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EXAMINER
HOLMAN, JOHN D

ART UNIT	PAPER NUMBER
3667	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 18/561,442	Applicant(s) DAI et al.	
	Examiner JOHN D HOLMAN	Art Unit 3666	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 11/16/2023.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-23 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-23 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☑ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 11/16/2023 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☑ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☑ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☑ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Status of Claims

This is the first Office Action on the merits. Claims 1-23 are currently pending and addressed below.

Priority

Receipt is acknowledged of certified copies of priority documents required by 37 CFR 1.55, and a certified English translation of the foreign application pursuant to 37 CFR 41.154(b) and 41.202(e).

Information Disclosure Statement

The information disclosure statement (IDS) submitted on 11/16/2023 was filed before the mailing date of the present Office Action. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclos7ure statement is being considered by the examiner.

Specification

Under 37 CFR 1.52(b)(6),

> Other than in a reissue application or reexamination or supplemental examination proceeding, the paragraphs of the specification, other than in the claims or abstract, may be numbered at the time the application is filed, and should be individually and consecutively

> numbered using Arabic numerals, so as to unambiguously identify each paragraph. The number should consist of at least four numerals enclosed in square brackets, including leading zeros (e.g., [0001]). The numbers and enclosing brackets should appear to the right of the left margin as the first item in each paragraph, before the first word of the paragraph, and should be highlighted in bold. A gap, equivalent to approximately four spaces, should follow the number. Nontext elements (e.g., tables, mathematical or chemical formulae, chemical structures, and sequence data) are considered part of the numbered paragraph around or above the elements, and should not be independently numbered. If a nontext element extends to the left margin, it should not be numbered as a separate and independent paragraph. A list is also treated as part of the paragraph around or above the list, and should not be independently numbered.

The disclosure is objected to because of the following informalities: **the paragraphs are not numbered as requested by 37 CFR 1.52(b)(6)**. Examiner notes that numbering the paragraphs in accordance with 37 CFR 1.52(b)(6) assists with interviews and citations to the instant specification. Examiner kindly requests Applicant submit a new specification which follows the guidance under 37 CFR 1.52(b)(6).[1]

Appropriate correction is required.

Abstract

Applicant is reminded of the proper content of an abstract of the disclosure.

A patent abstract is a concise statement of the technical disclosure of the patent and should include that which is new in the art to which the invention pertains. The abstract should not refer to purported merits or speculative applications of the invention and should not compare the invention with the prior art.

[1] Examiner notes that a Preliminary Amendment was filed on 11/16/2023 amending the specification to add ¶ [0001] while the remaining paragraphs of the specification are not numbered.

If the patent is of a basic nature, the entire technical disclosure may be new in the art, and the abstract should be directed to the entire disclosure. If the patent is in the nature of an improvement in an old apparatus, process, product, or composition, the abstract should include the technical disclosure of the improvement. The abstract should also mention by way of example any preferred modifications or alternatives.

Where applicable, the abstract should include the following: (1) if a machine or apparatus, its organization and operation; (2) if an article, its method of making; (3) if a chemical compound, its identity and use; (4) if a mixture, its ingredients; (5) if a process, the steps.

Extensive mechanical and design details of an apparatus should not be included in the abstract. The abstract should be in narrative form and generally limited to a single paragraph within the range of 50 to 150 words in length.

See MPEP § 608.01(b) for guidelines for the preparation of patent abstracts.

The abstract of the disclosure is objected to because **the Abstract contains 231 words**. A corrected abstract of the disclosure is required and must be presented on a separate sheet, apart from any other text. See MPEP § 608.01(b).

Claim Objections

Claims 6 and 19 are objected to because of the following informalities: **"API" should be fully defined prior to the use of an abbreviation**. Appropriate correction is required.

Claim 12 is objected to as containing a typographical error in referring to "any of the preceding claims" rather than a specific claim. The multiple dependency was corrected in all other

claims in a Preliminary Amendment dated 11/16/2023, except claim 12. Furthermore, Applicant paid for 3 claims in excess of 20, namely 21-23, and not for the number of claims that would be required if claim 12 depended from each of the preceding claims. **For purpose of compact prosecution, Examiner will examine claim 12 as if it were to reference claim 1.**

Claim Interpretation

Claim 9 recites contingent limitations that are not given patentable weight as presently written. Specifically, claim 9 recites "*if* it is possible to reach one respective road segment from the other…" after setting forth functional limitations that occur if this contingent step is performed. The broadest reasonable interpretation of a system (or apparatus or product) claim having structure that performs a function, which only needs to occur if a condition precedent is met, requires structure for performing the function should the condition occur, but not to actually perform the function. MPEP § 2111.04(II). As such, for the purpose of compact prosecution the limitation that precedes the contingent language in claim 9 will be addressed below, but that limitation, as presently written, does not weigh on the patentability of the claim as a whole because the contingent limitation are not positively recited in the claims.

