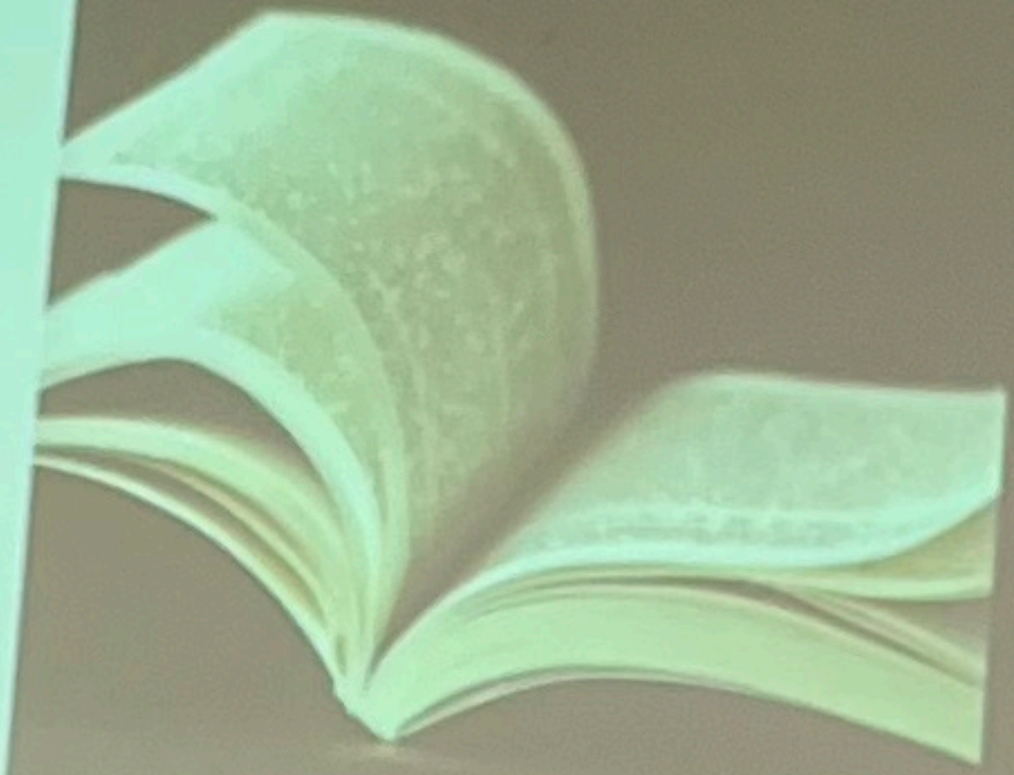
Reference Books

1. Python ML by Example by Yuxi (Hayden) Liu

2. Artificial Intelligence A Modern Approach (4th edition) by Stuart Russell and Peter Norvig (by Pearson Education Inc.) (pdf freely available)



