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Applied Deep Learning

Introduction

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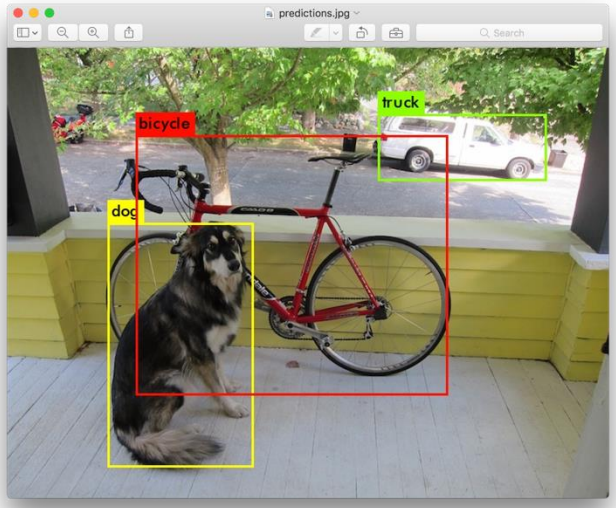
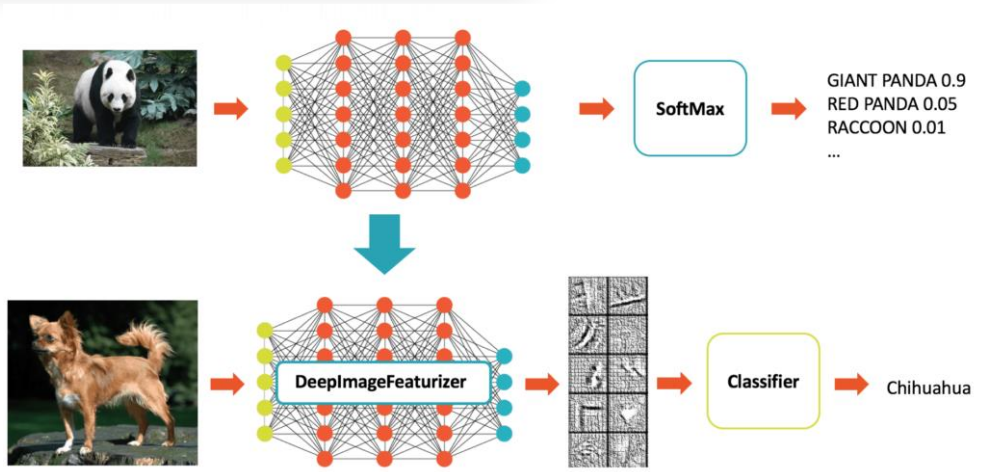
Semester overview

Semester overview

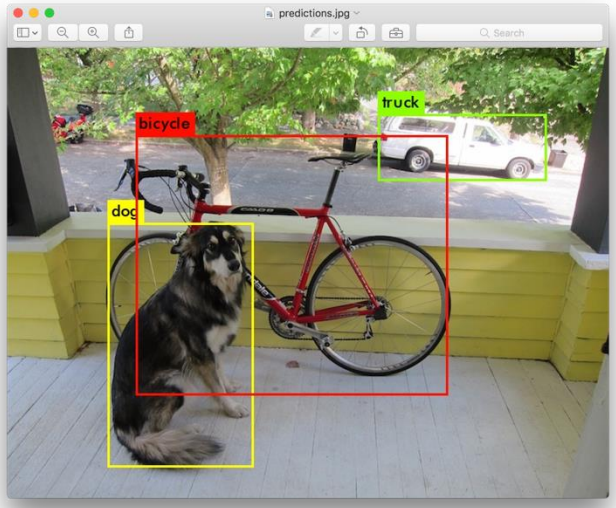
- Introduction
- Python primer
- Introduction to machine learning
  - Data preparation
  - Methods
  - Quality control
- Neural nets basics
- CNNs and Transfer learning

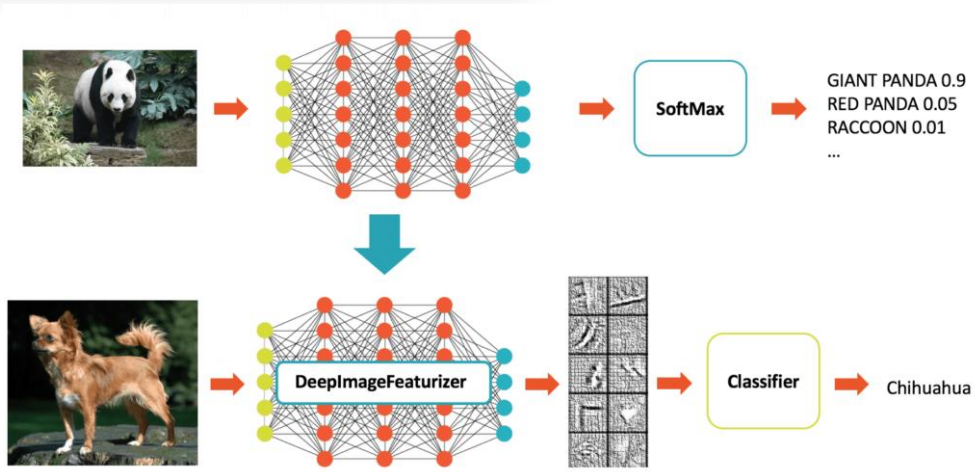




Semester overview

- Deep Learning
  - Optimizers
  - Encodings
  - Hyperparameter tuning
  - Regularization
- Deep reinforcement learning