Examiner suggest changing "if" to "when" to positively recite the limitation that precedes "if."

The following is a quotation of 35 U.S.C. 112(f):

> (f) Element in Claim for a Combination. – An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The following is a quotation of pre-AIA 35 U.S.C. 112, sixth paragraph:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The claims in this application are given their broadest reasonable interpretation using the plain meaning of the claim language in light of the specification as it would be understood by one of ordinary skill in the art. The broadest reasonable interpretation of a claim element (also commonly referred to as a claim limitation) is limited by the description in the specification when 35 U.S.C. 112(f) is invoked.

As explained in MPEP § 2181, subsection I, claim limitations that meet the following three-prong test will be interpreted under 35 U.S.C. 112(f):

(A) the claim limitation uses the term "means" or "step" or a term used as a substitute for "means" that is a generic placeholder (also called a nonce term or a non-structural term having no specific structural meaning) for performing the claimed function;

(B) the term "means" or "step" or the generic placeholder is modified by functional language, typically, but not always linked by the transition word "for" (e.g., "means for") or another linking word or phrase, such as "configured to" or "so that"; and

(C) the term "means" or "step" or the generic placeholder is not modified by sufficient structure, material, or acts for performing the claimed function.

Use of the word "means" (or "step") in a claim with functional language creates a rebuttable presumption that the claim limitation is to be treated in accordance with 35 U.S.C. 112(f). The presumption that the claim limitation is interpreted under 35 U.S.C. 112(f) is rebutted when the claim limitation recites sufficient structure, material, or acts to entirely perform the recited function.

Absence of the word "means" (or "step") in a claim creates a rebuttable presumption that the claim limitation is not to be treated in accordance with 35 U.S.C. 112(f). The presumption that the claim limitation is not interpreted under 35 U.S.C. 112(f) is rebutted when the claim limitation recites function without reciting sufficient structure, material or acts to entirely perform the recited function.

Claim limitations in this application that use the word "means" (or "step") are being interpreted under 35 U.S.C. 112(f) except as otherwise indicated in an Office action.

Conversely, claim limitations in this application that do not use the word "means" (or "step") are not being interpreted under 35 U.S.C. 112(f) except as otherwise indicated in an Office action.

This application includes one or more claim limitations that do not use the word "means," but are nonetheless being interpreted under 35 U.S.C. 112(f) because the claim limitation(s) uses a generic placeholder that is coupled with functional language without reciting sufficient structure to perform the recited function and the generic placeholder is not preceded by a structural modifier. Such claim limitation(s) is/are:

(1) "an **attention module**…configured to receive a set of input dimensions for each segment of the route…" (claims 1 and 20; no support found in the specification; see § 112 rejections below);

(2) "an **attention adjust module** configured to receive each set of input dimensions and generate therefrom a weight modifier for modifying attention weights…" (claims 1, 11, and 20; no support found in the specification; see § 112 rejections below);

(A) Each of the limitations (1) - (2) recited above use the generic placeholder "module" for performing a claimed function, or other generic placeholder. See MPEP 2181, 1A ("The following is a list of non-structural generic placeholders that may invoke 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, paragraph 6: "mechanism for," "module for," "device for," "unit for," "component for," "element for," "member for," "apparatus for," "machine for," or "system for." *Welker Bearing Co., v. PHO, Inc.*, 550 F.3d 1090, 1096, 89 USPQ2d 1289, 1293-94 (Fed. Cir. 2008"). Accordingly, recitations of "module" in (1)-(2) above pass prong A.

(B) each of the phrases following the bolded portion in limitations (1)-(2) constitute functional language modifying the generic terms in prong (A), respectively.

(C) each of the terms preceding "module" in (1)-(2) above do not connote sufficient structure for performing the claimed function. In addition, none of the generic placeholders recited in (A) are modified by sufficient structure, materials, or acts for performing the claimed function.

Because these claim limitations are being interpreted under 35 U.S.C. 112(f), they are being interpreted to cover the corresponding structure described in the specification as performing the claimed function, and equivalents thereof.

