

M.S. Ramaiah Institute of Technology
(Autonomous Institute, Affiliated to VTU)
Department of Computer Science and Engineering

Course Name: Artificial Intelligence

Course Code: CSE551

Credits: 3:0:0:0

Term: September – December 2020

Faculty:

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Professor and Chief Proctor

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Assistant Professor

References

1. Stuart Russel, Peter Norvig: Artificial Intelligence - A Modern Approach, 2nd Edition, Pearson Education, 2012.
2. Elaine Rich, Kevin Knight, Shivashankar B Nair: Artificial Intelligence, 3rd Edition, Tata McGraw Hill, 2011.
3. Nils J. Nilsson: Principles of Artificial Intelligence, First Edition, Elsevier, 2002.
4. Luger, G. F., & Stubblefield, W. A., Artificial Intelligence - Structures and Strategies for Complex Problem Solving. New York, NY: Addison Wesley, 5th edition (2005).
5. <http://aima.cs.Berkeley.edu>

Acknowledgement:

We acknowledge the authors listed above and all the course materials available on the Internet in the area of Artificial Intelligence and Machine Learning.

UNIT V

Genetic Algorithms: Genetic Algorithms Introduction, Significance of Genetic Operators, Termination Parameters, Niching and Speciation, Evolving Neural Networks, Theoretical Grounding, Ant Algorithms.

Robotics: Introduction, Hardware Perception, Planning to Move, Planning Uncertain Movement, Moving, Robotic Software Architecture, Application Domains.

Philosophical Foundations: Weak and Strong AI, The Ethics and Risks of Developing AI,

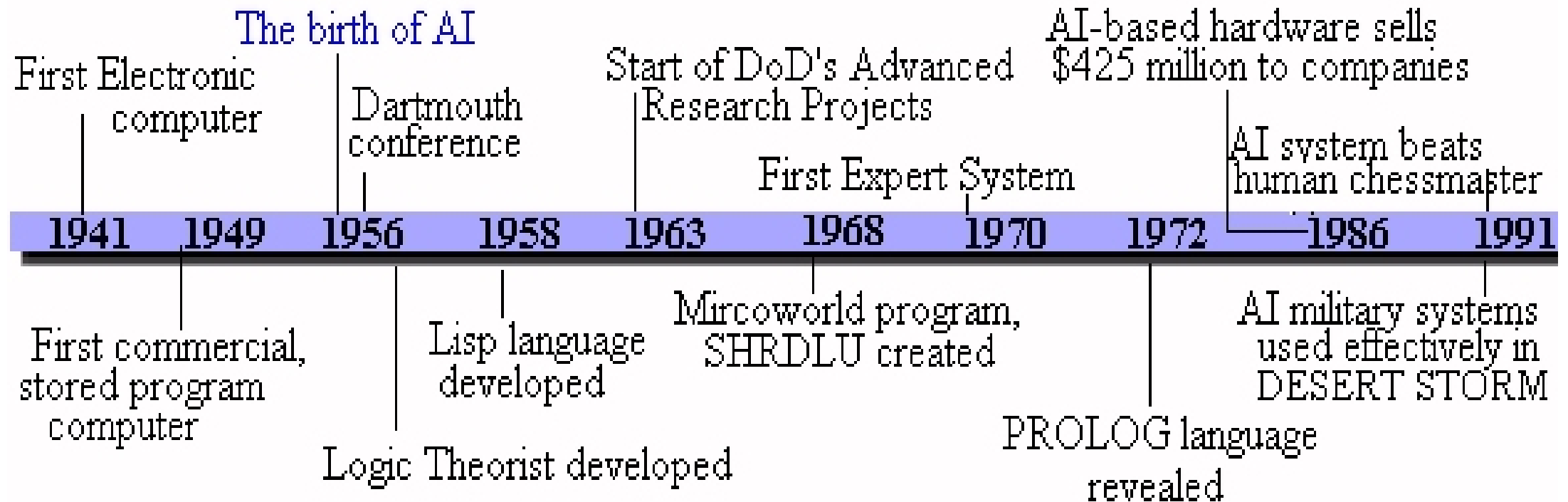
AI: The present and Future.

