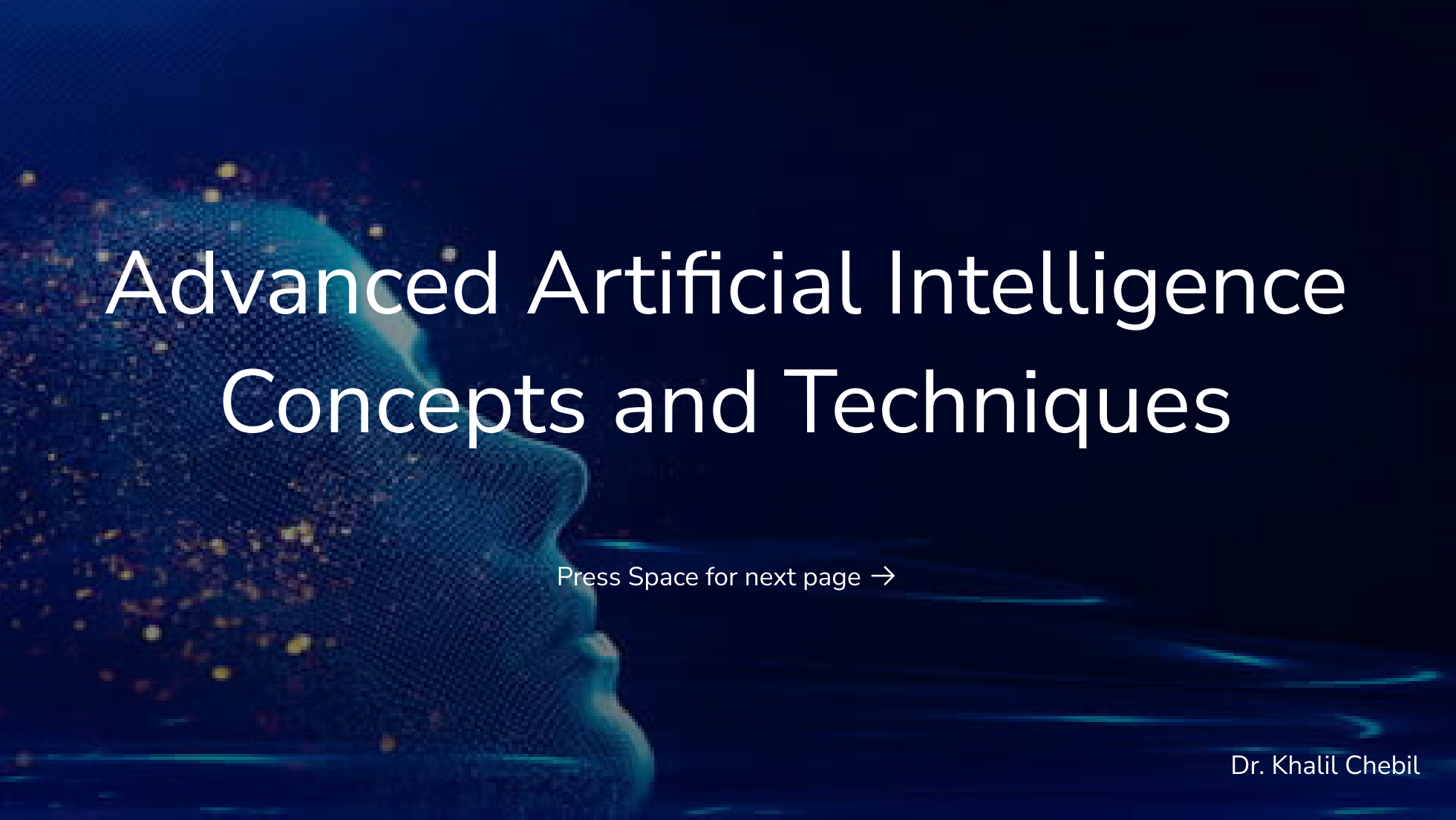

Advanced Artificial Intelligence Concepts and Techniques

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Dr. Khalil Chebil

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Chapter 1: Introduction to Artificial Intelligence