If applicant does not intend to have these limitations interpreted under 35 U.S.C. 112(f) applicant may: (1) amend the claim limitation(s) to avoid it/them being interpreted under 35 U.S.C. 112(f) (e.g., by reciting sufficient structure to perform the claimed function); or (2) present a sufficient showing that the claim limitation(s) recite(s) sufficient structure to perform the claimed function so as to avoid it/them being interpreted under 35 U.S.C. 112(f).

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

Claims 1-23 rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor (or for applications subject to pre-AIA 35 U.S.C. 112, the applicant), regards as the invention.

Claims 1 and 20 recite the limitations "attention module" and "attention adjust module," which invoke 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. However, the written description fails to disclose the corresponding structure, material, or acts for performing the entire claimed function and to clearly link the structure, material, or acts to the function.

While both terms appear in the specification in the form of a verbatim recitation of the claim set, there is no description that would constitute sufficient supporting structure for the two modules. Furthermore, the specification describes an "attention mechanism," "attention head," "attention function," "attention score," and "attention layer." However, there is no descriptive connections between these terms and the claimed "attention module" or "attention adjust module." Therefore, the claims are indefinite and are rejected under 35 U.S.C. 112(b) or pre-AIA 35 U.S.C. 112, second paragraph.

Claims 2-19 and 21-23 depend from claim 1 and 20 and, therefore, are indefinite for the same reason.

Applicant may:

(a) Amend the claim so that the claim limitation will no longer be interpreted as a limitation under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph;

(b) Amend the written description of the specification such that it expressly recites what structure, material, or acts perform the entire claimed function, without introducing any new matter (35 U.S.C. 132(a)); or

(c) Amend the written description of the specification such that it clearly links the structure, material, or acts disclosed therein to the function recited in the claim, without introducing any new matter (35 U.S.C. 132(a)).

If applicant is of the opinion that the written description of the specification already implicitly or inherently discloses the corresponding structure, material, or acts and clearly links them to the function so that one of ordinary skill in the art would recognize what structure, material, or acts perform the claimed function, applicant should clarify the record by either:

(a) Amending the written description of the specification such that it expressly recites the corresponding structure, material, or acts for performing the claimed function and clearly links or associates the structure, material, or acts to the claimed function, without introducing any new matter (35 U.S.C. 132(a)); or

(b) Stating on the record what the corresponding structure, material, or acts, which are implicitly or inherently set forth in the written description of the specification, perform the claimed function. For more information, see 37 CFR 1.75(d) and MPEP §§ 608.01(o) and 2181.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> 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.

Claims 21 and 22 are rejection under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claims do not fall within at least one of the four categories of patent eligible subject matter because the claims recite only software *per se* without any physical or tangible form. Specifically, claims 21 and 22 are directed toward a computer program product and a computer program which, under the broadest reasonable interpretation, is software *per se*. Software *per se* is not patentable under § 101; therefore, the claimed inventions do not fall within a statutory class of patentable subject matter. See MPEP § 2106.03(I).

NOTE: For compact prosecution, if claims 21 and 22 are amended to overcome the software *per se* rejection without further amendment to overcome the below abstract idea discussed in claim 20, claims 21 and 22 would remain subject to a § 101 rejection based on reciting an abstract idea without significantly more.

Claims 1-20 and 23 are rejected under 35 U.S.C. 101 because they recite an abstract idea without significantly more.

101 Analysis - Step 1

Claims 1-17 recite an apparatus, therefore claims 1-17 are a machine, which is within at least one of the four statutory categories.

Claim 18 recites a system, therefore claim 18 is a machine, which is within at least one of the four statutory categories.

Claim 19 recites a device, therefore claim 19 is a machine, which is within at least one of the four statutory categories.

Claim 20 recites a method, therefore claim 20 is a process, which is within at least one of the four statutory categories.

Claim 23 recite a non-transitory storage medium storing instructions, therefore claim 23 is a machine, which is within at least one of the four statutory categories.

101 Analysis - Step 2A, Prong 1

Regarding Prong 1 of the Step 2A analysis, the claims are to be analyzed to determine whether they recite subject matter that falls within one of the follow groups of abstract ideas: a) mathematical concepts, b) certain methods of organizing human activity, and/or c) mental processes.

