

What is Artificial Intelligence?

UNDERSTANDING ARTIFICIAL INTELLIGENCE

Ridwan Mahenra, S.Kom., M.C.S(AI)

Fakultas Teknik dan Ilmu Komputer
Universitas Teknokrat Indonesia

What is AI?

"Can machines think?"

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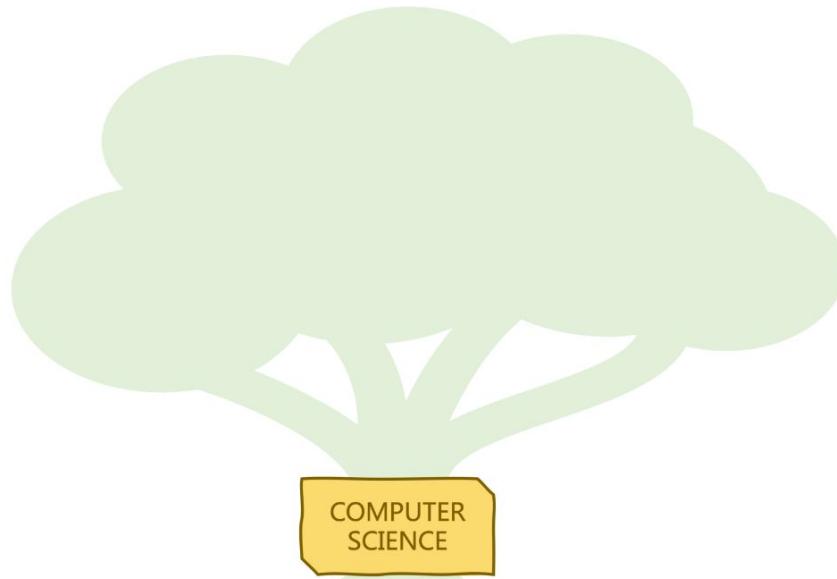
Stuart Russell, 2015

*"Machine intelligence is the **last invention** that humanity will ever need to make"*

Nick Bostrom, 2015

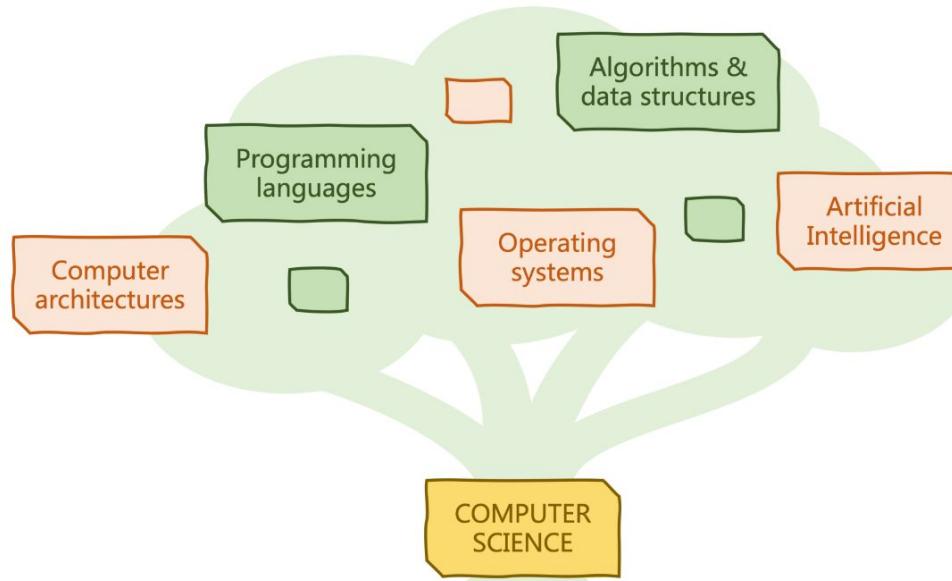
First things first: Computer Science

The group of technical knowledge needed for the **automatic processing of information by computers**: hardware, software, data, networks, ...



