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Artificial Intelligence FAQ

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1) What are the present capabilities of AI?

The Artificial Intelligence (AI) of today is noticeably advanced compared to what it was a few years back, and it continues to advance at a fast clip. The AI we know today is weak AI. When it comes to computer vision, we have neural networks capable of image recognition, but they cannot be a perfect match to any human visual system. However, it has been observed that, in a few exceptional cases, they have surpassed the human brain.

In the case of Natural Language Processing (NLP), Word Embedding, and Word2Vec, AI can be used to get effective results but still not considered as powerful as a human. Differential neural networks and augmented neural networks harbor better capabilities as they learn to store facts for later use. Their ability to reason facts help to solve more complex tasks. At present such systems are not much scalable.

Present-day AI applications include Google assistant, Chatbots, Google Photos, and Google smart reply for an automated response to a message, augmented reality and more. These, however, are all weak AI. For strong AI, problems like reasoning, computer vision, and natural language understanding must be solved. Once the answers are in place, AI will be implemented in multiple applications like the military, healthcare, self-driving cars, robotics and in numerous other sectors.

2) Does AI have a future? Share with some examples

AI is inevitable. Companies of all sizes (including the one person strength startups) have already begun to use data and analytics to enjoy a competitive edge. AI enables quicker evidence of centric decision making, process optimization, and insight generation.

In the coming years, we will ride self-driving cars, and in the field of cybernetics, robotics and AI will help to augment our bodies by giving strength, endurance, longevity and also helping the disabled. Although these things require powerful hardware and software, the near future will witness many applications of AI on end devices which are also known as Edge devices. These edge devices can be Smart-edge Agile, Beagle Bone AI, Raspberry Pi, Ultra96 board etc.

A few notable applications of the edge devices are:

- **Surveillance and Monitoring:** Deep Learning-enabled smart cameras can locally process captured images to identify and track multiple objects and people. The technology can detect suspicious activities directly on the Edge node.
- **Audio Event Detection:** Distinguishing sounds like baby crying, glass breaking, or a gunshot can trigger an action, including notifications or location detection, via triangulation. Since understanding specific sound events in multisource conditions is a latency-critical task, AI at the Edge can be super fast and effective. It can recognize an audio event among plentiful overlapping sound sources.

- **Body Monitoring:** Wearable devices collect a lot of data about an individual's activity, location, and heart rate among others. This information can be correlated with health, stress levels, and diet. It can alert wearers to a potential health issue before it becomes critical.

- **Text To Speech (TTS) and Speech to Text (STT)** are two examples of complex tasks in which AI and DL are used to bring these functionalities on the Edge. Examples include hands-free text read and write functions in automotive, where the driver can keep attention on his main task (drive the car) while interacting with the infotainment system.

Only off-the-shelf AI can evenly harness the potential of applied science. Readily available components-which does away with complex coding- can democratize the industry. Even a lay entrepreneur without any AI skills can harness the technology that recognizes the patterns hidden in Big Data.

3) What do you mean by intelligent agents and how are they connected with AI?

An intelligent agent extracts information and decides to do something purposeful. The intelligent agent can be anything, including people, sensory systems, and robots. In light of AI, the intelligent agent describes an autonomous computer program. It can select between different actions and is capable of actions based on its perceived information, along with its own experiences and own decisions about the actions it performs. These agents must take rational decisions and not any arbitrary decision.

A few examples of the intelligent agent we experience in real life include personal assistants in a smartphone-like Apple Siri, chatbots, AI –bots inside gaming applications, Amazon Alexa among others. These intelligent agents use Sensors to note requests made by users or automatically gather data from the internet without any user intervention.

4) What is the difference between supervised learning and unsupervised learning?

Supervised Learning

When it comes to supervised learning, a data sample extracted from a data source with proven correct classification comes already assigned. The use of such data is done with the assistance of feedforward models and the Multilayer perceptron.

The backpropagation algorithm is learning through training. The network in question gets trained via a learning algorithm which engages in error correction. The generated error signal is the output difference calculated with the desired output. The neuron's synaptic weight gets adjusted based on that error signal. Backpropagation learning happens in two ways:

- **Forward pass:** Input vector gets presented to the given network. The input signal is propagated forward, by successive neuron through that network and emerge from the network's output end as an output signal. This calculated output is compared with the desired response and the neuron's error is found. The network's synaptic weights during this pass continue unchanged.