Machine

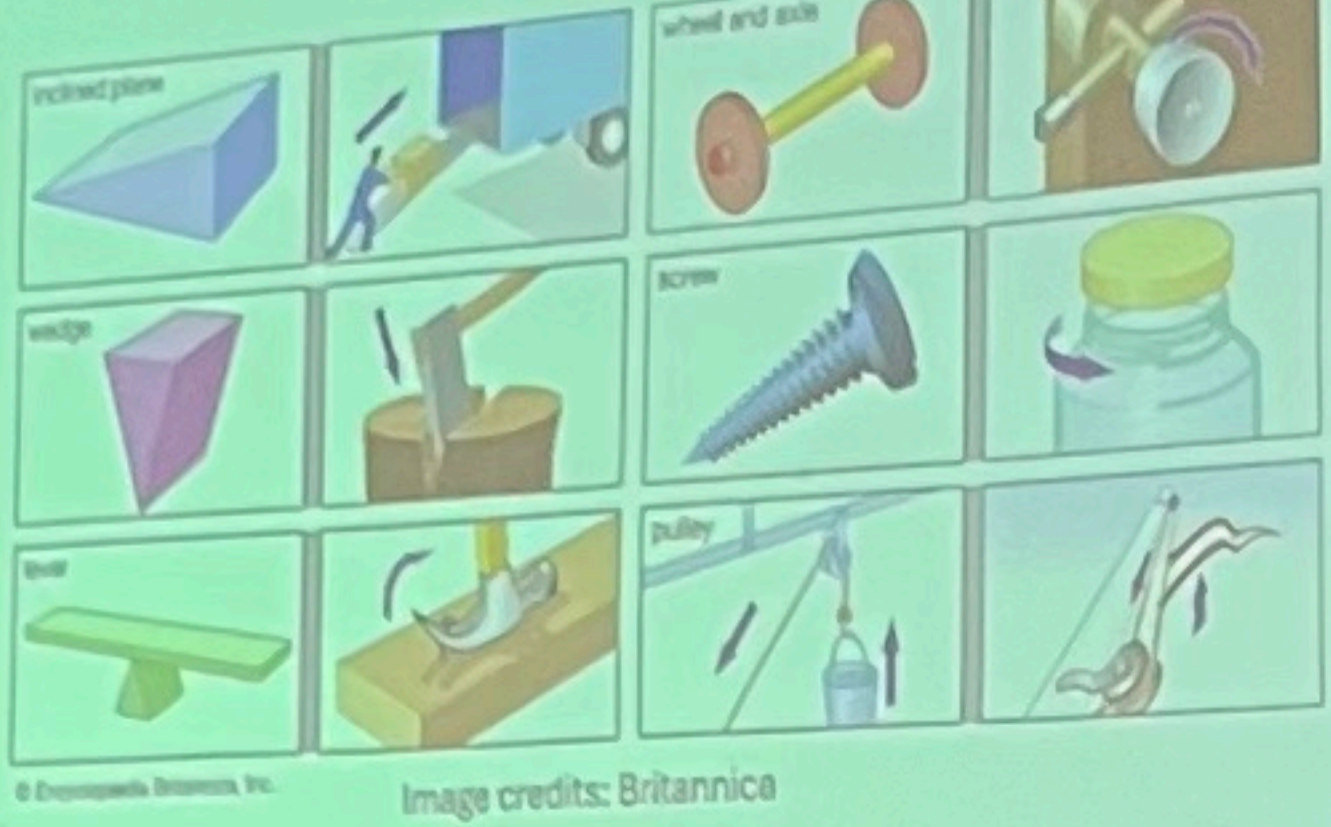