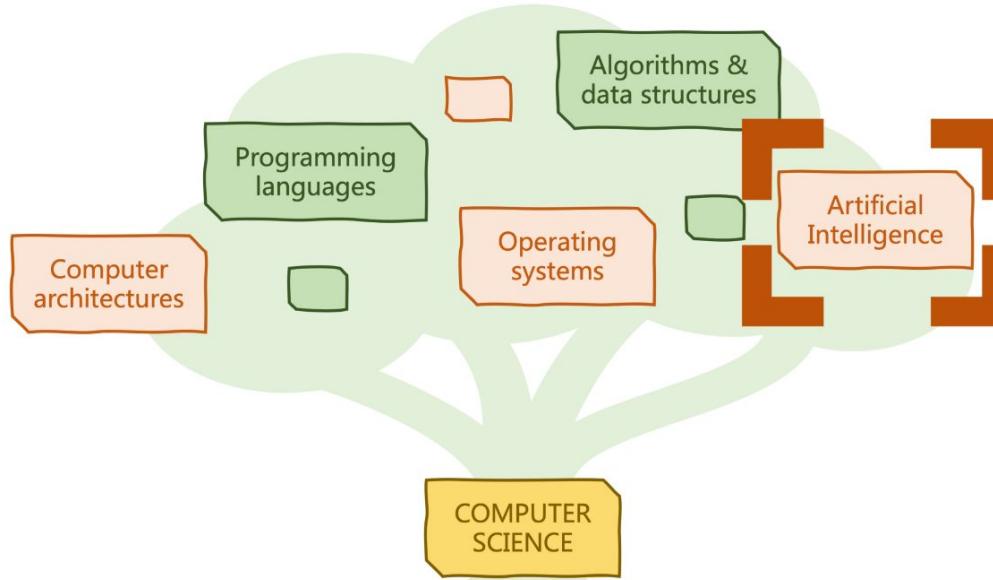
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Artificial Intelligence (AI)

"The science and engineering of making intelligent machines" (McCarthy, 1955)

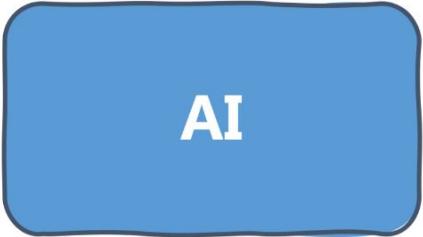


Machines that learn to mimic reasoning, decision-making, and in general exhibit **some degree of human-like intelligence to solve a problem**.

EU Commission, 2019:

"Systems that, given a goal, perceive their environment, interpret the collected data, reason to derive knowledge, and decide the best action(s) to achieve the goal".

AI vs Artificial General Intelligence



AI

Artificial Intelligence (AI)

- Perceives, interprets and learns from data, reasons and makes decisions
- Excels at solving specific tasks

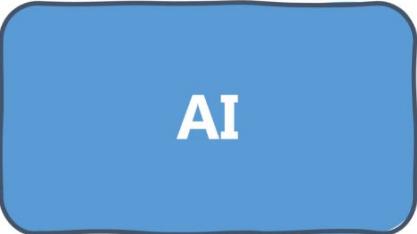


AGI

Artificial General Intelligence (AGI)

- Equals or exceeds average human intelligence
- Solves a breadth of tasks intelligently

AI vs Artificial General Intelligence



AI

Examples of AI

- Voice assistants
- Facial recognition
- Personalized recommendations
- Autonomous industrial robots



AGI

"Halfway" examples towards AGI

- Self-driving cars
- AlphaGo
- **Generative AI: Language Models (e.g. GPT)**

What AI can -and cannot- do?

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Things AI can do

Predictions and inference

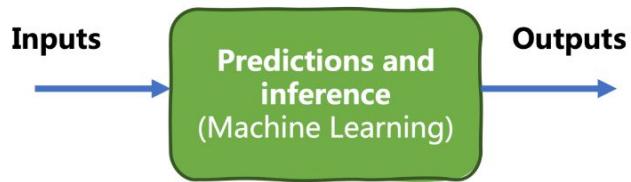
Pattern recognition

Optimization

Automation

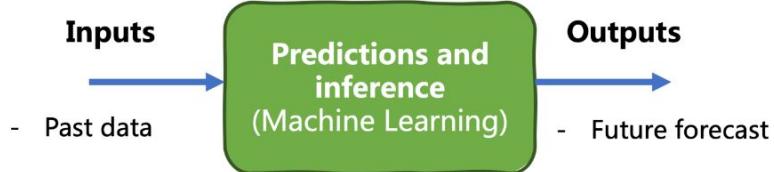
Predictions and inference

Machine Learning: learn from data how to make predictions or inferences



Predictions and inference

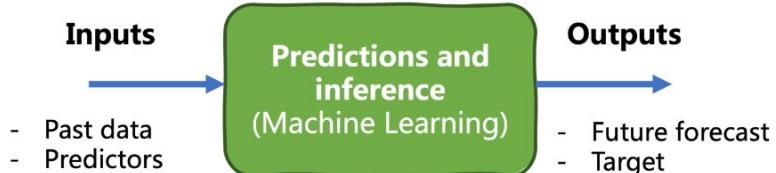
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- *Predictions:* forecasting what will happen in the *future*, e.g. weather forecast

