



US012051205B1

(12) **United States Patent**
Deutsch et al.

(10) **Patent No.: US 12,051,205 B1**
(45) **Date of Patent: Jul. 30, 2024**

(54) **SYSTEMS AND METHODS FOR INTERACTING WITH A LARGE LANGUAGE MODEL**

(71) Applicant: **OpenAI Opco, LLC**, San Francisco, CA (US)

(72) Inventors: **Noah Deutsch**, San Francisco, CA (US); **Benjamin Zweig**, San Francisco, CA (US)

(73) Assignee: **OpenAI OpCo, LLC**, San Francisco, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **18/475,722**

(22) Filed: **Sep. 27, 2023**

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G06T 7/10 (2017.01)

(52) **U.S. Cl.**
CPC **G06T 7/10** (2017.01); **G06T 2200/24** (2013.01)

(58) **Field of Classification Search**
CPC G06T 7/10-194; G06V 10/70-87
See application file for complete search history.

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Primary Examiner — Sean T Motsinger

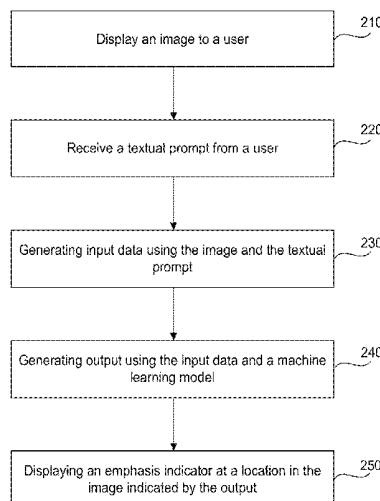
(74) *Attorney, Agent, or Firm* — Finnegan, Henderson, Farabow, Garrett & Dunner LLP

(57) **ABSTRACT**

Disclosed embodiments may include a method of interacting with a multimodal machine learning model; the method may include providing a graphical user interface associated with a multimodal machine learning model. The method may further include displaying an image to a user in the graphical user interface. The method may also include receiving a textual prompt from the user and then generating input data using the image and the textual prompt. The method may further include generating an output at least in part by applying the input data to the multimodal machine learning model, the multimodal machine learning model configured using prompt engineering to identify a location in the image conditioned on the image and the textual prompt, wherein the output includes a first location indication. The method may also include displaying, in the graphical user interface, an emphasis indicator at the indicated first location in the image.

20 Claims, 15 Drawing Sheets

200





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(12) **United States Patent**
Deutsch et al.

(10) **Patent No.: US 12,039,431 B1**
(45) **Date of Patent: Jul. 16, 2024**

(54) **SYSTEMS AND METHODS FOR INTERACTING WITH A MULTIMODAL MACHINE LEARNING MODEL**

(71) Applicant: **c/o OpenAI Opco, LLC**, San Francisco, CA (US)

(72) Inventors: **Noah Deutsch**, San Francisco, CA (US); **Nicholas Turley**, San Francisco, CA (US); **Benjamin Zweig**, San Francisco, CA (US)

(73) Assignee: **OpenAI OpCo, LLC**, San Francisco, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **18/475,588**

(22) Filed: **Sep. 27, 2023**

(51) **Int. Cl.**
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G06N 3/08 (2023.01)

(52) **U.S. Cl.**
CPC **G06N 3/0455** (2023.01); **G06N 3/08** (2013.01)

(58) **Field of Classification Search**
CPC G06N 3/0455; G06N 3/08
See application file for complete search history.

(56) **References Cited**

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Primary Examiner — Xuemei G Chen

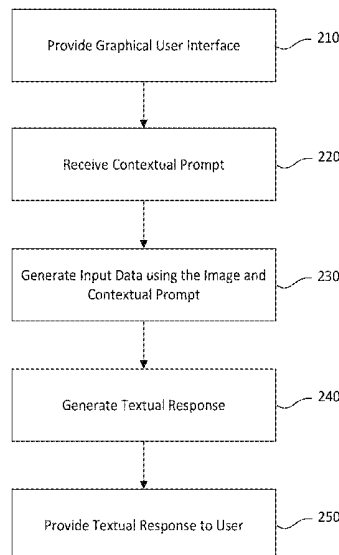
(74) *Attorney, Agent, or Firm* — Finnegan, Henderson, Farabow, Garrett & Dunner LLP

(57) **ABSTRACT**

The disclosed embodiments may include a method of interacting with a multimodal machine learning model; the method may include providing a graphical user interface associated with a multimodal machine learning model. The method may further include displaying an image to a user in the graphical user interface. The method may also include receiving a textual prompt from the user and then generating input data using the image and the textual prompt. The method may further include generating an output at least in part by applying the input data to the multimodal machine learning model, the multimodal machine learning model configured using prompt engineering to identify a location in the image conditioned on the image and the textual prompt, wherein the output comprises a first location indication. The method may also include displaying, in the graphical user interface, an emphasis indicator at the indicated first location in the image.

