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Patenting Artificial Intelligence in the United States

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Agenda

- What is AI
- Statistics
- Eligibility
- Practical Tips

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Artificial Intelligence H.R. 5515

The term ``artificial intelligence'' includes each of the following:
(1) Any artificial system that performs tasks under varying and unpredictable circumstances *without significant human oversight*, or that can *learn* from experience and improve performance when exposed to data set
(2) An artificial system developed in computer software, physical hardware, or other context that *solves tasks requiring human-like perception, cognition, planning, learning, communication, or physical action*
(3) An artificial system designed to *think or act like a human*, including cognitive architectures and neural networks.
(4) A set of techniques, including machine learning that is designed to *approximate a cognitive task*.
(5) An artificial system designed to *act rationally*, including an intelligent software agent or embodied robot that achieves goals *using perception, planning, reasoning, learning, communicating, decision-making, and acting*.

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Basic Categories

- System Architecture
  - Neural Networks; expert systems
- Data Processing
  - Problem Solving; Reasoning; Planning
- Learning/Training
  - Deep Learning; supervised v unsupervised
- AI embedded Apparatus/Method
  - Smart Home/IoT; security/fraud; VPAs (personal assistants); smart vehicles

Application of AI Examples

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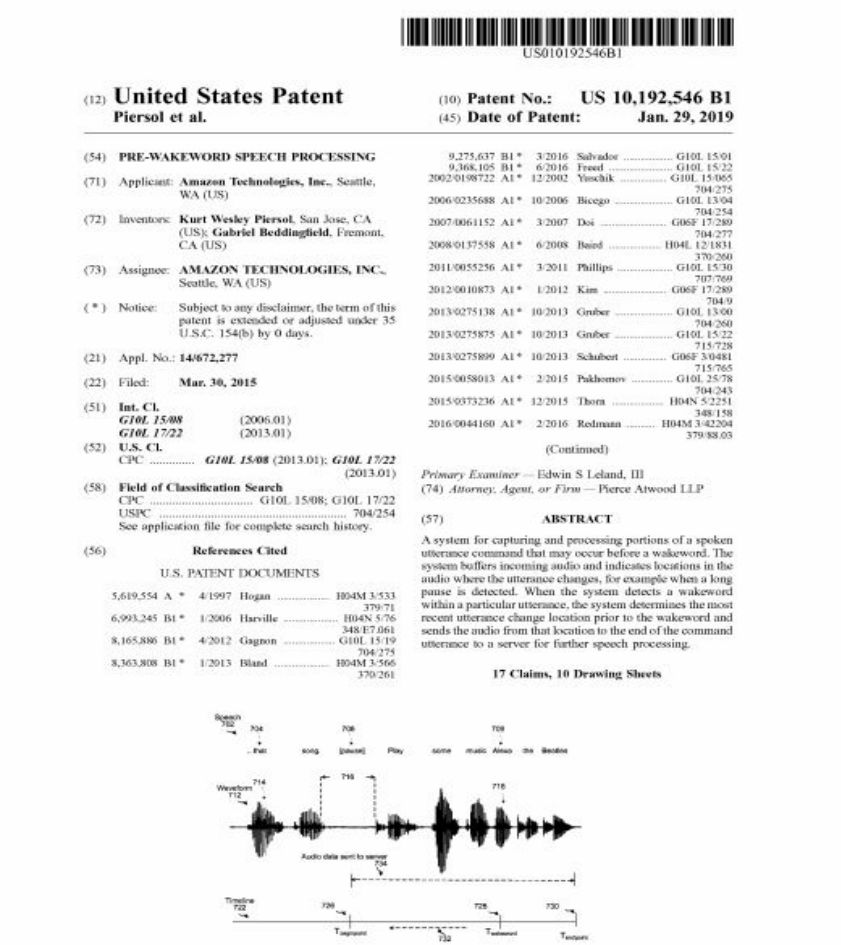
ALEXA Patent Example



US010192546B1

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

(10) **Patent No.: US 10,192,546 B1**
(45) **Date of Patent: Jan. 29, 2019**

(54) **PRE-WAKEWORD SPEECH PROCESSING**

(71) Applicant: **Amazon Technologies, Inc.**, Seattle, WA (US)

(72) Inventors: **Kurt Wesley Piersol**, San Jose, CA (US); **Gabriel Beddingfield**, Fremont, CA (US)

(73) Assignee: **AMAZON TECHNOLOGIES, INC.**, Seattle, WA (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.: **14/672,277**

(22) Filed: **Mar. 30, 2015**

(51) **Int. Cl.**
G10L 15/08 (2006.01)
G10L 17/22 (2013.01)

(52) **U.S. Cl.**
CPC ***G10L 15/08*** (2013.01); ***G10L 17/22*** (2013.01)

(58) **Field of Classification Search**
CPC G10L 15/08; G10L 17/22
USPC 704/254
See application file for complete search history.

