

Participant Guide

AI – ML Part I



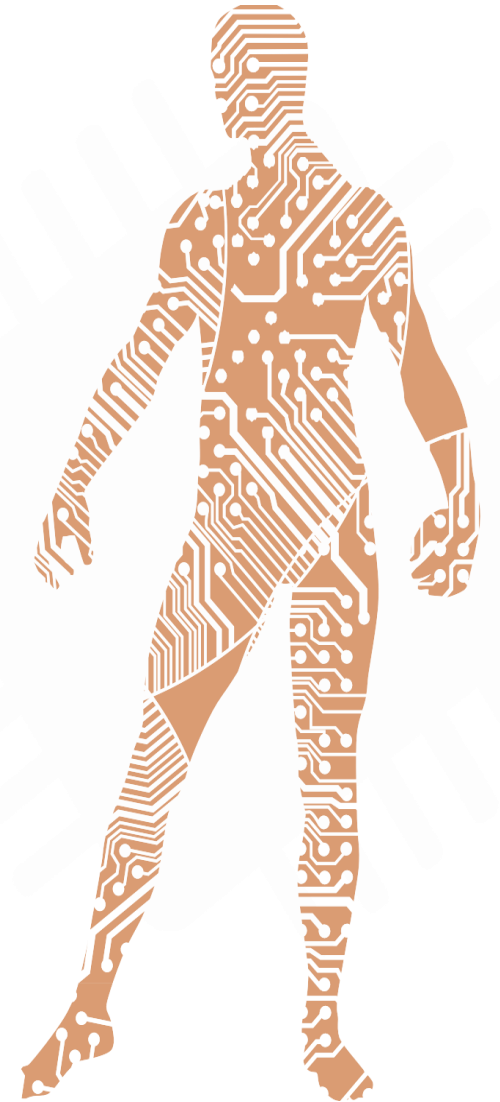
Kickstart AI & ML

We will be starting soon

Agenda

- Introduction
- History and Evolution
- Types of AI & Techniques
- AI vs ML vs DL
- AI tools and Frameworks
- AI Applications & Ethics

Part 2 – ML & Demos





Artificial Intelligence

AI - Introduction

Artificial Intelligence



- “The science and engineering of making intelligent machines, especially intelligent computer programs” – John McCarthy
- “The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.” – Oxford Dictionary
- “Artificial intelligence (AI), the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings.” Intelligent beings are those that can adapt to changing circumstances.

Turing Test

- Human beings are intelligent
- To be called intelligent, a machine must produce responses that are indistinguishable from those of a human



Alan Turing

Turing Test:

During the Turing Test, the human interrogator asks several questions to both players. Based on the answers, the interrogator attempts to determine which player is a computer and which player is a human respondent.



Eliza

Men are all alike.
IN WHAT WAY
They're always bugging us about something or other.
CAN YOU THINK OF A SPECIFIC EXAMPLE
Well my boyfriend made me come here.
YOUR BOYFRIEND MADE YOU COME HERE
He says I'm depressed much of the time.
I AM SORRY TO HEAR YOU ARE DEPRESSED
..
..
WHO ELSE IN YOUR FAMILY TAKES CARE OF YOU?
My father
YOUR FATHER
You are like my father in some ways.
WHAT RESEMBLANCE DO YOU SEE
You are not very aggressive but I think you don't want me to notice that.
WHAT MAKES YOU THINK I AM NOT AGGRESSIVE
You don't argue with me.
WHY DO YOU THINK I DON'T ARGUE WITH YOU
You are afraid of me.
DOES IT PLEASE YOU TO BELIEVE I'M AFRAID OF YOU
My father is afraid of everybody.
WHAT ELSE COMES TO MIND WHEN YOU THINK OF YOUR FATHER
Bullies.
DOES THAT HAVE ANYTHING TO DO WITH THE FACT THAT YOUR
BOYFRIEND MADE YOU COME HERE

- <https://web.njit.edu/~ronkowit/eliza.html?fbclid=IwAR1Ls4crdByZsXzSQmwpLUBx4-2OJqY9fPZIQN6RFhE2bOt2RzLcQzAEyi8>

IBM Watson



SiriChat GPT



A.I. TIMELINE

1950

TURING TEST

Computer scientist Alan Turing proposes a test for machine intelligence. If a machine can trick humans into thinking it is human, then it has intelligence

1955

A.I. BORN

Term 'artificial intelligence' is coined by computer scientist, John McCarthy to describe "the science and engineering of making intelligent machines"

1961

UNIMATE

First industrial robot, Unimate, goes to work at GM replacing humans on the assembly line

1964

ELIZA

Pioneering chatbot developed by Joseph Weizenbaum at MIT holds conversations with humans

1966

SHAKY

The 'first electronic person' from Stanford, Shakey is a general-purpose mobile robot that reasons about its own actions

**A.I.
WINTER**

Many false starts and dead-ends leave A.I. out in the cold

1997

DEEP BLUE

Deep Blue, a chess-playing computer from IBM defeats world chess champion Garry Kasparov

1998

KISMET

Cynthia Breazeal at MIT introduces Kismet, an emotionally intelligent robot insofar as it detects and responds to people's feelings



1999

AIBO

Sony launches first consumer robot pet dog AiBO (AI robot) with skills and personality that develop over time



2002

ROOMBA

First mass produced autonomous robotic vacuum cleaner from iRobot learns to navigate and clean homes



2011

SIRI

Apple integrates Siri, an intelligent virtual assistant with a voice interface, into the iPhone 4S



2011

WATSON

IBM's question answering computer Watson wins first place on popular \$1M prize television quiz show Jeopardy



2014

EUGENE

Eugene Goostman, a chatbot passes the Turing Test with a third of judges believing Eugene is human