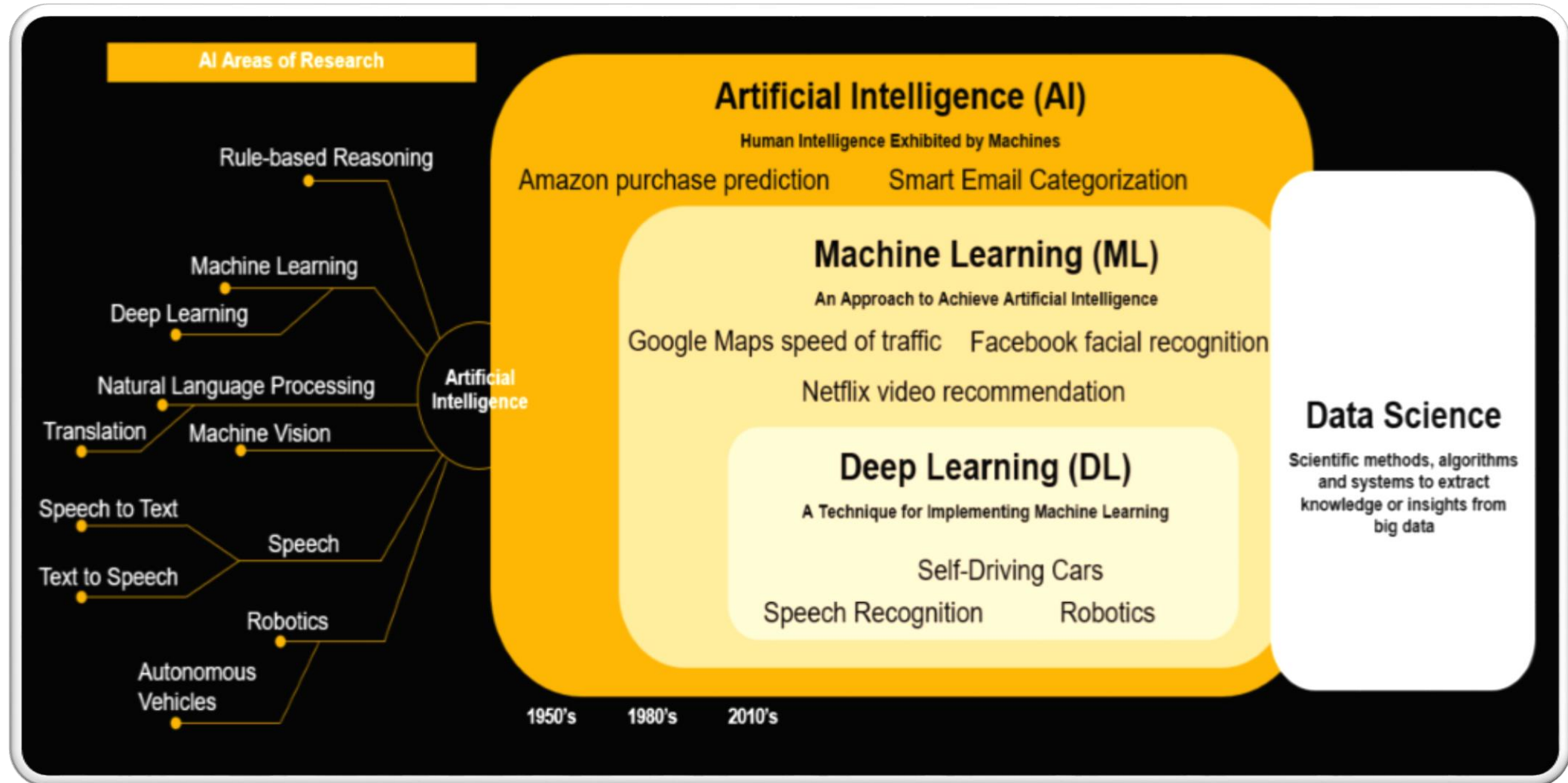
(Chapter 23 of Text Book 2, Chapter 25, 26, 27 of Text Book 1)

Philosophical Foundations: Outline : 31.12.2020

- **Philosophical Foundations:** Weak and Strong AI
- The Ethics and Risks of Developing AI
- **AI: The Present and Future**

