TEKsystems Global Services | WORKFORCE DEVELOPMENT

Participant Guide

AI – ML Part I

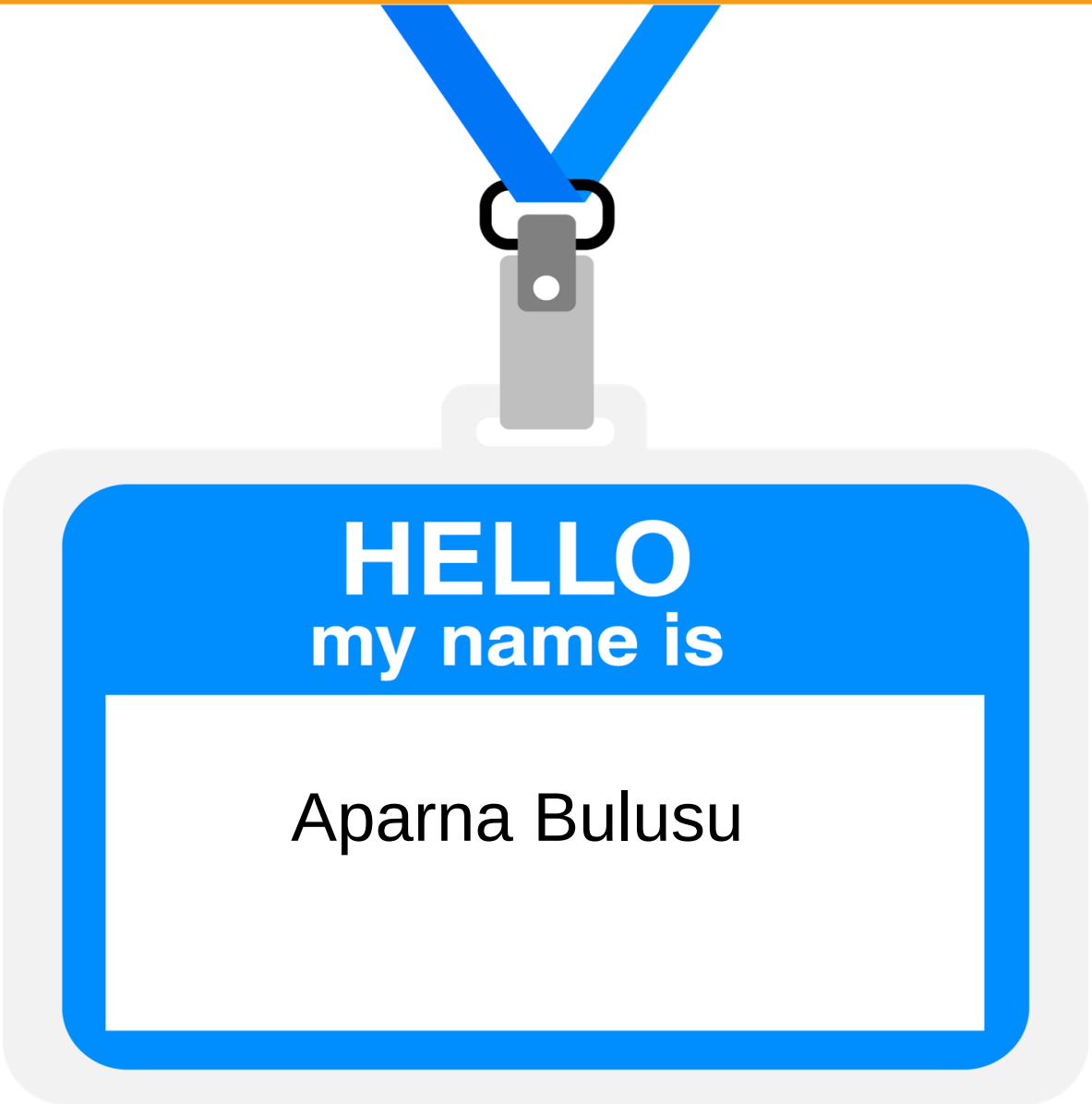
AI and Machine Learning Basics
IN1712

We will be starting soon

Agenda

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

Part 2 – ML & Demos



About me

- Over 15 years of teaching and training experience
- Author of 3 books
- Pursued Masters from NJIT in Information Systems
- Currently pursuing research in Natural Language Processing
- A Continual learner with a passion for MOOC's and eLearning

My pledge to you:

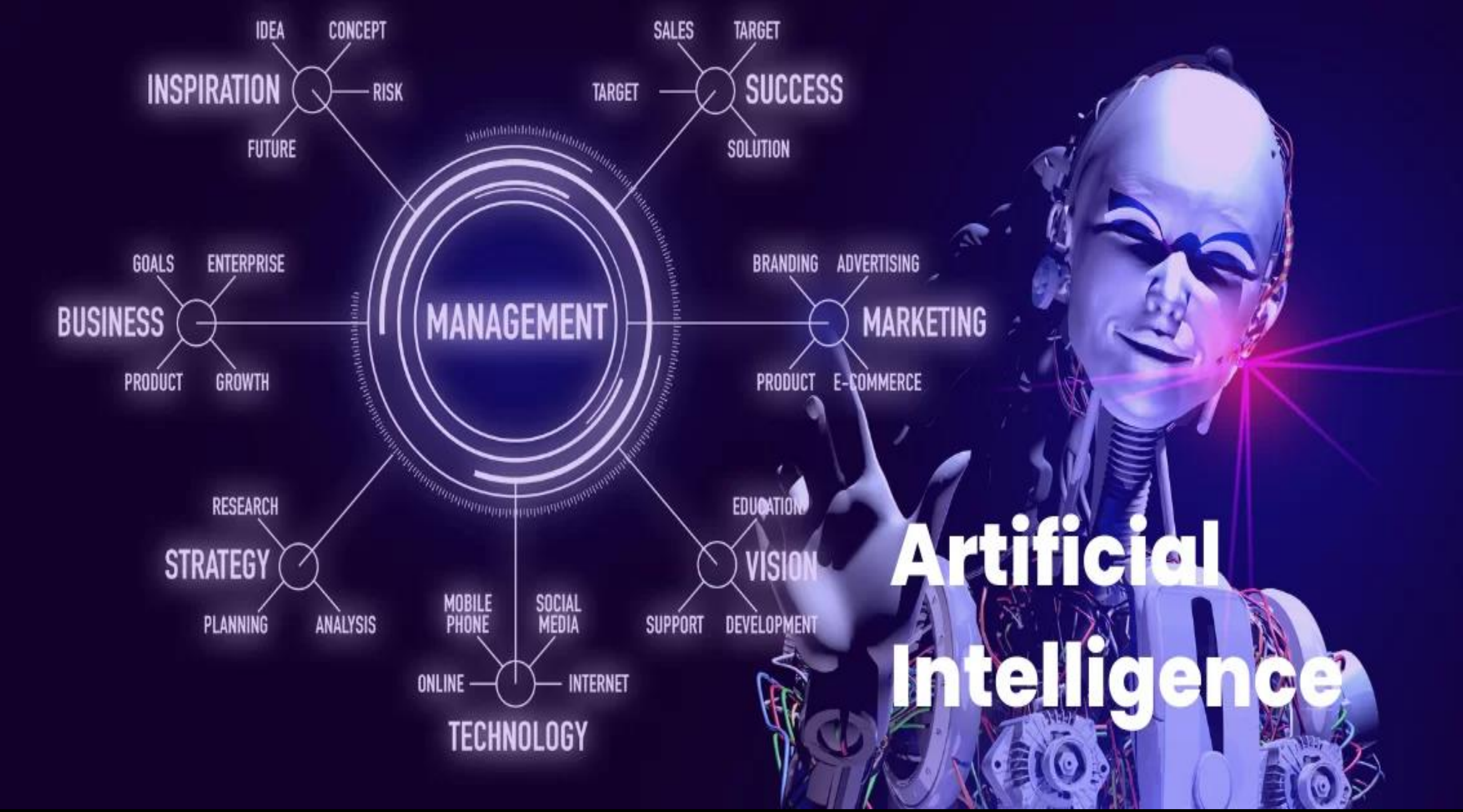
I will..

- Make this course interactive
- Ask you questions
- Ensure everyone can speak
- Create an inclusive learning environment
- Use an on-screen timer for breaks

…also, if you have an accessibility need, please let me know!

Your turn

- Job Title?
- Where are you based?
- Related experience if any?
- Goals from this training?
- Fun fact?


IDEA
CONCEPT
INSPIRATION
RISK
FUTURE
SALES
TARGET
TARGET
SUCCESS
SOLUTION
GOALS
ENTERPRISE
BUSINESS
PRODUCT
GROWTH
MANAGEMENT
BRANDING
ADVERTISING
MARKETING
PRODUCT
E-COMMERCE
RESEARCH
STRATEGY
PLANNING
ANALYSIS
EDUCATION
VISION
SUPPORT
DEVELOPMENT
MOBILE PHONE
SOCIAL MEDIA
ONLINE
INTERNET
TECHNOLOGY
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.

Player A
Computer

Player B
Human Responder

Player C
Interrogator

■ Question to Respondents

■ Answers to Question

abc NEWS

Eliza

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

IBM Watson

Siri .....Chat 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
SHAKEY
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*