20 Claims, 12 Drawing Sheets

200





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(12) **United States Patent**
Ramesh et al.

(10) **Patent No.:** **US 11,983,806 B1**
(45) **Date of Patent:** **May 14, 2024**

(54) **SYSTEMS AND METHODS FOR IMAGE GENERATION WITH MACHINE LEARNING MODELS**

10/77; G06V 30/413; G06V 30/1444; G06V 10/82; G06V 30/19147; G06V 10/774; G06F 18/214; G06N 3/08; G06N 3/047; G06N 3/045

(71) Applicant: **c/o OpenAI Opco, LLC**, San Francisco, CA (US)

See application file for complete search history.

(72) Inventors: **Aditya Ramesh**, San Francisco, CA (US); **Alexander Nichol**, San Francisco, CA (US); **Prafulla Dhariwal**, San Francisco, CA (US)

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(73) Assignee: **OpenAI Opco, LLC**, San Francisco, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(21) Appl. No.: **18/458,907**

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Primary Examiner — Duy M Dang

(51) **Int. Cl.**

G06K 9/36	(2006.01)
G06T 5/00	(2006.01)
G06T 11/60	(2006.01)
G06V 10/77	(2022.01)

(74) *Attorney, Agent, or Firm* — Finnegan, Henderson, Farabow Garrett & Dunner LLP

(52) **U.S. Cl.**

CPC **G06T 11/60** (2013.01); **G06T 5/00** (2013.01); **G06V 10/77** (2022.01); **G06T 2207/20104** (2013.01); **G06T 2207/20221** (2013.01)

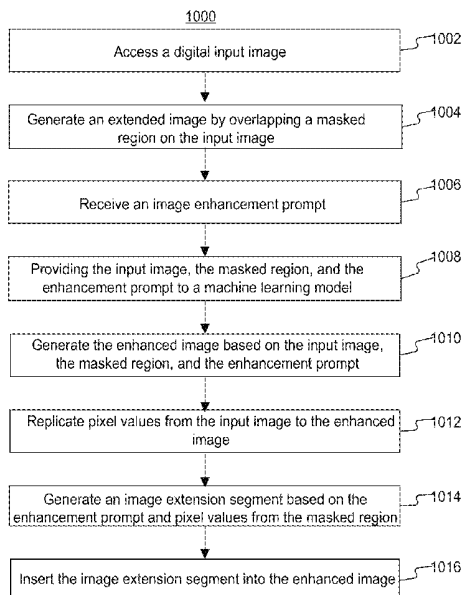
(57) **ABSTRACT**

Disclosed herein are methods, systems, and computer-readable media for regenerating a region of an image with a machine learning model based on a text input. Disclosed embodiments involve accessing a digital input image. Disclosed embodiments involve generating a masked image by removing a masked region from the input image. Disclosed embodiments involve accessing a text input corresponding to an image enhancement prompt. Disclosed embodiments include providing at least one of the input image, the masked region, or the text input to a machine learning model configured to generate an enhanced image. Disclosed embodiments involve generating, with the machine learning model, the enhanced image based on at least one of the input image, the masked region, or the text input.

(58) **Field of Classification Search**

CPC . G06T 11/60; G06T 5/00; G06T 2207/20104; G06T 2207/20221; G06T 7/11; G06T 7/187; G06T 7/70; G06T 7/73; G06T 7/75; G06T 7/77; G06T 11/00; G06T 2207/10004; G06T 2207/20084; G06T 2207/20081; G06T 2207/30196; G06V

20 Claims, 12 Drawing Sheets





US011887367B1

(12) **United States Patent**
Baker et al.