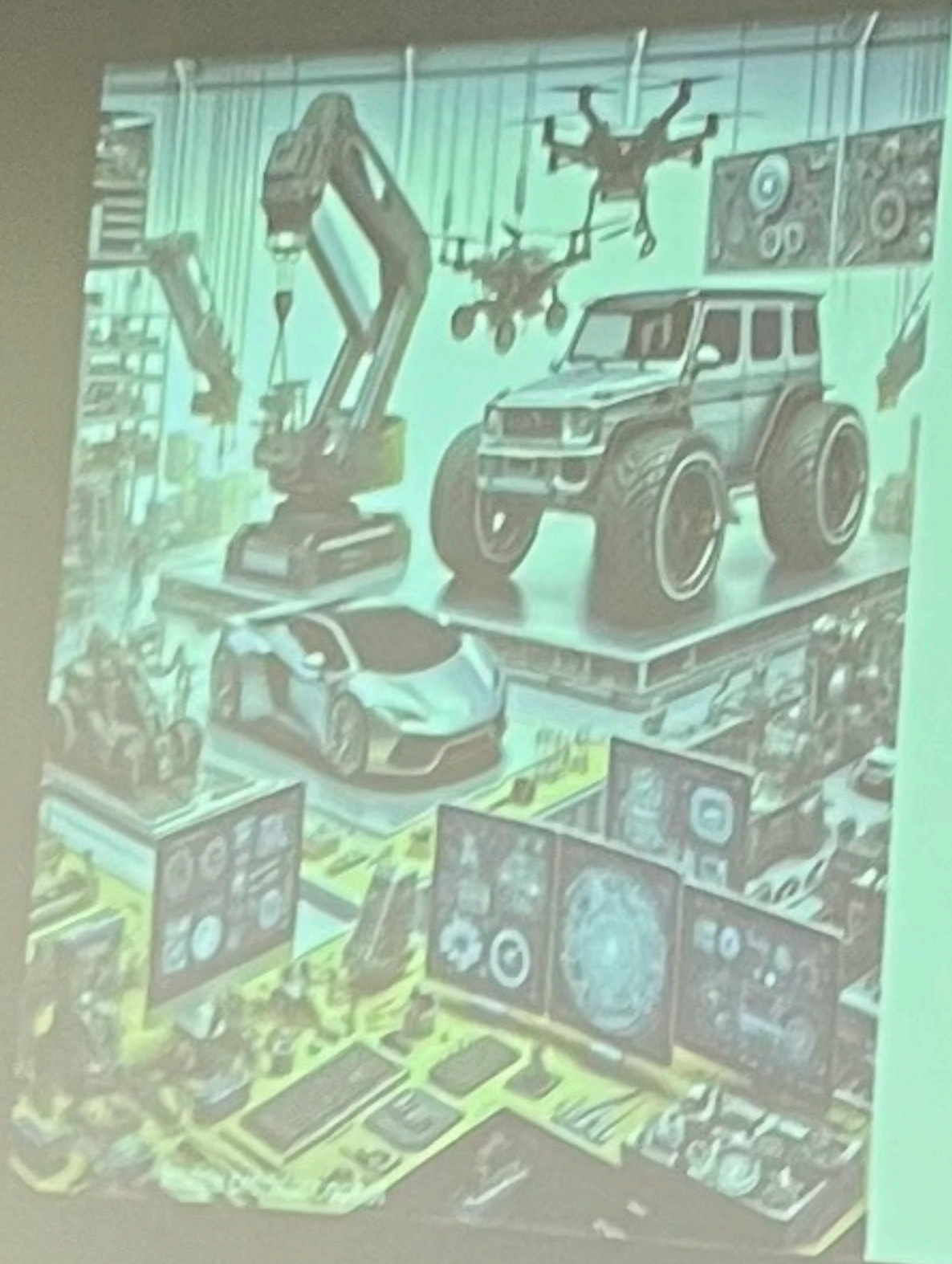


