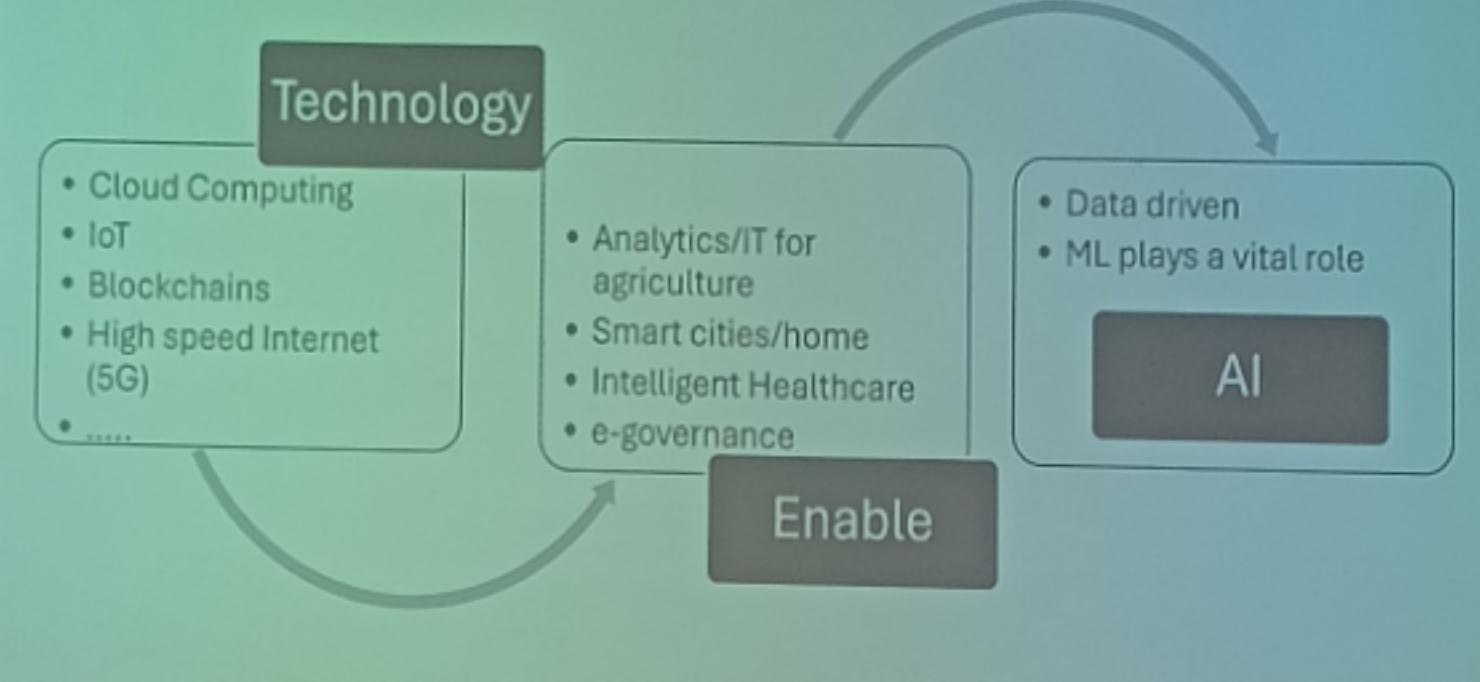


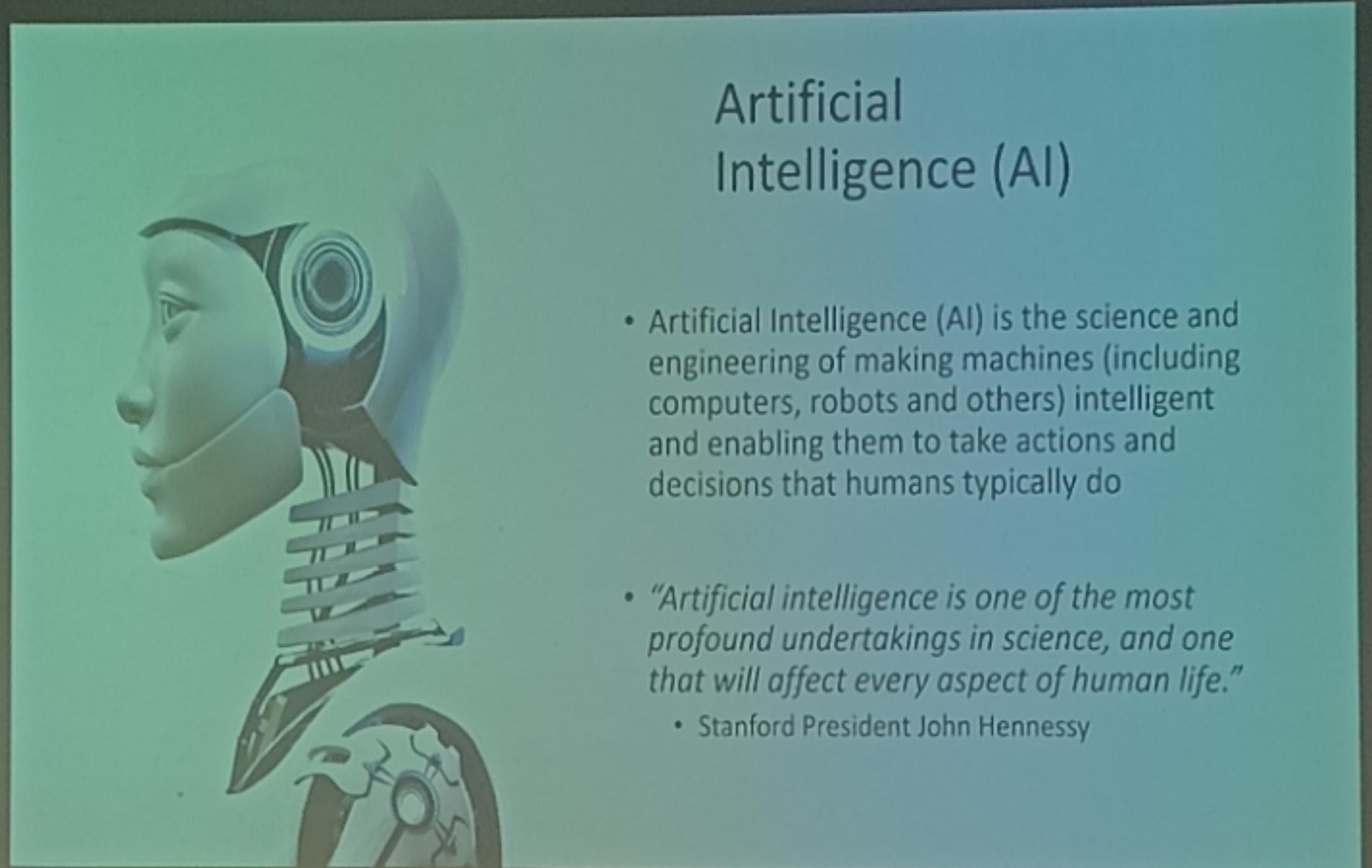
## Future of Technology



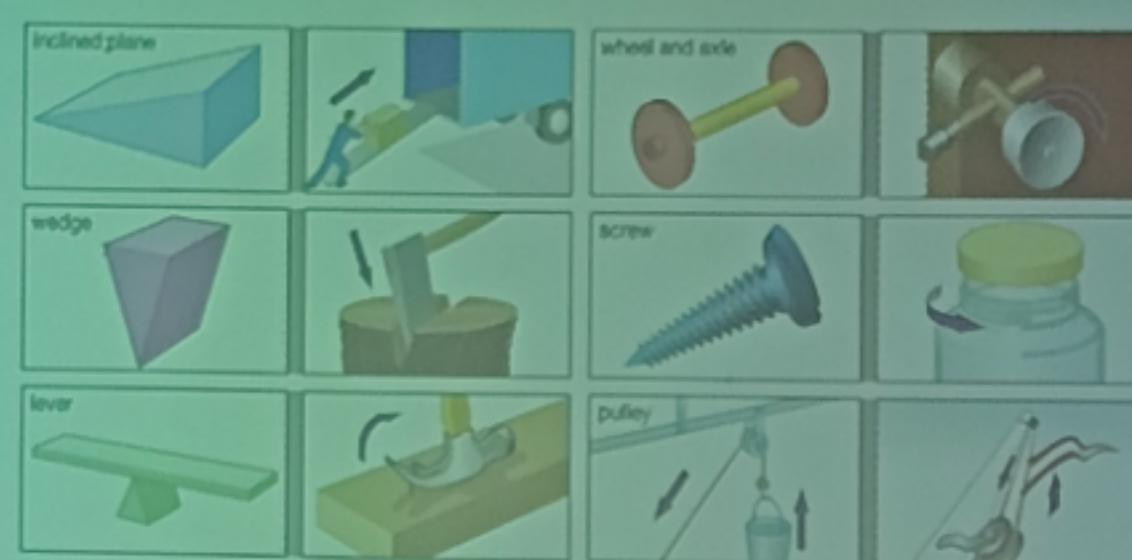
## Artificial Intelligence (AI)

- Artificial Intelligence (AI) is the science and engineering of making machines (including computers, robots and others) intelligent and