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(Continued)

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(74) *Attorney, Agent, or Firm* — Pierce Atwood LLP

(57) **ABSTRACT**

A system for capturing and processing portions of a spoken utterance command that may occur before a wakeword. The system buffers incoming audio and indicates locations in the audio where the utterance changes, for example when a long pause is detected. When the system detects a wakeword within a particular utterance, the system determines the most recent utterance change location prior to the wakeword and sends the audio from that location to the end of the command utterance to a server for further speech processing.

17 Claims, 10 Drawing Sheets

- 1. A computer-implemented method, comprising:
- receiving audio;
- storing, in non-transitory memory, audio data representing the audio;
- determining a first location in the audio data that includes a first amount of non-speech audio data;
- determining a wakeword at a second location in the audio data, the audio data including non-wakeword speech between the first location and the second location;
- determining a third location in the audio data that includes a second amount of non-speech audio data, the third location being after the second location in the audio data; and
- selecting, for speech processing, a portion of the audio data starting with the first location and ending with the third location, the portion of the audio data comprising at least the non-wakeword speech.

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(43) **Pub. Date: May 23, 2019**

(54) **PRE-WAKEWORD SPEECH PROCESSING**

(71) Applicant: **Amazon Technologies, Inc.**, Seattle, WA (US)

(72) Inventors: **Kurt Wesley Piersol**, San Jose, CA (US); **Gabriel Beddingfield**, Fremont, CA (US)

(21) Appl. No.: **16/256,376**

(22) Filed: **Jan. 24, 2019**

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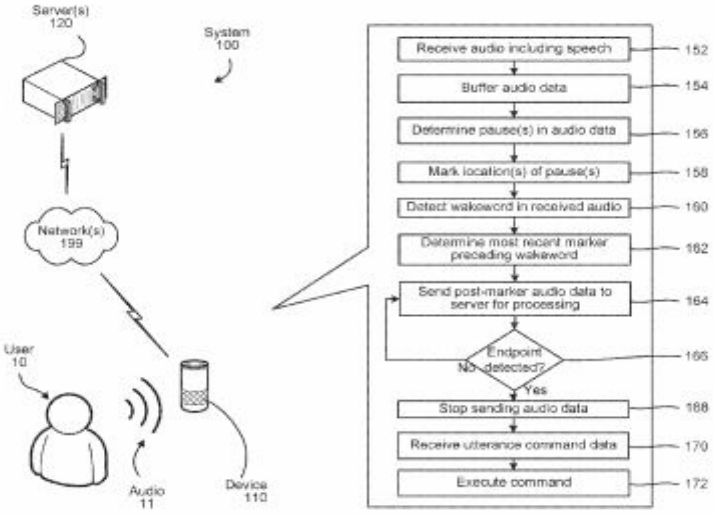
Publication Classification

(51) **Int. Cl.**
G10L 15/08 (2006.01)
G10L 17/22 (2006.01)

(52) **U.S. Cl.**
CPC ***G10L 15/08*** (2013.01); ***G10L 17/22*** (2013.01)

(57) **ABSTRACT**

A system for capturing and processing portions of a spoken utterance command that may occur before a wakeword. The system buffers incoming audio and indicates locations in the audio where the utterance changes, for example when a long pause is detected. When the system detects a wakeword within a particular utterance, the system determines the most recent utterance change location prior to the wakeword and sends the audio from that location to the end of the command utterance to a server for further speech processing.



13. A computing system comprising:

at least one processor;

a memory including instructions operable to be executed by the at least one processor to cause the system to perform a set of actions comprising:

receiving audio comprising speech;

storing audio data representing the speech in a non-transitory memory;

determining a first location in the audio data associated with a change in a characteristic of the speech;

determining a wakeword at a second location in the audio data;

determining a speech endpoint at a third location in the audio data;

determining a first portion of audio data, wherein the first portion of audio data begins proximate to the first location and ends proximate to the third location; and

selecting the first portion of audio data for speech processing.

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AI Patent Statistics in the USPTO

Source: “Mapping the Movement of AI into the Marketplace with Patent Data” (2018)

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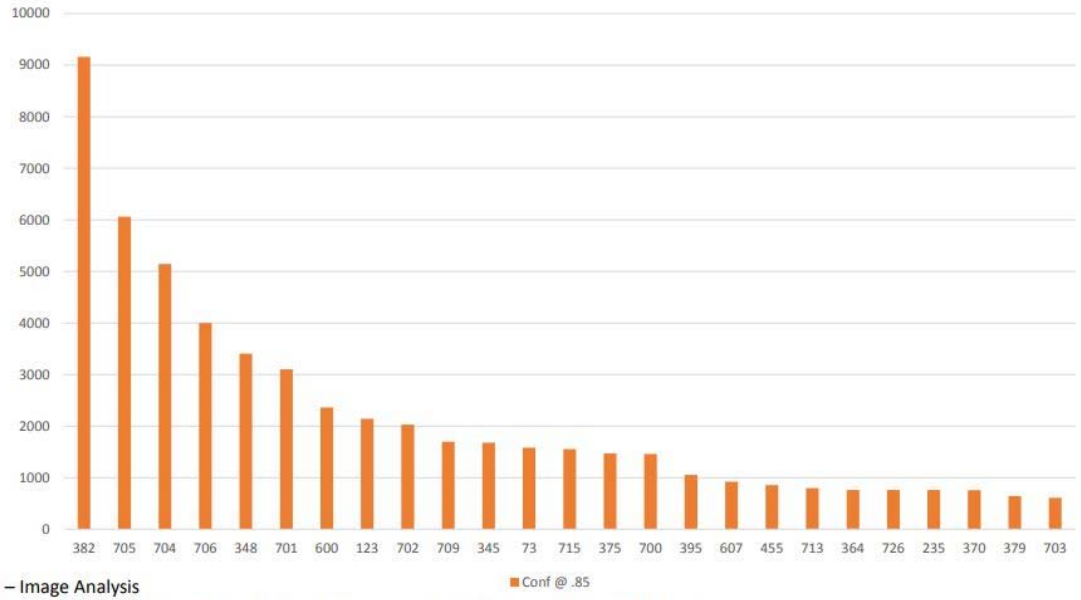
Issued Patents by Class (1990-2018)