- **Backward pass:** Describes that error signal which originates at that layer's output neuron and is subsequently propagated backward through the network. This calculates local gradient for every neuron in every layer and permits the network's synaptic weights to change the line with delta rule.

Unsupervised learning

In such cases, the self-organized neural networks learn through unsupervised learning algorithms. The networks identify concealed patterns in unlabeled input data. The term unsupervised learning mentions the learning ability along with the capability to organize information sans any error signal to examine the potential solution. This absence of direction for this learning algorithm in an unsupervised learning environment could occasionally be of an advantage since it allows the algorithm to look for previously overlooked patterns. The principal characteristics of Self-Organizing Maps include:

- Transformation of an incoming arbitrary dimension signal pattern into one or two-dimensional maps and also adaptively perform this transformation

- The representation of the feedforward structure of a network with a single computational layer made of neurons organized in columns and rows

- Each input signal, at every stage of representation, gets kept in the proper context.

- The neurons deal with closely related information slices and communication achieved via synaptic connections.

The computational layer is also called a competitive layer since the neurons in the layer compete with each other to become active. Hence, this learning algorithm is called a competitive algorithm.

5) What are the different types of AI?

Different kinds of AI have been written to help other artificial intelligence systems work smarter. Artificial Intelligence can be categorized into:

Reactive Machines AI

Oldest AI type with limited capabilities. This type of machines lacks the concept of previous experiences and the ability to learn. Reactive Machines AI cannot function beyond basic tasks for which they were initially programmed. Growth is not possible with reactive machines, and there is only stagnation in repetitive actions and behaviors.

Limited Memory AI

Such machines have capabilities similar to Reactive machines, and they can learn from historical data. Limited Memory AI machines, as their name implies, have limited memory. They can refer to the past for an extremely short period and then learn from it. These machines get trained using vast volumes of related training data. The memory stored data helps to create a reference model which is used to solve future problems. Limited Memory AI drives modern AI applications.

Theory of Mind AI

This is an advanced system capable of a better understanding of the entities it interacts with. This is achieved by discerning their thought processes, beliefs, needs, and emotions. These systems continue to be in development. The Theory of mind AI can swiftly recognize eye and facial movements and thus modify their act as per requirements.

Self-aware AI

This is a hypothetical AI and probably the most advanced kind of AI conceptualized by humankind. In Self-aware AI, robots or machines are fully aware of who they are and comprehend their internal traits. AI also understands the various conditions and states and even perceive human emotions.

6) What are the most common AI terms you should know?

Some AI terms are used more than others. The oft-requested terms are:

- **Algorithms:** This is a set of instructions or rules offered to AI or other machines to help it learn on its own. The most popular include classification, clustering, recommendation, and regression.
- **Turing test:** This tests the ability of an AI to pass off as a human, as conceptualized by Alan Turing. The AI in the headlight will communicate through written text.
- **Expert system:** A kind of AI which tries to imitate the expertise of a human in a specific area, like medical diagnosis. It blends an existing knowledge base with a hand-codes rules set for the application of that knowledge. Machine-learning techniques are rapidly substituting hand-coding.

- **Cognitive Computing:** A computerized model which mimics the thinking of the human brain. It involves self-learning via the use of data mining, natural language processing, and pattern recognition.

- **Decision tree:** A tree and branch centric model used to map decisions and their possible consequences, similar to a flow chart.

- **Data science:** Data Science is the field that combines systems, processes, and scientific methods from statistics, computer science, information science, and to deliver insight into phenomenon via either structured or unstructured data.

- **Data mining:** Action where data sets are examined and finding any patterns from that data which can be further used.

- **Computer Vision:** A simple way to comprehend such a concept is to teach machines the ways to interpret in visual terms the world (the machines `see'). A yet better way to define computer vision as it is known in the AI field which deals with the methodology of machines gaining a better level of comprehension from images or even videos.