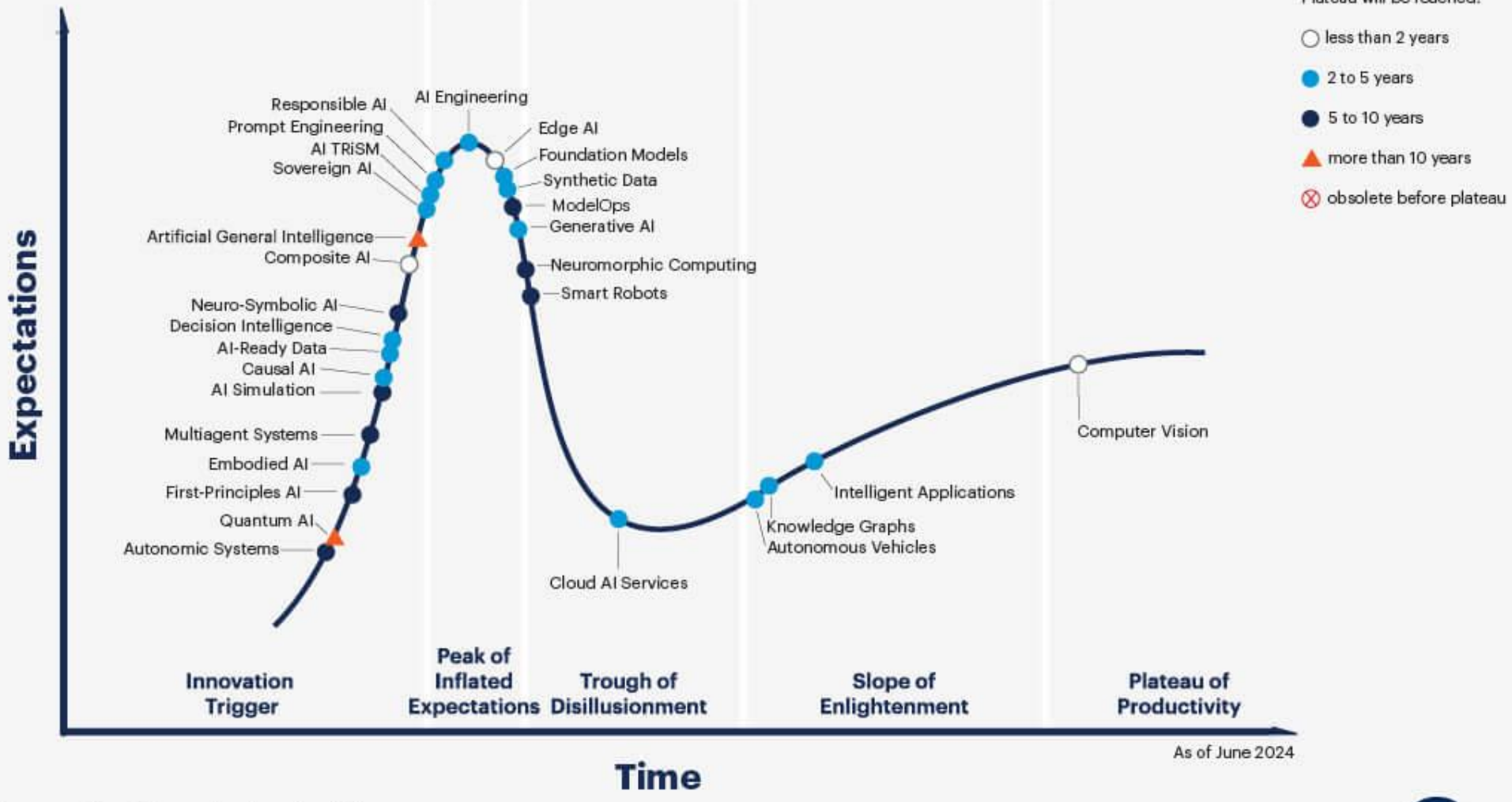
2014
EUGENE
Eugene Goostman, a chatbot passes the Turing Test with a third of judges believing Eugene is human

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



Source: Gartner

Gartner®

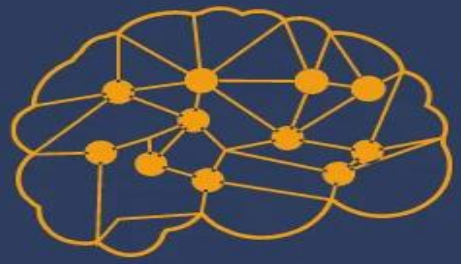
AI Types

Types of AI

Artificial Narrow Intelligence (ANI)

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

Artificial General Intelligence (AGI)



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

Artificial Super Intelligence (ASI)

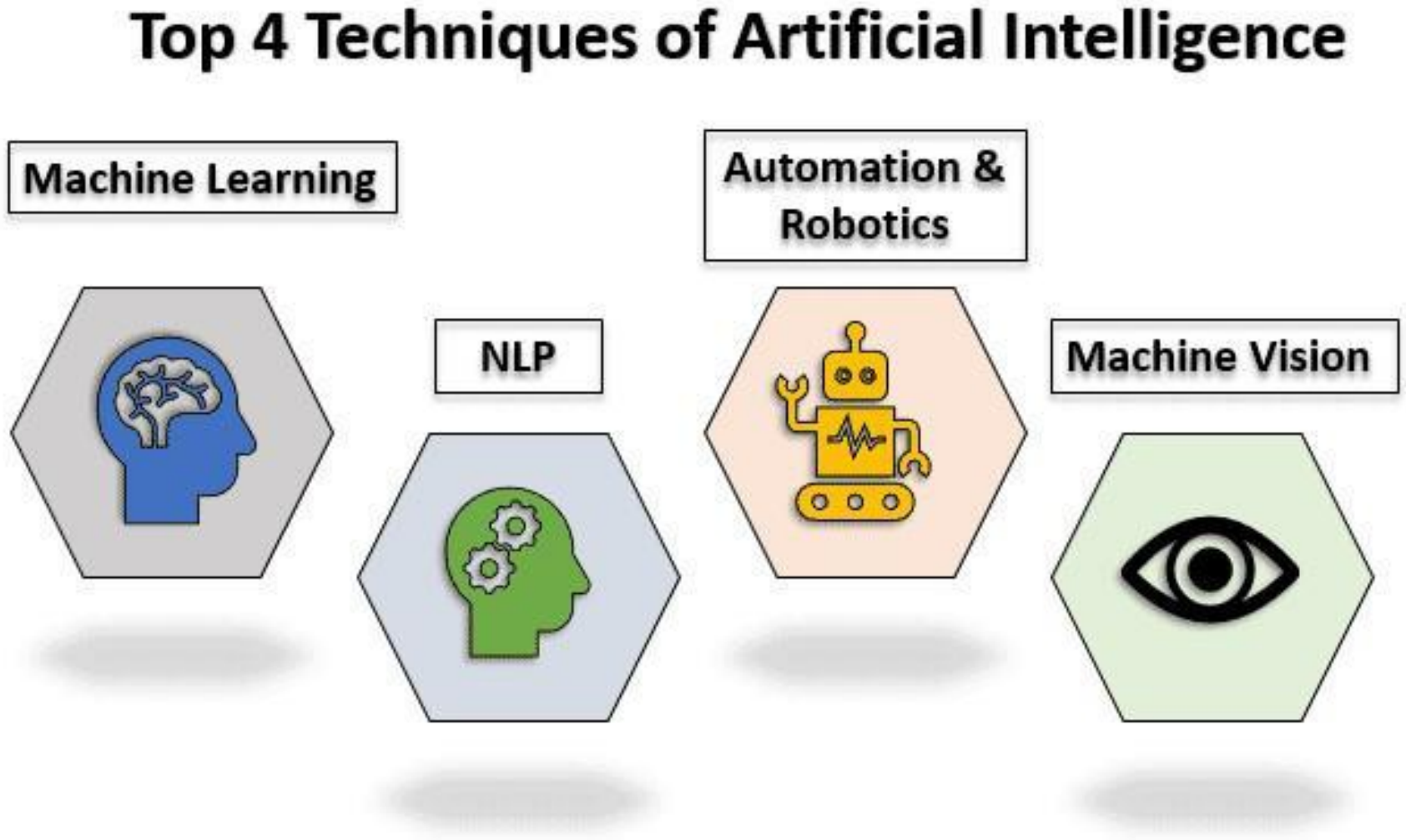
AI with intellectual capabilities surpassing that of human beings.