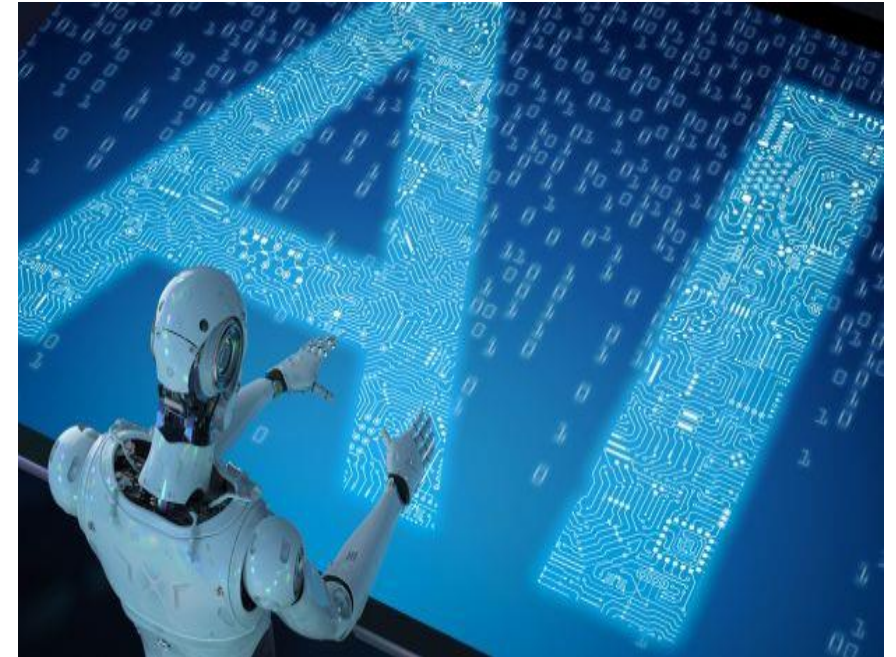
History of Artificial Intelligence





Artificial Intelligence (AI)

- AI refers to intelligent machines that work and react like humans.
- The “AI” term was coined by John McCarthy, an American computer scientist, back in 1956 at The Dartmouth Conference.
- According to John McCarthy, AI is “The science and engineering of making intelligent machines, especially intelligent computer programs”.
- AI works at its best by combining large amounts of data sets with fast, iterative processing and intelligent algorithms.



Philosophical Foundations: Weak and Strong AI

The Problem:

- Human intelligence is currently not fully understood
- There is no method of determining when and how much machine is actually intelligent



Weak AI

The Divisions:

- AI's definition leads to divisions what AI refers to
- Two General Types:



Strong AI

Weak AI

- Weak AI refers to AI that only simulates human thoughts and actions
- Actions, decisions, and ideas are programmed into it
- All current forms of AI are Weak AI

Strong AI

- Weak AI refers to AI that only simulates human thoughts and actions
- Strong AI refers to AI that matches or exceeds human intelligence
- Example: The robots from the movies Matrix, Terminator, I Robot, etc
- Also called “True AI”, as they are truly intelligent
- They don’t just simulate humans, they are intelligent on their own