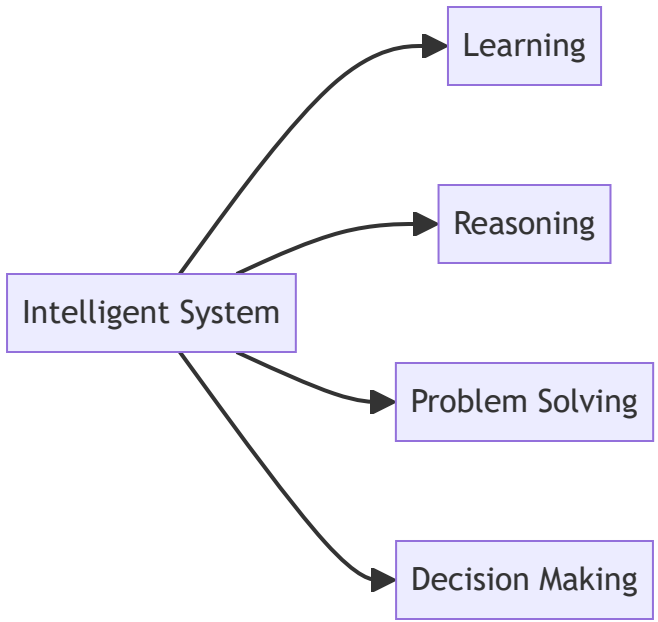
What is intelligence?

Intelligence involves **sensing**, **reasoning**, and **acting**.

- The ability to use reason to solve problems
- The ability to learn from experience
- The ability to acquire knowledge
- The ability to respond quickly and successfully to a new situation

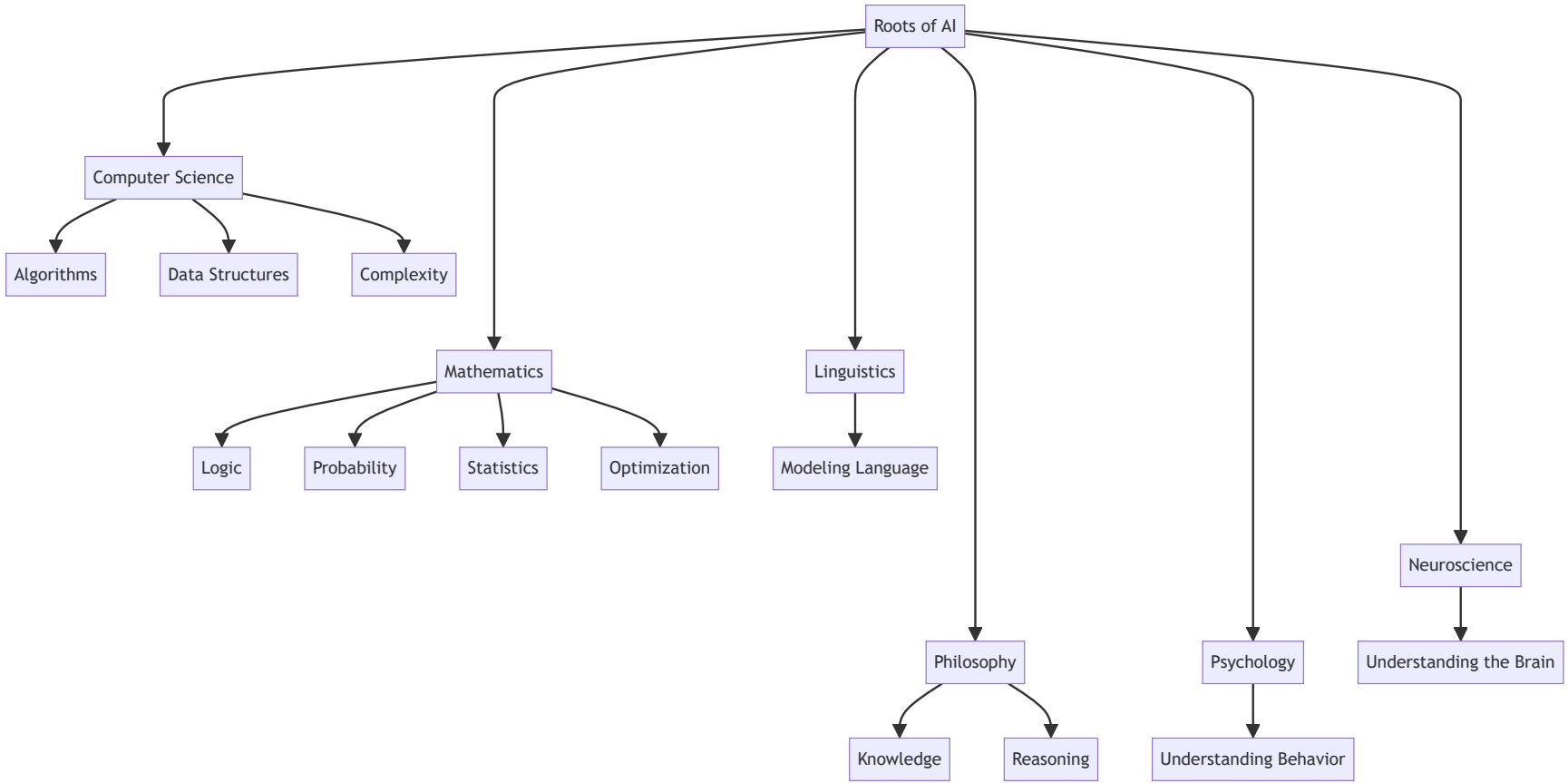
What is Artificial Intelligence?