Independent claim 1 includes limitations that recite an abstract idea (emphasized below) and will be used as a representative claim for the remainder of the 101 rejection. Claim 1 recites:

A computer-implemented apparatus for predicting traffic conditions in respect of a specified route within a road network, the apparatus comprising a processor and a memory, and being configured, under control of the processor, to execute instructions stored in the memory to:

receive input data representative of said specified route comprising one or more road segments between a start location and a destination selected from within a road network representing a geographical region;

obtain a diffusion graph representative of said specified route, said diffusion graph comprising edges connected by nodes, wherein a weight associated with each edge comprises a respective transition probability representing a likelihood of traffic on a respective road segment diffusing to another road segment; and

use a Transformer-based framework to predict a traffic condition for each segment of the route;

wherein said Transformer-based framework comprises an attention module and an input configured to receive a set of input dimensions for each segment of the route, said dimensions including at least a respective transition probability and temporal data, said Transformer-based framework further comprising an attention adjust module configured to receive each set of input dimensions and generate therefrom a weight modifier for modifying attention weights generated by said attention module based on the likelihood of a traffic state on one road segment influencing a traffic state on another road segment.

These limitations, as drafted, is a method that, under its broadest reasonable interpretation, covers performance of the limitation as certain mental processes and/or mathematical concepts. That is, nothing in the claim elements preclude the steps from practically being performed as in the mind (or on paper). For example, "obtaining a diffusion graph..." encompass a human mentally creating a graphical representation of the route and assigning a weight to each edge comprising a transition probability and/or simply using a mathematical concept to draw a graph of representative of the route on paper. Thus, the claim recites at least one abstract idea. The other independent claims of similar scope of claim 1 also recite at least one abstract idea.

101 Analysis - Step 2A, Prong 2

Regarding Prong 2 of the Step 2A analysis in the 2019 PEG, the claims are to be analyzed to determine whether the claim, as a whole, integrates the abstract into a practical application. It must be determined whether any additional elements in the claim beyond the abstract idea integrate the exception into a practical application in a manner that imposes a meaningful limit on the judicial exception. The courts have indicated that additional elements merely using a computer to implement an abstract idea, adding insignificant extra solution activity, or generally linking use of a judicial exception to a particular technological environment or field of use do not integrate a judicial exception into a "practical application."

In the present case, the additional limitations beyond the above-noted abstract idea are as follows (where the underlined portions are the "additional limitations" while the bolded portions continue to represent the "abstract idea"):

A computer-implemented apparatus for predicting traffic conditions in respect of a specified route within a road network, the apparatus comprising a processor and a memory, and being configured, under control of the processor, to execute instructions stored in the memory to:

receive input data representative of said specified route comprising one or more road segments between a start location and a destination selected from within a road network representing a geographical region;

obtain a diffusion graph representative of said specified route, said diffusion graph comprising edges connected by nodes, wherein a weight associated with each edge comprises

a respective transition probability representing a likelihood of traffic on a respective road segment diffusing to another road segment; and

use a Transformer-based framework to predict a traffic condition for each segment of the route;

wherein said Transformer-based framework comprises an attention module and an input configured to receive a set of input dimensions for each segment of the route, said dimensions including at least a respective transition probability and temporal data, said Transformer-based framework further comprising an attention adjust module configured to receive each set of input dimensions and generate therefrom a weight modifier for modifying attention weights generated by said attention module based on the likelihood of a traffic state on one road segment influencing a traffic state on another road segment.

For the following reason(s), the examiner submits that the above identified additional limitations do not integrate the above-noted abstract idea into a practical application.

The limitation of "receiving input data…" merely describes how to generally gather data, *i.e.*, receiving, recited at a high level of generality, and thus are insignificant extra-solution activity. See MPEP § 2106.05(g) ("whether the limitation is significant"). In addition, the uses of the recited judicial exception require such data gathering and, as such, these limitations do not impose any meaningful limits on the claim. The limitation amounts to necessary data gathering. MPEP § 2106.05. Furthermore, the processor, memory, and transformer-based framework comprising modules are recited at a high level of generality such that is amounts to no more than mere instructions to apply the exception using generic computer components.

Taken alone, the additional elements do not integrate the abstract idea into a practical application. Further, looking at the additional limitations as an ordered combination or as a whole, the limitations add nothing that is not already present when looking at the elements taken individually. For instance, there is no indication that the additional elements, when considered as a whole, reflect an improvement in the functioning or an improvement to another technology or technical field, apply or use the above-noted judicial exception to effect a particular process for creating a graphical representation of the route and assigning a weight to each edge comprising a transition probability, implement/use the above-noted judicial exception with a particular machine or manufacture that is integral to the claim, effect a transformation or reduction of a particular article to a different state or thing, or apply or use the judicial exception in some other meaningful way beyond generally linking the use of the judicial exception to a particular technological environment, such that the claim as a whole is not more than a drafting effort designed to monopolize the exception (MPEP§ 2106.05). Accordingly, the additional limitations do not integrate the abstract idea into a practical application because it does not impose any meaningful limits on practicing the abstract idea.