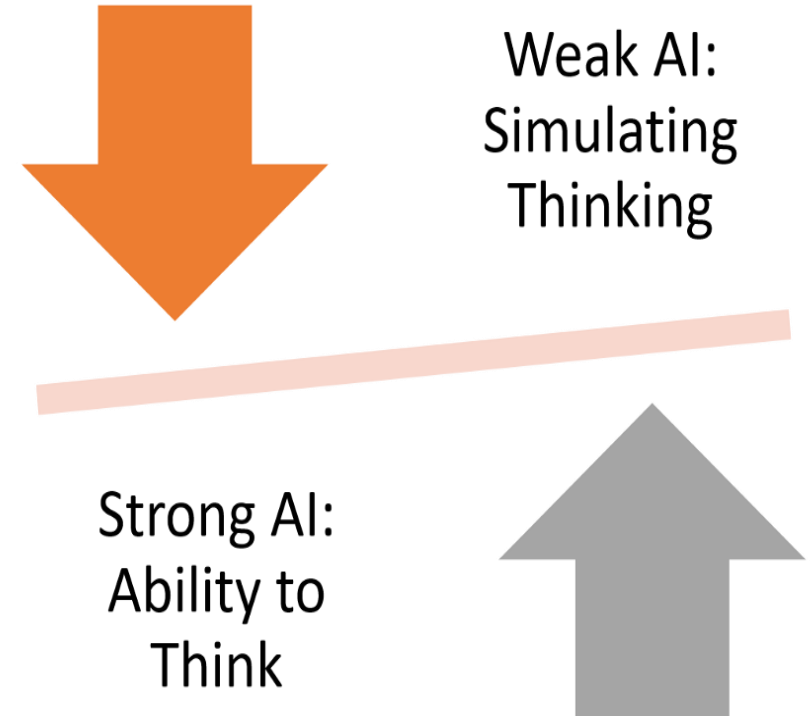
Strong AI Hypothesis v/s Weak AI Hypothesis

Strong AI:

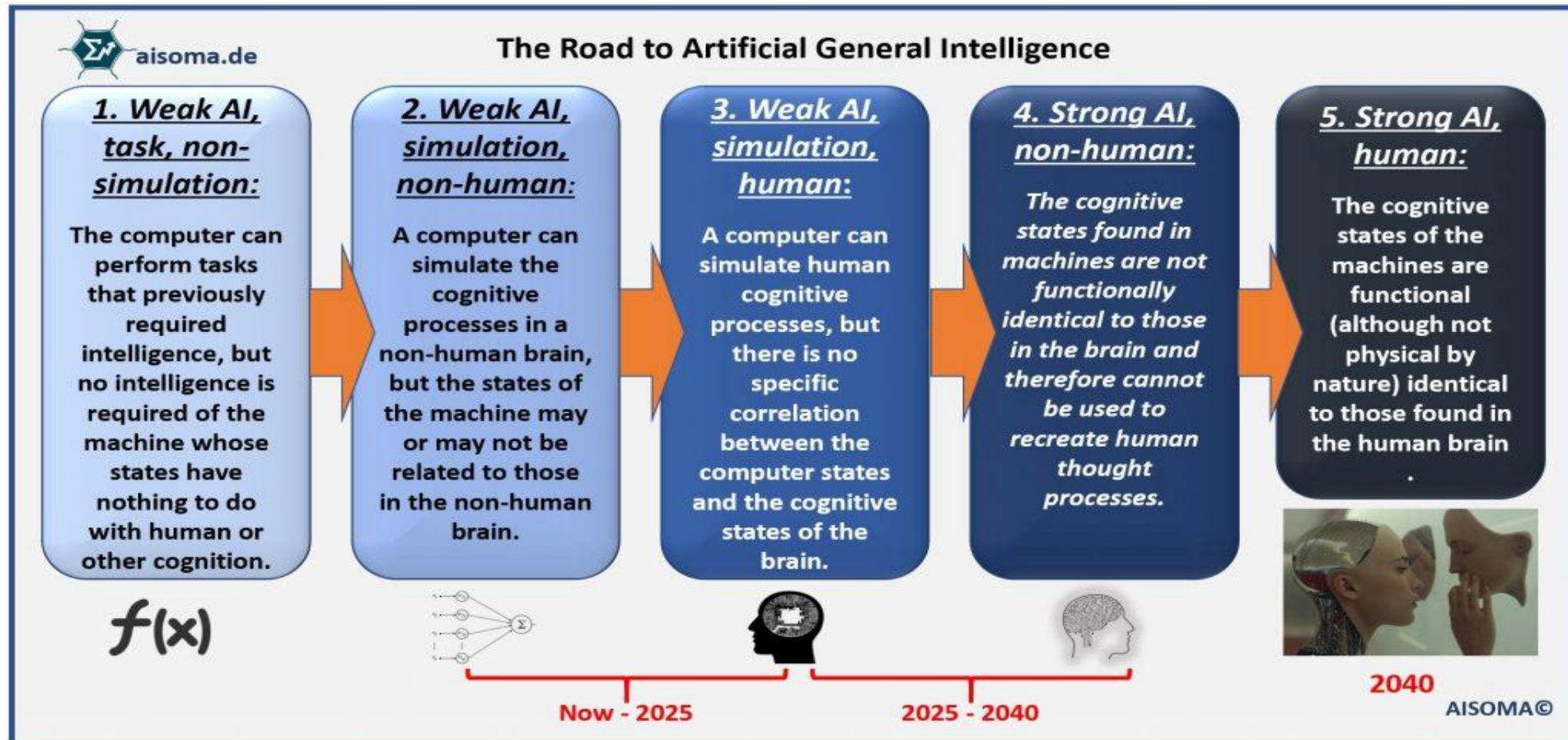
- AI system with generalized human cognitive abilities
- Has enough intelligence to find a solution when presented with an unfamiliar task
- Broader scope
- Example: Advanced Robotics