A branch in computer science that is concerned with **the automation of intelligent behaviors**.



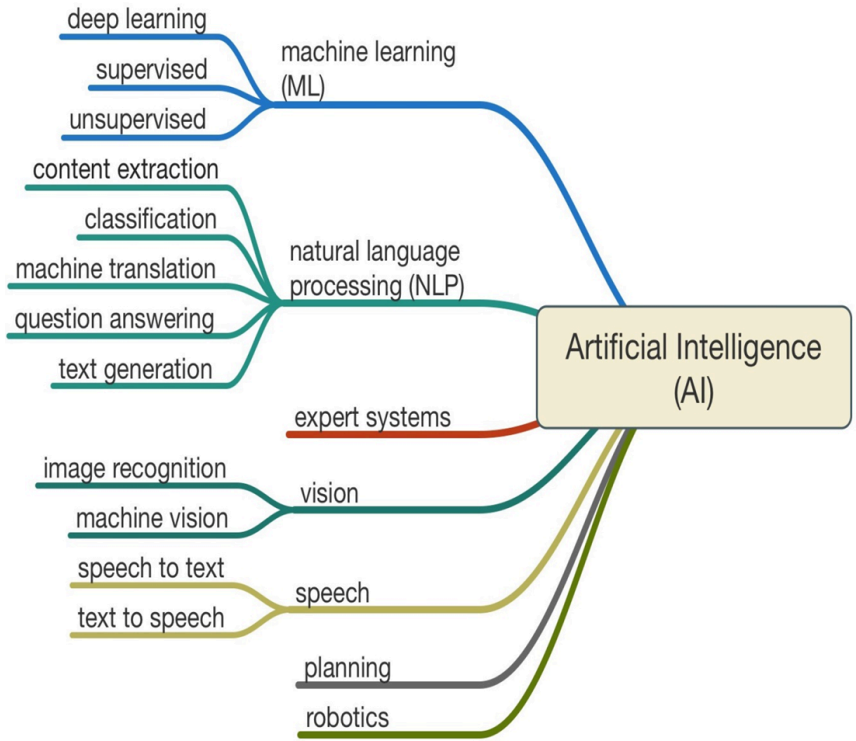
Such as: Speech recognition, Visual perception, Language translation...