101 Analysis - Step 2B

Regarding Step 2B of the 2019 PEG, representative independent claim 1 does not include additional elements (considered both individually and as an ordered combination) that are sufficient to amount to significantly more than the judicial exception for the same reasons to those discussed above with respect to determining that the claim does not integrate the abstract idea into a practical application. As discussed above with respect to integration of the abstract idea into a practical application, the additional element of a processor, memory, and transformer-based

framework creating a graphical representation of the route and assigning a weight to each edge comprising a transition probability amounts to nothing more than mere instructions to apply the exception using a generic computer component. Mere instructions cannot provide an inventive concept. Moreover, the "receiving input data…" amounts to nothing more than insignificant extra solution activities.

A conclusion that an additional element is insignificant extra solution activity in Step 2A must be re-evaluated in Step 2B to determine if the element is more than what is well-understood, routine, and conventional in the field. In this case, the additional limitations of "receiving input data…" are well-understood, routine, and conventional activities. Additionally, the remaining elements have all been deemed insignificant extra solution activity by one or more Courts; *see at least* MPEP 2106.05(d) and MPEP 2106.05(g):

a. ***receiving input data…*** is considered well-understood, routine, and conventional activity under *Symantec,* 838 F.3d at 1321, 120 USPQ2d at 1362 (utilizing an intermediary computer to forward information); *TLI Communications LLC v. AV Auto. LLC,* 823 F.3d 607, 610, 118 USPQ2d 1744, 1745 (Fed. Cir. 2016) (using a telephone for image transmission); *OIP Techs., Inc., v. Amazon.com, Inc.,* 788 F.3d 1359, 1363, 115 USPQ2d 1090, 1093 (Fed. Cir. 2015) (sending messages over a network); *buySAFE, Inc. v. Google, Inc.,* 765 F.3d 1350, 1355, 112 USPQ2d 1093, 1096 (Fed. Cir. 2014) (computer receives and sends information over a network).

Because the claims fail to recite anything sufficient to amount to significantly more than the judicial exception, independent claims 1, 12, 18-20, and 23 are patent ineligible under 35 U.S.C. 101.

Dependent claims 2-11, and 13-17 have been given the full two-part analysis and determined to specify limitations that elaborate on the abstract idea of claims 1, 12, and 20, and thus are directed to an abstract idea, do not recite additional limitations that integrate the claim into a practical application or amount to "significantly more" for similar reasons.

Claim Rejections - 35 USC § 103

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis (i.e., changing from AIA to pre-AIA) for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims the examiner presumes that the subject matter of the various claims was commonly owned as of the effective filing date of the claimed invention(s) absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and effective filing dates of each claim that was not commonly owned as of the effective filing date of the later invention in order for the examiner to consider the applicability of 35 U.S.C. 102(b)(2)(C) for any potential 35 U.S.C. 102(a)(2) prior art against the later invention.

Claims 1-23 are rejected under 35 U.S.C. 103 as being unpatentable over U.S. Pub. No. 2019/0204100 to Sharma in view of U.S. Pub. No. 2022/0277329 to Li et al.

Regarding claims 1 and 20-23, Sharma discloses:

A computer-implemented apparatus for predicting traffic conditions in respect of a specified route within a road network, the apparatus comprising a processor and a memory, and being configured, under control of the processor, to execute instructions stored in the memory to (¶ [0030] application server 110; ¶ [0033] application server comprises a processor and memory; ¶ [0036] describing the processor; ¶ [0039 describing the traffic predictor):

receive input data representative of said specified route comprising one or more road segments between a start location and a destination selected from within a road network representing a geographical region (¶ [0029] describing receiving a ride request that includes a start location and a destination within a road network representing a geographical region);

obtain a diffusion graph representative of said specified route, said diffusion graph comprising edges connected by nodes (Figure 3B depicting the nodes 302n-324n, road segments

302-324, and edges 334-394; ¶ [0045] describing the graph generated by the graph generator that includes the nodes, segments, and edges); **and**

input configured to receive a set of input dimensions for each segment of the route, including temporal data (¶ [0008] describing using day of the week, type of road, etc. as input; ¶¶ [0039], [0047] describing using a time period as input data).