Figure 1 AI Patents by Patent Class



382 – Image Analysis
705 – Data processing: financial, business practice, management, or cost/price determination
704 – Data processing: Speech, Linguistics, Language Translation, Audio (de)compression
706 - Data processing: Artificial Intelligence
348 –Television
702 – Data processing: Vehicles, Navigation, and Relative Location
600 – Surgery
123 – Internal Combustion Engines

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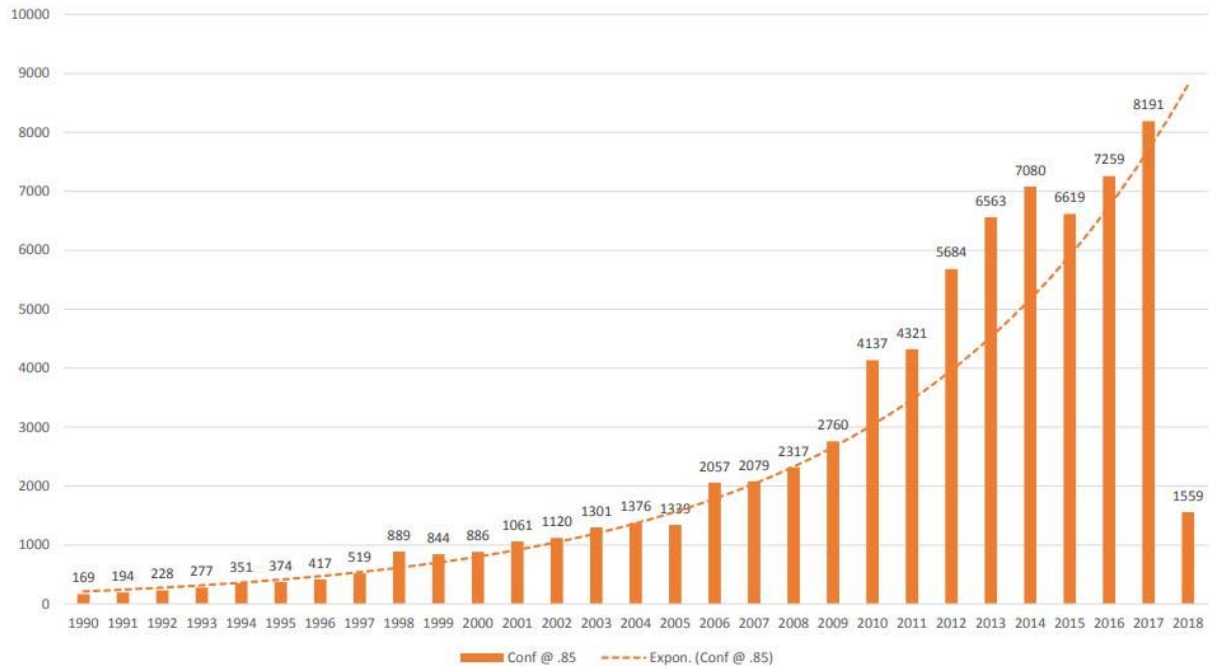
Numbers by Filing Date (1990-2018)