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.

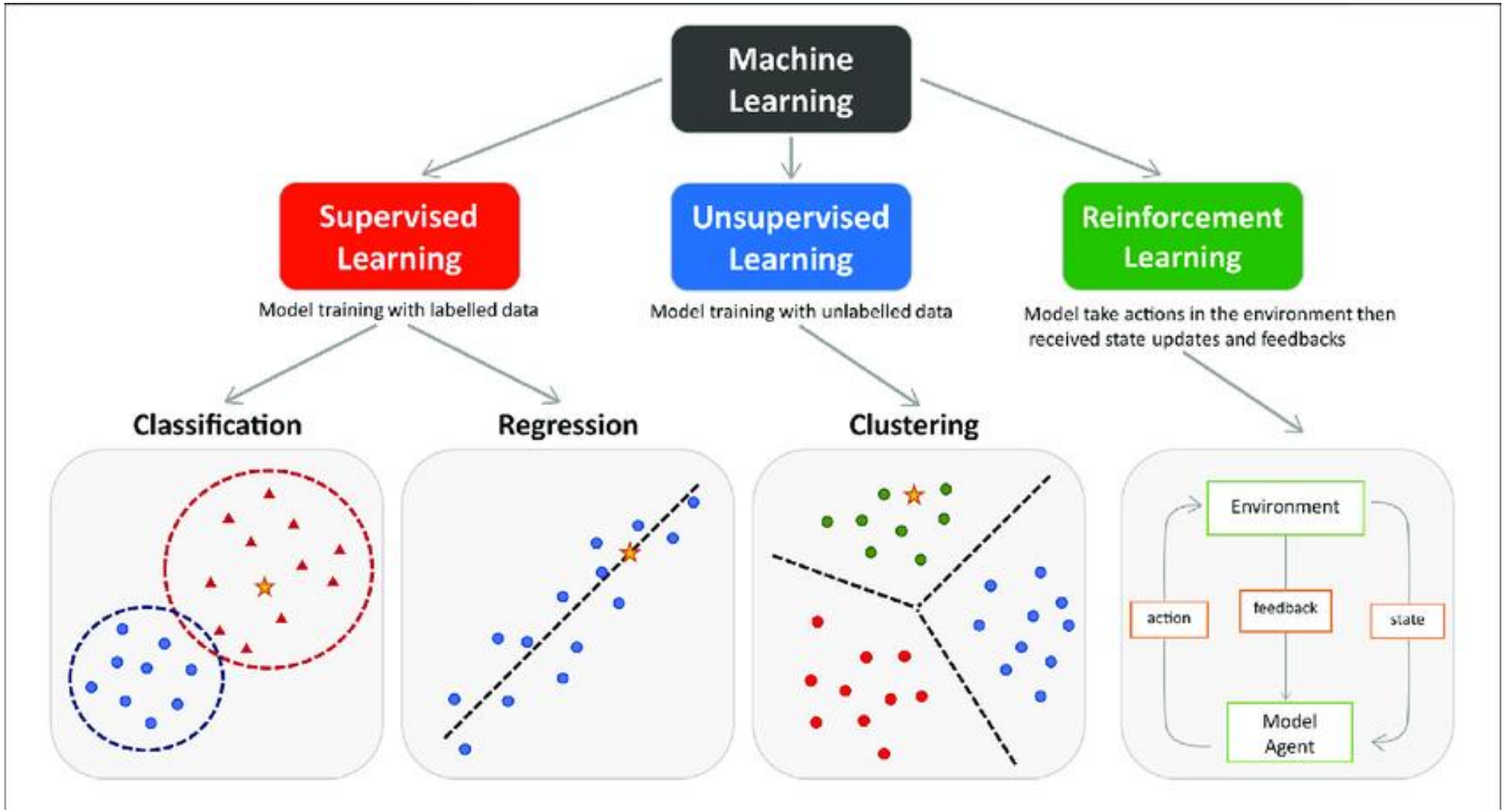
AI Techniques

AI - Techniques



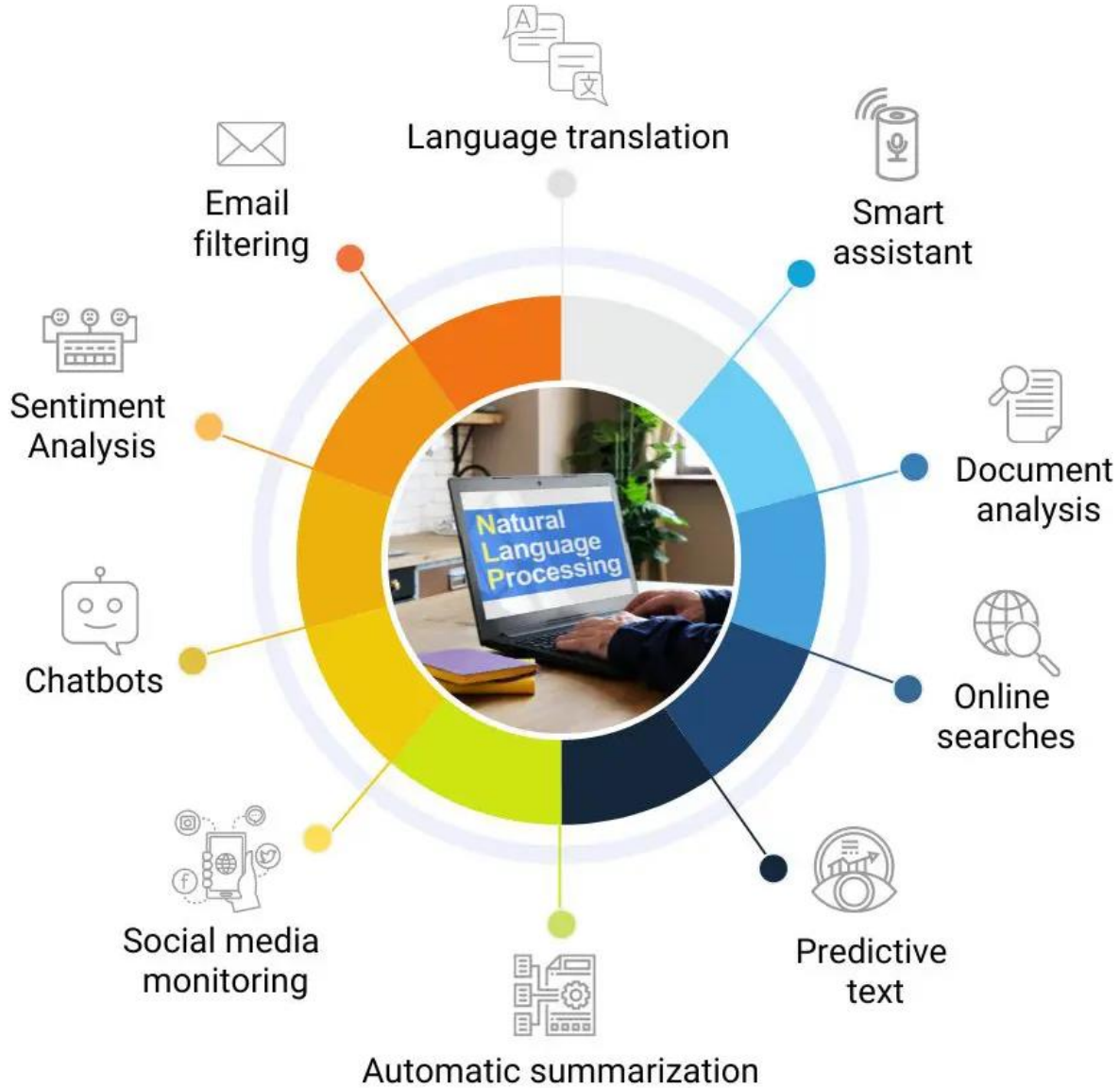
AI Techniques

- 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