enabling them to take actions and decisions that humans typically do
- *"Artificial intelligence is one of the most profound undertakings in science, and one that will affect every aspect of human life."*

• Stanford President John Hennessy



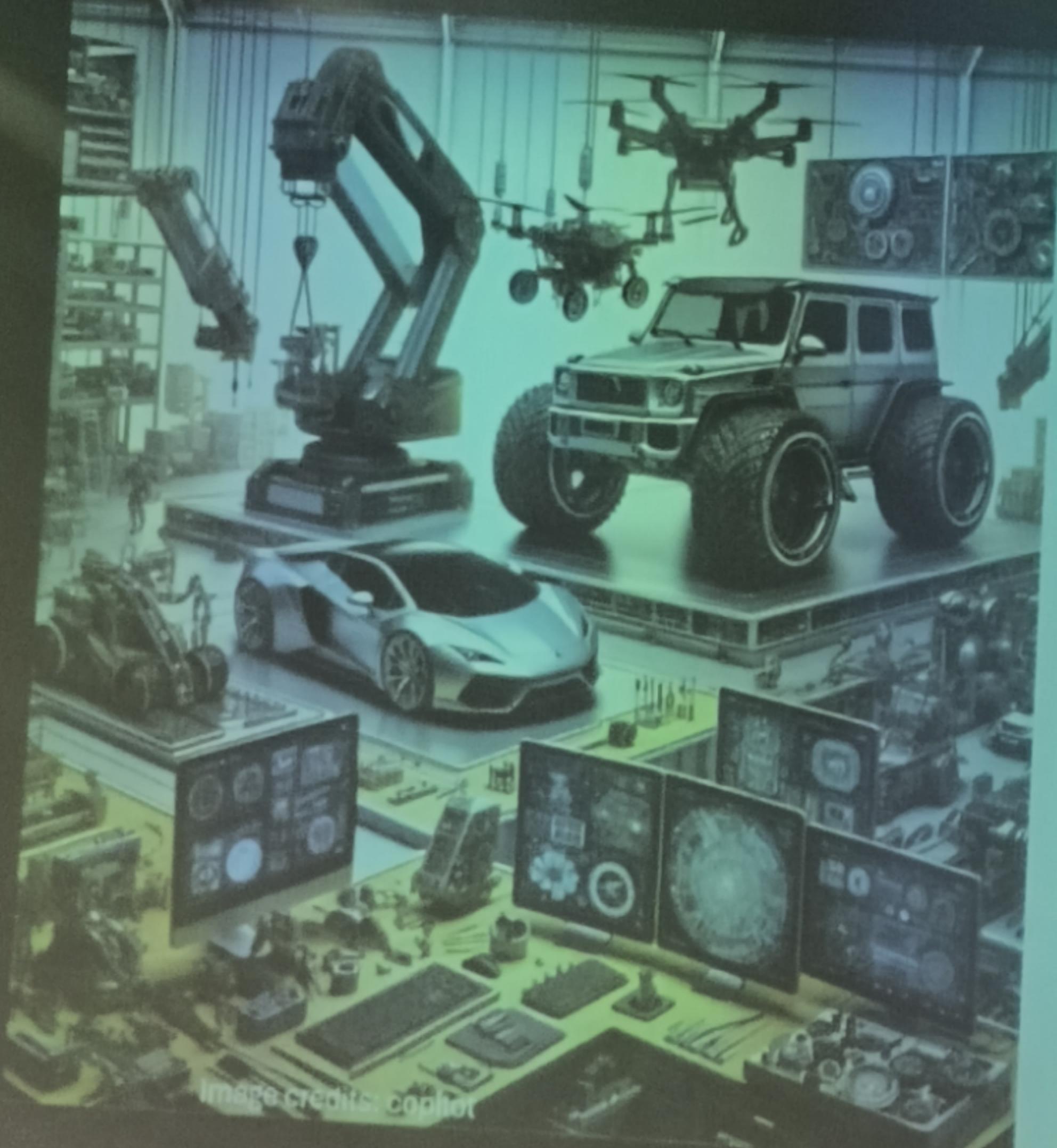
# Machine



© Encyclopædia Britannica, Inc.

