DEFINITIONS OF AI

"Artificial intelligence (AI) is the intelligence of machines or software, as opposed to the intelligence of humans or animals. It is also the field of study in computer science that develops and studies intelligent machines."

- Wikipedia

"Artificial Intelligence (AI) refers to the capability of a machine to imitate intelligent human behavior."

- ChatGPT, OpenAI

"Artificial intelligence leverages computers and machines to mimic the problem-solving and decision-making capabilities of the human mind"

- IBM

Attributes of AI

- **Pattern Recognition:** AI systems can identify and classify patterns in data
    - Depending on the type of AI, different types and quantities of data are needed
- **Adaptation through Learning:** Can adapt based on new data
    - Not all AI is built in with feedback loops
    - Machine learning is especially focused on this

Attributes of AI continued

- **Feedback Loop Integration: Advanced AI systems can use feedback loops to refine their operations over time**
  - Not default in all AI
- **Problem-solving:** Many AI systems can navigate through complex datasets or scenarios to reach a specific outcome or solution
- **Data Processing at Scale:** AI can handle vast amounts of data quickly and efficiently

AI DISCIPLINES
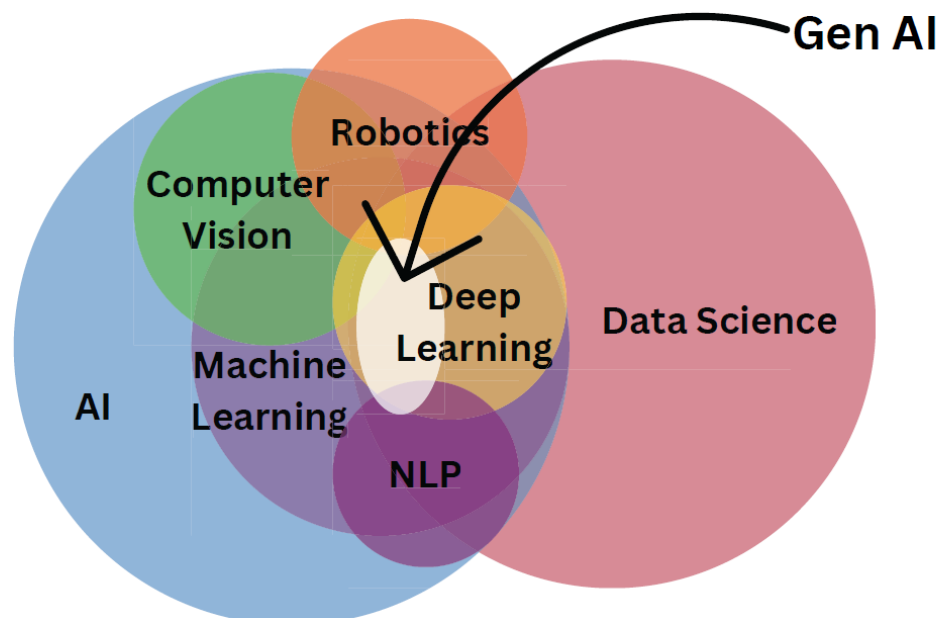
Machine Learning

A part of artificial intelligence where computers learn from data to make decisions or predictions, rather than relying on explicit programming

Features:
- Uses statistical techniques to give machines the ability to "learn"
- Models improve their performance as the amount of data increases*
- Includes supervised, unsupervised, semi-supervised, and reinforcement learning

Applications:
- Predictive analytics (stock market predictions)
- Personalized recommendations (Netflix movie suggestions)
- Fraud detection in financial services
- Health diagnostics based on patterns in patient data or diagnostic imagery

Natural Language Processing

Enables computers to understand, interpret, and produce human language in audio and written forms.