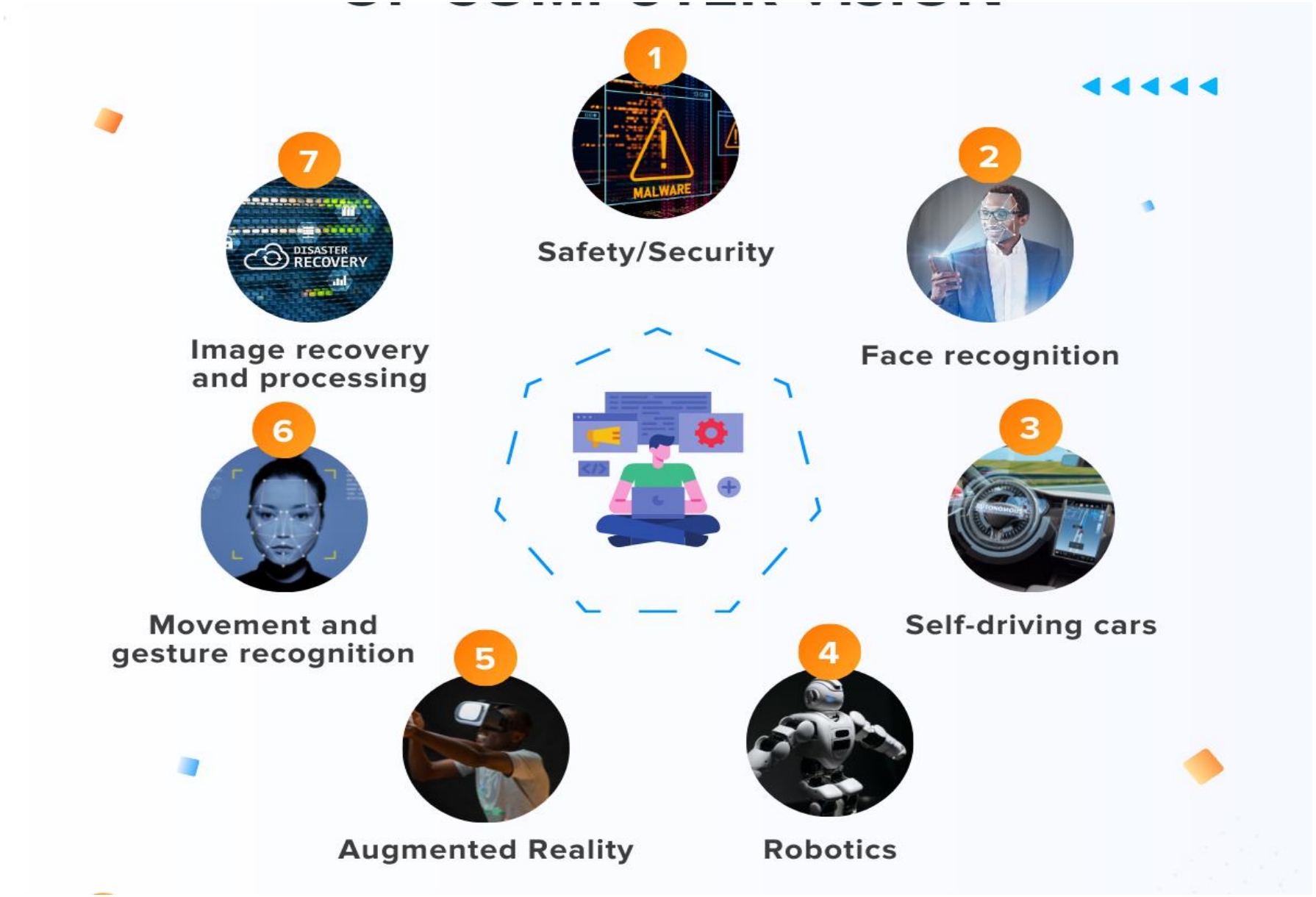
- **Robotics:** It is the application of AI that creates machines that can perform physical tasks in the real world. It involves tasks such as navigation, manipulation, coordination, and locomotion.