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

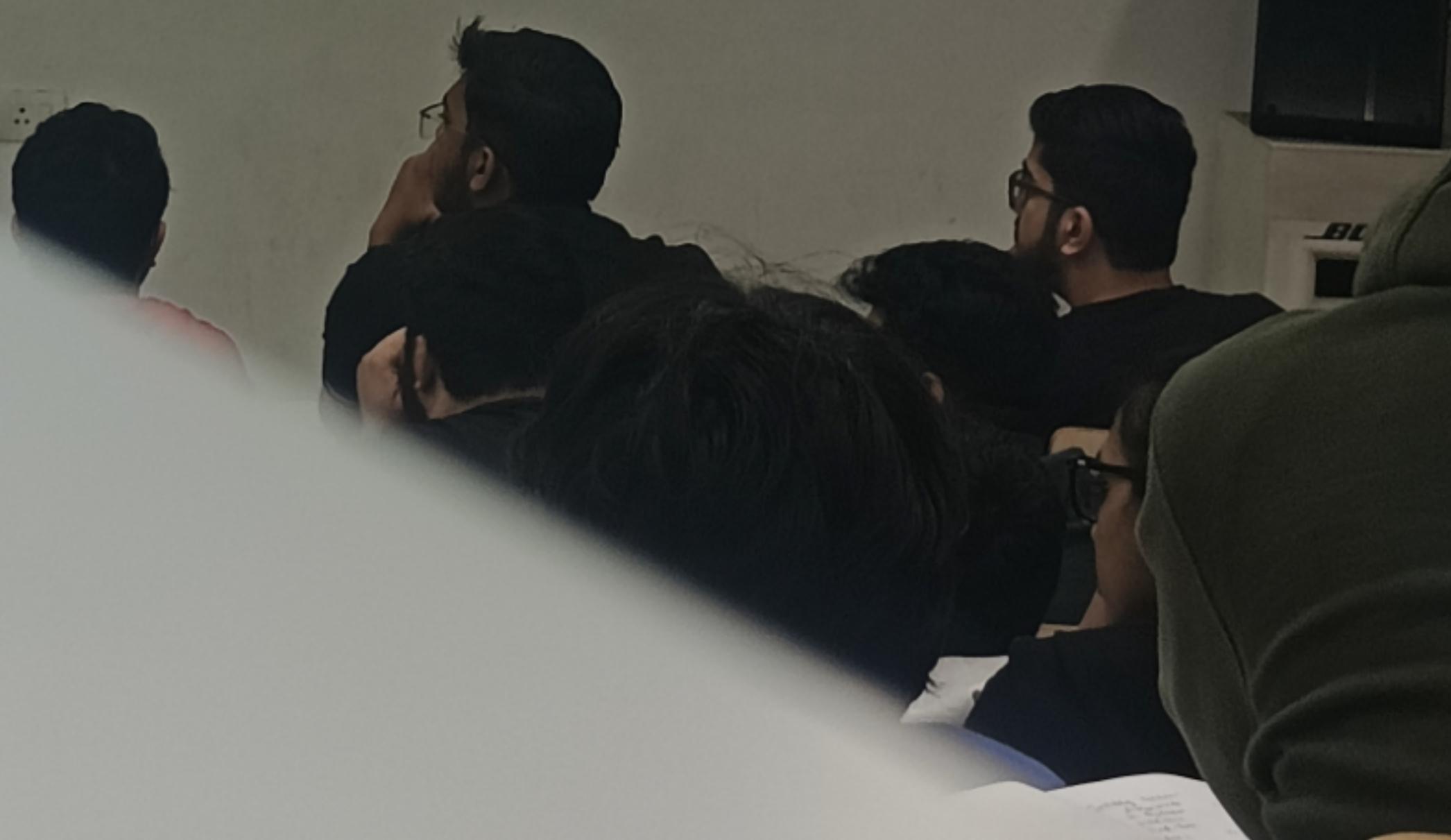
- University of Oxford:

