

Keyword(s): 35 U.S.C. § 101, patentability/validity, patentable subject matter, Alice-Mayo framework

General: Claims directed to a mathematical algorithms and mental processes without recitations of how they are applied are unpatentable under Section 101.

In re Board of Trustees of the Leland Stanford Junior University

United States Court of Appeals for the Federal Circuit

No. 2020-1012

Decided: March 11, 2021

I. Facts

The Board of Trustees of the Leland Stanford Junior University (“Stanford”) filed Application No. 13/445,925 (“’925 application”) on April 13, 2012. The ’925 application is directed to methods and computing systems for determining haplotype phase. Haplotype phasing is a process for determining the parent from whom alleles—i.e., versions of a gene—are inherited. According to the written description of the ’925 application, the claimed techniques aid in the interpretation of massive amounts of genetic data produced with each genome sequence by receiving certain types of genetic data and processing the data by performing mathematical calculations and statistical modeling to arrive at a haplotype phase determination. The ’925 application also explains that prior art methods of determining haplotype phase predicted haplotype phases for approximately 80 percent of heterozygous positions while the claimed methods increase the number of possible haplotype phase predictions to 97.9% of the heterozygous positions. The increase in haplotype phase predictions is made possible by factoring additional data into the analysis to allow for haplotype phase to be inferred in regions where the inheritance state is uninformative.

During prosecution, the Examiner rejected claims 1, 4–11, 14–25, and 27–30 as covering patent ineligible abstract mathematical algorithms and mental processes. This rejection was affirmed by the Board. Independent claim 1 is representative:

A method for resolving haplotype phase, comprising:
receiving allele data describing allele information regarding genotypes for a family comprising at least a mother, a father, and at least two children of the mother and the father, where the genotypes for the family contain single nucleotide variants and storing the allele data on a computer system comprising a processor and a memory;
receiving pedigree data for the family describing information regarding a pedigree for the family and storing the pedigree data on a computer system comprising a processor and a memory;
determining an inheritance state for the allele information described in the allele data based on identity between single nucleotide variants contained in the genotypes for the family using a Hidden Markov Model having hidden states implemented on a computer system comprising a processor and a memory, wherein the hidden states comprise inheritance states, a compression fixed error state, and a [Mendelian inheritance error]- rich fixed error state, wherein the inheritance states are maternal identical, paternal identical, identical, and non-identical;

receiving transition probability data describing transition probabilities for inheritance states and storing the transition probability data on a computer system comprising a processor and a memory;

receiving population linkage disequilibrium data and storing the population disequilibrium data on a computer system comprising a processor and a memory;

determining a haplotype phase for at least one member of the family based on the pedigree data for the family, the inheritance state for the information described in the allele data, the transition probability data, and the population linkage disequilibrium data using a computer system comprising a processor and a memory;

storing the haplotype phase for at least one member of the family using a computer system comprising a processor and a memory; and

providing the stored haplotype phase for at least one member of the family in response to a request using a computer system comprising a processor and a memory.

In its analysis of the Examiner's rejections, the Board applied the two-step framework established by the Supreme Court for determining patent eligibility in *Alice Corp. Pty. Ltd. v. CLS Bank Int'l* (Alice). In addressing step one of the Alice inquiry, the Board determined that the eight steps in claim 1 are directed to either the "mental steps of receiving, storing, or providing information" or "mathematical concepts." The Board reasoned that the claim recites steps for receiving and analyzing information, which humans could process in their minds, or by mathematical algorithms, which are mental processes within the abstract idea category. The Board also concluded that the mathematical process recited in the claims is not integrated into a practical application and that the claims do not improve computer technology, but rather use off-the-shelf computing equipment to perform an improved mathematical analysis. The Board also noted that the claims are also unlike those covering animation of 3-D characters in *McRO, Inc. v. Bandai Namco Games America Inc.*, which improve "the computer animation process itself." Thus, the Board concluded that claim 1 is directed to patent ineligible subject matter under § 101.

