematical algorithms, the well-known application by generic computer, and the well-known transformation of DNA samples into DNA data cannot serve as inventive concepts.

Because plaintiff's claims are not patent eligible under § 101, defendants' Rule 12(b)(6) motion is granted, and this case is dismissed.

**IT IS SO ORDERED**.

Dated: September 29, 2020

**HONORABLE SARA LIOI**
**UNITED STATES DISTRICT JUDGE**