Sharma does not expressly disclose wherein a weight associated with each edge comprises a respective transition probability representing a likelihood of traffic on a respective road segment diffusing to another road segment; and use a Transformer-based framework to predict a traffic condition for each segment of the route; wherein said Transformer-based framework comprises an attention module and an input configured to receive a set of input dimensions for each segment of the route, said dimensions including at least a respective transition probability and temporal data, said Transformer-based framework further comprising an attention adjust module configured to receive each set of input dimensions and generate therefrom a weight modifier for modifying attention weights generated by said attention module based on the likelihood of a traffic state on one road segment influencing a traffic state on another road segment.

Li et al, in the same field of endeavor, teaches a weight associated with each edge comprises a respective transition probability representing a likelihood of traffic on a respective road segment diffusing to another road segment; and use a Transformer-based framework to predict a traffic condition for each segment of the route; wherein said Transformer-based framework comprises an attention module and an input configured to receive a set of input dimensions for each segment of the route, said dimensions including at least a respective transition probability and temporal data, said Transformer-based framework further comprising an attention adjust module configured to receive each set of

input dimensions and generate therefrom a weight modifier for modifying attention weights generated by said attention module based on the likelihood of a traffic state on one road segment influencing a traffic state on another road segment (¶¶ [0078], [0079] describing using a transformer-based framework comprising an attention module and an attention adjust module to assign weights to each edge associated with a respective transition probability, to receive input dimensions for each segment, and to modify, or re-weight, the attention weights based on the transition probability; see also ¶¶ [0097], [0098] describing using the attention module and weighted segments to determine a plurality of probabilities of the vehicle transitioning to a different segment, or neighboring areas).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of the claimed invention to modify Sharma's invention to incorporate a weight associated with each edge comprises a respective transition probability representing a likelihood of traffic on a respective road segment diffusing to another road segment; and use a Transformer-based framework to predict a traffic condition for each segment of the route; wherein said Transformer-based framework comprises an attention module and an input configured to receive a set of input dimensions for each segment of the route, said dimensions including at least a respective transition probability and temporal data, said Transformer-based framework further comprising an attention adjust module configured to receive each set of input dimensions and generate therefrom a weight modifier for modifying attention weights generated by said attention module based on the likelihood of a traffic state on one road segment influencing a traffic state on another road segment, as taught by Li et al., with a reasonable expectation of success in casting higher weights into nearby grids possessing a better supply-demand ratio (e.g., a lower supply/demand ratio or

a higher demand/supply ratio, indicating high demand but low supply) than the current grid, so that more attention will be given to action destinations with abundant ride requests, and to obtain a dense and robust supply-demand context segment representation (Li et al. at ¶¶ [0078], [0079]).

Claim 20 contains the same limitations of claim 1.

Regarding claim 21 specifically, Sharma further discloses a computer program product (¶ [0081] computer program product).

Regarding claim 22 specifically, Sharma further discloses a computer program comprising instructions (¶ [0036] describing the computer instruction used to execute the function).

Regarding claim 23 specifically, Sharma further discloses a non-transitory storage medium storing instructions (¶ [0078] describing the non-transitory storage medium having instructions stored thereon).

Regarding claim 2, the combination of Sharma and Li et al. renders obvious all the limitations of claim 1. Sharma further discloses:

wherein each said set of input dimensions includes temporal data in the form of a day of the week and a time period represented by respective numerical values (¶ [0008] describing using day of the week, type of road, etc. as input; ¶¶ [0039], [0047] describing using a time period as input data).

Regarding claim 3, the combination of Sharma and Li et al. renders obvious all the limitations of claim 1. Sharma further discloses:

wherein each said set of input dimensions includes numerical data representative of a road type and/or a vehicle type in relation to travel along said specified route (¶ [0008] describing using day of the week, type of road, etc. as input; ¶¶ [0039], [0047] describing using a time period as input data).

Regarding claim 4, the combination of Sharma and Li et al. renders obvious all the limitations of claim 1. Sharma further discloses:

wherein each said set of input dimensions includes data representative of a speed of travel on a road segment and/or a length of a road segment (¶ [0008] describing using normalized default speed associated with the plurality of road segments).

Regarding claim 5, the combination of Sharma and Li et al. renders obvious all the limitations of claim 4. Sharma further discloses:

wherein said data representative of a speed of travel and/or said data representative of a length of a road segment is/are normalized in each said set of input dimensions (¶ [0008] describing using normalized default speed associated with each of the plurality of road segments, set of input dimensions).

Regarding claim 6, the combination of Sharma and Li et al. renders obvious all the limitations of claim 1. Sharma further discloses:

configured to receive said specified route from a routing API (¶¶ [0031], [0032] describing an API, or application server, sending and receiving the routes).