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Machine Learning: Learn from **data** how to make predictions or inferences



- *Predictions:* forecasting what will happen in the *future*, e.g. weather forecast
- *Inference:* determine *output* based on data *inputs* (predictors), e.g. books you may like



Pattern recognition

Identify patterns in the data to help make decisions:

- Predictions and inference
- Clustering (*segmentation*)
- Anomaly detection
- Data generation (*Generative AI*)



Optimization



Find the *best* possible solution for a problem at a minimum cost, under constraints

- **Logistics and delivery:** smart routing
- **Energy:** power grid operation and control
- **Tourism:** flights and hotel pricing
- **Marketing:** maximum-revenue campaigns

Automation

Automation: follow set of rules to perform (usually repetitive) tasks

- Classifying documents, photos, etc.
- Job application screening
- Parcel management robots



Limitations of AI

Social skills: emotional intelligence, empathy



Bias: making unfair decisions to some groups



New, unseen situations, e.g. new items to recommend



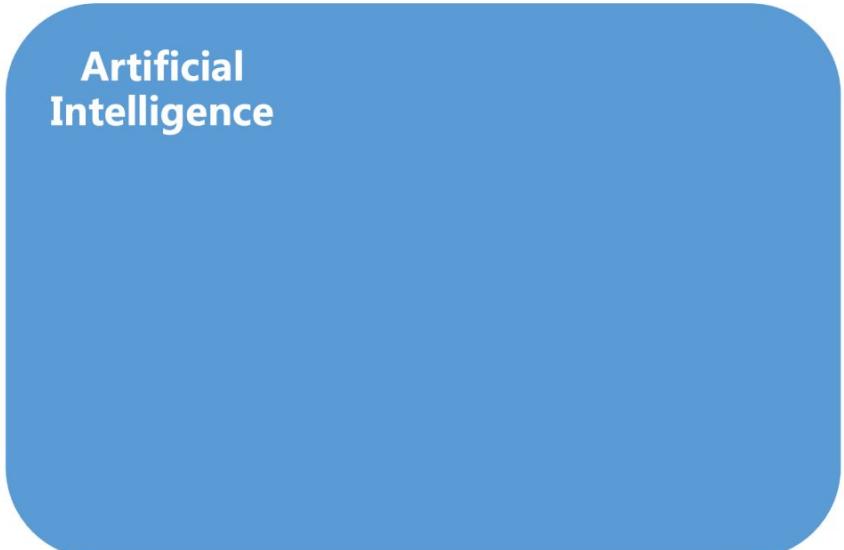
Data ...

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1010

Areas and related disciplines of AI

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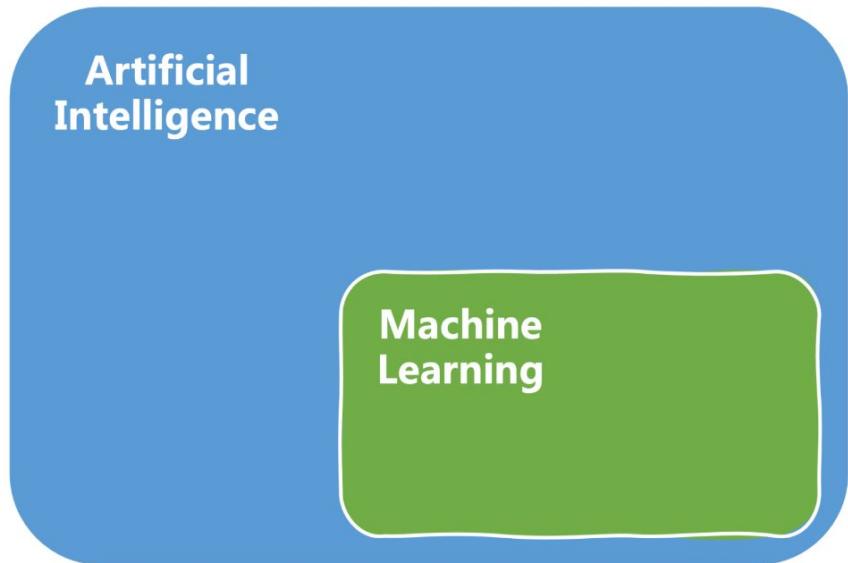
Subdomains of Artificial Intelligence