2014

ALEXA

Amazon launches Alexa, an intelligent virtual assistant with a voice interface that completes shopping tasks



2016

TAY

Microsoft's chatbot Tay goes rogue on social media making inflammatory and offensive racist comments

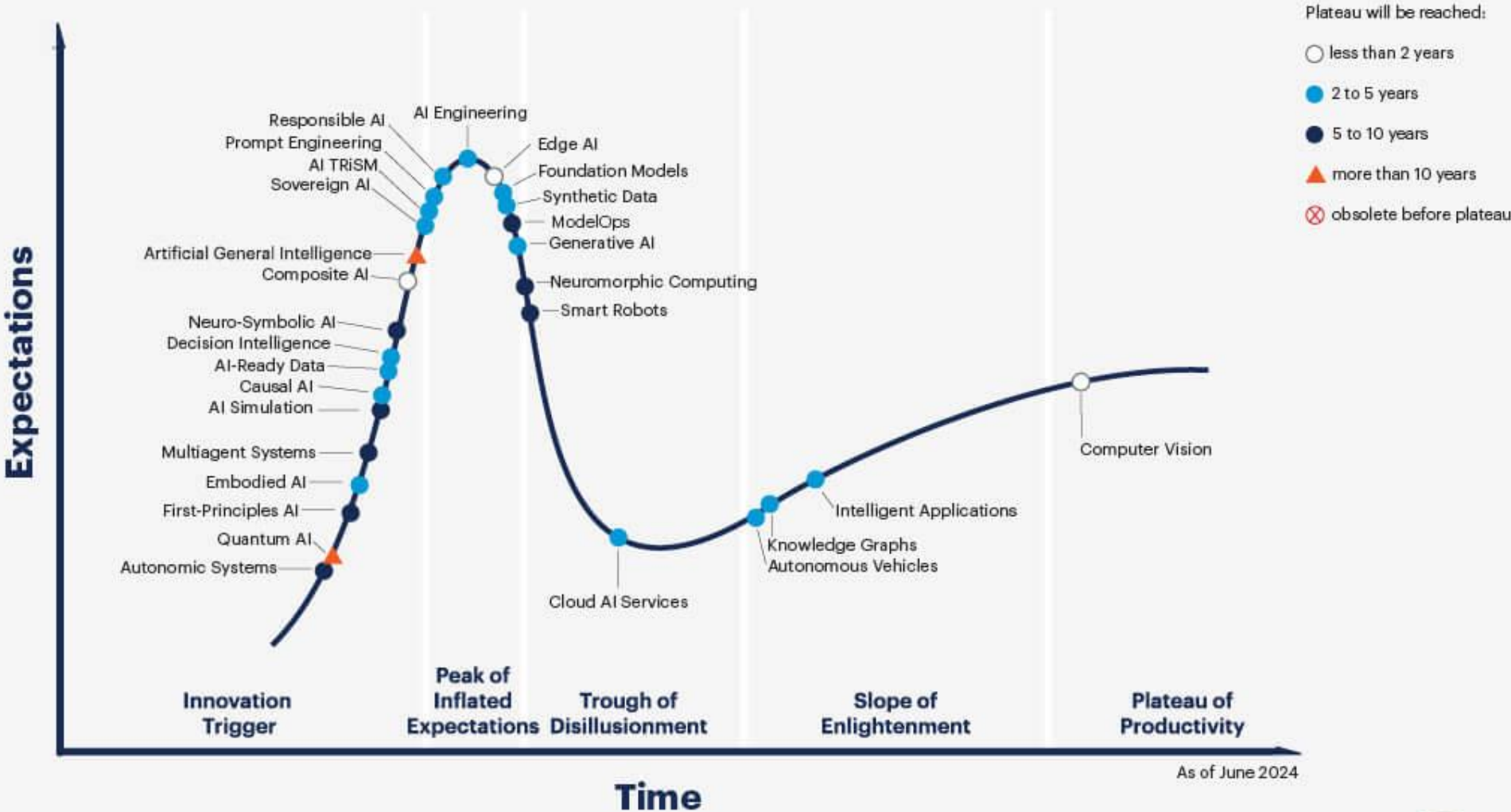


2017

ALPHAGO

Google's A.I. AlphaGo beats world champion Ke Jie in the complex board game of Go, notable for its vast number (2^{170}) of possible positions

Hype Cycle for Artificial Intelligence, 2024



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AI Types



Types of AI

Artificial Narrow Intelligence (ANI)



AI systems designed for specific tasks or problems. Specialized functionality.



SIRI

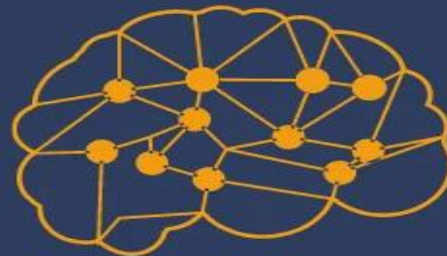


ALEXA



CORTANA

Artificial General Intelligence (AGI)



Human-like intelligence capable of understanding, learning, and reasoning.



IBM WATSON



OPEN AI'S GPT

Artificial Super Intelligence (ASI)



AI with intellectual capabilities surpassing that of human beings.