(10) **Patent No.:** **US 11,887,367 B1**
(45) **Date of Patent:** **Jan. 30, 2024**

(54) **USING MACHINE LEARNING TO TRAIN AND USE A MODEL TO PERFORM AUTOMATIC INTERFACE ACTIONS BASED ON VIDEO AND INPUT DATASETS**

(71) Applicant: **OpenAI Opco, LLC**, San Francisco, CA (US)

(72) Inventors: **Bowen Baker**, Nevada City, CA (US); **Ilge Akkaya**, Palo Alto, CA (US); **Peter Zhokhov**, South San Francisco, CA (US); **Joost Huizanga**, San Francisco, CA (US); **Jie Tang**, San Francisco, CA (US); **Adrien Ecoffet**, Burlingame, CA (US); **Brandon Houghton**, San Francisco, CA (US); **Raul Sampedro Gonzalez**, San Mateo, CA (US); **Jeffrey Clune**, Vancouver (CA)

(73) Assignee: **OpenAI Opco, LLC**, San Francisco, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **18/303,552**

(22) Filed: **Apr. 19, 2023**

(51) **Int. Cl.**
G06V 20/40 (2022.01)
G06V 10/774 (2022.01)

(52) **U.S. Cl.**
CPC **G06V 20/41** (2022.01); **G06V 10/774** (2022.01)

(58) **Field of Classification Search**
CPC G06V 20/41; G06V 10/774
See application file for complete search history.

(56) **References Cited**

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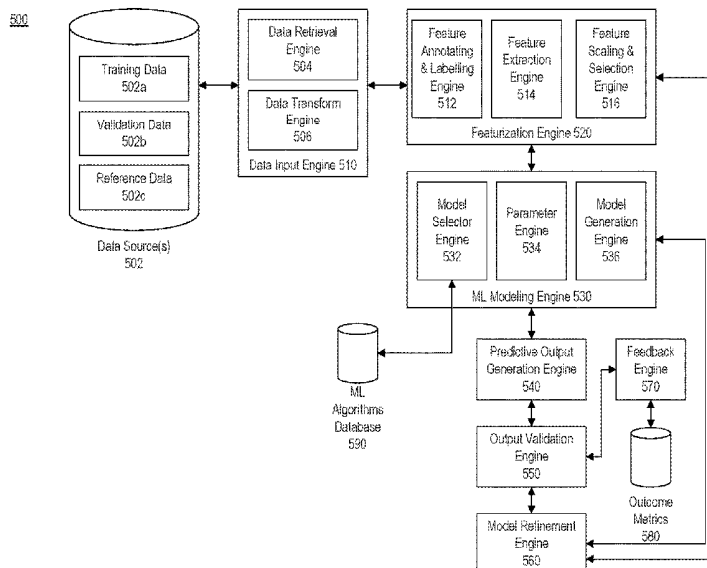
Primary Examiner — Md K Talukder

(74) *Attorney, Agent, or Firm* — Finnegan, Henderson, Farabow Garrett & Dunner LLP

(57) **ABSTRACT**

Disclosed herein are methods, systems, and computer-readable media for training a machine learning model to label unlabeled data and/or perform automated actions. In an embodiment, a method comprises receiving unlabeled digital video data, generating pseudo-labels for the unlabeled digital video data, the generating comprising receiving labeled digital video data, training an inverse dynamics model (IDM) using the labeled digital video data, and generating at least one pseudo-label for the unlabeled digital video data, wherein the at least one pseudo-label is based on a prediction, generated by the IDM, of one or more actions that mimic at least one timestep of the unlabeled digital video data. In some embodiments, the method further comprises adding the at least one pseudo-label to the unlabeled digital video data and further training the IDM or a machine learning model using the pseudo-labeled digital video data.

20 Claims, 5 Drawing Sheets





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(12) **United States Patent**
Ramesh et al.

(10) **Patent No.: US 11,922,550 B1**
(45) **Date of Patent: Mar. 5, 2024**

(54) **SYSTEMS AND METHODS FOR
HIERARCHICAL TEXT-CONDITIONAL
IMAGE GENERATION**

(71) Applicant: **OpenAI Opco, LLC**, San Francisco,
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(72) Inventors: **Aditya Ramesh**, San Francisco, CA
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(73) Assignee: **OpenAI Opco, LLC**, San Francisco,
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patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **18/193,427**

(22) Filed: **Mar. 30, 2023**

(51) **Int. Cl.**
G06T 11/60 (2006.01)
G06F 40/284 (2020.01)
G06F 40/30 (2020.01)
G06N 3/045 (2023.01)
G06N 3/08 (2023.01)

(Continued)

(52) **U.S. Cl.**
CPC **G06T 11/60** (2013.01); **G06F 40/284**
(2020.01); **G06F 40/30** (2020.01); **G06N**
3/045 (2023.01); **G06N 3/08** (2013.01); **G06T**
9/002 (2013.01); **G06T 11/001** (2013.01)

(58) **Field of Classification Search**
CPC G06T 11/60; G06T 40/284; G06T 40/30;
G06T 9/002; G06T 11/001; G06N 3/045;
G06N 3/08; G06F 40/284; G06F 40/30

See application file for complete search history.