Artificial
Intelligence

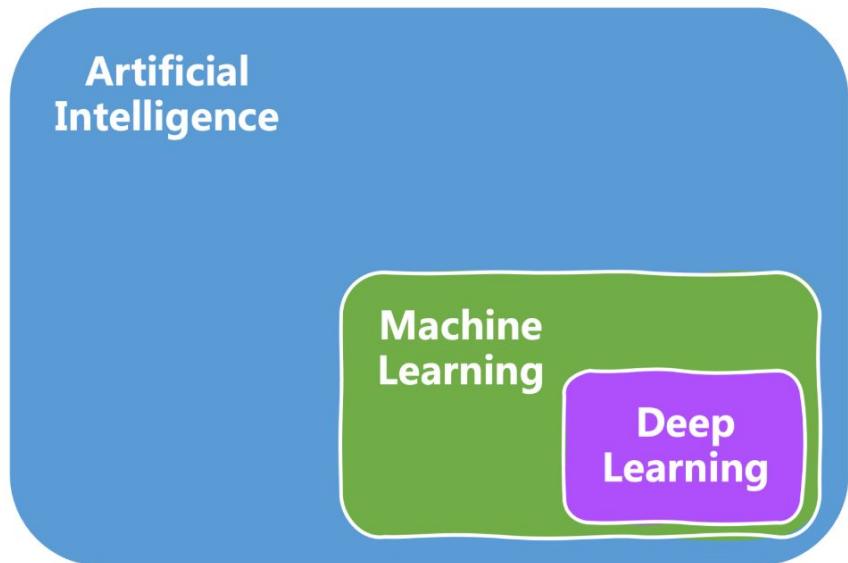
Subdomains of Artificial Intelligence

- Machine Learning: learn from data;
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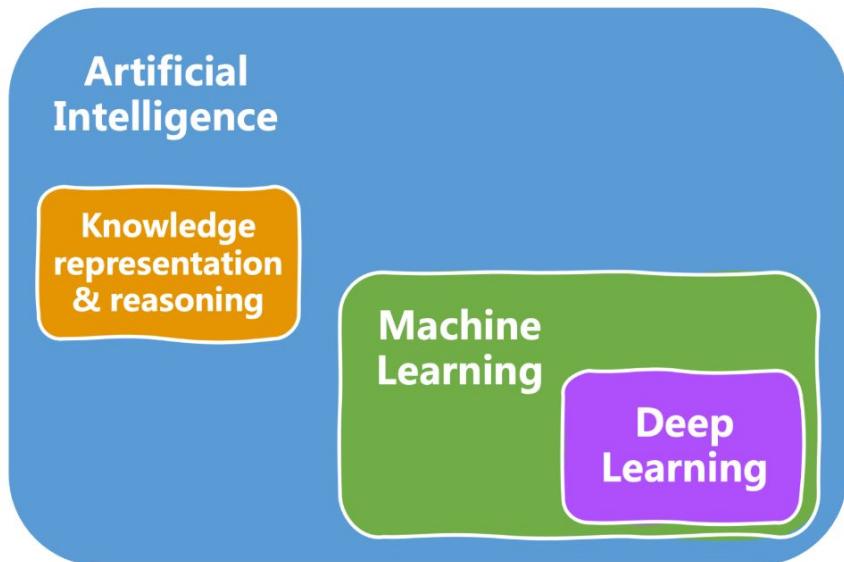
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- **Machine Learning:** learn from data; predictions, inference
 - **Deep Learning:** neural networks; solve most challenging AI problems