Image credits: Britannica

- (wiki) A machine is a physical system that uses power to apply forces and control movement to perform an action

- Make our lives easier



Complex Machines

- Combine two or more simple machines

- Sewing Machines/Cars/cranes

- Computers/robots

Future of AI

- Pieter Abbeel (UCB) : robots will keep us safer, especially from disasters

- Stuart Russell (UCB): very smart computers could solve all our problems, including climate change

- Matthew Taylor (WSU) : friendly robots could give the elderly live better lives

- Murray Shanahan (Imperial College): AI will improve medical care

- University of Oxford:
  - Machines will be better than us at translating languages by 2024 and writing school essays by 2026

- Within ten years computers will be better at driving a truck than us and by 2031 they will be better at selling goods

- AI will write a bestselling book by 2049 and conduct surgery by 2053

Is AI a Threat?

- Industrialization: Machines replaced lot of human jobs

- Computers replaced lot of book-keeping/Accountants

- Ray Zinn on Forbes in May 2017
  - economics, like life, finds a way
  - jobs will change, the economy will expand
  - AI will help create jobs
  - technical applications require a range of workers, from field techs who repair sensors to data scientists who model from massive data sets

Healthcare

Diagnostic, personalized medicines

Finance

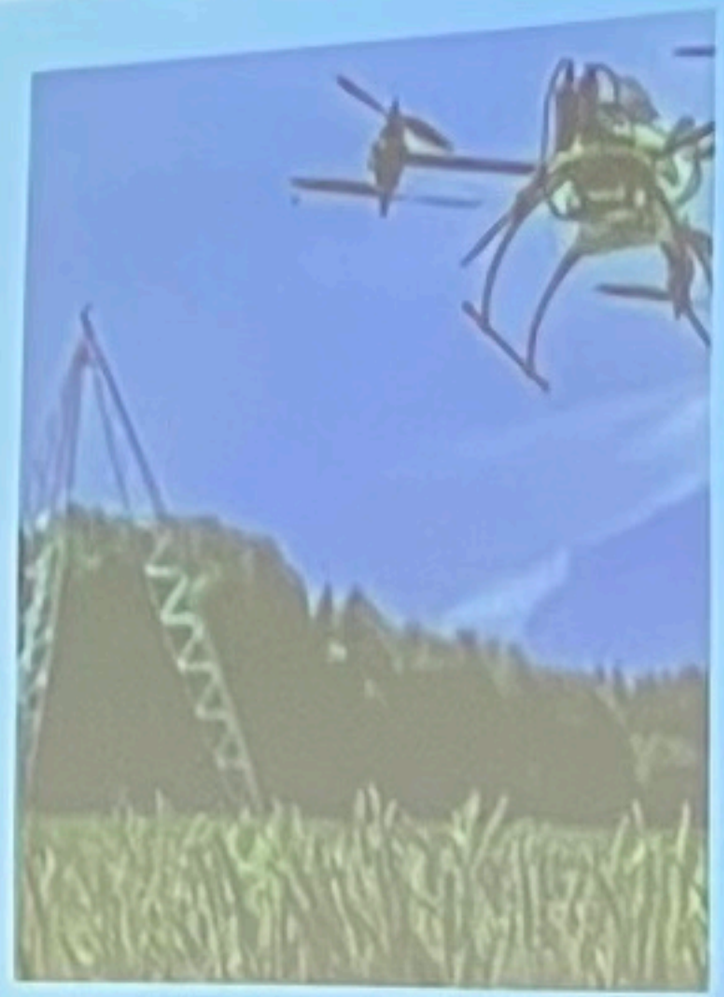
Fraud detection, algorithmic trading

Daily life

Online Shopping, Digital Assistants, Recommender systems (personalized recommendations) and the list can go on...

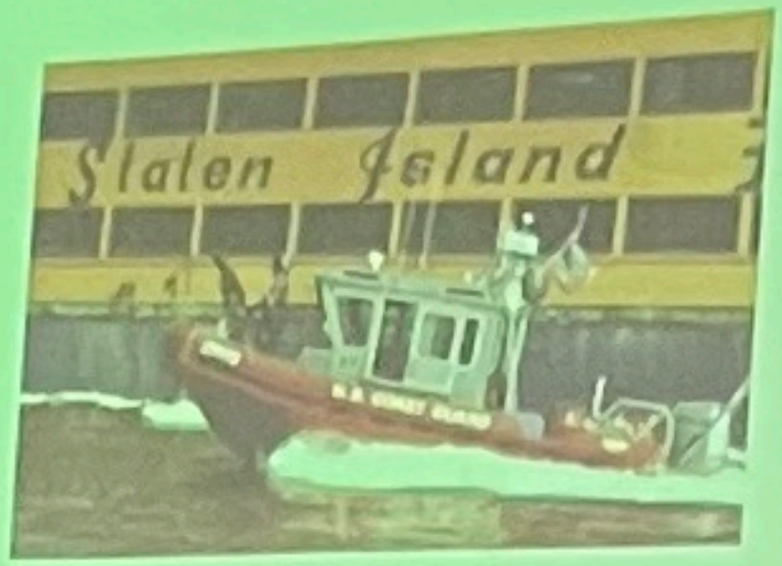
AI for Social Good (1)

- The global population: 9.7-108 by 2050
  - Increased agricultural production in order to meet food demands
- Computer Vision
- Data analytics for farmers
  - (weather patterns, soil type, water resource availability, nature of consumption patterns)
- Efficient supply chain management



AI for Social Good (2)

- AI for Public and Wild life Safety
- Limited Resources
- Use Game Theory, ML and AI
  - Automated Event Discovery
  - In Place in USA[1]:
    - PROTECT
    - ARMOUR
    - PAWS



Images: Teamcore, Harvard

AI for Social Good (3)

- In India: severe shortage of medical facilities and experts in the rural areas
- By 2030, we will have a large aging population
- Predictive diagnostics
  - use the large database of hospital records available to identify the susceptibility of each patient to different diseases and prepare them beforehand to handle the diseases to which they are susceptible
- IoT based framework
  - assistive devices that can be used to monitor body vitals, provide safety alarm to doctors as needed and provide updates/feedback to the patients on timely basis