- **Learning:** Refers to the act of gaining knowledge or skill by studying, being taught, practice, or undergoing any action. The types of learning can be supervised learning, unsupervised learning, and reinforcement learning.

- **Chabot:** Abbreviation for Chatter Robot. A chatbot, in essence, is a software/computer program that converses with a human in a human-understandable language. The chatbot tries to simulate human conversation with the help of artificial intelligence. It is one of the many applications of machine learning. A few common examples of chatbots include Apple's Siri, Google's Google-assistant, Amazon's Alexa, Microsoft's Cortana, and so on. This slice of technology finds use in E-commerce customer service, for internet gaming, in call centers among others.

- **Knowledge engineering:** Concentrates on the building of knowledge-centric systems. This includes all scientific, technical, and social aspects of that system.

7) What do you mean by neural networks?

Artificial Neural networks can be described as human brain-inspired powerful computational models. These models are used in multiple areas like engineering, medicine, economics, and computing among many others. The optimization theory forms the base of any artificial neural network. The network is made of artificial neurons (processing units) which are connected to other neurons. Such neurons are influenced by weights of that neural network. The word "network" in the phrase "Neural Network" refers to the connection that exists between neurons present in a system's layers. Such weights represent connections which are present within the neurons determining the impact of a single neuron on another one. Sensory data are interpreted

via machine perception, clustering or labeling raw input. Patterns recognized are numerical, and contained in vectors, into that all real-world data, including images, time series. Sound, or text, must be translated.

8) What is AI, ML, and DL?

Artificial intelligence is a machine that can think of the way people think. Artificial intelligence (AI) is a wide-ranging branch of computer science concerned with building smart machines which can perform tasks that generally need human intelligence. Such processes include learning (acquiring information and also the rules for using such information): self-correction, and reasoning.

The term machine learning mentions to the automated detection of meaningful patterns within data. Machine learning is a type of AI that allows a system to learn from data rather than through explicit programming. Machine learning utilizes a bouquet of algorithms which iteratively learn from available data to improve, describe the data, and consequently predict outcomes. As the training data is fed into the algorithms, it is possible to produce precise models based on that specific data.

Deep learning can be regarded as a machine learning subset. It is a component of machine learning which focuses on the formation of "abstractions and concepts." The Deep learning systems typically ingest huge masses of data and then generalize the features and categories related to such data via supervised or even unsupervised learning. Deep learning systems rely on neural networks.

9) What is the connection between AI and Deep learning?

There is no direct connection between AI and Deep Learning. AI is independent of Deep learning but it is possible to say there exists a relation between AI and Deep learning through Machine Learning as Deep Learning is a framework to solve machine learning problems. Artificial intelligence is applied based on machine learning algorithms. The latter is based on data science algorithms and statistics to work on the data extracted from and produced by multiple resources. An AI problem can be solved by any framework, and Deep learning is simply one among them.

10) What is the relation between AI and machine learning? How AI and ML do works?

Artificial Intelligence is the bigger concept of machines being able to carry out tasks in a way that we consider "smart". AI is the study of how to train the computers so that computers can do things which at present human can do better and Machine Learning is a current AI application which offers computer systems with the ability to automatically gain knowledge and also improve from the experience even if there is no explicit program in this regard. ML concentrates on development of those algorithms which can not only analyze data but also make predictions. It is one of the ways we expect to achieve AI.

11) How does AI work?

Artificial intelligence takes advantage of machine learning to mimic the intelligence of humans. The computer must learn the procedure to respond to a few particular actions. It thus utilizes algorithms along with historical data to cook up something termed a propensity model. The Propensity models then begin to make predictions (like scoring leads).

12) How does Machine Learning work?

Machine learning utilizes two kinds of methodologies: supervised learning, where a model is trained on known input and also output data to enable it to predict future outputs, and unsupervised learning, that locates hidden patterns or the intrinsic structures in that input data.

Everything begins with the training of a machine-learning model, which is a mathematical function totally capable of repeated modification of how it operates until accurate predictions can be made when given fresh data.

Prior to the start of training, you must choose the data to gather and then decide which features of given data are important.