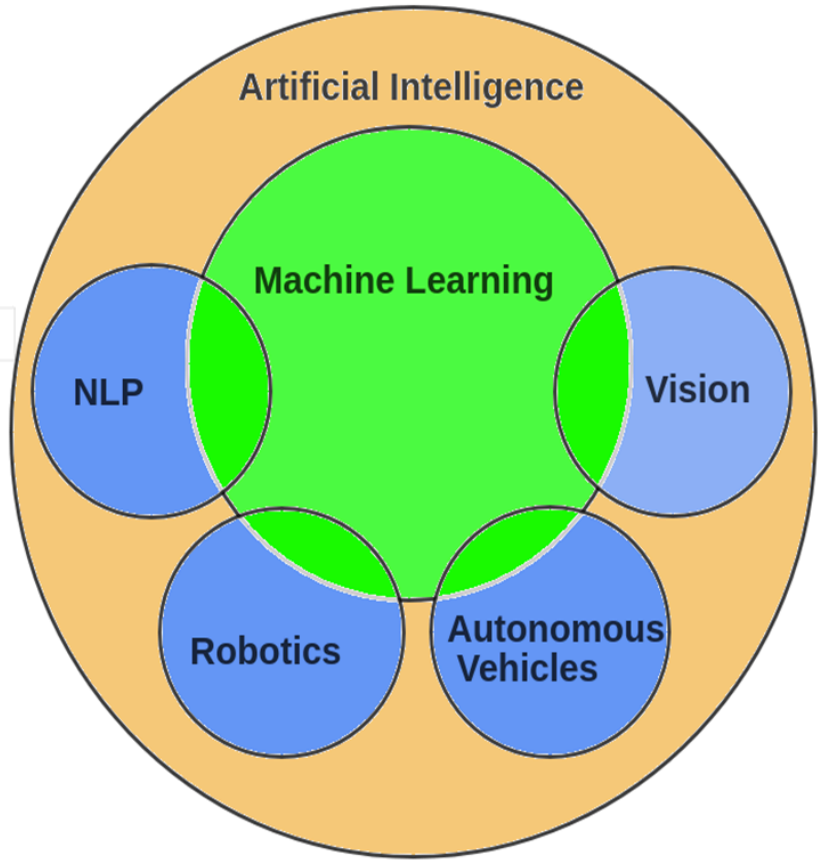
Roots of Artificial Intelligence



Timeline of AI History

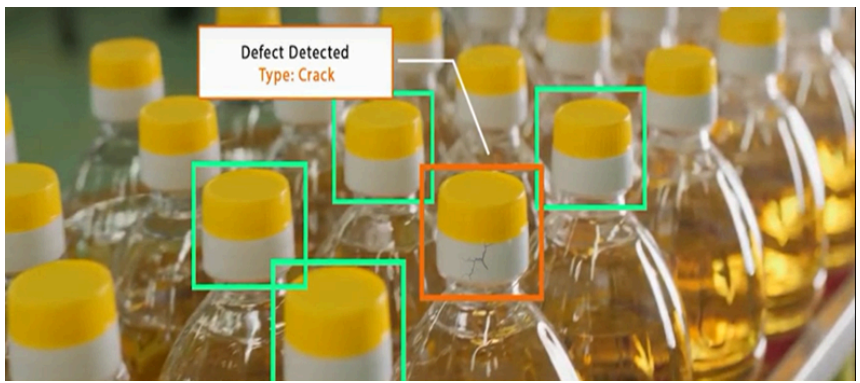
AI Subfields

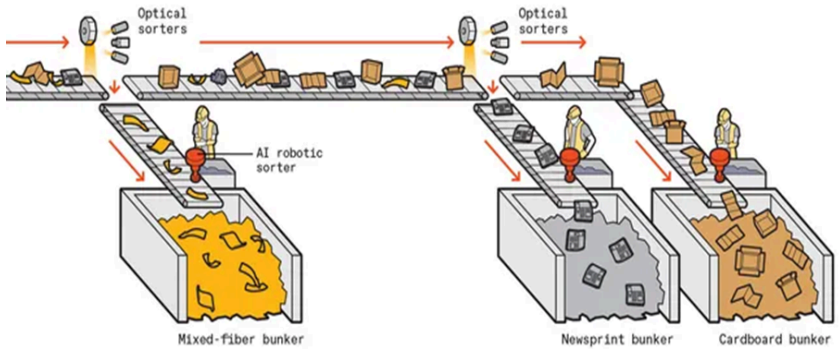




Applications of AI in Industry

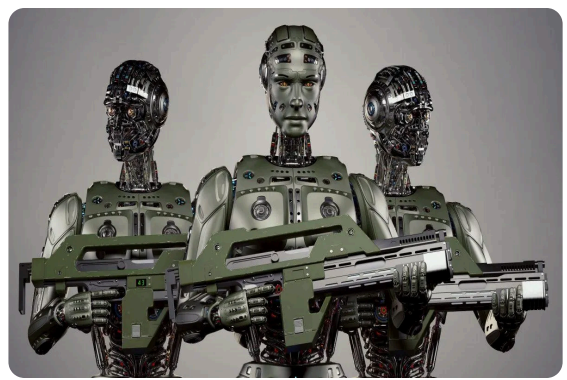
- **Anomaly Detection:** in processes and equipment
- **Optimize processes:** Improve yield
- **Make smarter decisions** and minimize risk
- **Predict future scenarios** with neural networks





Is artificial intelligence dangerous?

- AI can be dangerous if misused or poorly designed
- Risks include:
  - Job displacement
  - Privacy concerns
  - Bias and discrimination
  - Autonomous weapons
- Importance of ethical AI development and regulation



How to achieve AI?

Two Main Lines of Research:

1. Phenomenal Approach:

- **Knowledge Representation**: Encoding information about the world in a structured format for AI to process
- **Expert Systems and Planning**: AI use domain-specific knowledge to make decisions and plan actions
- **From Natural to Artificial Systems**: AI systems that mimic natural biological process (Biological Approach)
  - **Artificial Neural Networks**: Modeled after the human brain. – ANN
  - **Evolutionary Algorithms**: Inspired by natural selection (human evolution)

How to achieve AI?

Two Main Lines of Research:

2. Biological Approach:

- **Searching**: AI systems explore possible solutions to find the most optimal path. Ex. Gaming
- **Learning**: AI systems learn by finding patterns in data and improve over time. Key Types:
  - **Supervised Learning**: Learning from labeled datasets.
  - **Unsupervised Learning**: Discovering hidden patterns in unlabeled data.
  - **Reinforcement Learning**: Trial-and-error learning to maximize rewards.
- **Agent**: AI systems interact with the environment by perception, communication, and action
  - **Natural Language Processing (NLP)**: Understanding and generating human language.
  - **Computer Vision**: Recognizing images, objects, and actions.
  - **Robotics**: Performing tasks based on sensor inputs

Chapter 2: Important Concepts in AI