Figure 2 AI Patents by Patent Application Date



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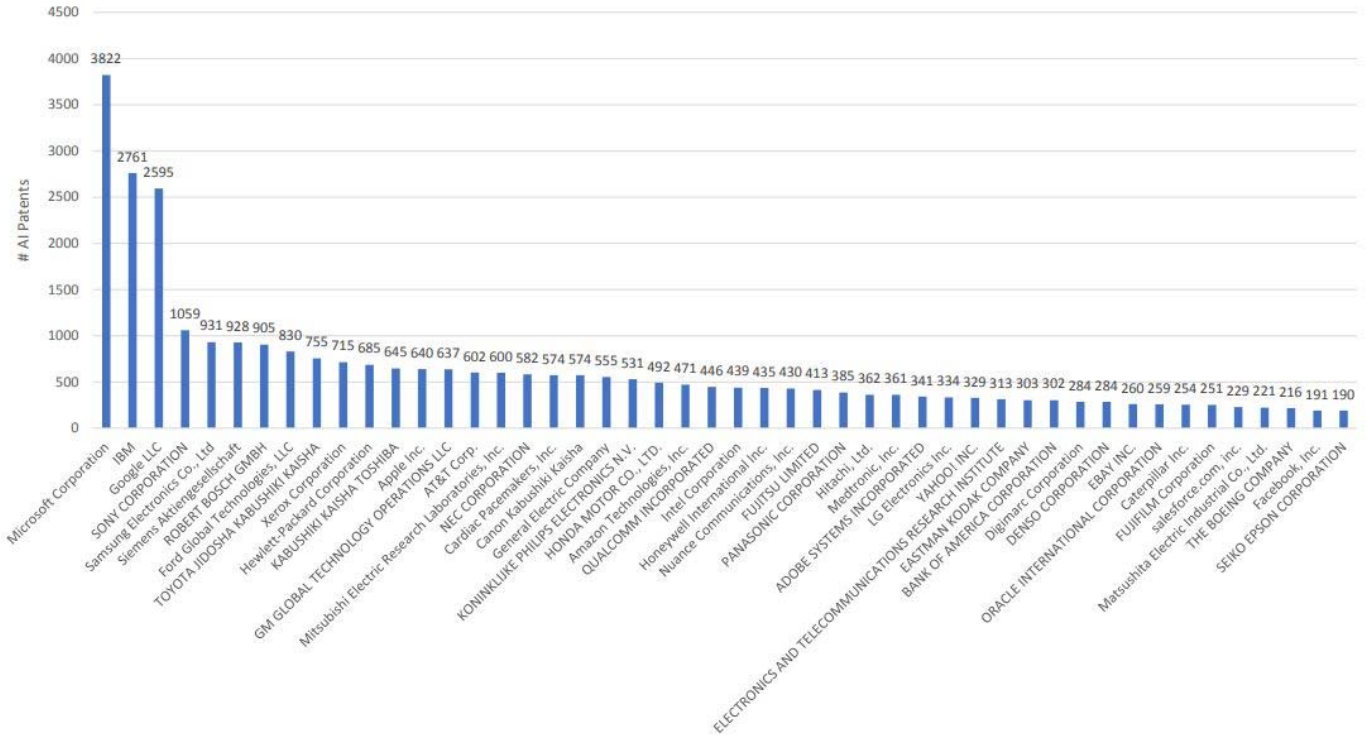
Assignee (1990-2018)

Figure 3 AI Patents by Assignee (Patent Owner)



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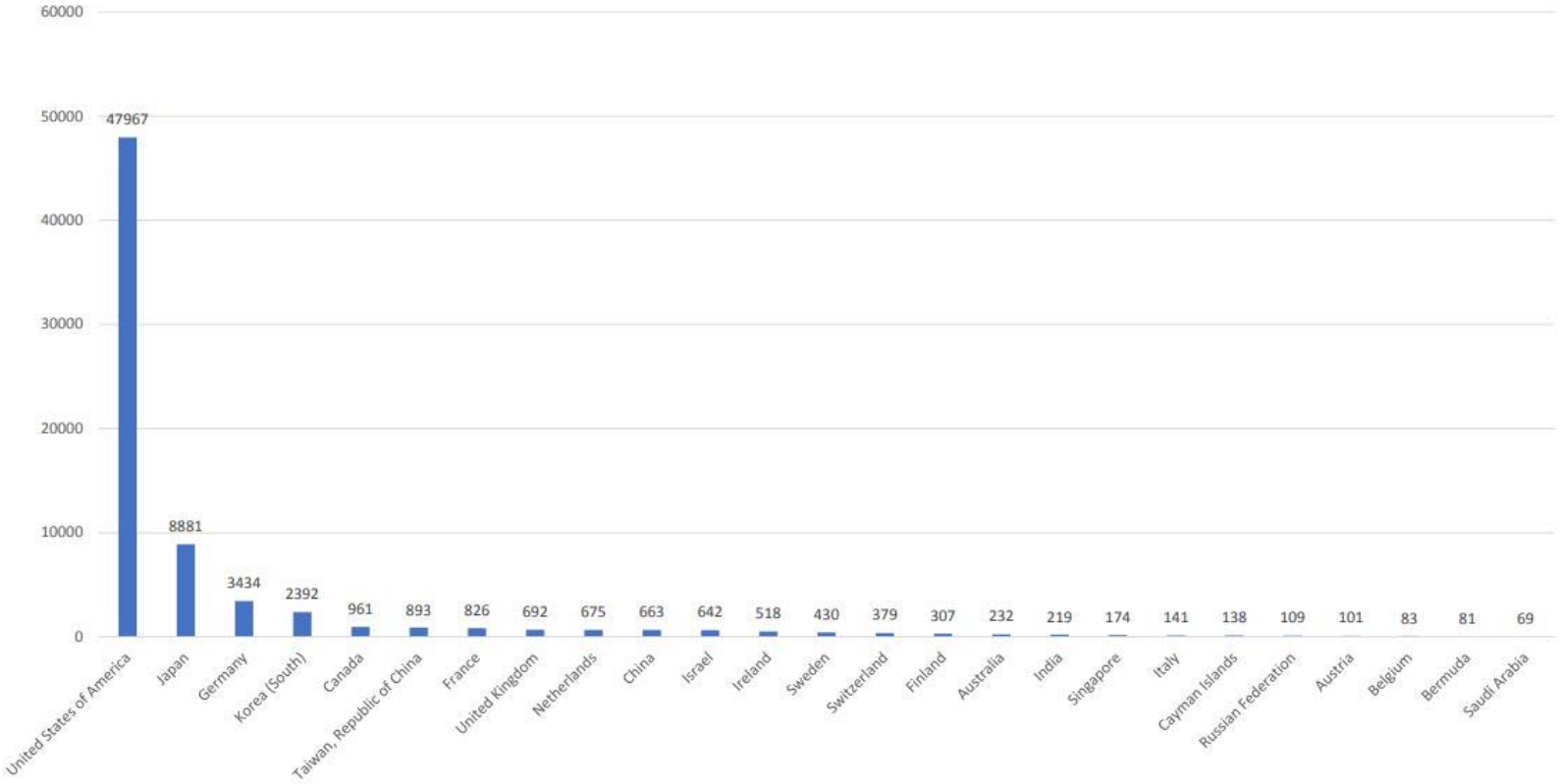
Inventor Country (1990 – 2018)