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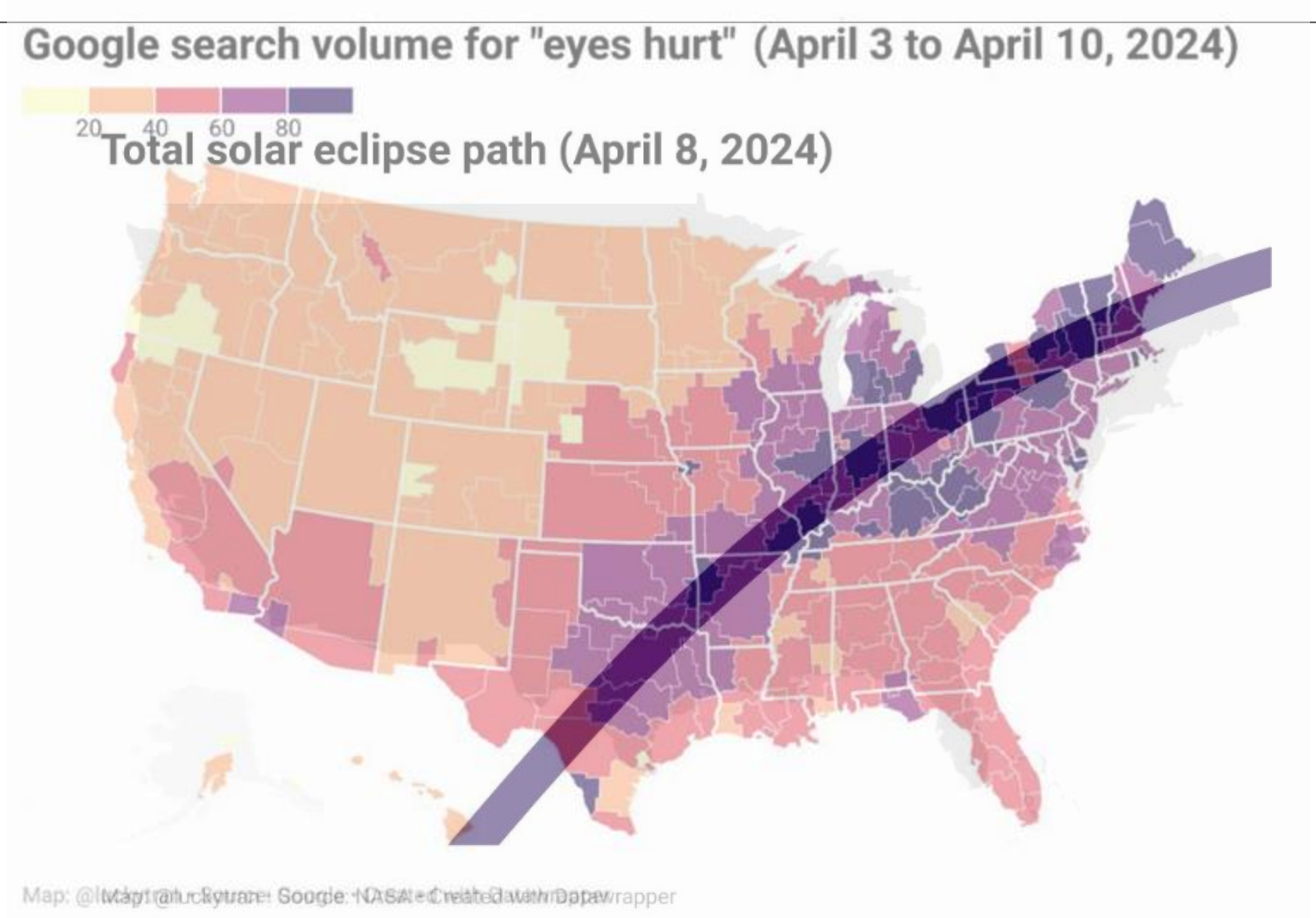
Introduction

What is ai?


Google search volume for "eyes hurt" (April 3 to April 10, 2024)
20
40
60
80
Total solar eclipse path (April 8, 2024)
Map: @lucyturan · Google · NASA · Created with Datawrapper

Definition of artificial intelligence

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- Artificial intelligence is an upper handle for application, where machines show human-like intelligent behavior
- It consists of
  - Perceiving
  - Synthesizing
  - and inferring information
- Examples are speech recognition, machine vision, translation, natural language processing, ...

Definition of artificial intelligence

- weak ai
  - Ai is an attempt to simulate rational / cognitive intelligence on machines, so it can be used for human purpose
  - Processing of information for certain areas
  - Examples
    - Expert systems
    - navigation
    - Speech recognition
    - autocorrect
    - Pattern analysis

Definition of artificial intelligence

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- Strong ai / artificial general intelligence
  - A form of ai that reaches or exceeds human intelligence.
- Uses
  - Logicial thinking
  - Reasoning (under uncertain environment)
  - Planing
  - Learning
  - Natural language as communication

  all together to reach it‘s goals

Definition of artificial intelligence

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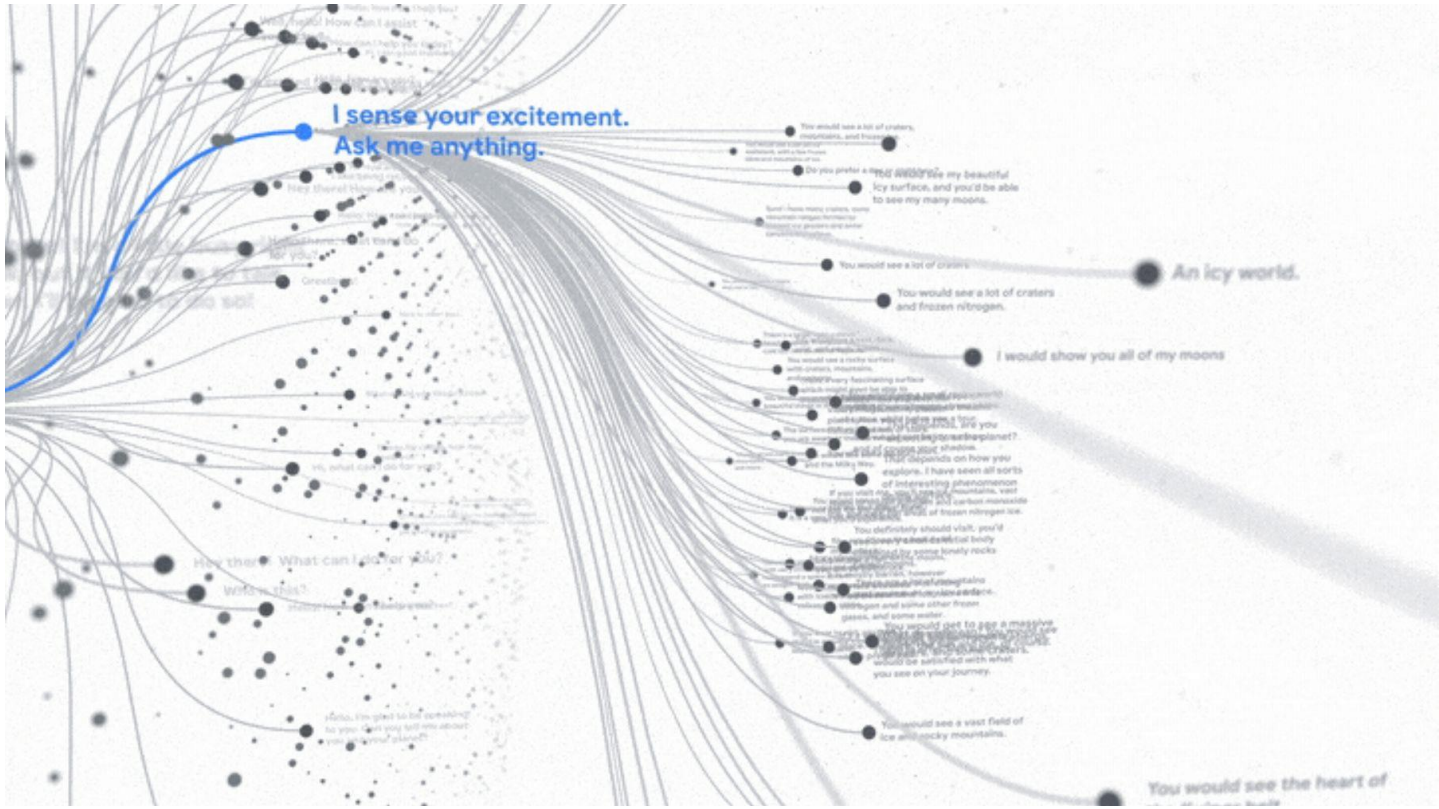
- On a higher level
  - Self-awareness
  - Self-knowledge
  - Sensibility
  - Wisdom