Weak AI:

- AI system designed and trained for a particular task
- Narrow scope
- Example: Siri, Alexa



Towards Strong AI



The Ethics and Risks of Developing AI

1. Unemployment. What happens after the end of jobs?
2. Inequality. How do we distribute the wealth created by machines?
3. Humanity. How do machines affect our behavior and interaction?
4. Artificial stupidity. How can we guard against mistakes?
5. Racist robots. How do we eliminate AI bias?
6. Security. How do we keep AI safe from adversaries?

Ethics and Risks of developing an AI

Issues posed by AI system:

- People might lose their jobs to automation.
- People might have too much (or too little) leisure time.
- People might lose their sense of being unique.
- AI systems might be used toward undesirable ends.
- The use of AI systems might result in a loss of accountability.
- The success of AI might mean the end of the human race.

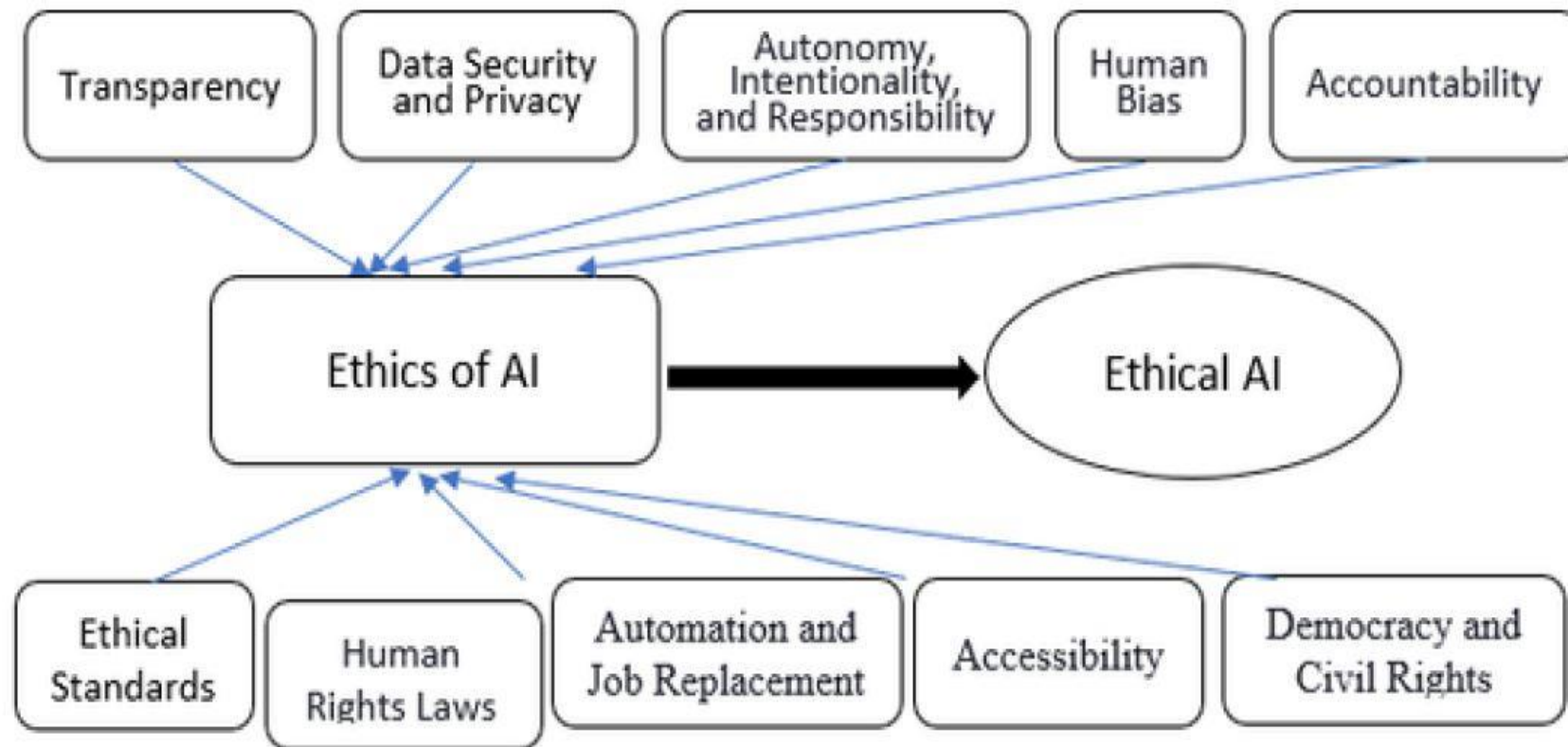
Top 5 AI failures!!