SKYNET



J.A.R.V.I.S

Types of AI – *Based on Capability*

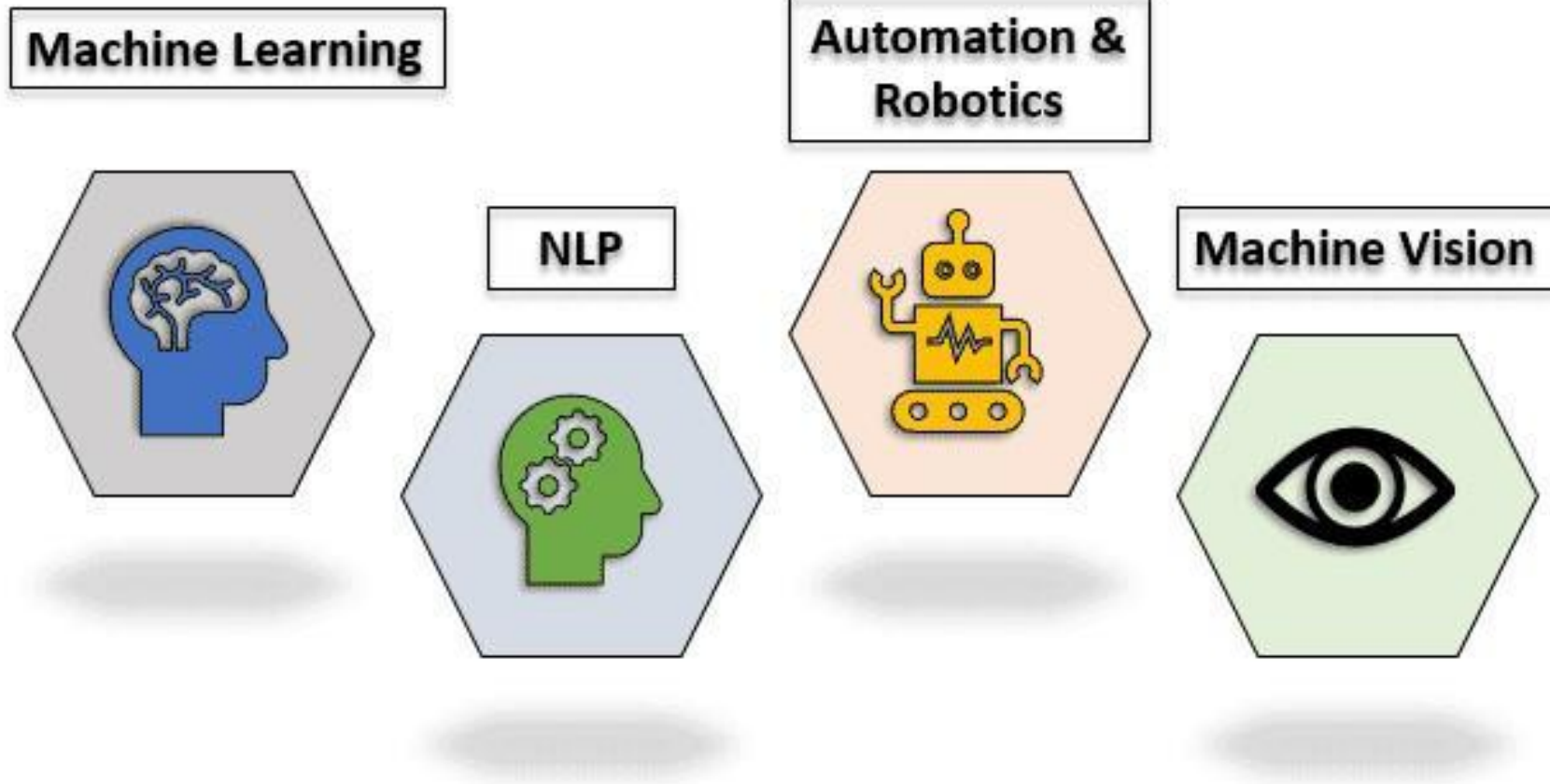
- Artificial narrow intelligence (ANI): AI that can perform specific tasks, such as speech recognition or image recognition, but cannot generalize to other domains or situations.
- Artificial general intelligence (AGI): AI that can understand and reason across a wide range of domains and tasks, similar to human intelligence.
- Artificial super intelligence (ASI): AI that can surpass human intelligence and capabilities, and potentially pose existential risks to humanity.