(56) **References Cited**

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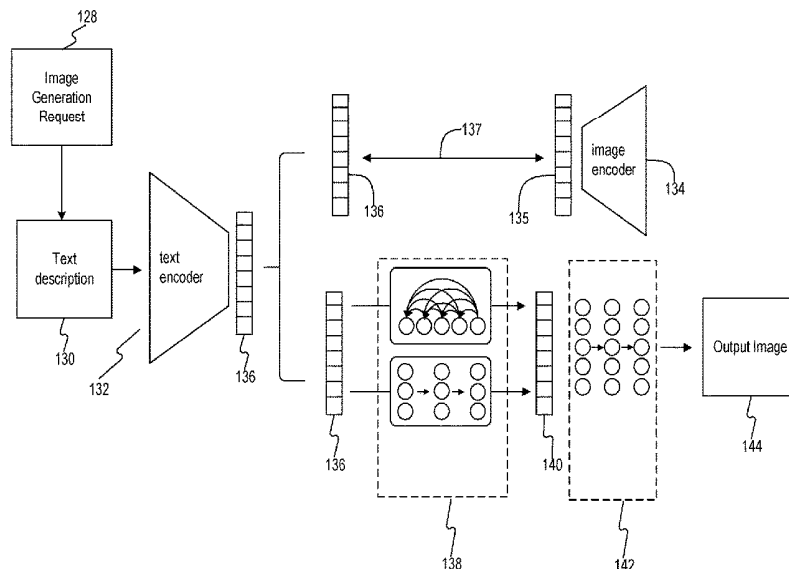
Primary Examiner — Jin Cheng Wang

(74) *Attorney, Agent, or Firm* — Finnegan, Henderson,
Farabow, Garrett & Dunner LLP

(57) **ABSTRACT**

Disclosed herein are methods, systems, and computer-readable media for generating an image corresponding to a text input. In an embodiment, operations may include accessing a text description and inputting the text description into a text encoder. The operations may include receiving, from the text encoder, a text embedding, and inputting at least one of the text description or the text embedding into a first sub-model configured to generate, based on at least one of the text description or the text embedding, a corresponding image embedding. The operations may include inputting at least one of the text description or the corresponding image embedding, generated by the first sub-model, into a second sub-model configured to generate, based on at least one of the text description or the corresponding image embedding, an output image. The operations may include making the output image, generated by the first second sub-model, accessible to a device.

20 Claims, 5 Drawing Sheets





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(12) **United States Patent**
Mishchenko et al.

(10) **Patent No.:** **US 11,922,144 B1**
(45) **Date of Patent:** **Mar. 5, 2024**

(54) **SCHEMA-BASED INTEGRATION OF EXTERNAL APIs WITH NATURAL LANGUAGE APPLICATIONS**

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(71) Applicant: **OpenAI Opco, LLC**, San Francisco, CA (US)

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(72) Inventors: **Andrey Mishchenko**, San Francisco, CA (US); **David Medina**, San Francisco, CA (US); **Paul McMillan**, San Francisco, CA (US); **Athyuttam Eleti**, San Francisco, CA (US)

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(73) Assignee: **OpenAI Opco, LLC**, San Francisco, CA (US)

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

Primary Examiner — Hanh Thi-Minh Bui

(74) *Attorney, Agent, or Firm* — Finnegan, Henderson, Farabow, Garrett & Dunner LLP

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(57) **ABSTRACT**

(51) **Int. Cl.**
G06F 8/35 (2018.01)
G06F 16/332 (2019.01)
G06F 16/34 (2019.01)

Disclosed herein are methods, systems, and computer-readable media for integrating a particular external application programming interface (API) with a natural language model user interface. In one embodiment, a method includes receiving a first input at the natural language model user interface, determining the first input includes a request to integrate the particular external application programming interface (API) with the natural language model user interface, identifying the particular external API based on the received input, integrating the particular external API with the natural language model user interface, accessing the particular external API based on the first input or a second input at the natural language model user interface, and transmitting, based on the accessing, a response message to the natural language model user interface, the response message including a result of the accessing.