Features:
- Understanding the grammatical structure of sentences
- Grasping the meaning behind words and sentences
- Recognizing the context and intent behind phrases
- Identifying and categorizing opinions and emotions in text*

Applications:
- Chatbots and virtual assistants (examples: Siri, Alexa)
- Sentiment analysis for product reviews or social media*
- Translation (example: Google Translate)
- Text summarization and classification
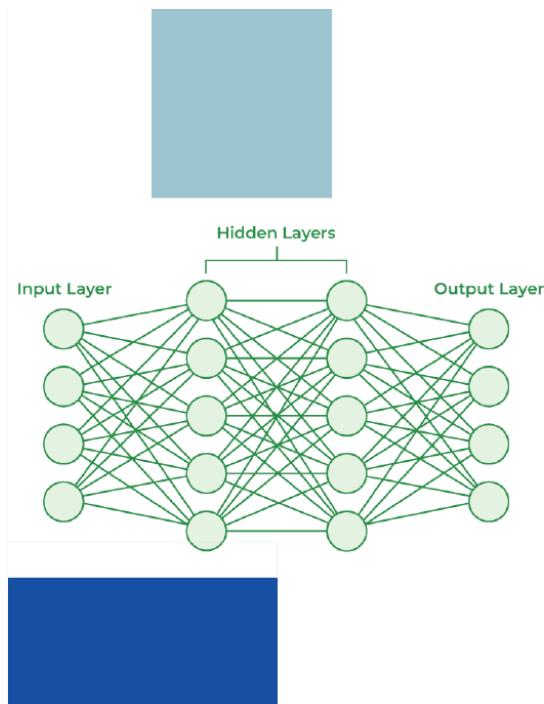
Neural Networks

These models are designed to process data in a similar structure to the neural networks in the human brain

Features:
- Consist of layers of interconnected nodes or "neurons"
- Capable of learning patterns from data

Image: geeksforgeeks.org

Deep Learning

Deep learning utilizes neural networks with many layers to process large volumes of data. They can identify intricate patterns within images, text, audio, and more.

Features:
- Requires large data sets for training
- Can automatically extract features from raw data

Applications:
- Image and video processing
- Natural Language Processing tasks
- Game play (AlphaGo vs human Go player)

Computer Vision

Computer vision enables computers to interpret and decide based on visual data such as images or video.

Features:
- Image recognition and classification
- Facial recognition
- Object detection and tracking
- Scene reconstruction

Applications:
- Facial recognition systems
- Autonomous vehicles
- Medical scan imagery
- Augmented reality

GENERATIVE AI

Generative AI differs from other fields in AI, because generative AI actually generates new data, new content. Other AI fields simply analyze data and/or create predictions based on analyzing data. Mostly based on foundation models.

3 Main Types of GenAI

- Large Language Models (LLMs)
- Image Generation Models
- Video Generation Models

Large Language Models (LLMs)

LLMs are foundational models, using deep learning/neural networks to process large and varied sets of data and generate new, synthesized, human-like data.

Features:
- Built using transformer architecture, which is a form of deep learning
- Require incredibly large quantities of data
- Trained on vast textual datasets to capture nuances

Applications:
- Content creation & summarization (ChatGPT, Anthropic)
- Advanced chatbots
- Assisting in research and data analysis
- Can help create training data*

Examples:
- ChatGPT by OpenAI
- Claude by Anthropic
- Gemini by Google (DeepMind)

Image Generation Models

Image generation models create new images based on user input. Input can range from text-to-image, or include a combination of text and image.

Features:
- Image generation
- Modifying an existing image
- Control and modify style output
- Adjust resolution of AI generated image

Video Generation Models

Video generation models create new videos based on user input. Input can range from text-to-video, or include a combination of text, image, and editing existing video.

Features:
- Video creation (including b-roll)
- Editing and modifying existing video
- Object manipulation
- Automated enhancement
- Resizing

Robotics

The design, construction, and utilization of machines that are equipped to perform tasks independently with minimal or zero human intervention.

Features:
- Can interact with the physical world
- Often combined with computer vision, sensors, and AI algorithms

Robotics continued

Applications:
- Industrial robots for manufacturing and warehouses (Amazon)
- Robotic vacuum cleaners (Roomba)
- Surgical robots