- 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





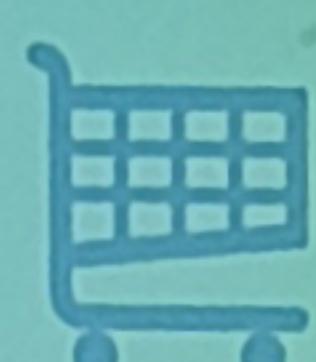
## Healthcare

Diagnostic, personalized medicines



## Finance

Fraud detection, algorithmic trading



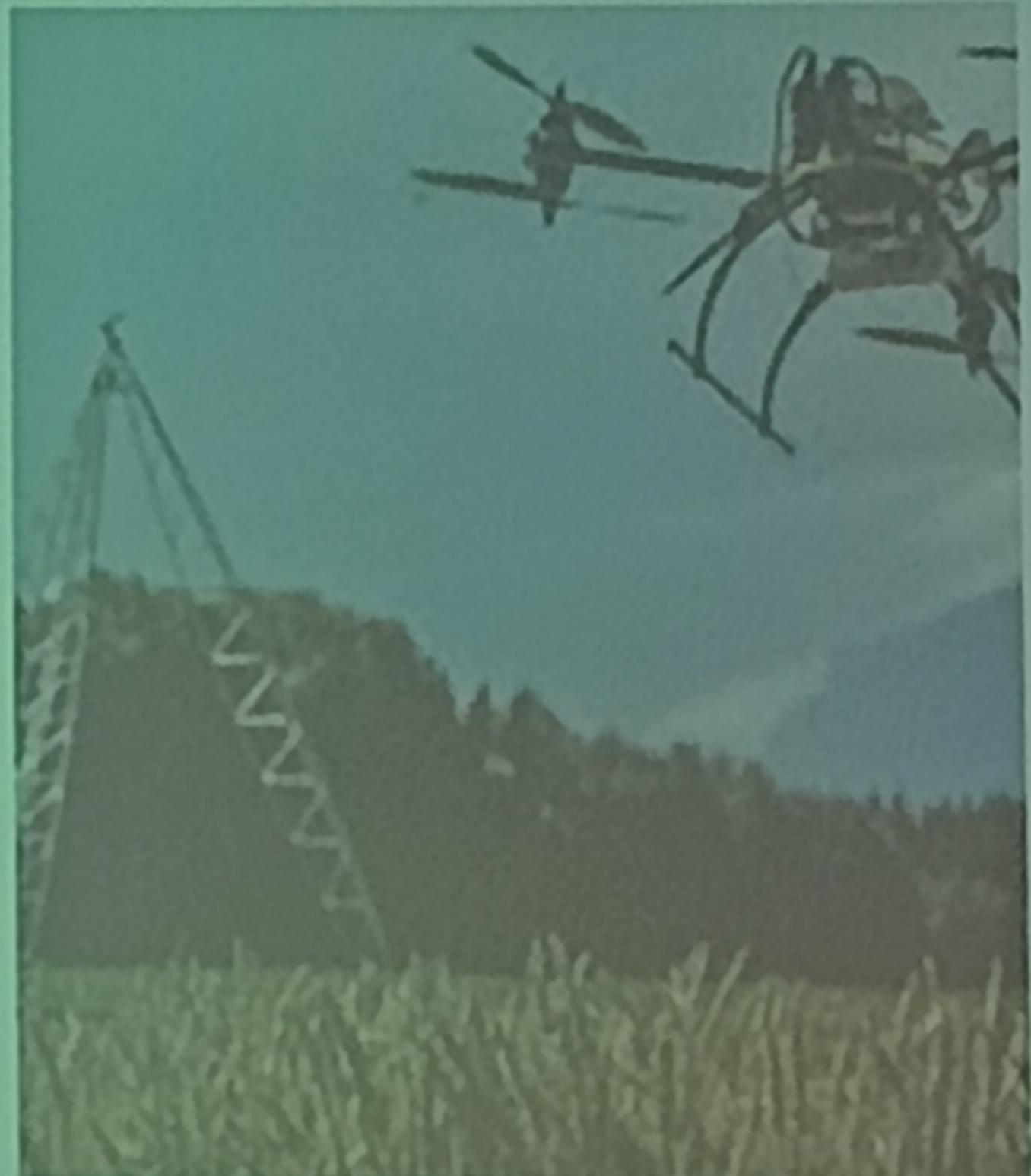
## Daily life

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

# AI for Social Good (1)

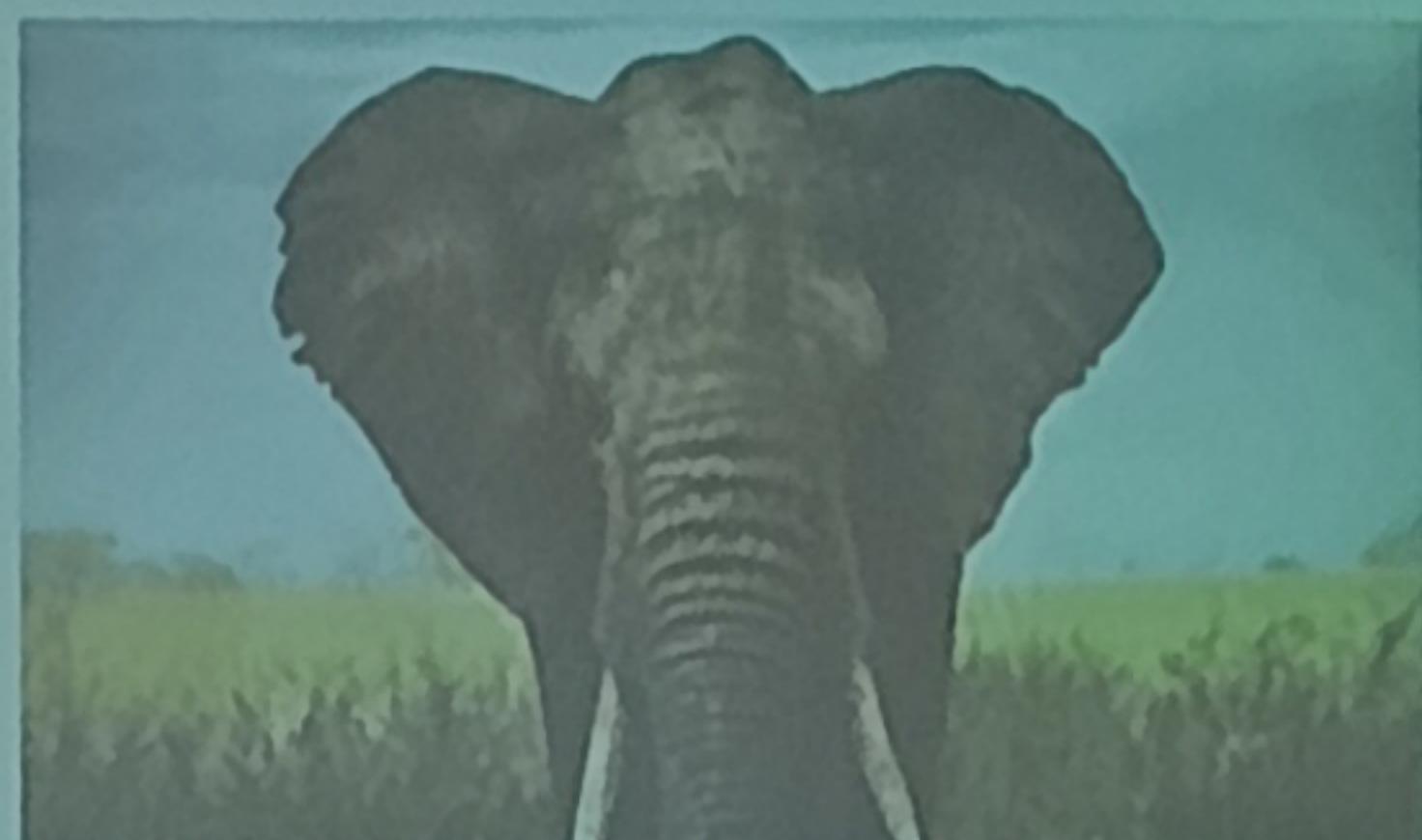
---

- The global population: 9.7-10B 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<sup>1</sup>:
    - 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



#### Intelligence in Humans



- We think, do learn from observations, act/make decisions
- Can machines think?
- Can we make machine learn from observations?
- Can we make machines take decisions?



Projector

# Intelligence in Humans



- We think, do learn from observations, act/make decisions
- Can machines think?
- Can we make machine learn from observations?
- Can we make machines take decisions?