(52) **U.S. Cl.**
CPC **G06F 8/35** (2013.01); **G06F 16/3329** (2019.01); **G06F 16/345** (2019.01)

(58) **Field of Classification Search**
CPC G06F 8/35; G06F 16/3329; G06F 16/345
See application file for complete search history.

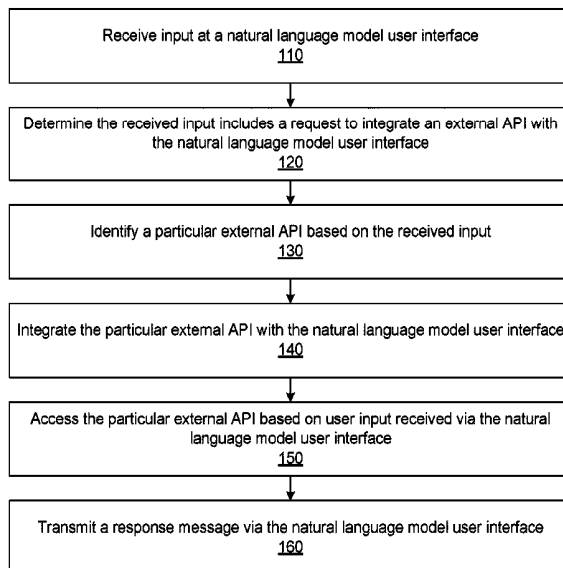
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12 Claims, 5 Drawing Sheets

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(12) **United States Patent**
Puri et al.

(10) **Patent No.:** **US 11,983,488 B1**
(45) **Date of Patent:** **May 14, 2024**

(54) **SYSTEMS AND METHODS FOR LANGUAGE MODEL-BASED TEXT EDITING**

(71) Applicant: **OpenAI Opco, LLC**, San Francisco, CA (US)

(72) Inventors: **Raul Puri**, San Francisco, CA (US);
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Nikolas Tezak, San Francisco, CA (US);
Nicholas Ryder, San Francisco, CA (US)

(73) Assignee: **OpenAI OpCo, LLC**, San Francisco, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(51) **Int. Cl.**
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G06F 40/103 (2020.01)
G06F 40/40 (2020.01)

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CPC **G06F 40/166** (2020.01); **G06F 40/103** (2020.01); **G06F 40/40** (2020.01)

(58) **Field of Classification Search**
CPC G06F 40/166; G06F 40/103; G06F 40/40; G06F 3/167; G06F 16/90335; G10L 15/26; G10L 15/22; G06N 3/044
See application file for complete search history.

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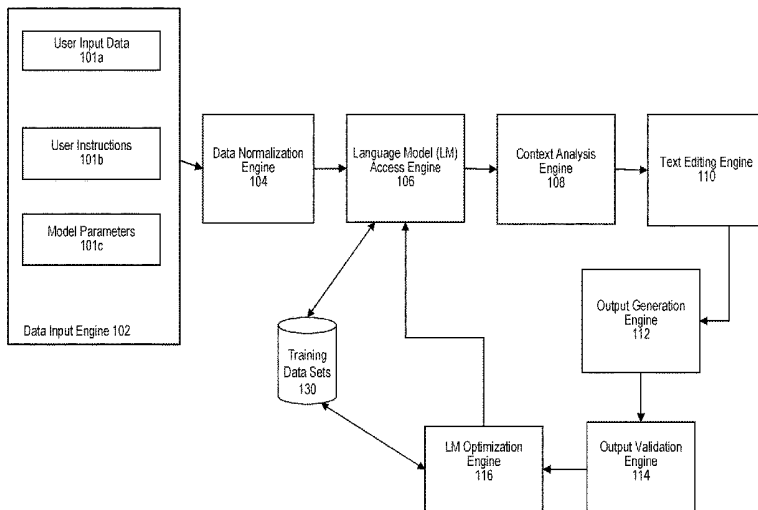
Primary Examiner — Richmond Dorvil
Assistant Examiner — Nadira Sultana
(74) *Attorney, Agent, or Firm* — Finnegan, Henderson, Farabow, Garrett & Dunner LLP

(57) **ABSTRACT**

Disclosed herein are methods, systems, and computer-readable media for automatically generating and editing text. In an embodiment, a method may include receiving an input text prompt and receiving one or more user instructions. The method may also include accessing a language model based on the input text prompt and the one or more user instructions. The method may also include outputting, using the accessed language model, language model output text. The method may also include editing the input text prompt based on the language model and the one or more user instructions by replacing at least a portion of the input text prompt with the language model output text.