Figure 4 AI Patents by Inventor Country



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Patent Eligibility For AI Inventions

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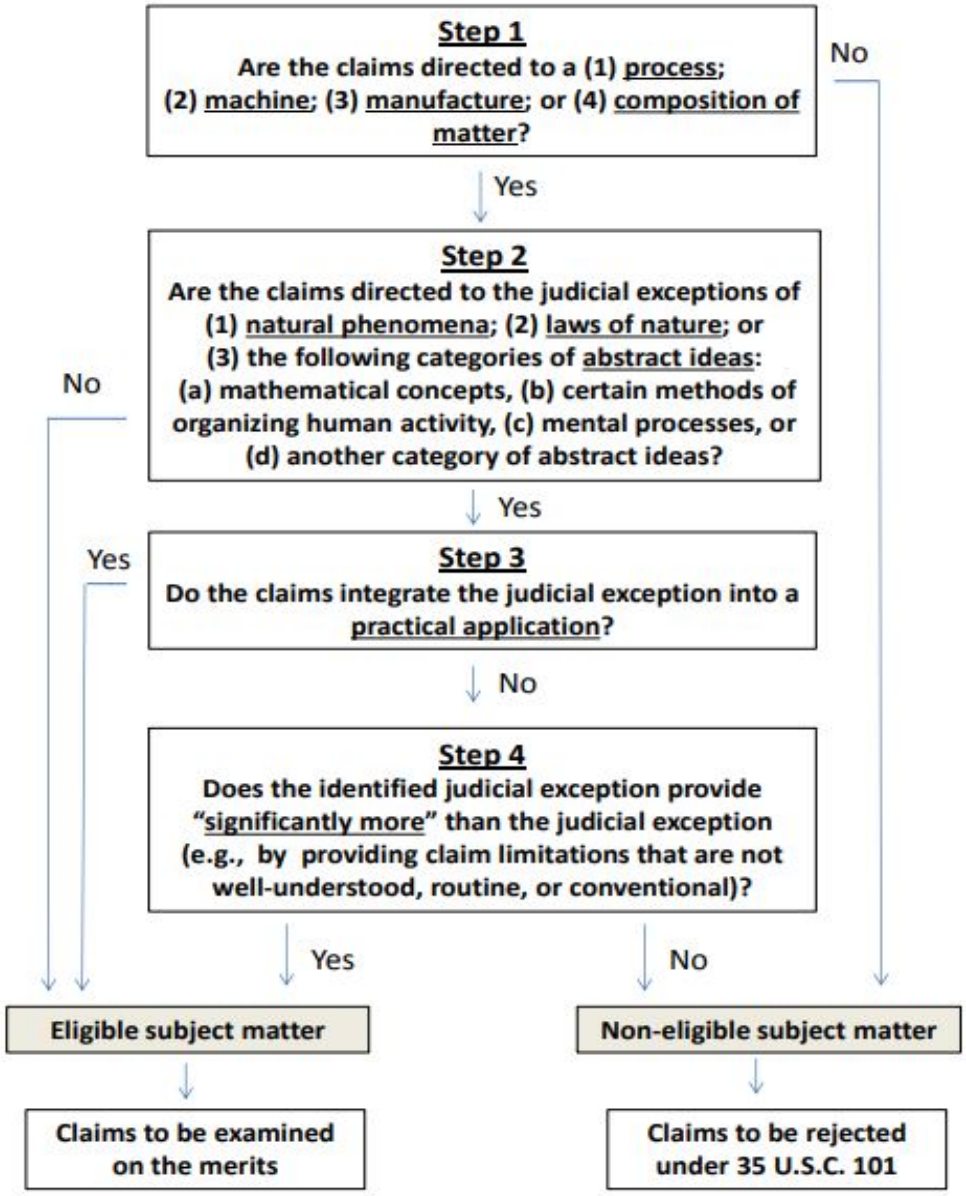