Blake Lemoine: Google LaMDA



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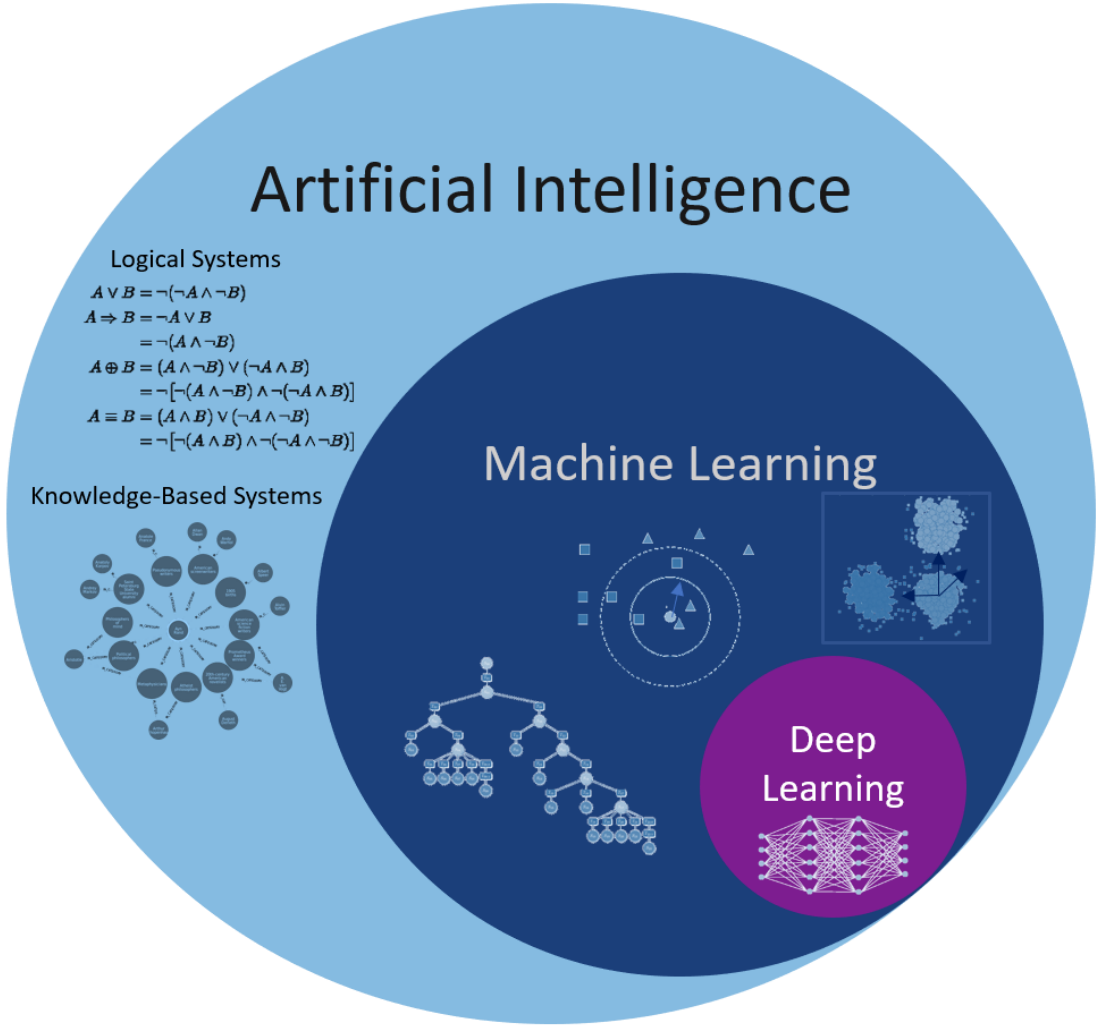
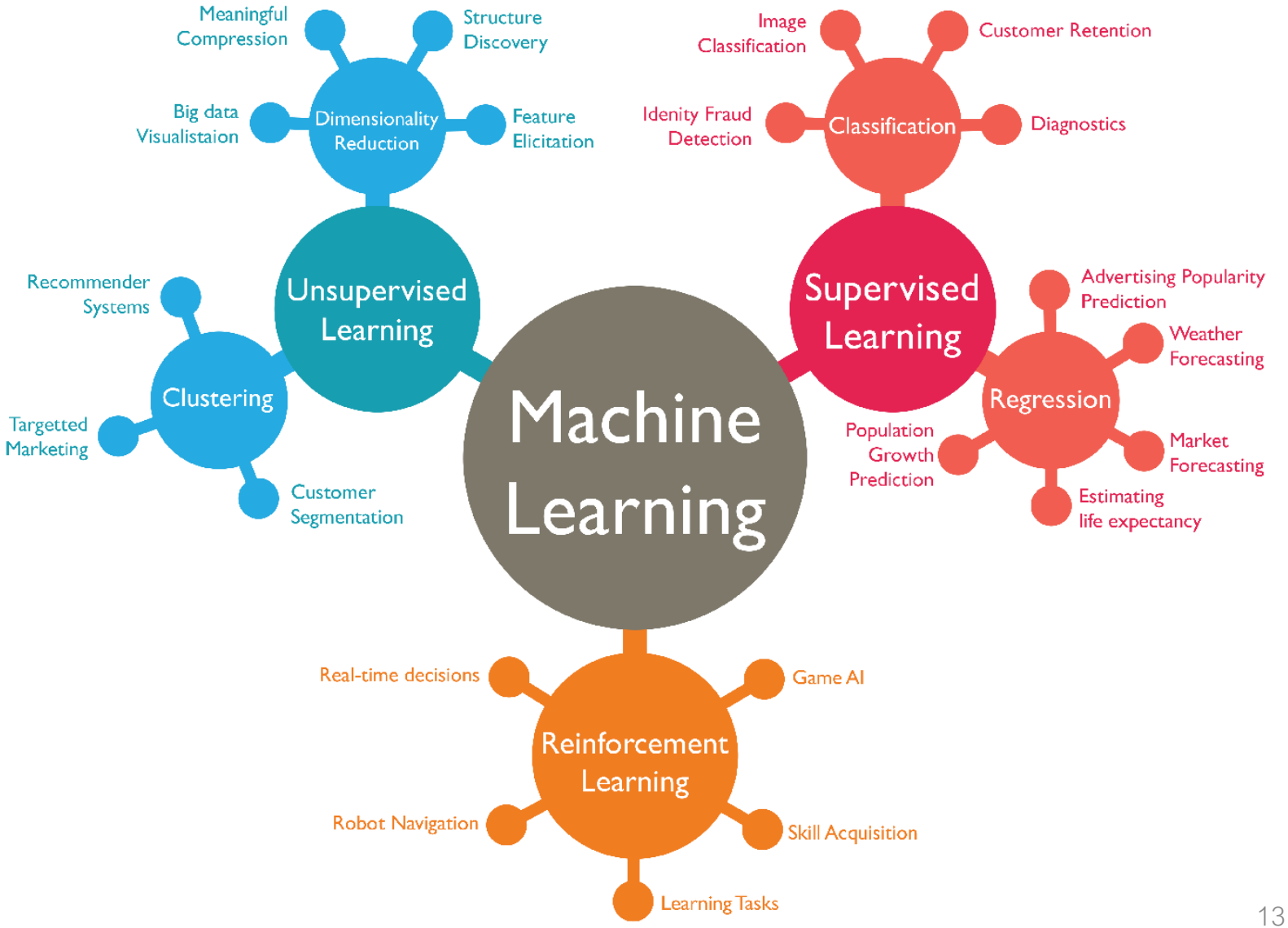
Overview over ai