16 Claims, 11 Drawing Sheets

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(12) **United States Patent**
Bavarian et al.

(10) **Patent No.: US 11,886,826 B1**
(45) **Date of Patent: Jan. 30, 2024**

(54) **SYSTEMS AND METHODS FOR LANGUAGE MODEL-BASED TEXT INSERTION**

(56) **References Cited**

- (71) Applicant: **OpenAI Opco, LLC**, San Francisco, CA (US)
- (72) Inventors: **Mohammad Bavarian**, San Francisco, CA (US); **Heewoo Jun**, San Francisco, CA (US)
- (73) Assignee: **OpenAI Opco LLC**, San Francisco, CA (US)

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(21) Appl. No.: **18/183,898**

* cited by examiner

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Primary Examiner — Satwant K Singh

- (51) **Int. Cl.**
G06F 17/00 (2019.01)
G06F 40/40 (2020.01)
G06F 40/166 (2020.01)
G06F 40/253 (2020.01)
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G06N 20/00 (2019.01)

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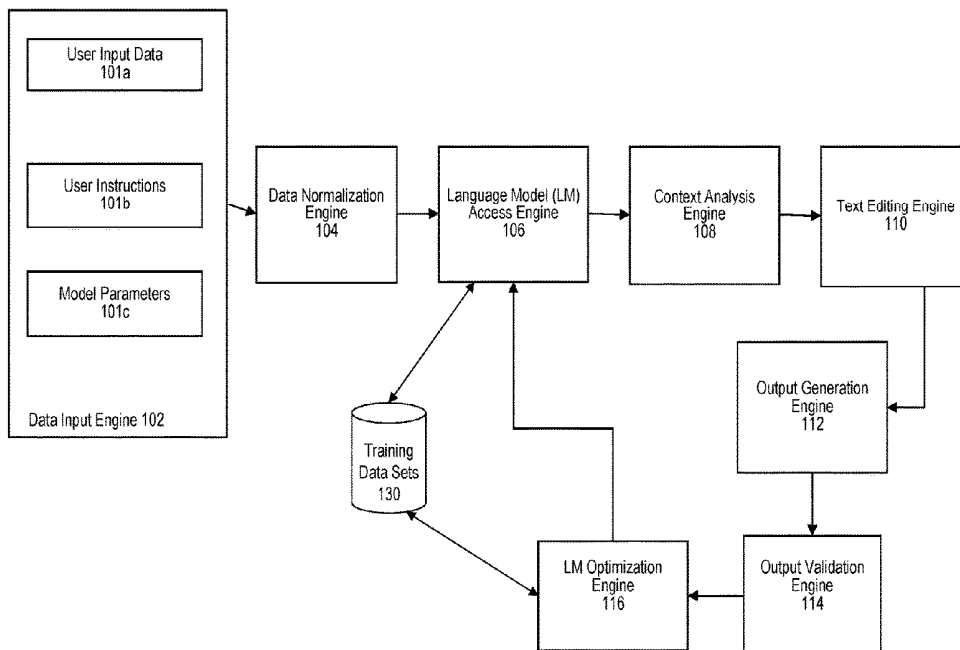
(57) **ABSTRACT**

Disclosed herein are methods, systems, and computer-readable media for automatically generating and inserting text. In an embodiment, a method may include receiving an input text prompt comprising a prefix portion and a suffix portion. The method may also include accessing a language model based on the input text prompt, and determining a set of context parameters based on the input text prompt and the language model. The method may also include generating an output text prompt based on the set of context parameters and the language model, and inserting the output text prompt into the input text prompt.

- (58) **Field of Classification Search**
None
See application file for complete search history.