Turning to step two of the Alice inquiry, the Board concluded that the claims did not include additional limitations that, when taken individually or as a whole, provide an inventive concept that transforms the abstract idea into patent eligible subject matter. The Board found that the steps of receiving data, performing calculations using that data, storing the results, and providing the results upon request using a computer did not go beyond the well-known, routine, and conventional. The Board explained that, although the claims may provide a valuable contribution to science, the contribution does not go beyond patent ineligible mental processes and mathematical operations. The Board separately addressed claims 9 and 19, which recite certain steps culminating in a final step of "providing the drug for treatment." However, the Board determined that claims 9 and 19 are drawn to patent ineligible subject matter because they "are not directed to a specific method of treatment, do not identify specific patients, do not recite a specific compound, do not prescribe particular doses, and do not identify the resulting outcome." Stanford appealed.

II. Issue

Did the Board err in determining that the claims were directed to non-patentable subject matter?

III. Discussion

No. The court laid out the two-step test of Alice of examining whether a claim is directed to patent ineligible subject matter (such as an abstract idea) and if the claim is found to be abstract, the claim is examined to determine whether it contains an inventive concept sufficient to transform the abstract idea into patent eligible subject matter. In this second step, the claim elements are considered individually and as an ordered combination to determine whether any additional limitations amount to significantly more than the ineligible concept.

The court turned to claim 1 and found that on its face, representative claim 1 is drawn to a method for resolving haplotype phase that involves receiving allele data and pedigree data and determining an inheritance state based on the received data using a hidden Markov model. The method then involves receiving transition probability data and population linkage disequilibrium data and determining a haplotype phase based on that received data as well as the earlier-calculated inheritance state using a computer system comprising a processor and a memory. Lastly, the method involves storing the haplotype phase and providing it in response to a request using a computer system comprising a processor and a memory. The court found that claim 1 recites no concrete application for the haplotype phase beyond storing it and providing it upon request.

Stanford argued that claim 1 is not directed to an abstract idea because the specific application of the steps is novel and enables scientists to ascertain more haplotype information than was previously possible (97.9% vs. approximately 80% phasing of all heterozygous positions). The court was unpersuaded, noting that prior cases found that a claim for a new abstract idea is still an abstract idea and that patent law does not protect such claims, without more, no matter how groundbreaking the advance. The court reasoned that the claimed advance proffered by Stanford, that the process yields a greater number of haplotype phase predictions, may constitute a new or different use of a mathematical process, but the court was not persuaded that the process is an improved technological process. The court concluded that claim 1 is directed to the abstract idea of mathematically calculating alleles' haplotype phase.

Turning to step two of the Alice test, the court found claim 1 recites no steps that practically apply the claimed mathematical algorithm. Instead, claim 1 ends at storing the haplotype phase and providing it in response to a request. The court noted that simply storing information and providing it upon request does not alone transform the abstract idea into patent eligible subject matter. The court further noted that claim 1 neither requires, nor results in, a specialized computer or a computer with a specialized memory or processor and the court specifically pointed to the language of claim 1, stating “[i]ndeed, it is hard to imagine a patent claim that recites hardware limitations in more generic terms than the terms employed by claim 1.” Therefore, taken individually, the limitations of claim 1 fail to transform the claims into a patent eligible application. The court also stated that Stanford failed to explain how that combination of elements moves the claimed subject matter beyond the abstract and into the practical. Likewise, the court stated that a specific or different combination of mathematical steps that yields a greater number of haplotype predictions than previously achievable under the prior art is not enough to transform claim 1 into a patent eligible application. The court observed that that alleged innovation accomplished in claim 1 is in the mathematical analysis itself, namely, in the receipt of data, executing mathematical calculations, and storing the resulting data and therefore subsists in the basic tools of scientific and technological work. The court also found that the remaining claims contain no limitations that, when considered individually or as an ordered combination, transform them into patent eligible applications. Therefore, the court held that the Board was correct in finding that the claims of the ‘925 application are drawn to patent ineligible subject matter under § 101.

IV. Conclusion

Improved results are not sufficient alone to render a claim eligible under § 101. Additionally, adding generic computer elements, providing of results, as well as general recitations of medical application of generated results are insufficient to render a claim eligible under § 101.