Regarding claim 7, the combination of Sharma and Li et al. renders obvious all the limitations of claim 1. Sharma further discloses:

further configured to calculate a travel time in respect of said specified route based on the predicted traffic conditions (¶ [0032] describing determining a travel time based on the predicted traffic conditions).

Regarding claim 8, the combination of Sharma and Li et al. renders obvious all the limitations of claim 1. Sharma further discloses:

further configured to output the predicted traffic conditions in relation to said specified route on a display (¶ [0037] describing that the determined travel time, which is based on the predicted traffic conditions, or travel cost, which is also based on the predicted traffic conditions, is presented to the user via a display).

Regarding claim 9, the combination of Sharma and Li et al. renders obvious all the limitations of claim 1. Sharma further discloses:

configured to obtain an edge-based graph representative of said specified route in which each vertex represents a segment of the road network, and a vertex is connected to an adjacent vertex if it is possible to reach one respective road segment from the other, and to determine the diffusion graph using the edge-based graph (Figure 3B depicting the nodes 302n-324n, road segments 302-324, and edges 334-394, including each vertex being connected to an adjacent vertex via graph nodes if possible to reach one respective segment from the other; ¶ [0045] describing the graph generated by the graph generator that includes the nodes, segments, and edges, which includes vertices).

Regarding claim 10, the combination of Sharma and Li et al. renders obvious all the limitations of claim 1. Li et al. further discloses:

configured to determine respective transition probabilities in the diffusion graph based on corresponding weights in the edge-base graph (¶¶ [0078], [0079] describing using a transformer-based framework comprising an attention module and an attention adjust module to assign weights to each edge associated with a respective transition probability, to receive input dimensions for each segment, and to modify, or re-weight, the attention weights based on the transition probability; see also ¶¶ [0097], [0098] describing using the attention module and weighted segments to determine a plurality of probabilities of the vehicle transitioning to a different segment, or neighboring areas, in an edge based graph).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of the claimed invention to modify Sharma's invention to incorporate determining respective transition probabilities in the graph based on corresponding weights in the edge-based graph, as taught by Li et al., with a reasonable expectation of success in casting higher weights into nearby grids possessing a better supply-demand ratio (e.g., a lower supply/demand ratio or a higher demand/supply ratio, indicating high demand but low supply) than the current grid, so that more attention will be given to action destinations with abundant ride requests, and to obtain a dense and robust supply-demand context segment representation (Li et al. at ¶¶ [0078], [0079]).

Regarding claim 11, the combination of Sharma and Li et al. renders obvious all the limitations of claim 1. Li et al. further discloses:

wherein the attention adjust module is configured to generate the weight modifier for modifying attention weights based on distances between road segments (¶¶ [0078], [0079] describing modifying the attention weights based on distance between nearby grids, or segments).

It would have been obvious to a person having ordinary skill in the art before the effective filing date of the claimed invention to modify Sharma's invention to incorporate modifying the attention weights based on distances between road segments, as taught by Li et al., with a reasonable expectation of success in casting higher weights into nearby grids possessing a better supply-demand ratio (e.g., a lower supply/demand ratio or a higher demand/supply ratio, indicating high demand but low supply) than the current grid, so that more attention will be given to action destinations with abundant ride requests, and to obtain a dense and robust supply-demand context segment representation (Li et al. at ¶¶ [0078], [0079]).

Regarding claim 12, Sharma discloses:

A communications apparatus for allocating resources to service requests related to a shared economy on-demand travel and/or transport service provision, the communications apparatus comprising a processor, a memory (¶ [0049] describing the communication networking comprising a processor and memory) **and a computer-implemented apparatus according to [claim 1] for predicting traffic conditions** (See claim 1 above), **and being configured, under control of the processor, to:**

receive a service request; identify a start location and a destination specified in said service request; obtain a recommended route comprising one or more road segments between said start location and said destination selected from within a road network

representing a geographical region; identify a service provider for fulfilling said service request; and input said recommended route and data representative of said service provider to said apparatus for predicting traffic conditions to generate a set of predicted traffic condition data associated with said one or more road segments in said recommended route (¶ [0032] describing receiving a service request that identifies a start and destination, identifies available service providers and inputs the route and service provider to determine the travel time for each route, which is based on the predicted traffic conditions in response to the booking request).

Regarding claim 13, the combination of Sharma and Li et al. renders obvious all the limitations of claim 12. Sharma further discloses:

configured to output said predicted traffic condition data in association with said recommended route on a user display (¶ [0037] describing that the determined travel time, which is based on the predicted traffic conditions, or travel cost, which is also based on the predicted traffic conditions, is presented to the user via a display).