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PTO Memo April 19, 2018

- Addresses Berkheimer case (holding: whether something is well-understood, routine and conventional to a skilled artisan is a FACTUAL determination)
  - An additional element represents well-understood, routine, conventional activity ONLY when the examiner can READILY CONCLUDE that the element(s) is “widely prevalent or in use in the relevant industry”
  - Must have EXPRESS SUPPORT with citation to admission, case or other support
  - If challenged by applicant, examiner should reevaluate
- Increases likelihood that a decision by a finder of fact is required
  - Renders it more difficult to dismiss case and/or get summary judgement on 101 grounds

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Most Recent Guidelines

- Revised Examination guidelines January 7, 2019, revised first step of examination under Alice
  - Provide groupings of subject matter that are abstract
    - Mathematical Concept: math relationships, math formulas, math calculations
    - Certain Methods of organizing human activity: commercial/legal activity, marketing, managing relationships
    - Mental Processes: concepts performed in human mind
  - If claim does not recite subject matter that falls within one of these groupings, typically does not recite abstract idea

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Examples

Source: U.S. Patent and Trademark Office

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USPTO Example: Method for Training a Neural Network for Facial Detection

Background:

Facial detection is a computer technology for identifying human faces in digital images which can be used in tagging pictures in social networking sites to security access control. Applicant's invention addresses the issue of the inability to robustly detect human faces in images where there are shifts, distortions, and variations in scale and rotation of the face pattern in the image. The first feature is the use of an expanded training set of facial images to train the neural network. The second feature of applicant's invention is the minimization of false positives by performing an iterative training algorithm, in which the system is retrained with an updated training set containing the false positives produced after face detection has been performed on a set of non-facial images. This combination of features provides a robust face detection model that can detect faces in distorted images while limiting the number of false positives.

Continued: Method for Training a Neural Network for Facial Detection

Claim 1:

A computer-implemented method of training a neural network for facial detection comprising:

collecting a set of digital facial images from a database;

applying one or more transformations to each digital facial image including mirroring, rotating, smoothing, or contrast reduction to create a modified set of digital facial images;

creating a first training set comprising the collected set of digital facial images, the modified set of digital facial images, and a set of digital non-facial images;

training the neural network in a first stage using the first training set;

creating a second training set for a second stage of training comprising the first training set and digital non-facial images that are incorrectly detected as facial images after the first stage of training; and

training the neural network in a second stage using the second training set.

Continued: Method for Training a Neural Network for Facial Detection

Step	Analysis
1: Statutory Category?	**Yes.** The claim recites a series of steps and, therefore, is a process.
2A - Prong 1: Judicial Exception Recited?	**No**. The claim does not recite any of the judicial exceptions enumerated in the 2019 PEG. For instance, the claim does not recite any mathematical relationships, formulas, or calculations. While some of the limitations may be based on mathematical concepts, the mathematical concepts are not recited in the claims. Further, the claim does not recite a mental process because the steps are not practically performed in the human mind. Finally, the claim does not recite any method of organizing human activity such as a fundamental economic concept or managing interactions between people. Thus, the claim is **eligible** because it does not recite a judicial exception.
2A - Prong 2: Integrated into a Practical Application?	**N/A.**
2B: Claim provides an Inventive Concept?	**N/A.**

USPTO Example: Adaptive Monitoring of Network Traffic Data

Background**:**

Network visibility tools enable close monitoring of computer network traffic, applications, performance, and resources. The data acquired through these network visibility tools is extremely useful in optimizing network performance, resolving network issues, and improving network security. One industry standard network visibility protocol is NetFlow. NetFlow records are very large and the continual generation and export of them hinders network performance. Moreover, continual analysis of the network is not always necessary when the network is performing under normal conditions.

Applicant's invention varies the amount of network data collected based on monitored events in the network. That is, the system will only collect NetFlow protocol data and export a NetFlow record when abnormal network conditions are detected. Periodically, the network data is compared to a predefined quality threshold. If an abnormal condition is present, the system begins collecting NetFlow protocol data, which can later be used for analyzing the abnormal condition and when the abnormal condition no longer exists, NetFlow protocol data is no longer collected.

Continued: Adaptive Monitoring of Network Traffic Data

Claim 1:

A method for adaptive monitoring of traffic data through a network appliance connected between computing devices in a network, the method comprising:

collecting, by the network appliance, traffic data relating to the network traffic passing through the network appliance, the traffic data comprising at least one of network delay, packet loss, or jitter;

comparing, by the network appliance, at least one of the collected traffic data to a predefined threshold; and

collecting additional traffic data relating to the network traffic when the collected traffic data is greater than the predefined threshold, the additional traffic data comprising Netflow protocol data.