overview

- Ai: Machines that learn or reason
- ML: algorithms that learn without explicitly being programmed
- DL: neural networks, that adapt and learn from vast amount of data



overview


Machine Learning
Unsupervised Learning
Dimensionality Reduction
Meaningful Compression
Structure Discovery
Big data Visualistaion
Feature Elicitation
Clustering
Recommender Systems
Targetted Marketing
Customer Segmentation
Supervised Learning
Classification
Image Classification
Customer Retention
Idenity Fraud Detection
Diagnostics
Regression
Advertising Popularity Prediction
Weather Forecasting
Market Forecasting
Estimating life expectancy
Population Growth Prediction
Reinforcement Learning
Real-time decisions
Game AI
Robot Navigation
Skill Acquisition
Learning Tasks

Machine Learning

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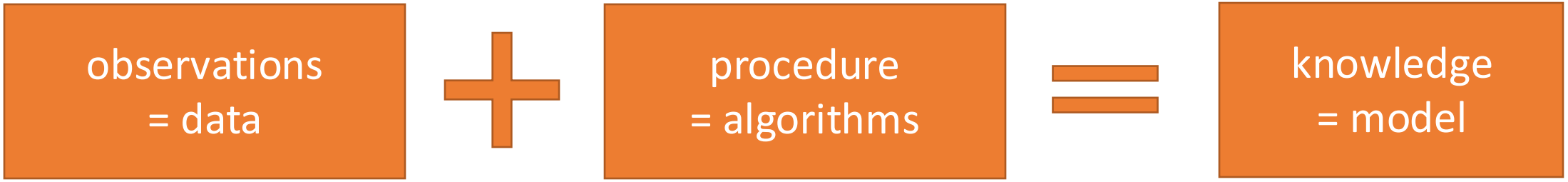
- Creating knowledge from experience