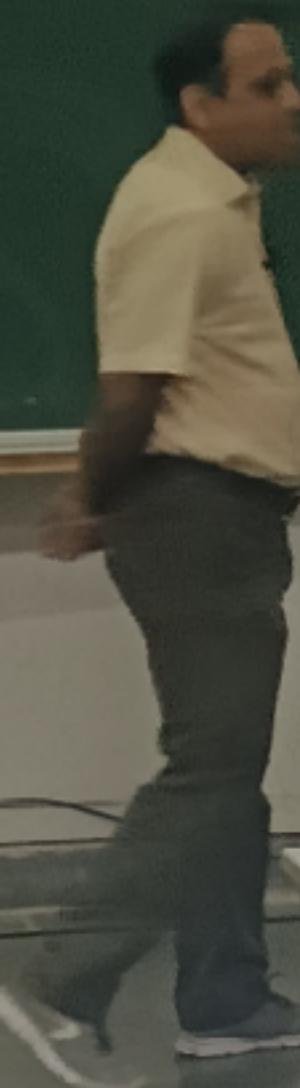
www.doodlevit.com  
Image credits: <https://doodlevit.com>

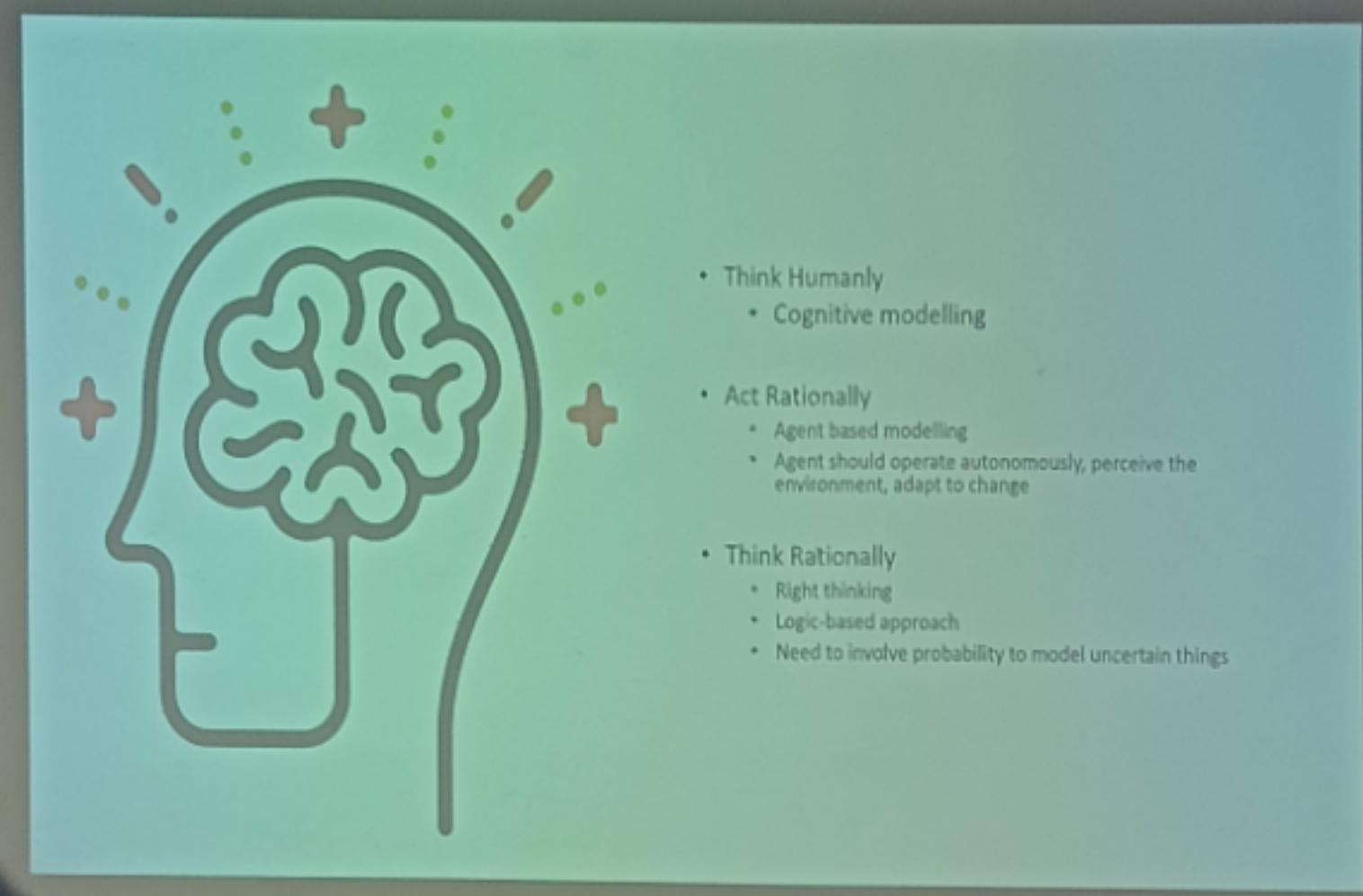
## Two dimensions to AI

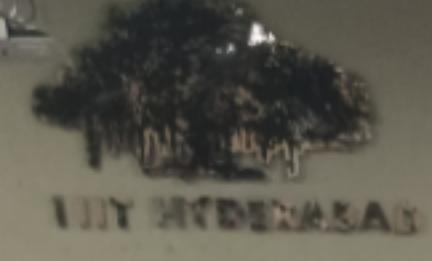
- Human vs Rational
  - Rationality: doing always right thing
- Act vs Think

## Acting Humanly Turing Test

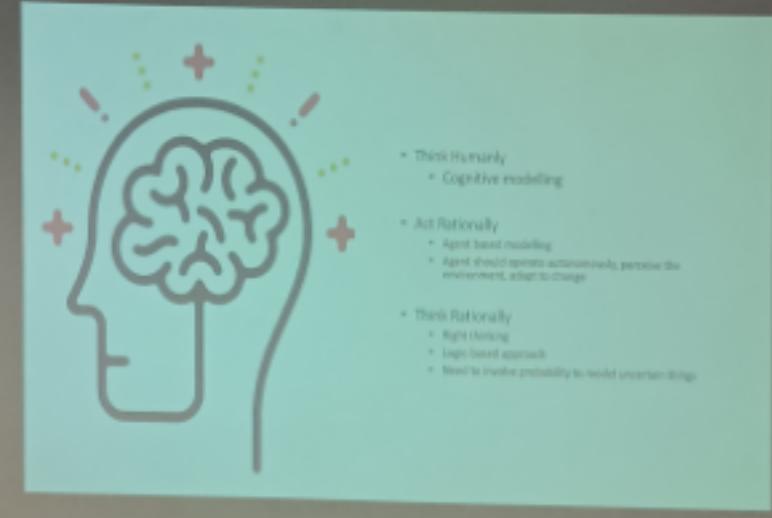
- |                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• An human interrogator is not able to distinguish between computer and human after posing some written questions</li><li>• Computer need following capabilities<ul style="list-style-type: none"><li>• Natural language processing</li><li>• Knowledge representation</li><li>• Automated reasoning</li><li>• Machine Learning</li></ul></li></ul> | <p>Total Turing Test</p> <p>Involves interaction with objects, people, Moving objects around etc.,</p> <p>Additionally need Computer Vision and Robotics</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|