Continued: Adaptive Monitoring of Network Traffic Data

Step	Analysis
1: Statutory Category?	**Yes.** The claim recites a series of steps and, therefore, is a process.
2A - Prong 1: Judicial Exception Recited?	**Yes**. The claim recites the limitation of comparing at least one of the collected traffic data to a predefined threshold. This limitation, as drafted, is a process that, under its broadest reasonable interpretation, covers performance of the limitation in the mind but for the recitation of generic computer components. That is, other than reciting "by the network appliance," nothing in the claim element precludes the step from practically being performed in the mind. For example, but for the "by the network appliance" language, the claim encompasses a user simply comparing the collected packet loss data to a predetermined acceptable percentage in his/her mind. The mere nominal recitation of a generic network appliance does not take the claim limitation out of the mental processes grouping. Thus, the claim recites a mental process.
2A - Prong 2: Integrated into a Practical Application?	**Yes**. The claim recites the combination of additional elements of collecting at least one of network delay, packet loss, or jitter relating to the network traffic passing through the network appliance, and collecting additional Netflow protocol data relating to the network traffic when the collected network delay, packet loss, or jitter is greater than the predefined threshold. Although each of the collecting steps analyzed individually may be viewed as mere pre- or post-solution activity, the claim as a whole is directed to a particular improvement in collecting traffic data. Specifically, the method limits collection of additional data to when the data reflects an abnormal condition, which avoids excess traffic volume on the network and hindrance of network performance. The collected data can then be used to analyze the cause of the abnormal condition. This provides a specific improvement over prior systems. The claim as a whole integrates the mental process into a practical application. Thus, the claim is **eligible** because it is not directed to the recited judicial exception.
2B: Claim provides an Inventive Concept?	**N/A.**

Continued: Adaptive Monitoring of Network Traffic Data

Claim 2:

A method for monitoring of traffic data through a network appliance connected between computing devices in a network, the method comprising:

collecting, by the network appliance, traffic data relating to the network traffic passing through the network appliance, the traffic data comprising at least one of network delay, packet loss, or jitter; and

comparing, by the network appliance, at least one of the collected traffic data to a predefined threshold.

Continued: Adaptive Monitoring of Network Traffic Data

Step	Analysis
1: Statutory Category?	**Yes.** The claim recites a series of steps and, therefore, is a process.
2A - Prong 1: Judicial Exception Recited?	**Yes**. The claim recites the limitation of comparing at least one of the collected traffic data to a predefined threshold. This limitation, as drafted, is a process that, under its broadest reasonable interpretation, covers performance of the limitation in the mind but for the recitation of generic computer components. That is, other than reciting "by the network appliance," nothing in the claim element precludes the step from practically being performed in the mind. For example, but for the "by the network appliance" language, the claim teaches a user comparing collected data to a predetermined acceptable quality percentage in his/her mind. The mere nominal recitation of a generic network appliance does not take the claim limitation out of the mental processes grouping. Thus, the claim recites a mental process.
2A - Prong 2: Integrated into a Practical Application?	**No**. The claim recites two additional elements: collecting at least one of network delay, packet loss, or jitter relating to the network traffic passing through the network appliance, and that a generic network appliance performs the comparing step. The collecting step is recited at a high level of generality (i.e., as a general means of gathering network traffic data for use in the comparison step), and amounts to mere data gathering, which is a form of insignificant extra-solution activity. The network appliance that performs the comparison step is also recited at a high level of generality, and merely automates the comparison step. Each of the additional limitations is no more than mere instructions to apply the exception using a generic computer component (the network appliance).

2A - Prong 2: Integrated into a Practical Application? Continued	The combination of these additional elements is no more than mere instructions to apply the exception using a generic computer component (the network appliance). Accordingly, even in combination, these additional elements do not integrate the abstract idea into a practical application because they do not impose any meaningful limits on practicing the abstract idea. The claim is directed to the abstract idea.
2B: Claim provides an Inventive Concept?	**No.** As discussed with respect to Step 2A Prong Two, the additional elements in the claim amount to no more than mere instructions to apply the exception using a generic computer component. The same analysis applies here in 2B, i.e., mere instructions to apply an exception on a generic computer cannot integrate a judicial exception into a practical application at Step 2A or provide an inventive concept in Step 2B. Under the 2019 PEG, a conclusion that an additional element is insignificant extra-solution activity in Step 2A should be re-evaluated in Step 2B. Here, the collecting step was considered to be extra-solution activity in Step 2A, and thus it is re-evaluated in Step 2B to determine if it is more than what is well-understood, routine, conventional activity in the field. The background of the example does not provide any indication that the network appliance is anything other than a generic, off-the-shelf computer component, and the *Symantec*, *TLI*, and *OIP Techs.* court decisions cited in MPEP 2106.05(d)(II) indicate that mere collection or receipt of data over a network is a well-understood, routine, and conventional function when it is claimed in a merely generic manner. Accordingly, a conclusion that the collecting step is well-understood, routine, conventional activity is supported under *Berkheimer* Option 2. For these reasons, there is no inventive concept in the claim, and thus it is **ineligible**.