Regarding claim 14, the combination of Sharma and Li et al. renders obvious all the limitations of claim 12. Sharma further discloses:

further configured to predict an arrival time of said service provider at said destination using the predicted traffic condition data (¶¶ [0031], [0032] describing predicting an arrival time and travel time to the destination based on the predicted traffic consdition).

Regarding claim 15, the combination of Sharma and Li et al. renders obvious all the limitations of claim 14. Sharma further discloses:

further configured to allocate another service request to said service provider based on said predicted arrival time at said destination of the previous service request (¶ [0037] describing presenting the user with the route information, which includes the predicted arrival time at the destination, and the user sending another service request in the form of a service confirmation, which the service provider then allocates the vehicle to the user).

Regarding claim 16, the combination of Sharma and Li et al. renders obvious all the limitations of claim 12. Sharma further discloses:

comprising a data store in which is stored edge-based graph data for said road network, and wherein said apparatus for predicting traffic conditions is further configured to selectively retrieve said edge-based graph data representative of a recommended route from said data store (¶ [0038] describing the data storage of the graph generator that contains the graph data for the road network where the edge-based graph data representative of the route is retrieved from).

Regarding claim 17, the combination of Sharma and Li et al. renders obvious all the limitations of claim 16. Sharma further discloses:

wherein said data store is a distributed data store comprising a plurality of memory locations, each memory location storing edge-based graph data for a different respective portion of said road network (¶ [0033] describing using a plurality devices at different locations

that have graph data stored thereon, and retrieved by the graph generator to generate the edge-based graph of the route for the particular segment that the device storage is located).

Regarding claim 18, Sharma discloses:

A communications system for allocating resources to service requests related to a shared economy on-demand transport and/or delivery service provision, the communications system comprising at least one user communications device and communications network equipment operable for the communications server apparatus and the at least one user communications device to establish communication with each other therethrough, and at least one service provider communications device and communications network equipment operable for the communications server apparatus and the at least one service provider communications device to establish communication with each other therethrough (Figure 1, Ref. No. 114 communication network, 108 passenger device, 110 application server, 102 and 104 plurality of vehicle with on-board devices)**, the communications server apparatus comprising a processor, a memory and a computer-implemented apparatus according to claim 1** (See claim 1 above), **and being configured, under the control of the processor, to execute instructions stored in the memory to:**

receive a service request from the user communications device; input a start location and a destination specified in said service request to a routing API to obtain a recommended route comprising one or more road segments between said start location and said destination selected from within a road network representing a geographical region; identify a service provider for fulfilling said service request; and input said recommended route and data representative of said service provider to said apparatus for predicting traffic conditions to

generate a set of predicted traffic condition data associated with said one or more road segments in said recommended route (¶ [0032] describing receiving a service request from a user communication device to a routing API, or application server, that identifies a start and destination, identifies available service providers and inputs the route and service provider to determine the travel time for each route, which is based on the predicted traffic conditions in response to the booking request).

Regarding claim 19, Sharma discloses:

A service provider communications device for receiving data representative of service requests allocated to a service provider from a communications server apparatus via a communications network, the service provider communications device comprising a routing API (Figure 1, Ref. No. 114 communication network, 108 passenger device, 110 application server (includes routing API), 102 and 104 plurality of vehicle with on-board devices)**, and a computer-implemented apparatus according to a claim 1** (See claim 1 above), **a processor and a memory, and being configured, under control of the processor, to execute instructions stored in the memory to:**

receive data representative of a service request including a start location and a destination; input said start location and destination specified in said service request to said routing API to obtain a recommended route comprising one or more road segments between said start location and said destination selected from within a road network representing a geographical region; and input said recommended route and data representative of said service provider to said apparatus for predicting traffic conditions to generate a set of predicted traffic condition data associated with said one or more road segments in said

recommended route (¶ [0032] describing receiving a service request from a user communication device to a routing API, or application server, that identifies a start and destination, identifies available service providers and inputs the route and service provider to determine the travel time for each route, which is based on the predicted traffic conditions in response to the booking request).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. **U.S. Pub. No. 2023/0058520 to Jiang et al.** teaches receiving a route, obtaining a graphical representative having nodes and edges, and uses a transform-based framework comprising an attention module to predict traffic conditions (Figure 2; ¶¶ [0058] – [0067]).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN D HOLMAN whose telephone number is (571)270-5291. The examiner can normally be reached M-F 7:30am-4pm ET.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hitesh Patel can be reached at 571-270-5442. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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