What is 'Intelligence'

- the ability to understand, learn and think

- (wiki) the capacity for abstraction, logic, understanding, self-awareness, learning, emotional knowledge, reasoning, planning, creativity, critical thinking, and problem-solving

Acting Humanly Turing Test

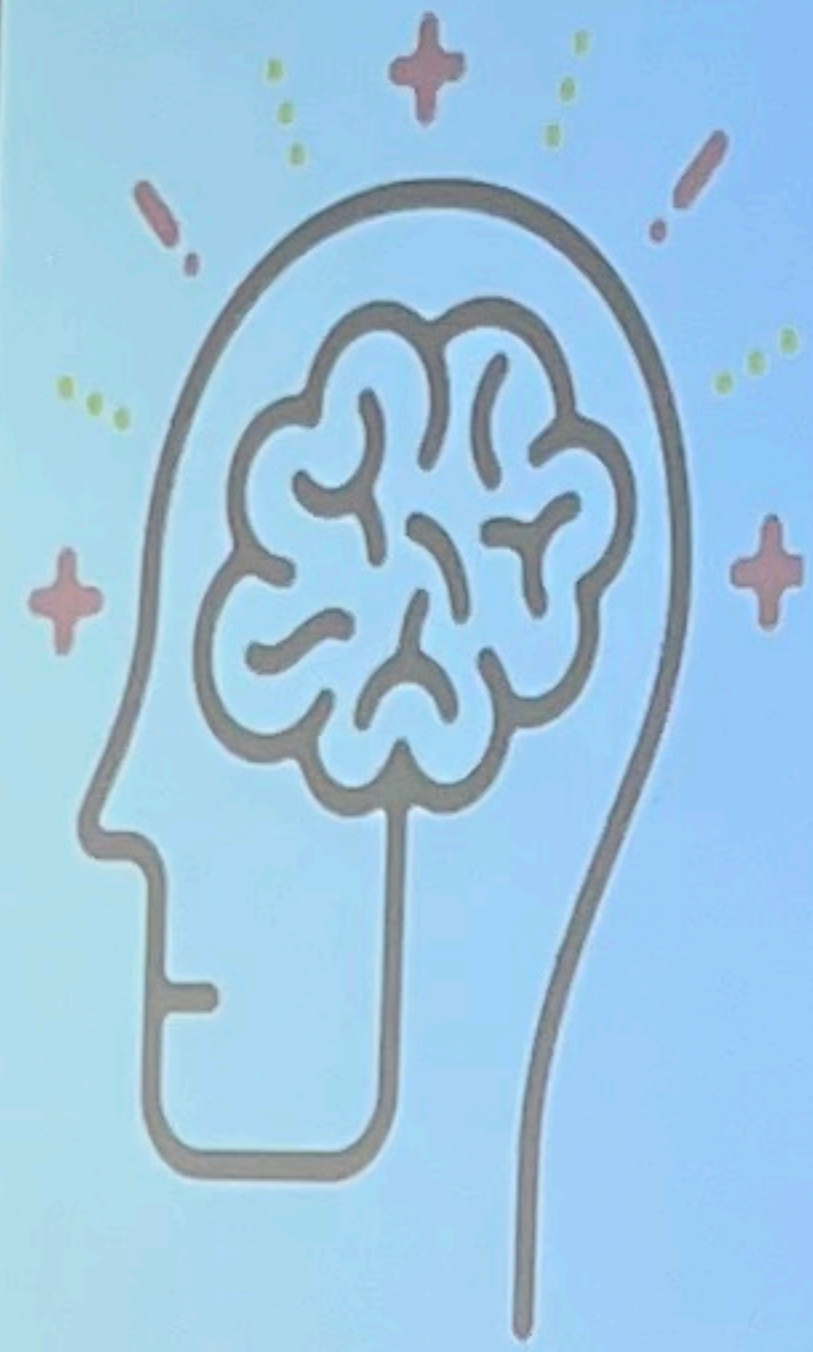
- An human interrogator is not able to distinguish between computer and human after posing some written questions