USPTO Example: Method for Transmission of Notifications When Medical Records Are Updated

Background:

It is difficult for medical providers to share updated information about a patient's condition with other health care providers using current patient management systems. Currently, medical providers must continually monitor a patient's medical records for updated information, which is often-times incomplete since records in separate locations are not timely or readily-shared or cannot be consolidated due to format inconsistencies as well as physicians who are unaware that other physicians are also seeing the patient for varying reasons. To solve this problem, applicant has invented a network-based patient management method that collects, converts and consolidates patient information from various physicians and health-care providers into a standardized format, stores it in network-based storage devices, and generates messages notifying health care providers or patients whenever that information is updated.

Continued: Method for Transmission of Notifications When Medical Records Are Updated

Claim 2:

A method comprising:

a. storing information about a patient's condition in a plurality of network-based non-transitory storage devices having a collection of medical records stored thereon;

b. providing access, by a content server, to users so that any one of the users can update the information about the patient's condition in the collection of medical records, and;

c. storing the updated information about the patient's condition in the collection of medical records in the plurality of network-based non-transitory storage devices.

Continued: Method for Transmission of Notifications When Medical Records Are Updated

Step	Analysis
Step 1: Statutory Category?	**Yes.** The claim recites a series of steps and, therefore, is a process.
Step 2A - Prong 1: Judicial Exception Recited?	**Yes.** The claim as a whole recites a method of organizing human interactions. The claimed invention is a method that allows for users to access and update patients' medical records and store the updated information which is a method of managing interactions between people. The mere nominal recitation of a generic content server and generic network-based storage devices does not take the claim out of the methods of organizing human interactions grouping. Thus, the claim recites an abstract idea.
Step 2A—Prong 2: Integrated into a Practical Application?	**No.** The claim as a whole merely describes how to generally "apply" the concept of storing and updating patient information in a computer environment. The claimed computer components are recited at a high level of generality and are merely invoked as tools to perform an existing medical records update process. Simply implementing the abstract idea on a generic computer is not a practical application of the abstract idea.
Step 2B: Inventive Concept?	**No.** As noted previously, the claim as a whole merely describes how to generally "apply" the concept of updating medical records in a computer environment. Thus, even when viewed as a whole, nothing in the claim adds significantly more (i.e., an inventive concept) to the abstract idea. The claim is **ineligible**.

Continued: Method for Transmission of Notifications When Medical Records Are Updated

Claim 1:

A method comprising:

a. storing information in a standardized format about a patient's condition in a plurality of network-based non-transitory storage devices having a collection of medical records stored thereon;

b. providing remote access ~~, by a content server,~~ to users over a network so any one of the users can update the information about the patient's condition in the collection of medical records in real time through a graphical user interface, wherein the one of the users provides the updated information in a non-standardized format dependent on the hardware and software platform used by the one of the users;

c. converting, by a content server, the non-standardized updated information into the standardized format,

d. storing the standardized updated information about the patient's condition in the collection of medical records in the ~~plurality of network-based non-transitory storage devices~~ standardized format;

e. automatically generating a message containing the updated information about the patient's condition by the content server whenever updated information has been stored; and

f. transmitting the message to all of the users over the computer network in real time, so that each user has immediate access to up-to-date patient information.

Continued: Method for Transmission of Notifications When Medical Records Are Updated

Step	Analysis
Step 1: Statutory Category?	**Yes.** The claim recites a series of steps and, therefore, is a process.
Step 2A - Prong 1: Judicial Exception Recited?	**Yes.** The claim as a whole recites a method of organizing human activity. The claimed invention is a method that allows for users to access patients' medical records and receive updated patient information in real time from other users which is a method of managing interactions between people. Thus, the claim recites an abstract idea.
Step 2A—Prong 2: Integrated into a Practical Application?	**Yes.** The claim recites a combination of additional elements including storing information, providing remote access over a network, converting updated information that was input by a user in a non-standardized form to a standardized format, automatically generating a message whenever updated information is stored, and transmitting the message to all of the users. The claim as a whole integrates the method of organizing human activity into a practical application. Specifically, the additional elements recite a specific improvement over prior art systems by allowing remote users to share information in real time in a standardized format regardless of the format in which the information was input by the user. Thus, the claim is **eligible** because it is not directed to the recited judicial exception (abstract idea).
Step 2B: Inventive Concept?	**N/A.**

Practical Guidance in the U.S.

- Non-conventional arrangement of generic, conventional pieces is patent eligible
- Use of a mathematical formula in a claimed method or system doe NOT make the claim abstract in and of itself
  - Claim must include other non-generic elements
- Consider elements individually and as a whole when arguing non-conventionality
- Argue improvement over prior art technology or practical functionality of a generic computer

Patent Drafting Tips

- Take control of the narrative to Prebut 101 (i.e., make it difficult for the examiner to even reject on 101 grounds)
  - What was conventional? Discuss in Background
  - How does claimed invention improve the conventional? Explain in Description
- Describe in sufficient detail (avoid being too high level)
- Claim that “something more” that moves the invention from possibly abstract to practical

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Thank you!!

Dankeschön!!

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