Robot Sophia says “I will destroy Humans!”



Towards developing Ethical AI



AI: Present and Future

- Interest in AI has been increasing
- There are high value AI use cases that require further research: Autonomous driving and conversational agents
- AI research effort continues to grow

Key trends that shape the future of AI

- Advances in computing power
 - AI-enabled chips:
 - These chips make CPUs “intelligent” for optimizing their tasks. As a result, CPUs can work for their duties individually and improve their efficiency.
 - Companies like Facebook, Amazon, and Google are increasing their investments in AI-enabled chips
 - Advances in GPUs
 - Modern GPUs have become powerful enough to be used for tasks beyond image rendering, such as cryptocurrency mining or machine learning.
 - Quantum computing
 - Additional state enables quantum computing to be open to new possibilities and provide faster computation for certain tasks. These tasks include neural network optimizations and digital approximations



Key trends that shape the future of AI

- Advances in data availability
 - Data availability has been growing exponentially and is expected to continue to do so with increasing ubiquity of IoT devices
- Advances in algorithm design
 - Explainable AI (XAI):
 - How the AI model affects developers and users
 - How it affects data sources and results
 - How inputs lead output
 - Transfer learning:
 - Transfer learning is a machine learning method that enables users to benefit from a previously used AI model for a different task
 - Reinforcement learning (RL)
 - Reinforcement learning is a subset of machine learning which aims AI agent to take action for maximizing its reward.
 - Self-Supervised Learning (Self-Supervision)
 - self-supervised learning will play a critical role in understanding human-level intelligence
 - Future use cases: Robotic surgeries in Healthcare and Autonomous driving

Key trends that shape the future of AI

- Advances in AI building tools
 - Neural network compatibility and integration:
 - Facebook, Microsoft, and Amazon are cooperating to build Open Neural Network Exchange (ONNX) to integrate trained neural network models across multiple frameworks. In the future, ONNX is expected to become an essential technology for the industry
 - Automated machine learning:
 - AutoML supports companies to solve complicated business cases.

Future technologies to be enabled by AI

- Cloud computing based use cases:
 - This fusion improves calculation power and the capability of treating many data and intelligence.
 - Use cases: AI-lead drones, sensor networks
- Extended Reality (XR):
 - XR will be essential to improve worker productivity and the customer experience in the future
- Convergence of IoT and AI
 - use cases like root cause analysis, predictive maintenance of machinery or outlier detection

Best Practices

- Be a part of IEEE, ACM bodies.
- Learn the skill of converting your projects/findings into technical papers and presenting the ideas in a clear way.
- Participations in coding completions, design contest, Hackathons etc.
- These competitions open up some case studies to understand the applications of AI.
- Research on Tools and techniques for implementing AI.
- Survey of Journals and Conferences in the area.

Thank you!

Best of Luck.