UIN SYARIF HIDAYAH

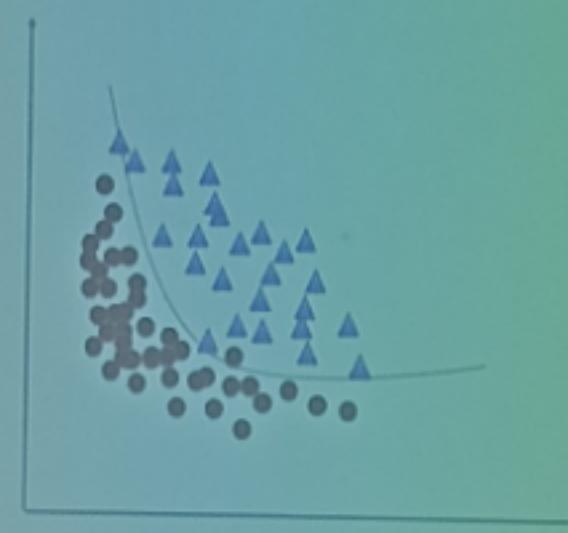


## What is Machine Learning?

- Machine learning: construction of algorithms that can learn from and make predictions on data
- data == features
- Supervised: Classification, regression

## 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



## 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

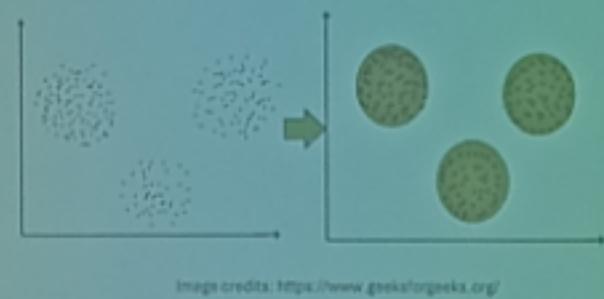
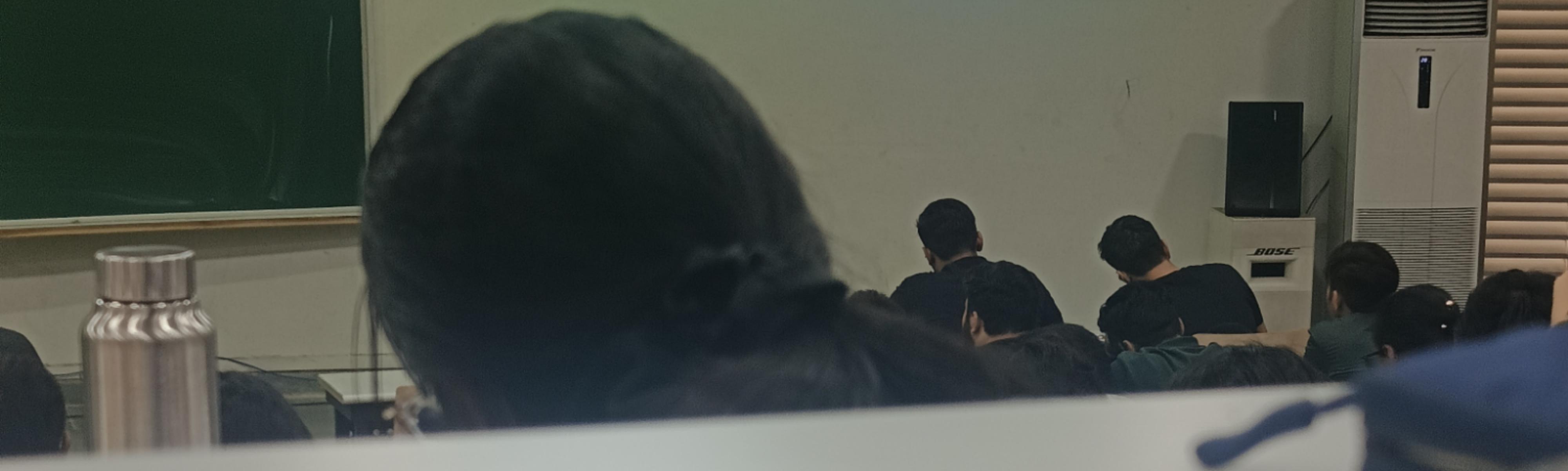
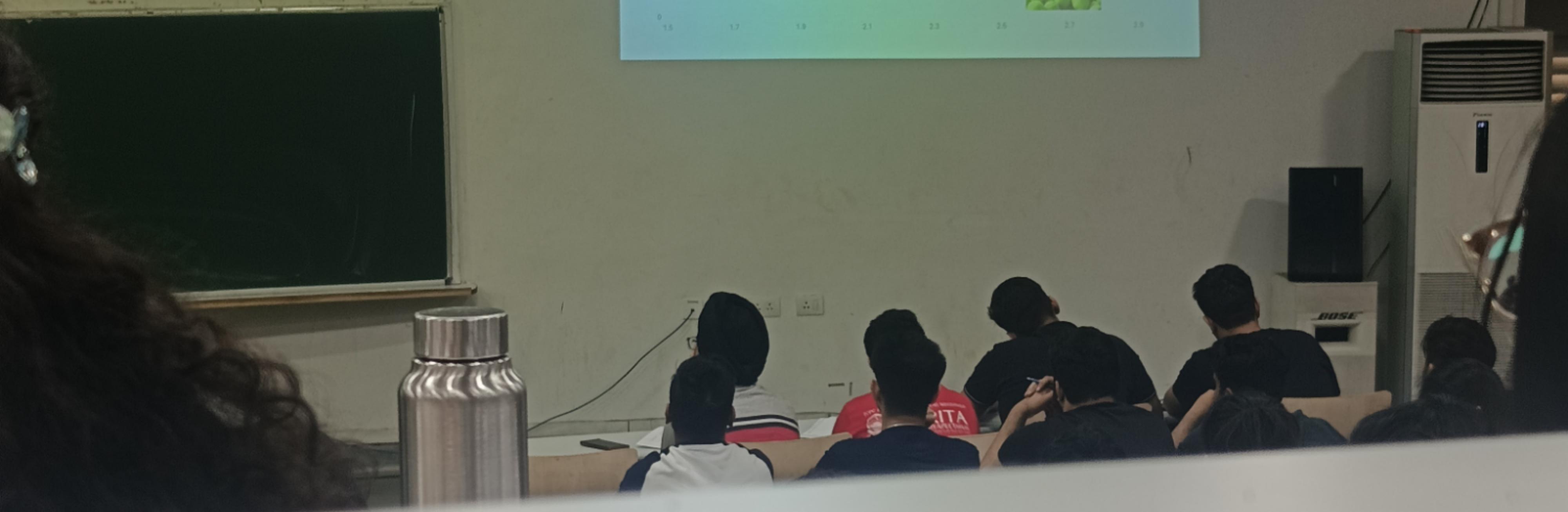
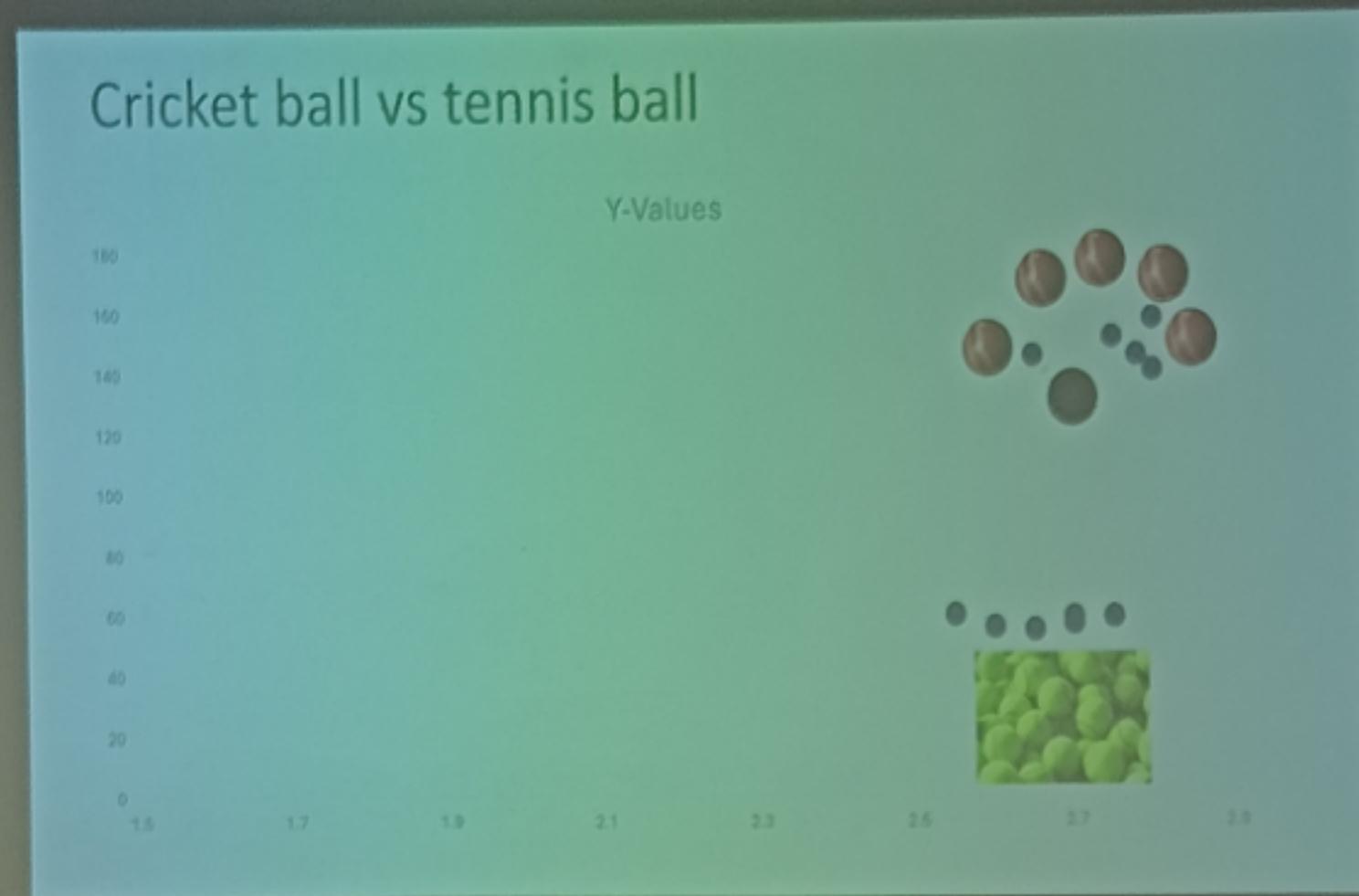
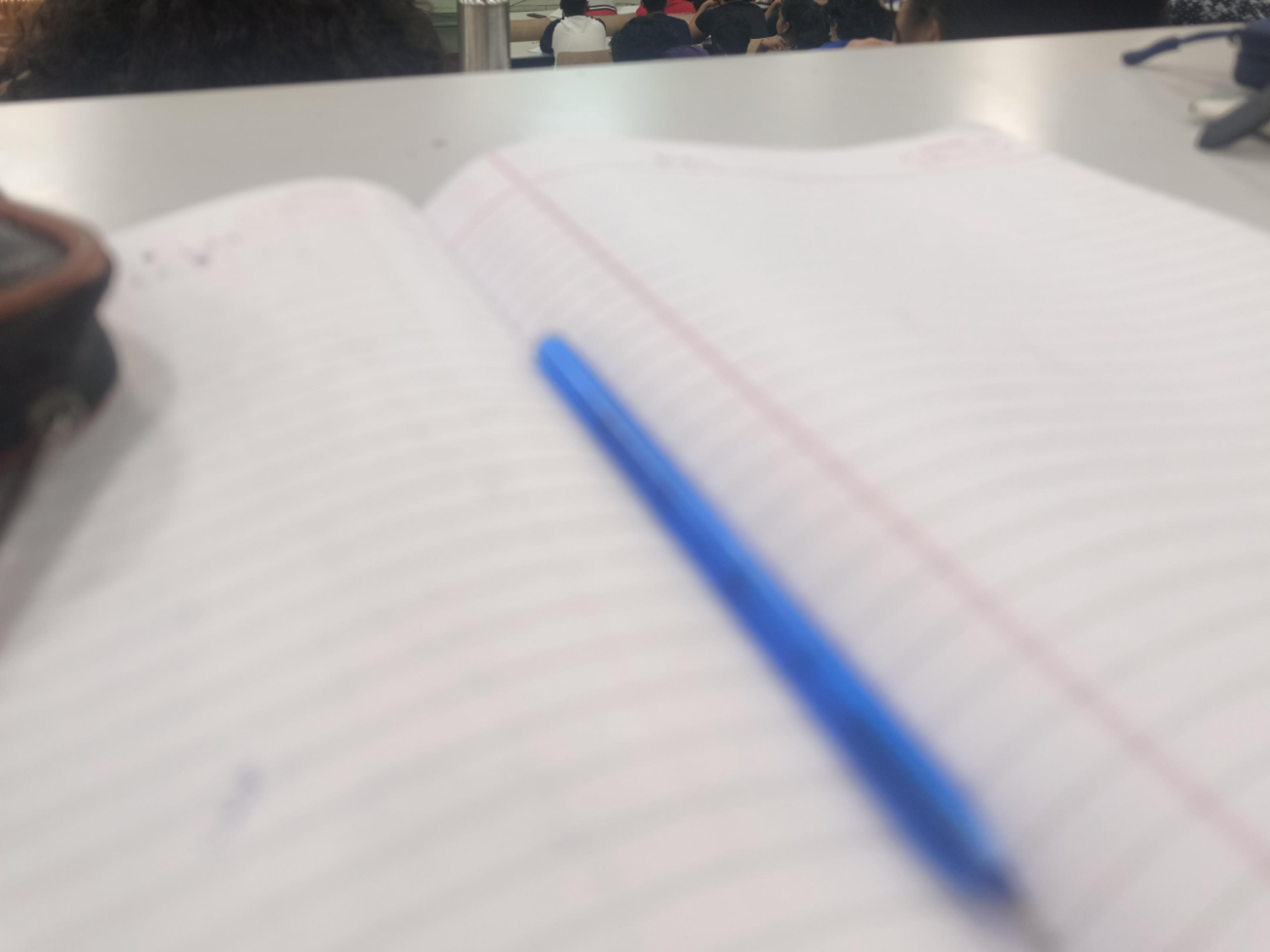
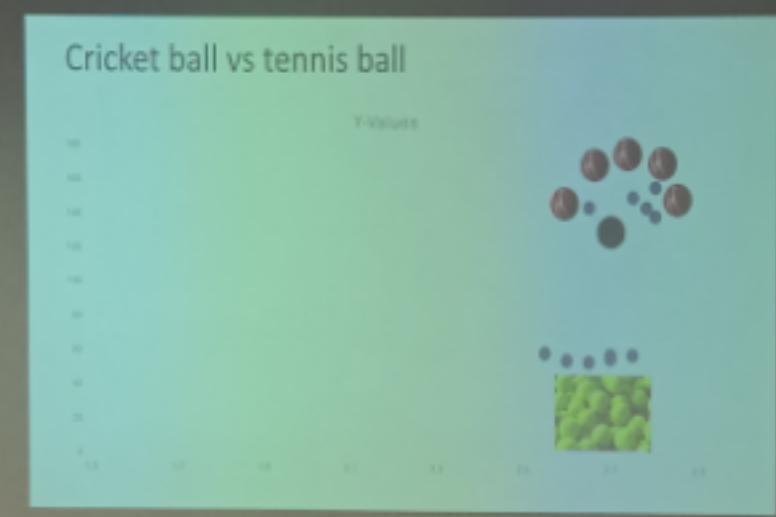