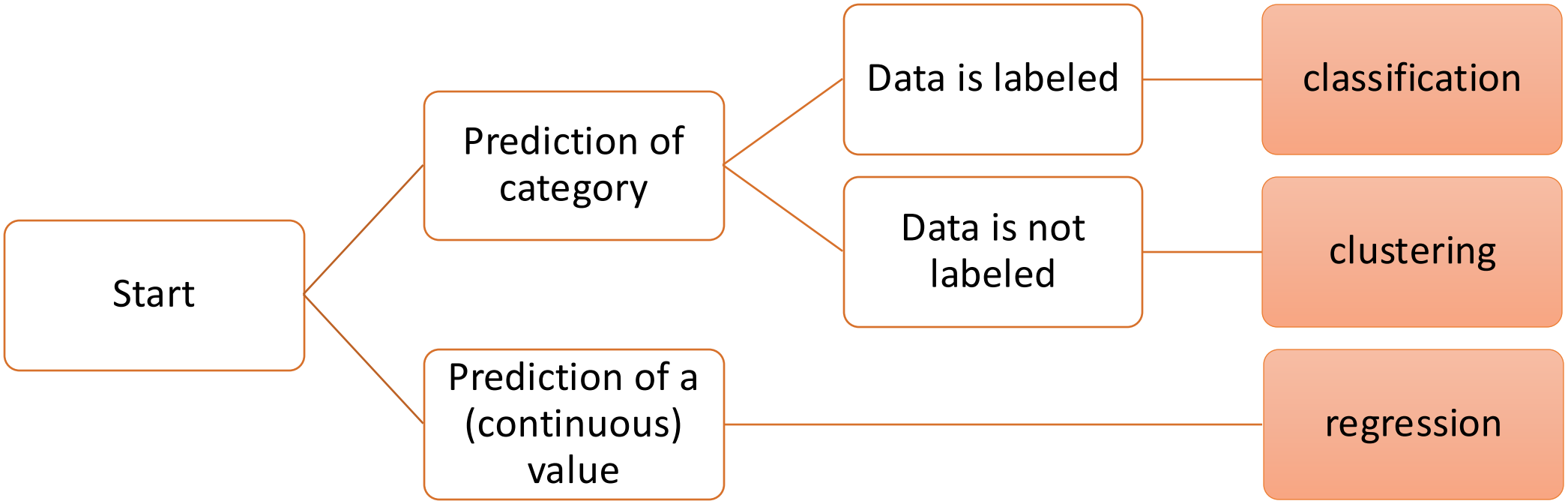


- Goal:
  - Find solutions to problems
  - Find patterns

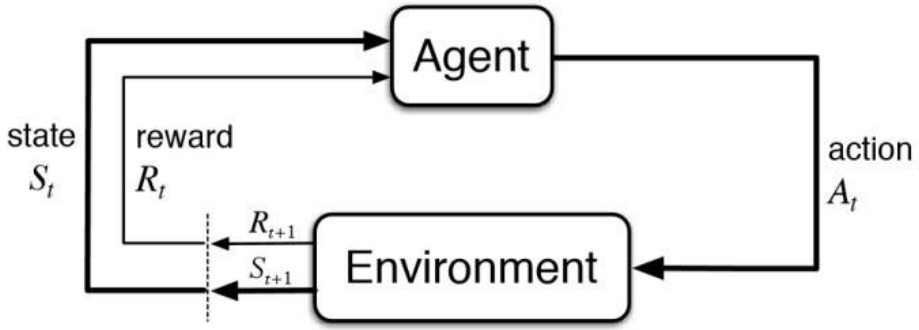
➔ Computer systems should be able to take decisions on their own

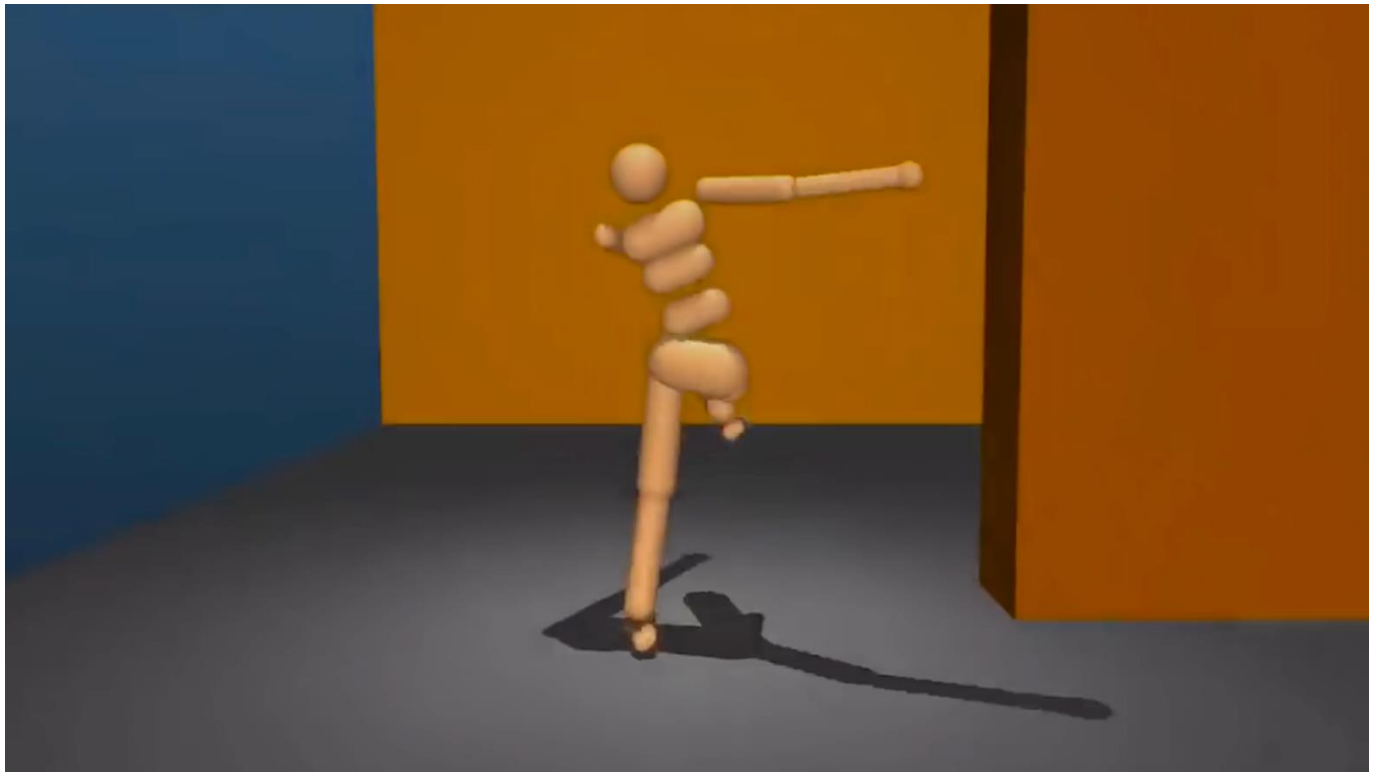
- Inductive learning (from particular → to general)

Decision helper



Reinforcement Learning





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Current Development

Short story of ai

- In the spring of 2016, Microsoft was facing a full-blown PR disaster. The culprit was the Twitter chatbot named Tay, which had been published shortly before. The AI personality suddenly started spouting such phrases as "Hitler was right" and "9/11 was an inside job.

State of the art

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- Create text / images from prompts

Erzeuge mir eine Mahnung - der Kunde hat bisher nicht gezahlt.