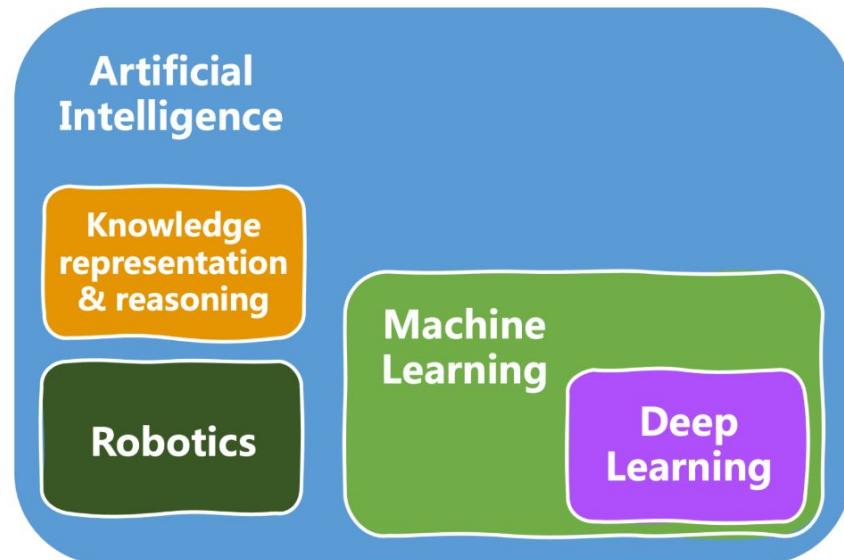
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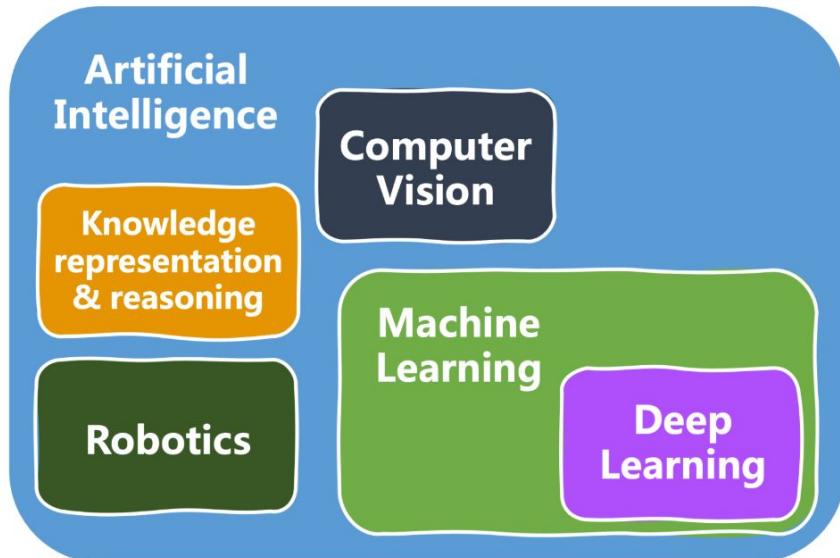
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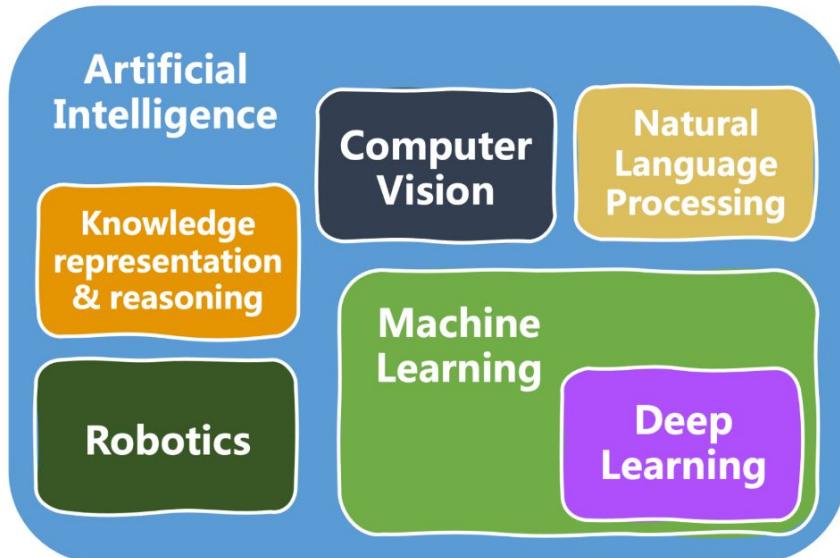
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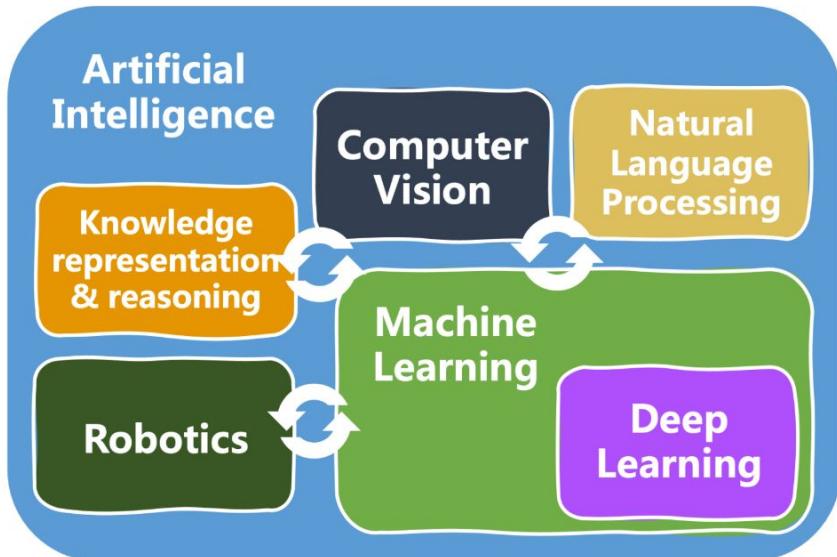
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Examples of AI applications