AI in Robotics

- Precision Farming
- Automotive Value Chain
- Warehouse Automation
- Military Applications

AI Techniques

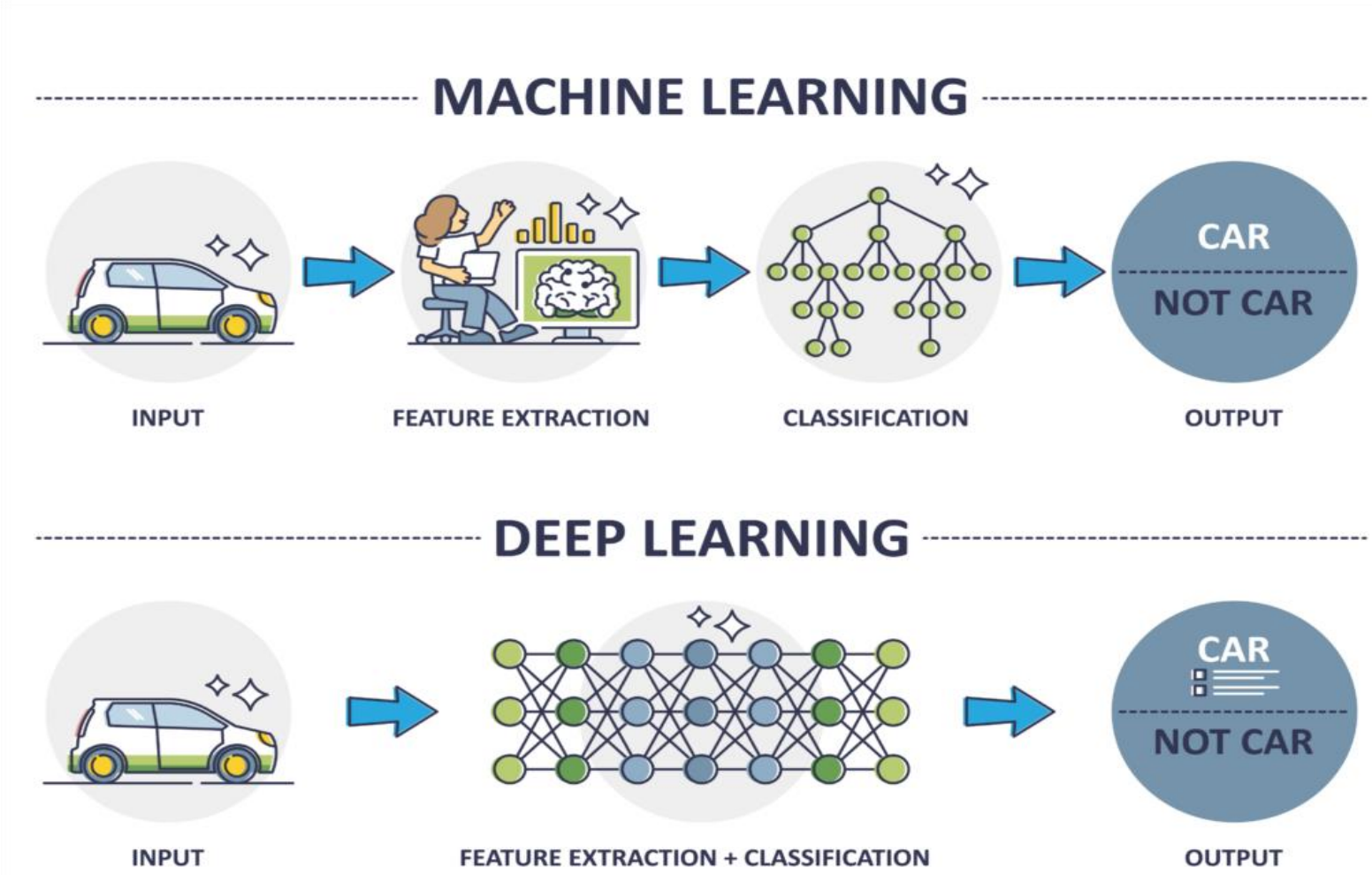
- **Computer Vision**: It is the field of AI that enables computers to understand and process visual information. It involves tasks such as face recognition, object detection, scene understanding, and image generation.