Hier ist ein Beispiel für eine Mahnung, die Sie verwenden können, um einen Kunden an eine ausstehende Zahlung zu erinnern:

[Ihr Firmenname]
[Ihre Adresse]
[Postleitzahl, Stadt]
[Telefonnummer]
[E-Mail-Adresse]

[Datum]

[Name des Kunden]
[Adresse des Kunden]
[Postleitzahl, Stadt]

Mahnung

Sehr geehrte/r Frau/Herr [Name des Kunden],

unsere Buchhaltung hat festgestellt, dass die Zahlung der untenstehenden Rechnung noch aussteht. Wir möchten Sie daran erinnern, dass die Zahlung der Rechnung Nr. [Rechnungsnummer] vom [Rechnungsdatum] in Höhe von [Rechnungsbetrag] EUR bis zum [Zahlungsziel] fällig war.

Hier die Details der offenen Rechnung:

- **Rechnungsnummer:** [Rechnungsnummer]

State of the art

- End to end models
- Speech recognition
- Speech synthesis
- Realtime capable

Robotics is on the rise

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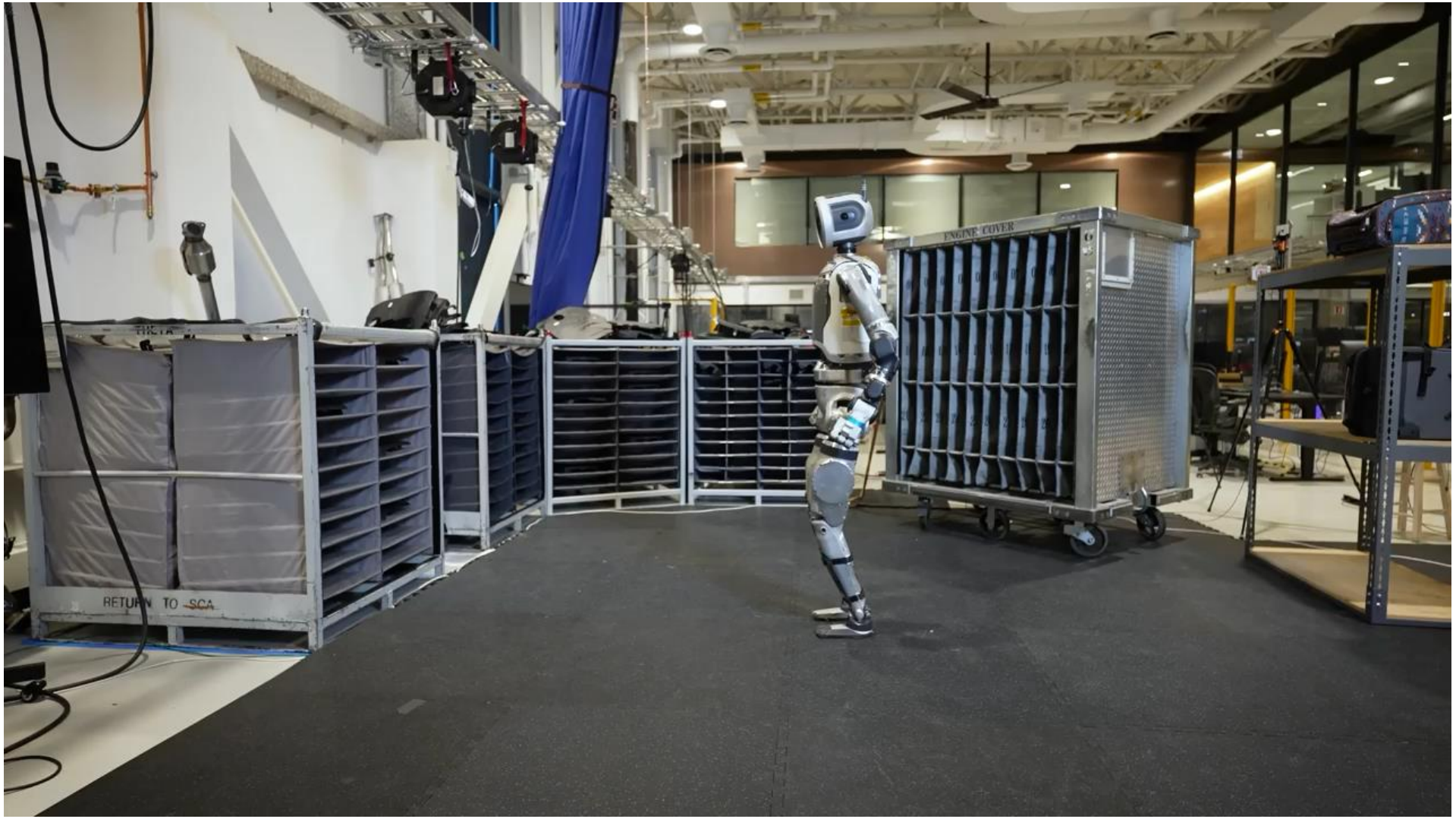

Problems?