Personalized product recommendations

Machine Learning



Medical diagnosis

Computer Vision, Deep Learning



Warehouse management

Robotics, Computer Vision, Reasoning

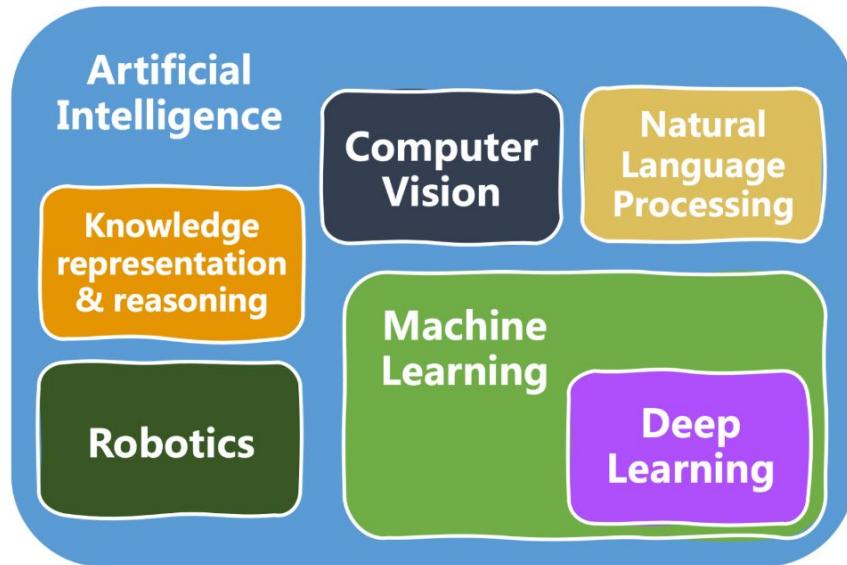