AI has multiple fields to get into. The primary aims of AI include perception, natural language processing (NLP), deduction and reasoning, ability to manipulate, knowledge representation, planning, learning, and move objects. AI research's long term goals include achieving Social Intelligence, Creativity, and General (human level) Intelligence.

To get started user should be aware of a few basic things like data collection, data preparation, model selection, model training, and deployment, why they are needed and used for. We will focus more here for the enthusiasts who want to build their own machine learning applications.

The first step is to choose a particular application once the application is selected. The user then choose any of the built models for their application. To deploy these models the user can select any of the programming languages. Even though there are multiple programming languages, python has preference over others due to its library being better suitable for machine learning. The pre-trained convolutional neural network model **"facenet_keras", Mask R-CNN", "YOLOv2", "Semantic Image Segmentation – Deeplabv3"** etc are already available which can be tested on single board computers like raspberry pi and beagle bone.

13) Which are the artificial intelligence platforms available?

Artificial Intelligence (AI) platforms involve the use of appropriate machines to perform many tasks typically done by human beings. These platforms mimic the human mind's cognitive function like problem-solving, general intelligence, reasoning, learning, and social intelligence. AI platforms

offer tool kits to construct intelligent applications. A few examples of AI platforms are:

Google Assistant Services

The Google Assistant Library for Python is an effective solution for anyone who wants to quickly incorporate the Assistant into a project. The library is supported on popular hardware like the Raspberry Pi. The Google Assistant Service offers you unrestricted control over integration with Assistant by giving a streaming endpoint. This assistant actively listens to your voice and respond to your queries. All the user has to say is "Ok Google" or "Hey Google" followed by the query. To use the Voice Assistant the first action is to sign up on the google site. Access to the Internet is thus compulsory. It is vital to be connected to the internet to use the voice assistant as it gets all the data and the answers from the cloud.

Tensorflow

It is an open-source software library used for numerical computation utilizing data flow graphs. The graph nodes represent mathematical operations, and the graph edges symbolize multidimensional data arrays communicated within them. The flexible architecture permits users to arrange computation to one or multiple CPUs or GPUs in a desktop, server, or mobile device having a single API. Tensor Flow version 1.9 is officially supported by google for Raspberry Pi. As the new version of Tensor Flow is easier to install, it will help open up Machine Learning to new audiences. A greater number of educational materials and tutorials are expected to emerge, enabling an increasing number of interested individuals to explore the possibilities of Machine Learning on such a cost-effective and flexible device.

Amazon SageMaker

Amazon SageMaker is a fully-managed service enabling both data scientists and developers to swiftly and easily build, train, and even deploy Machine Learning models in any scale. Amazon SageMaker takes away all barriers which typically discourages developers keen to use Machine Learning. Amazon SageMaker Neo is a new capability of Amazon SageMaker that enables Machine Learning models to train only once- and after the initial training-run with optimal performance anywhere in the cloud and at the edge. The Amazon SageMaker Neo compiler converts all models into an efficient common format; these models when executed on the device uses fewer than one-hundredth of the resources consumed by a generic framework. The Amazon SageMaker Neo runtime is improved for underlying hardware, utilizing particular instruction sets that help to accelerate the ML inference. The benefit is that the converted models get to perform at up to twice the speed, with zero accuracy loss. Sophisticated models can now be run on almost all resource-limited device like Raspberry Pi and BeagleBone. Developers can also run the models on target hardware without depending on the framework.

IBM Watson Machine Learning

IBM Watson Machine Learning can be used to build analytical models and neural networks. It can be trained with unique data which can be deployed for use in applications.

Watson Machine Learning offers a complete set of services and tools, enabling the user to build, train, and then deploy Machine Learning models. The user can select from tools that completely automate the training process for swift prototyping. These tools give unfettered control to create a model matching the user's requirements. Watson Machine Learning can be construed as a service on IBM Cloud. The service features training and subsequent deployment of Machine Learning models and neural networks. Built on a scalable and open-source platform based on Docker and Kubernetes components, Watson Machine Learning helps the user to build, deploy, and even manage Machine Learning along with deep learning models using programming Interfaces like python client library, REST API, Training infrastructure and Deployment infrastructure to deploy trained models.