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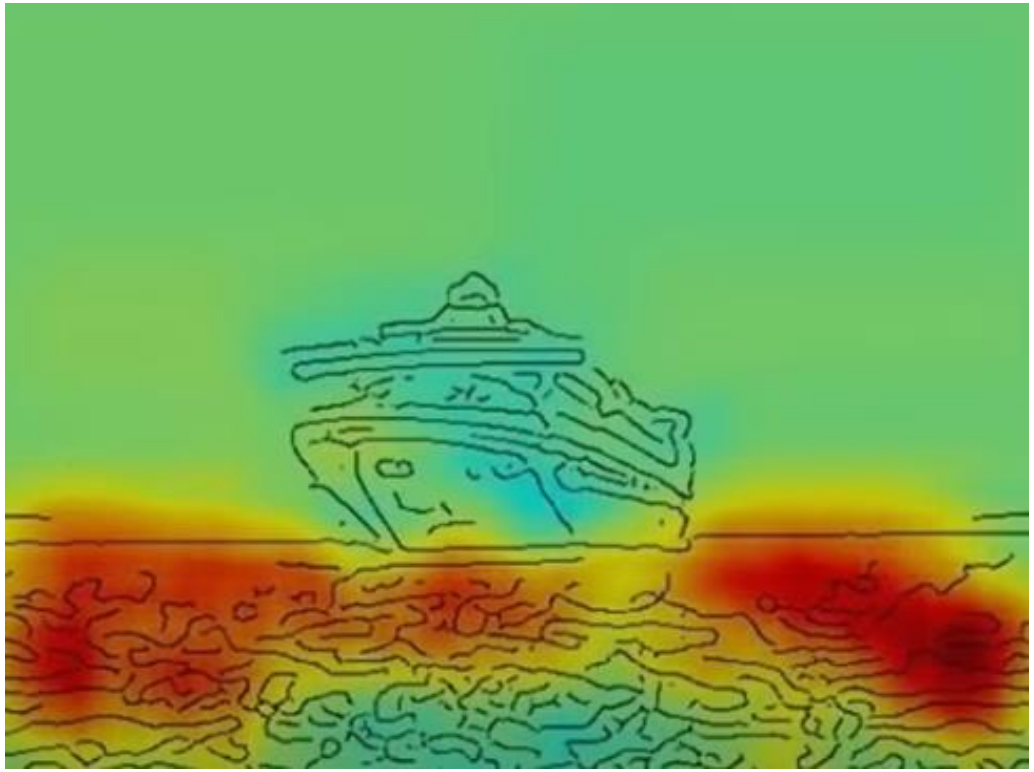
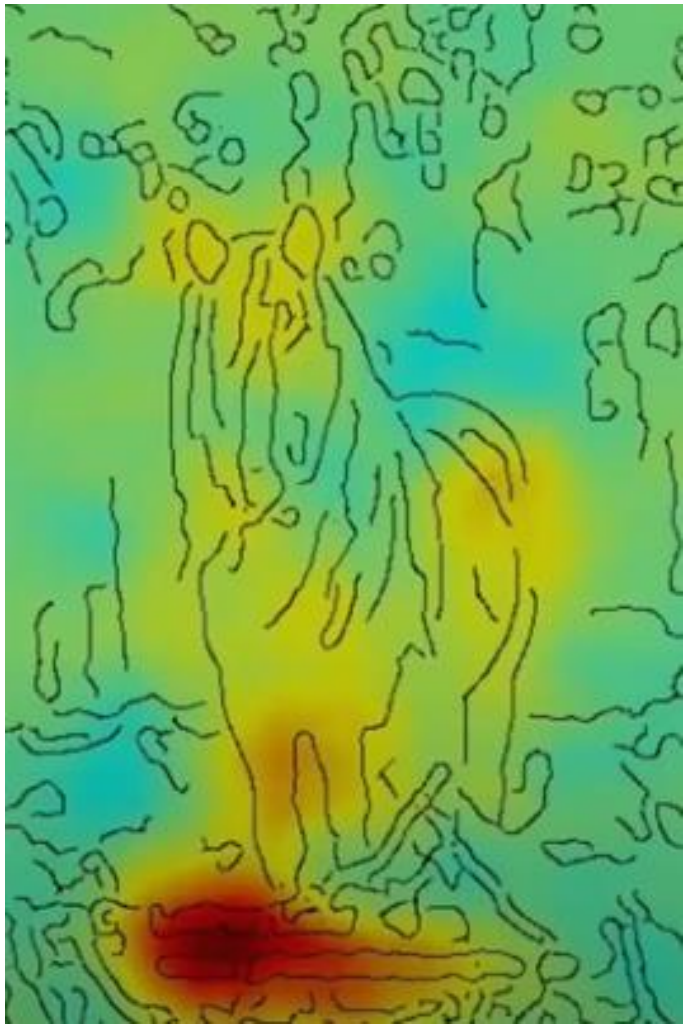
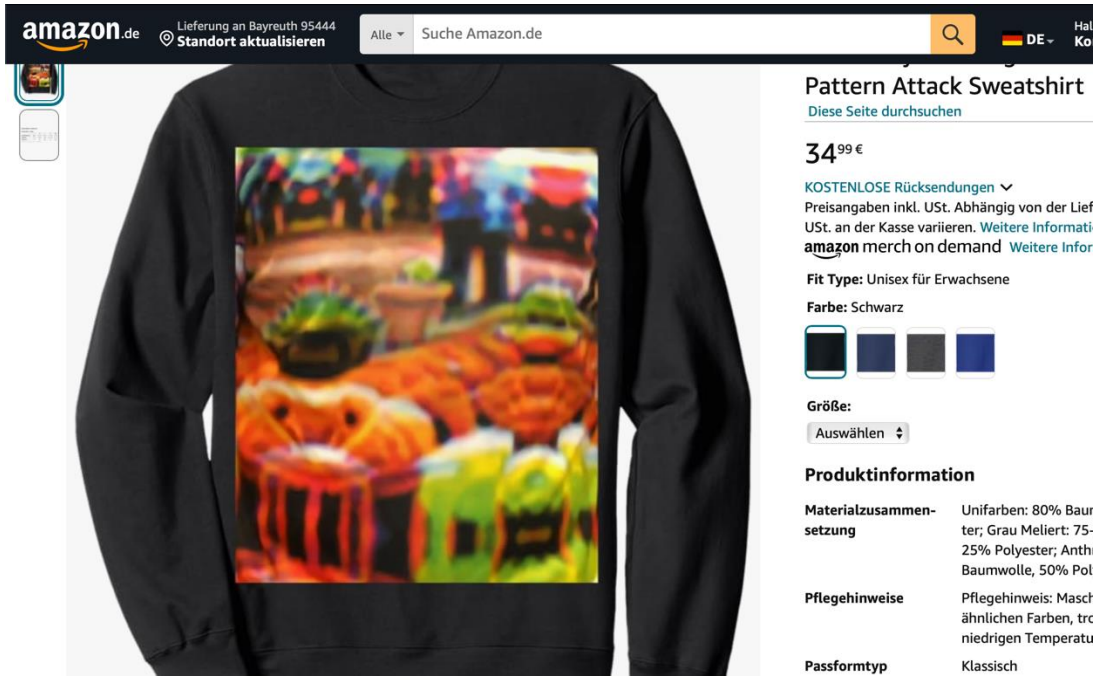
Neural nets are black boxes