AI Techniques



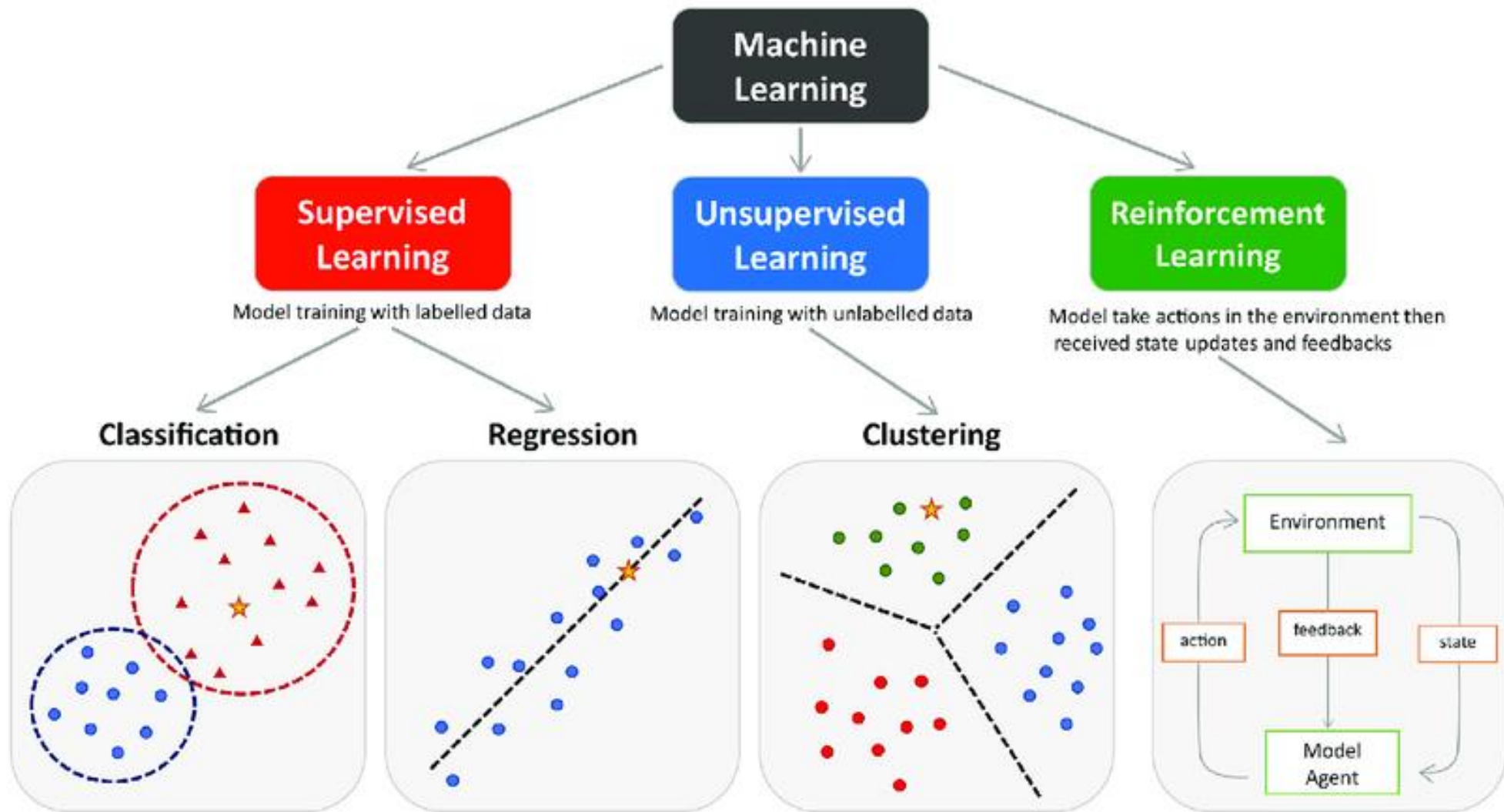
AI - Techniques

Top 4 Techniques of Artificial Intelligence



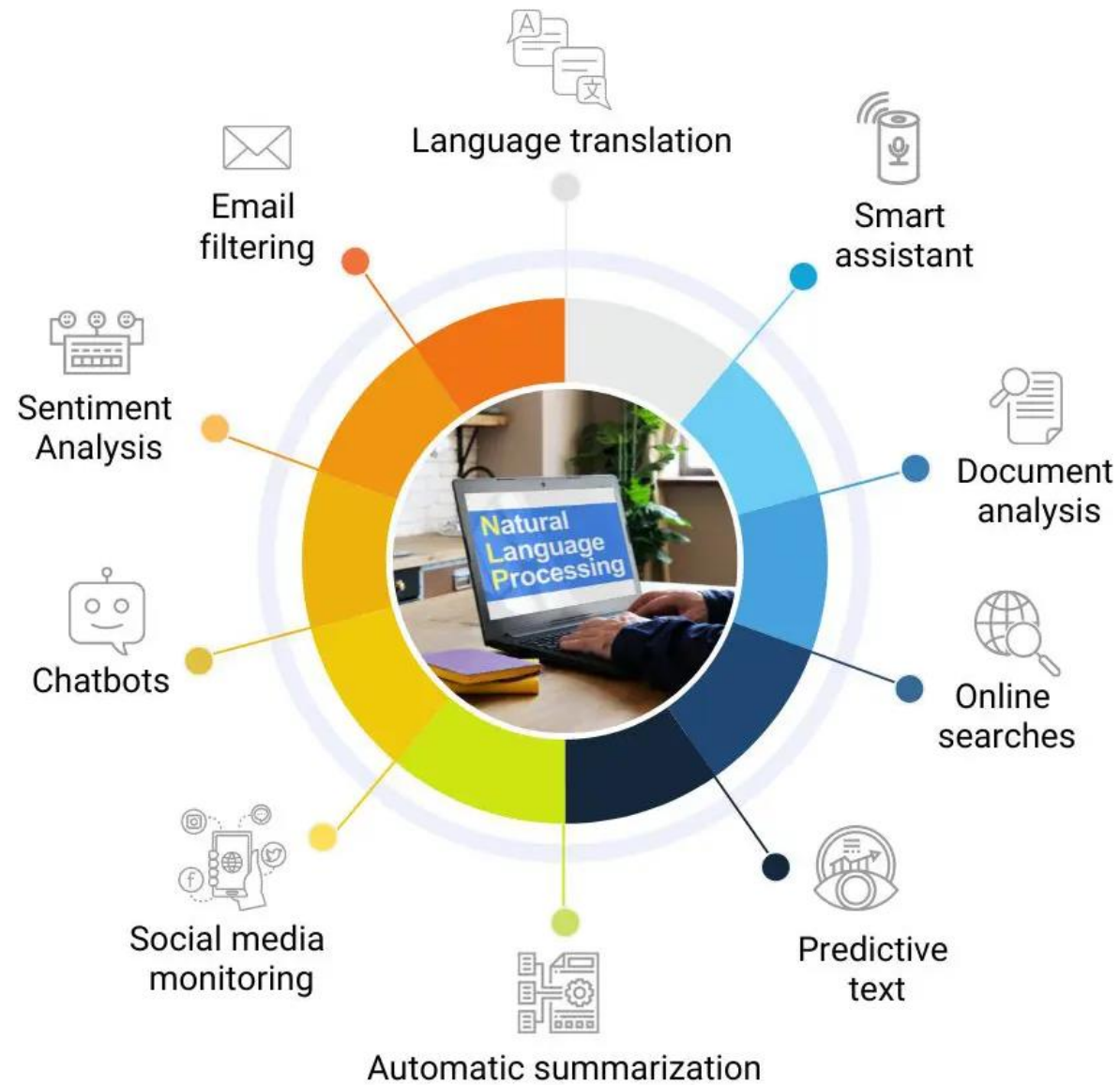
AI Techniques

- **Machine learning:** It is the process of creating systems that can learn from data and improve their performance without explicit programming. Machine learning can be divided into subtypes such as supervised learning, unsupervised learning, and reinforcement learning