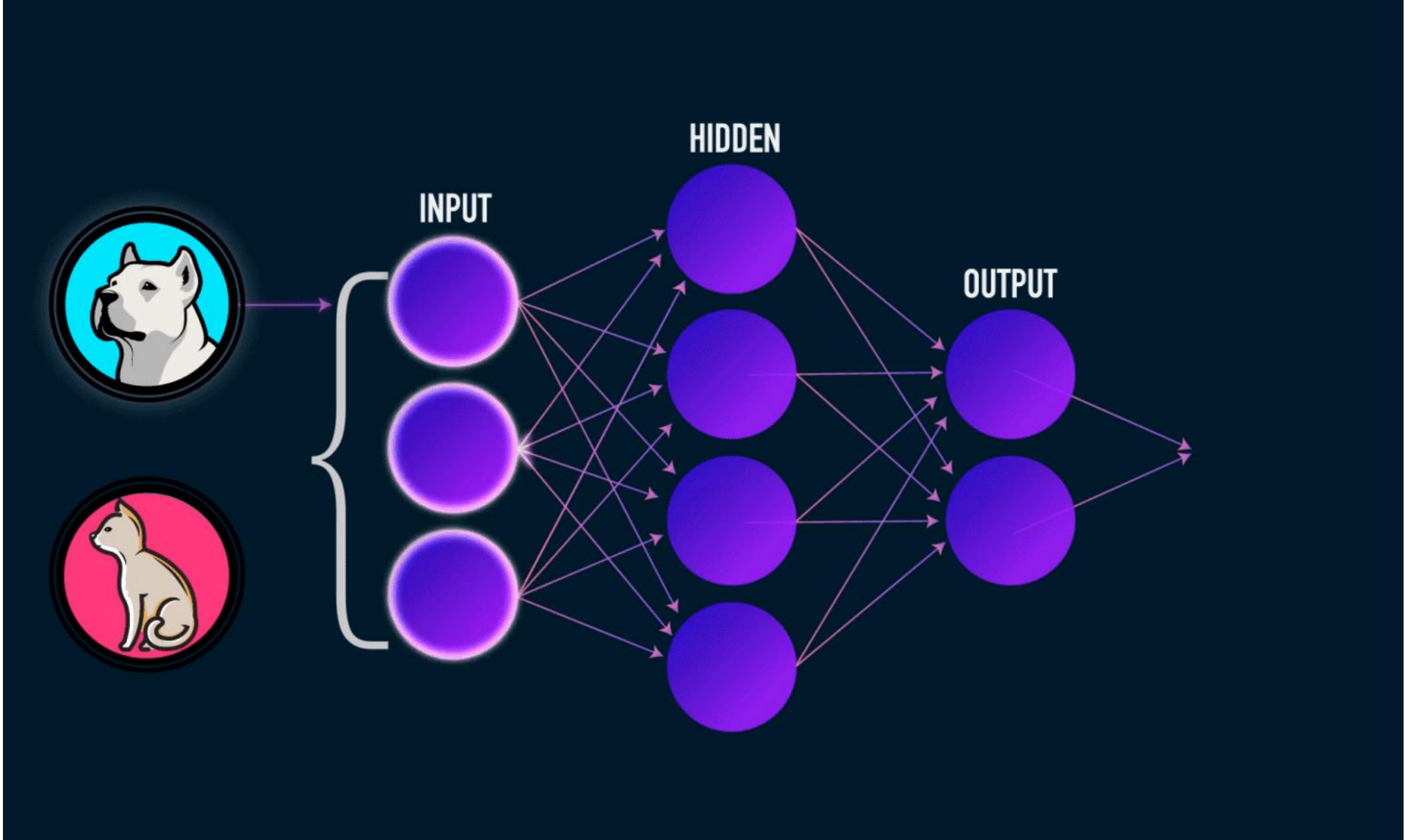


AI Techniques

- **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




HIDDEN
INPUT
OUTPUT

Deep Learning Networks

- Artificial Neural Networks
- Convolutional Networks
- Recurrent Networks
- Transformers
- Generative Adversarial Networks