- Computer need following capabilities
  - Natural language processing
  - Knowledge representation
  - Automated reasoning
  - Machine Learning

Total Turing Test

Involves interaction with objects, people,
Moving objects around etc.,

Additionally need Computer Vision and Robotics



- Think Humanly
  - Cognitive modelling

- Act Rationally
  - Agent based modelling
  - Agent should operate autonomously, perceive the environment, adapt to change

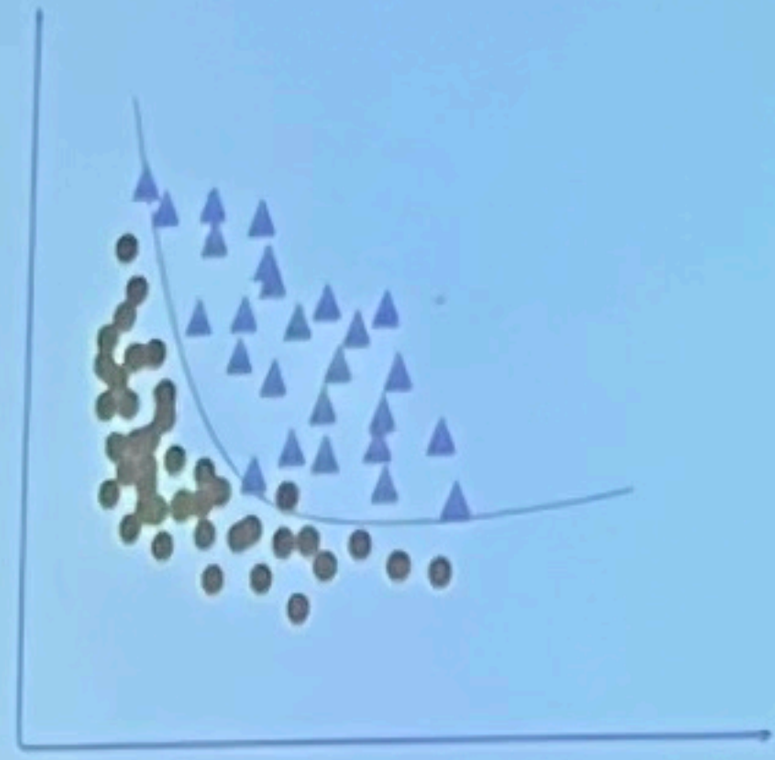
- Think Rationally
  - Right thinking
  - Logic-based approach
  - Need to involve probability to model uncertain things

What is Machine Learning?

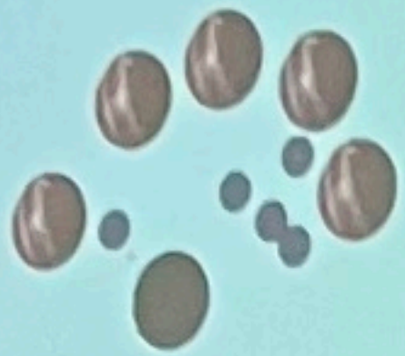
- Machine learning: construction of algorithms that can learn from and make predictions on data

- data == features

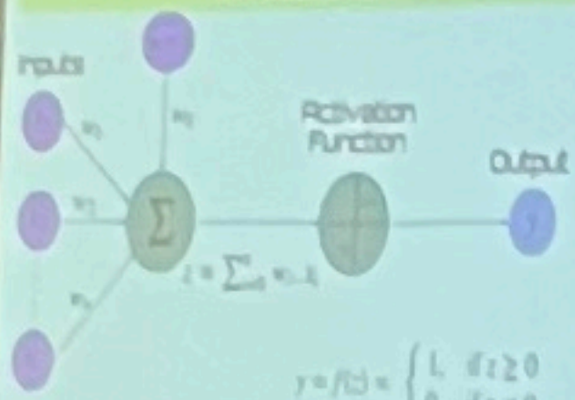
- Supervised: Classification, regression
- Unsupervised: Clustering, anomaly detection