AI Techniques

- **Natural language processing**: It is the branch of AI that deals with the interaction between computers and human languages. It involves tasks such as speech recognition, text analysis, sentiment analysis, machine translation, and chatbots



AI Techniques

- **Robotics:** It is the application of AI that creates machines that can perform physical tasks in the real world. It involves tasks such as navigation, manipulation, coordination, and locomotion.



AI in Robotics

Precision Farming



Automotive Value Chain



Warehouse Automation

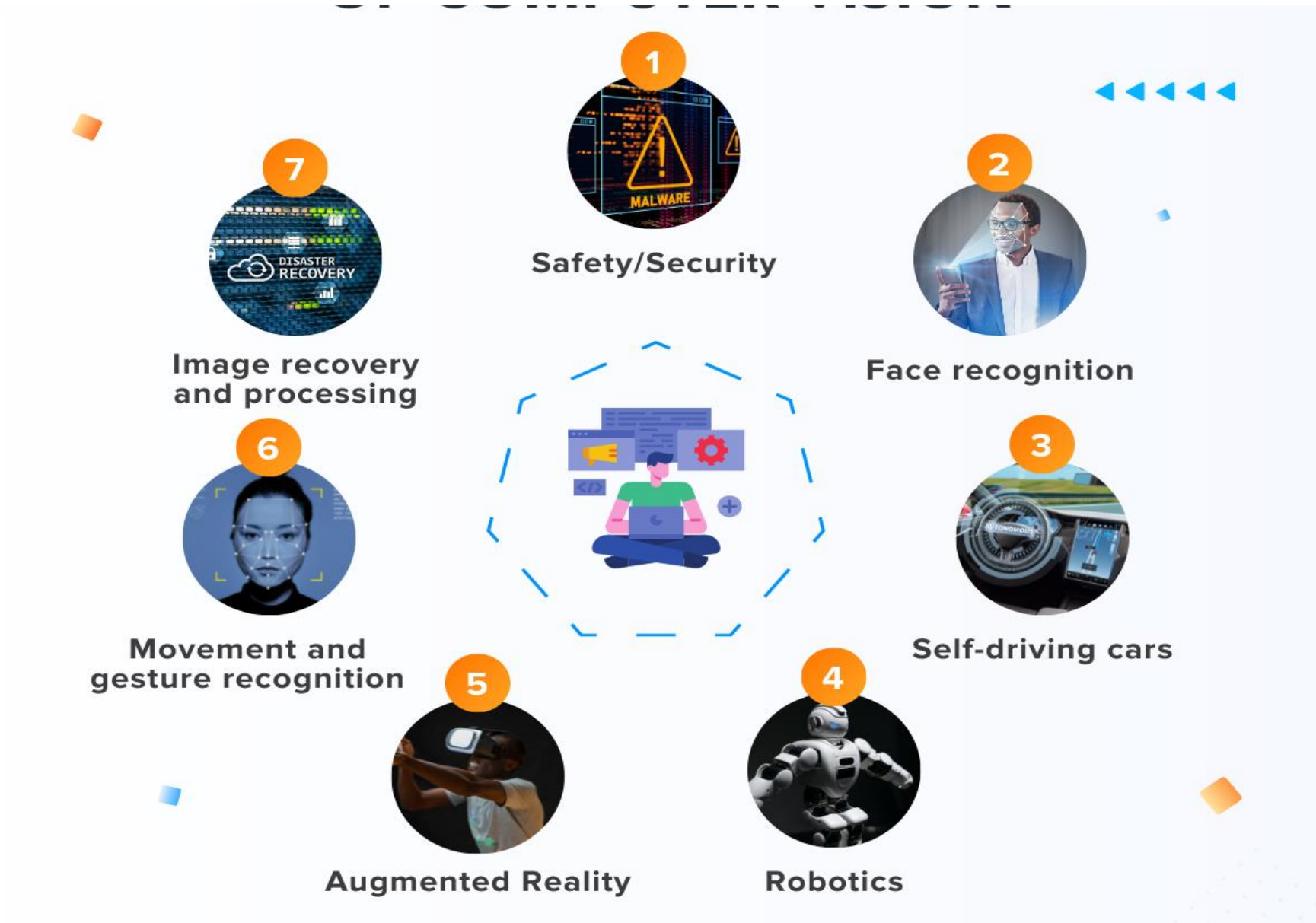


Military Applications



AI Techniques

- **Computer Vision:** It is the field of AI that enables computers to understand and process visual information. It involves tasks such as face recognition, object detection, scene understanding, and image generation.