20 Claims, 11 Drawing Sheets

100





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(54) **SYSTEMS AND METHODS FOR USING CONTRASTIVE PRE-TRAINING TO GENERATE TEXT AND CODE EMBEDDINGS**

(52) **U.S. Cl.**
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(57) **ABSTRACT**

Embodiments of the present disclosure may include systems, methods, and computer readable media for generating a vector representation, including receiving a training data set, the training data set including a plurality of paired data samples corresponding to positive example pairs, each positive example pair including a first data unit and a second data unit. Embodiments may also include converting the training data set into at least one first vector of a vector representation. Embodiments may further include accessing one or more negative example pairs to contrast against the positive example pairs. Embodiments may also include converting the one or more negative example pairs into one or more second vectors of the vector representation. Embodiments may further include training an artificial machine learning model to generate additional vectors of the vector representation. Further embodiments may include systems, methods, and media for determining semantic similarity based on one or more vector representations.

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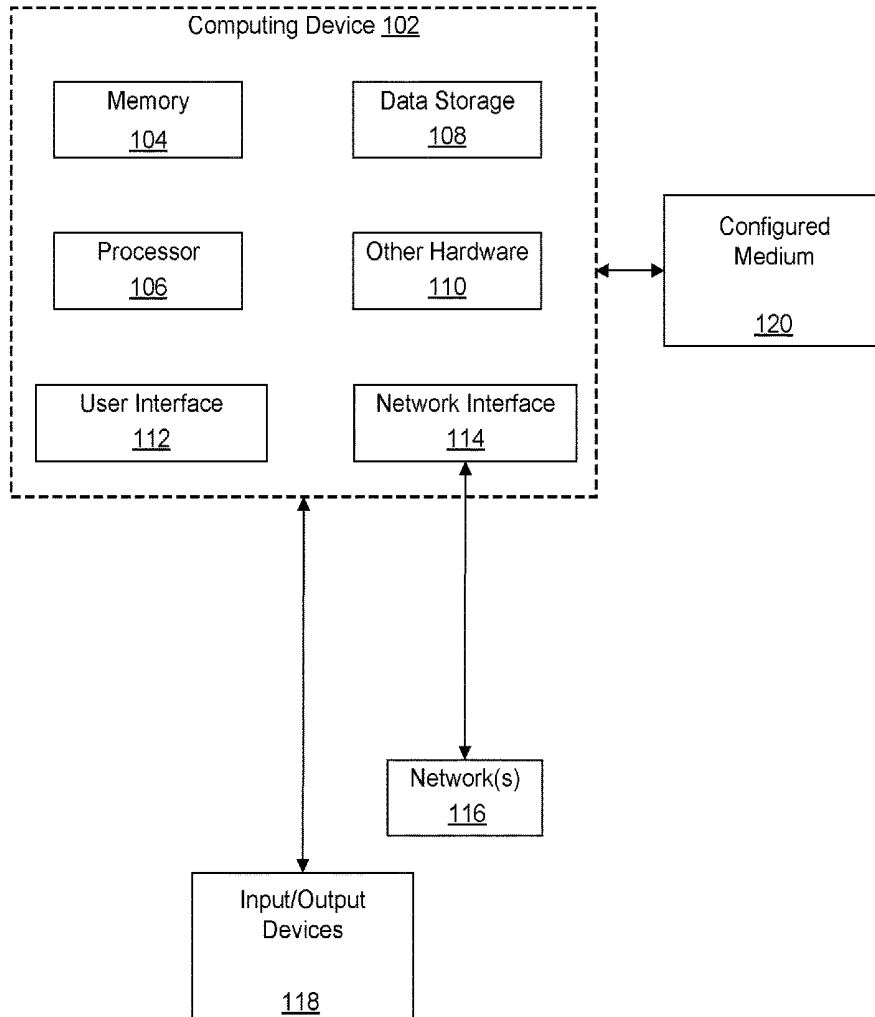
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(54) **SYSTEMS AND METHODS FOR GENERATING NATURAL LANGUAGE USING LANGUAGE MODELS TRAINED ON COMPUTER CODE**

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(57) **ABSTRACT**

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Disclosed herein are methods, systems, and computer-readable media for generating natural language based on computer code input. In an embodiment, a method may comprise one or more of: accessing a docstring generation model configured to generate docstrings from computer code; receiving one or more computer code samples; generating, using the docstring generation model and based on the received one or more computer code samples, one or more candidate docstrings representing natural language text, each of the one or more candidate docstrings being associated with at least a portion of the one or more computer code samples; identifying at least one of the one or more candidate docstrings that provides an intent of the at least a portion of the one or more computer code samples; and/or outputting, via a user interface, the at least one identified docstring with the at least a portion of the one or more computer code samples.

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