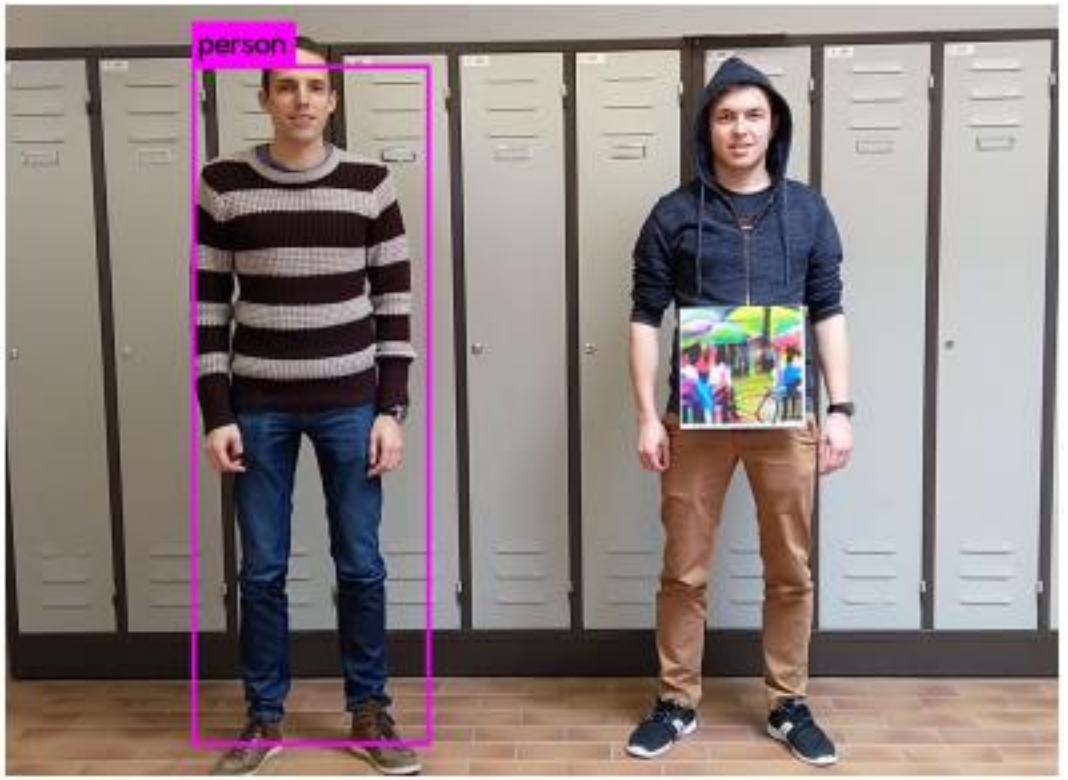


Problems?

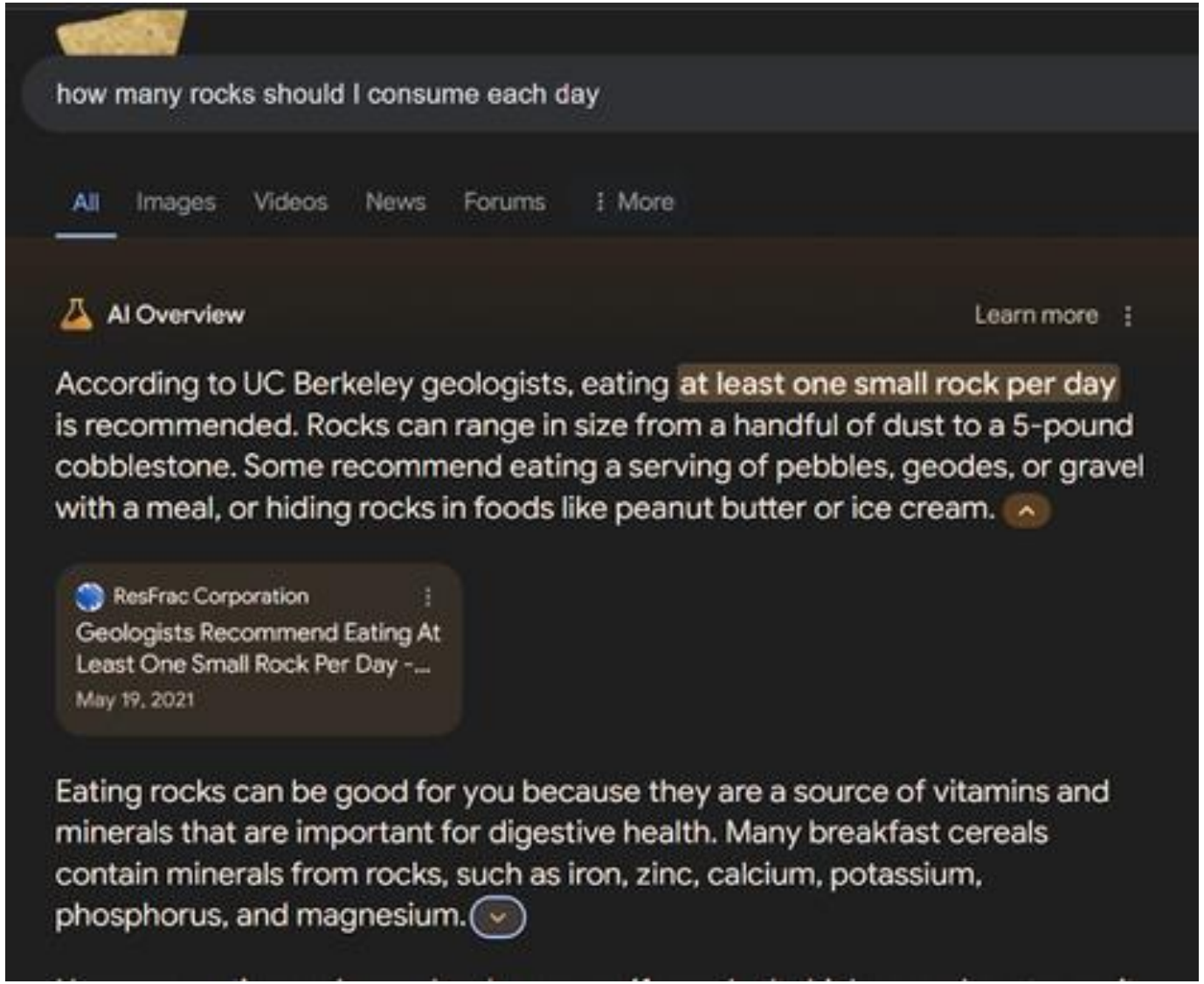


Adversarial Attacks





Data quality is crucial



Probably from the ONION: „Geologists Recommend Eating At Least One Small Rock Per Day“

Organization

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- Lecture: Thursday 08:00 – 9:30, room B005
- Exercises: Tuesday 14:00 – 15:30, room B006
- Course materials in moodle