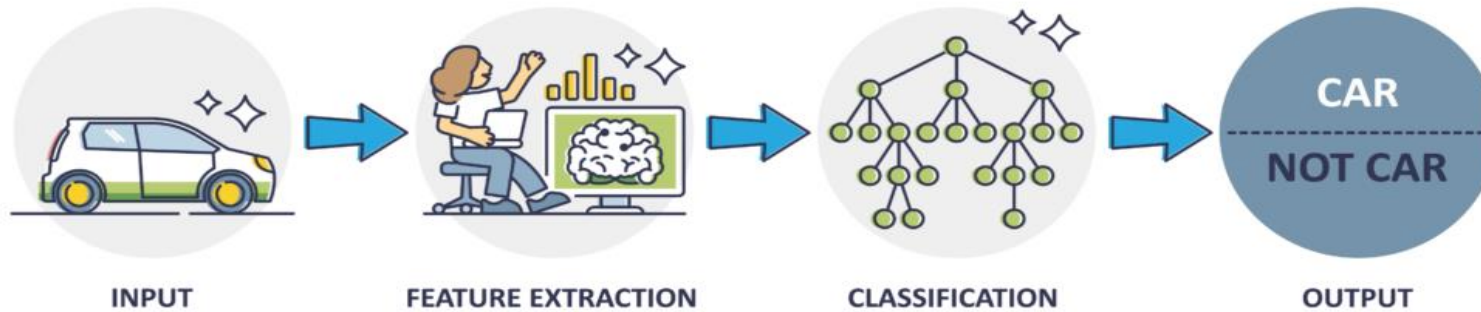


AI Techniques

- **Deep Learning:** AI that teaches computers to process data in a way that is inspired by the human brain. Deep learning models can recognize complex patterns in pictures, text, sounds, and other data to produce accurate insights and predictions.