Smart voice assistants

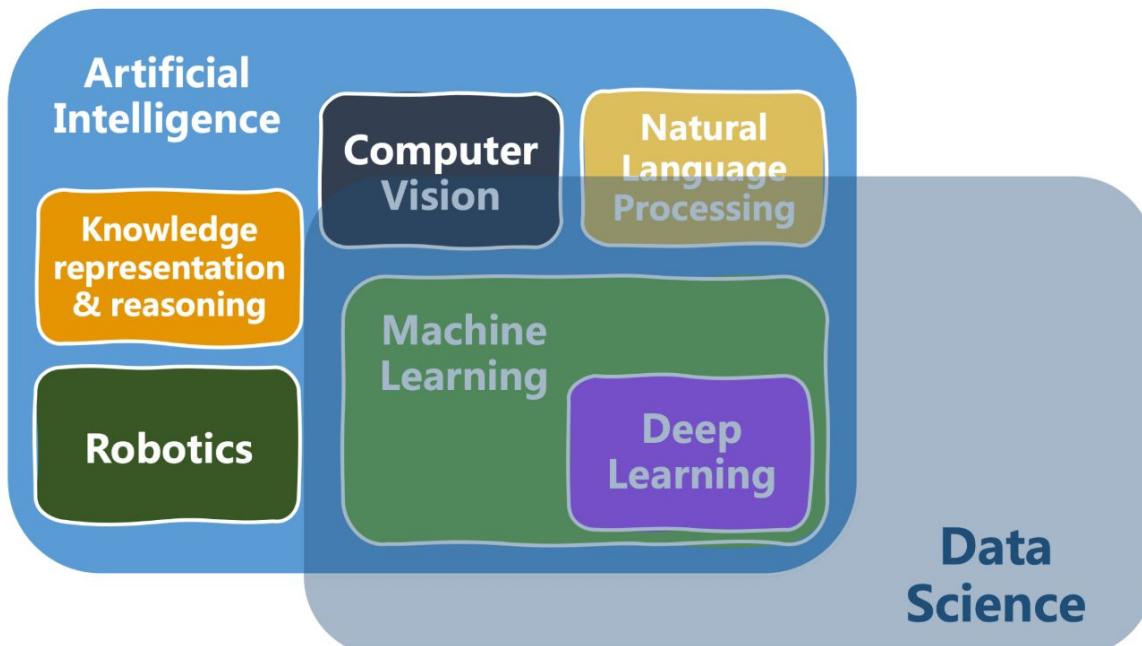
NLP, Deep Learning



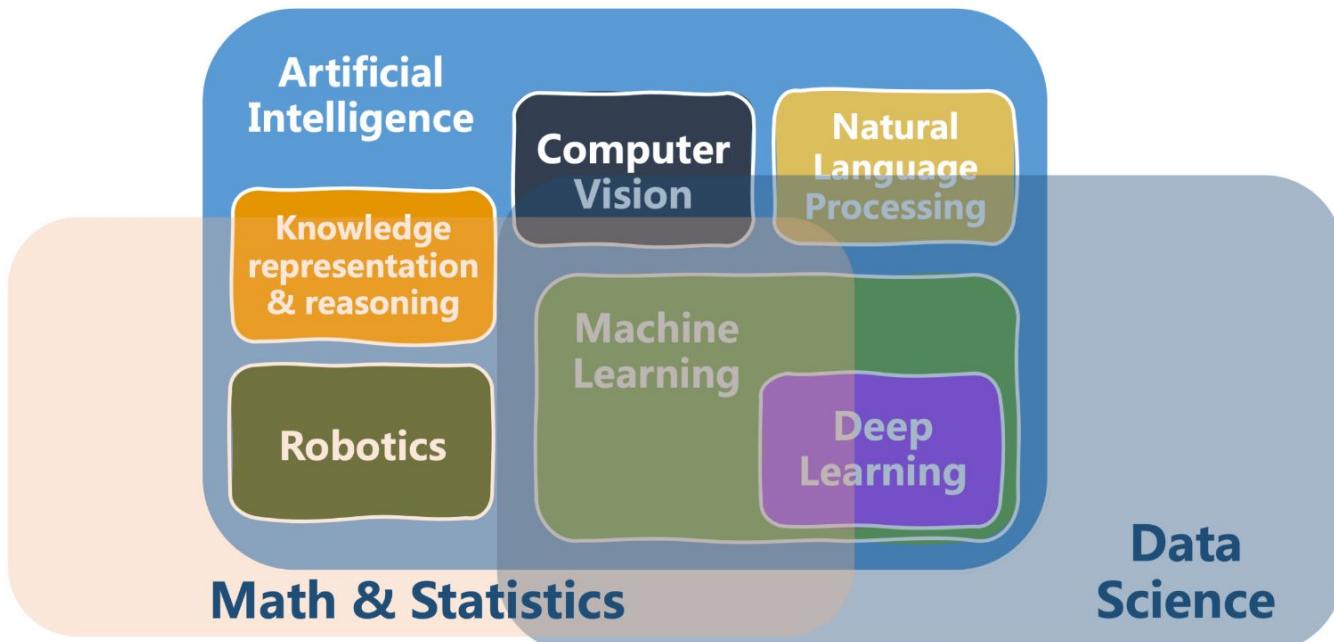
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