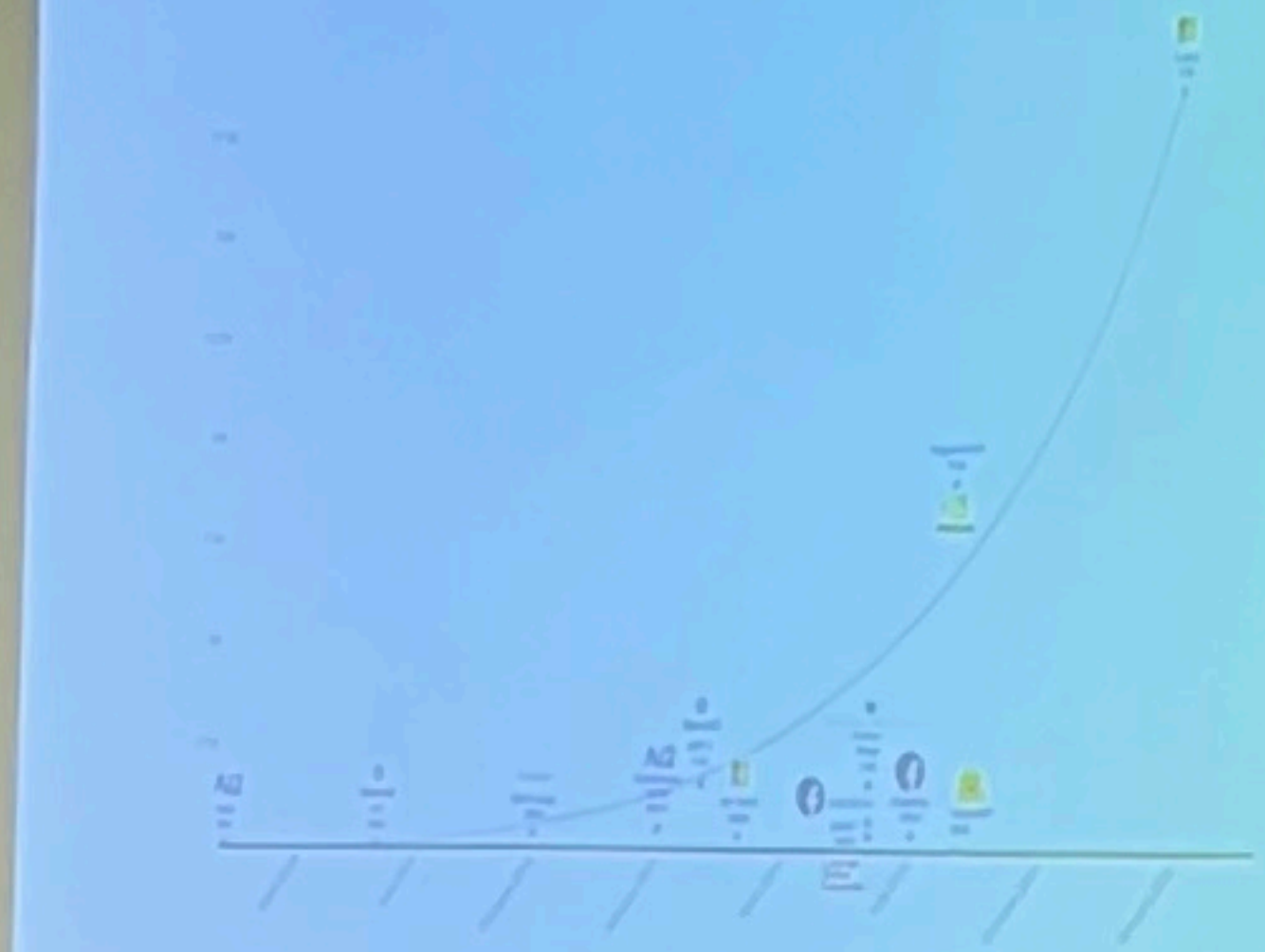
Cricket ball vs tennis ball



Perceptron: Threshold Activation



Complexity of neural networks



GPT 4 (March'23)
1.76 trillion params

GPT3 May 2021
175 billion parameters

MT-NLG 530B
PaLM 540B