APPLICATIONS OF DEEP LEARNING

Image Recognition

Natural Language Processing

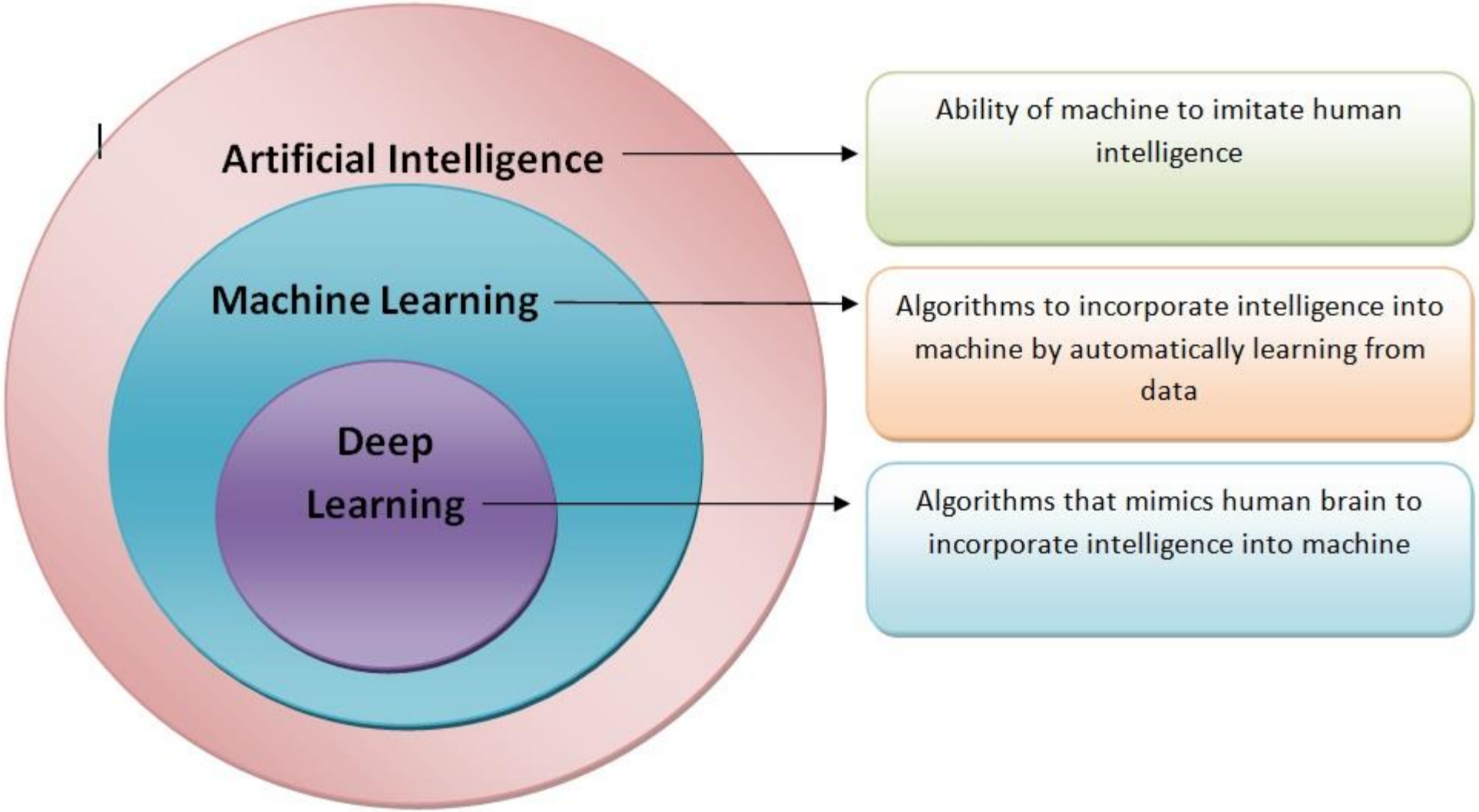
Portfolio Management & prediction of stock price movements.

Drug Discovery & better diagnostics of diseases in Healthcare

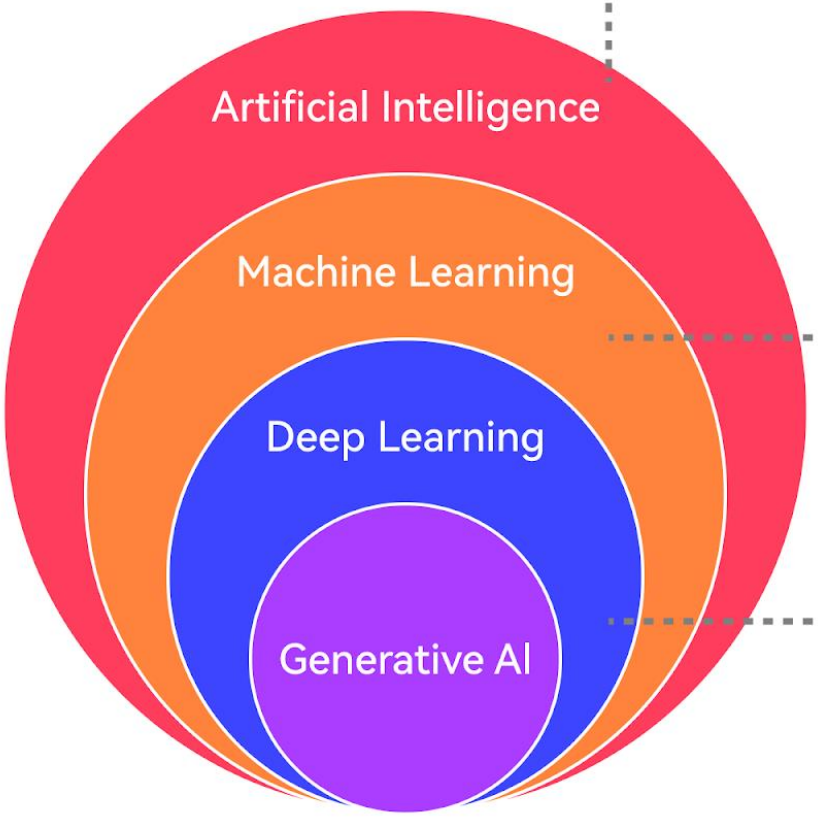
Speech Recognition

Robots and Self-Driving Cars

AI vs ML vs DL



And now, Gen AI



AI refers to the development of computer systems to perform tasks that need human intelligence

Machine learning is a subset of AI that enables computers to learn from experience

Deep learning is a subset of ML that uses neural networks for data processing

Generative AI is a subset of DL that generates content like text, images, or code based on input

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

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