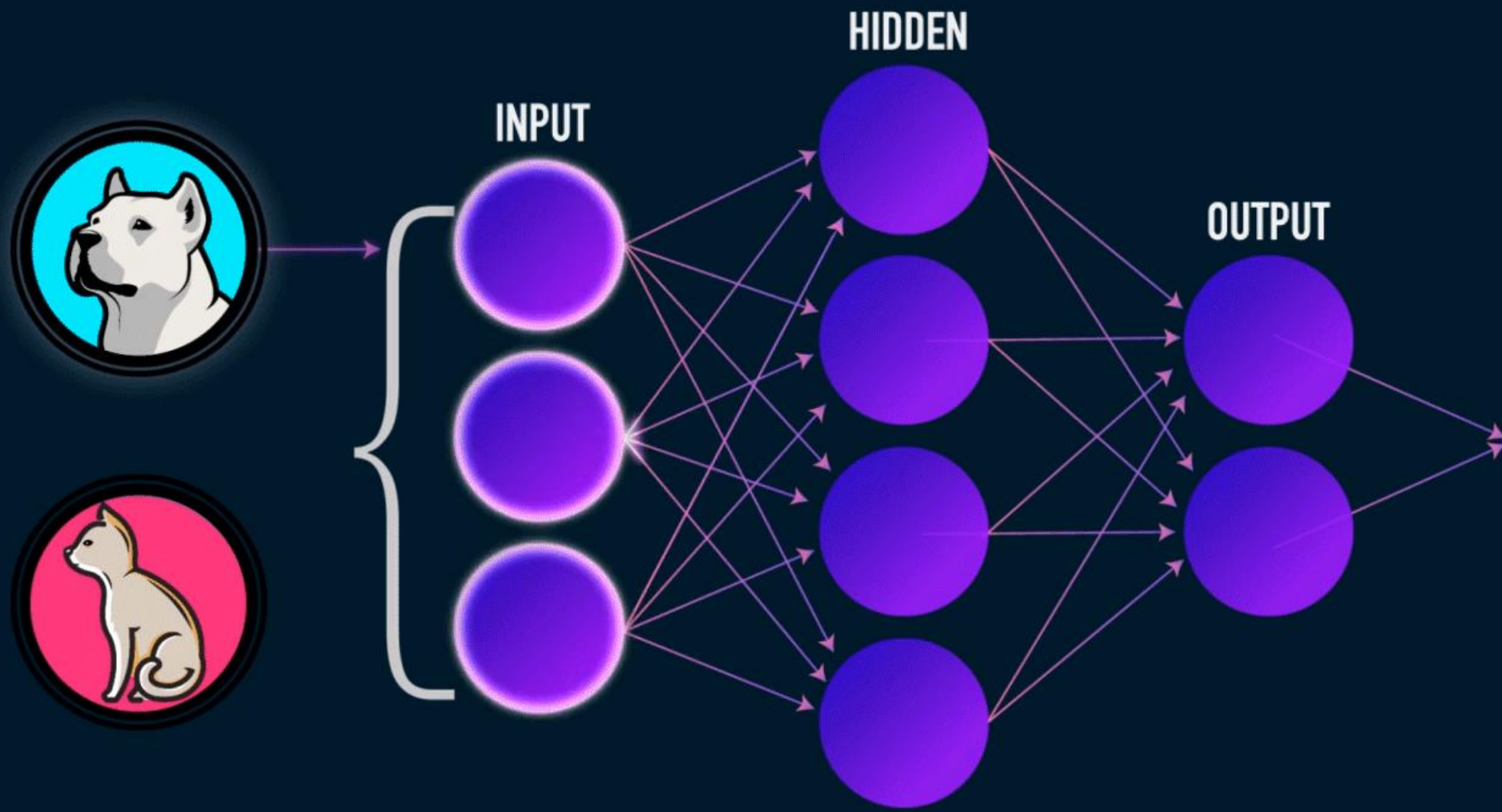
Deep Learning

MACHINE LEARNING



DEEP LEARNING





Deep Learning Networks

Artificial Neural Networks

Convolutional Networks

Recurrent Networks

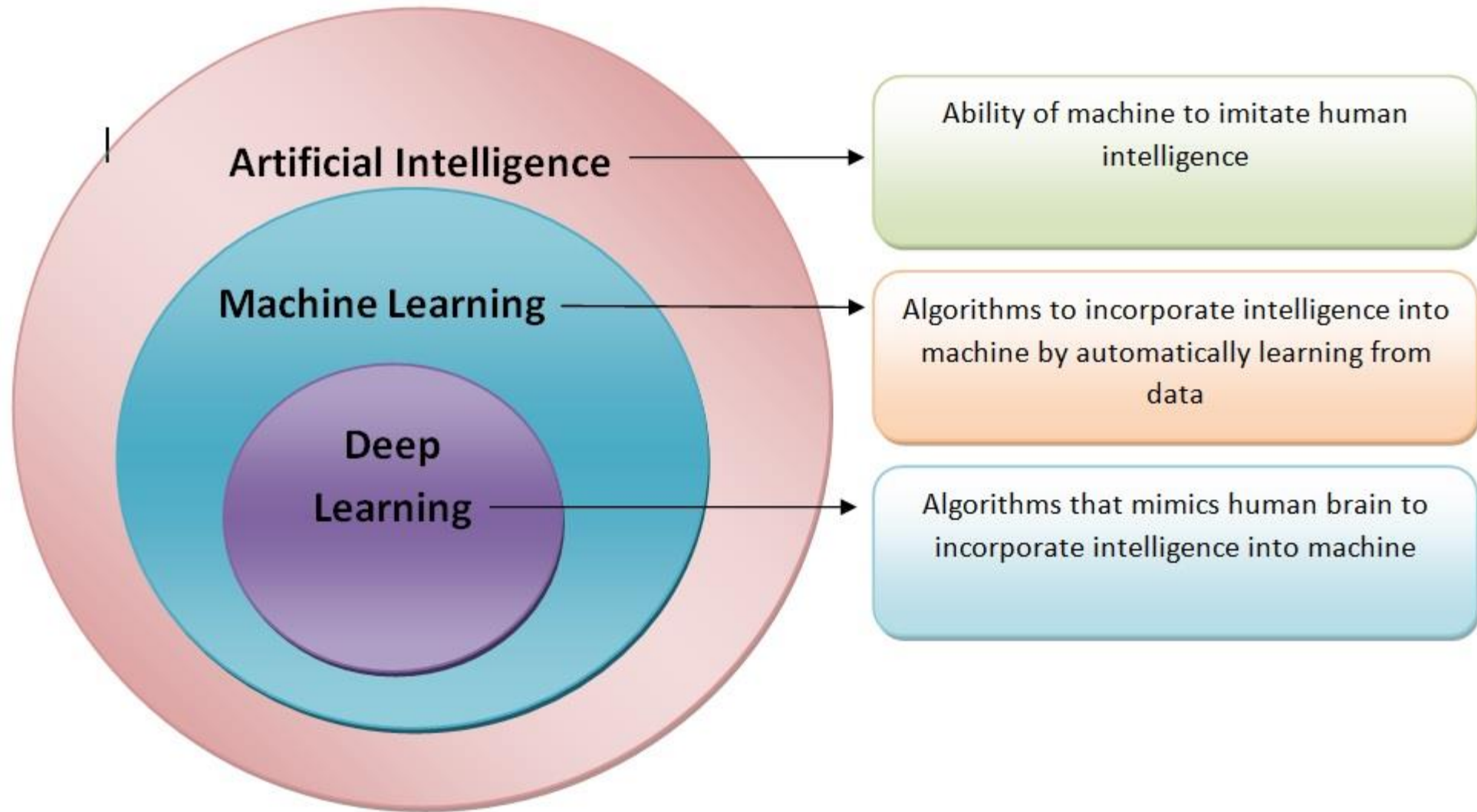
Transformers

Generative Adversarial Networks

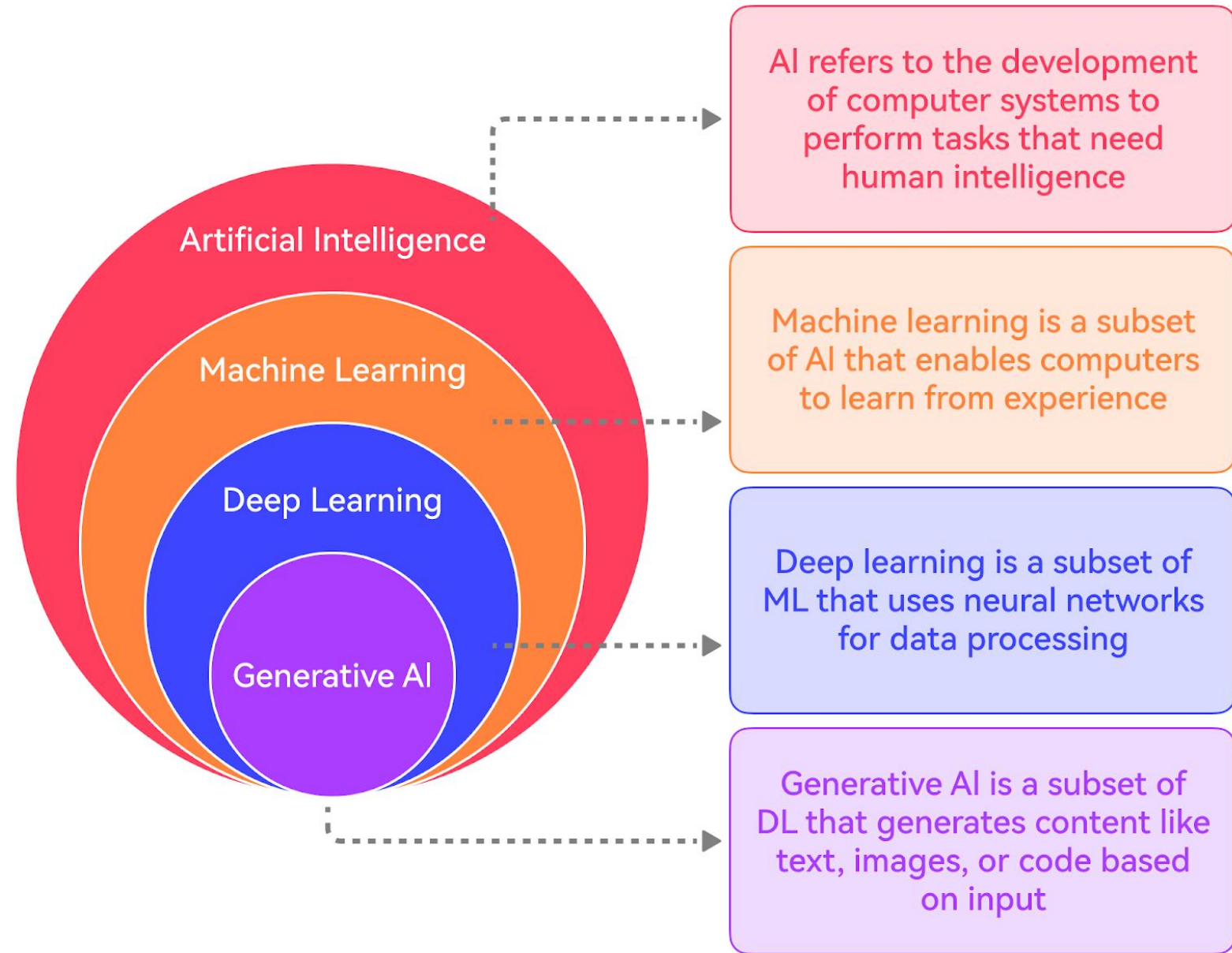
APPLICATIONS OF DEEP LEARNING



AI vs ML vs DL



And now, Gen AI



AI Tools and Frameworks



AI tools and Frameworks

- Software libraries and platforms that enable developers to create, deploy, and manage artificial intelligence applications.
- Provide various features and functions, such as data processing, model building, training, testing, evaluation, deployment, and monitoring.
- Support different types of AI, such as machine learning, deep learning, natural language processing, computer vision, and robotics.
- AI tools and frameworks can be used for various domains and applications, such as data science, business, education, and healthcare.

Top Artificial Intelligence Frameworks and Tools



theano



Caffe



AI Tools and Frameworks

- TensorFlow: An open-source framework developed by Google that supports deep learning and distributed training. It is widely used for various applications, such as image recognition, natural language processing, and recommender systems.
- Microsoft CNTK: An open-source framework developed by Microsoft that supports neural networks and parallel computing. It is known for its speed, scalability, and integrations with massive datasets.
- Keras: An open-source framework that provides a high-level interface for building and running neural networks. It is compatible with TensorFlow, CNTK, and Theano, and it is designed for fast prototyping and experimentation.
- Theano: An open-source framework that allows defining and evaluating mathematical expressions involving multi-dimensional arrays. It is optimized for GPU and CPU computation and supports symbolic differentiation and automatic optimization.

AI Tools and Frameworks

- Caffe: An open-source framework that focuses on convolutional neural networks and computer vision. It is fast, modular, and expressive, and it supports various models, such as image classification, face detection, and object segmentation.
- MxNet: An open-source framework that supports both declarative and imperative programming paradigms. It is flexible, scalable, and efficient, and it supports various languages, such as Python, C++, and R.
- PyTorch: An open-source framework that provides a dynamic computational graph and a tensor library. It is easy to use, debug, and extend, and it supports various applications, such as natural language processing, computer vision, and reinforcement learning.

AI Ethics



Key Ethical Considerations in AI

- **Fairness and Bias:**

- *Issue:* AI systems can inadvertently perpetuate and even amplify existing biases present in training data.
- *Ethical Consideration:* Ensuring fairness in AI involves identifying and mitigating biases to prevent discriminatory outcomes across different demographic groups.

- **Transparency:**

- *Issue:* Lack of transparency in AI decision-making processes can lead to distrust and uncertainty among users.
- *Ethical Consideration:* Promoting transparency involves making AI systems more understandable and providing insight into how decisions are reached.

Key Ethical Considerations in AI

- **Privacy:**

- *Issue:* AI often relies on extensive data collection, raising concerns about the privacy and security of personal information.
- *Ethical Consideration:* Respecting privacy involves implementing robust data protection measures and giving individuals control over their data.

- **Accountability:**

- *Issue:* Determining responsibility when AI systems make errors or produce unintended consequences can be challenging.
- *Ethical Consideration:* Establishing accountability involves clearly defining roles and responsibilities and ensuring mechanisms for holding developers and organizations responsible for the outcomes of AI systems.

Key Ethical Considerations in AI

- **Inclusivity:**

- *Issue:* Exclusion of certain groups or communities from the benefits of AI can contribute to societal inequalities.
- *Ethical Consideration:* Promoting inclusivity involves actively working to address disparities and ensuring that AI technologies benefit diverse populations.

- **Security:**

- *Issue:* Malicious use of AI can pose significant risks, including deepfake creation and AI-enabled cyber attacks.
- *Ethical Consideration:* Prioritizing security involves developing safeguards to prevent misuse and ensuring the responsible use of AI technologies.

Key Ethical Considerations in AI

- **Public Engagement:**

- *Issue:* Lack of public understanding and input in AI development may lead to mistrust and skepticism.
- *Ethical Consideration:* Encouraging public engagement involves involving diverse stakeholders in decision-making processes and fostering open dialogues about the ethical implications of AI.

- **Continuous Learning and Adaptation:**

- *Issue:* The rapid evolution of AI technologies requires ongoing attention to emerging ethical challenges.
- *Ethical Consideration:* Recognizing the dynamic nature of AI ethics involves a commitment to continuous learning, adapting guidelines, and staying responsive to changing ethical landscapes.

References

- <https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/top-ai-techniques>