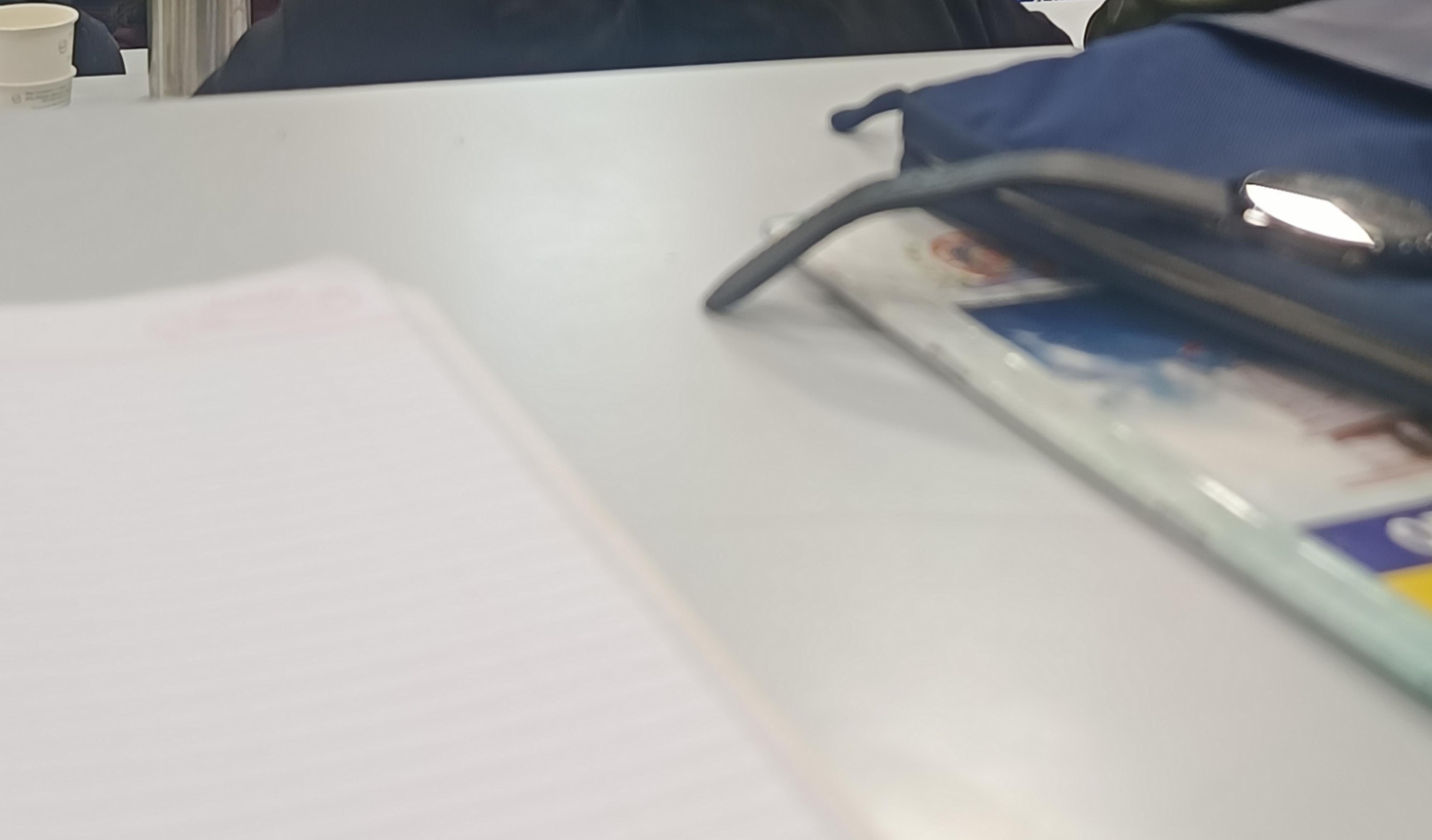
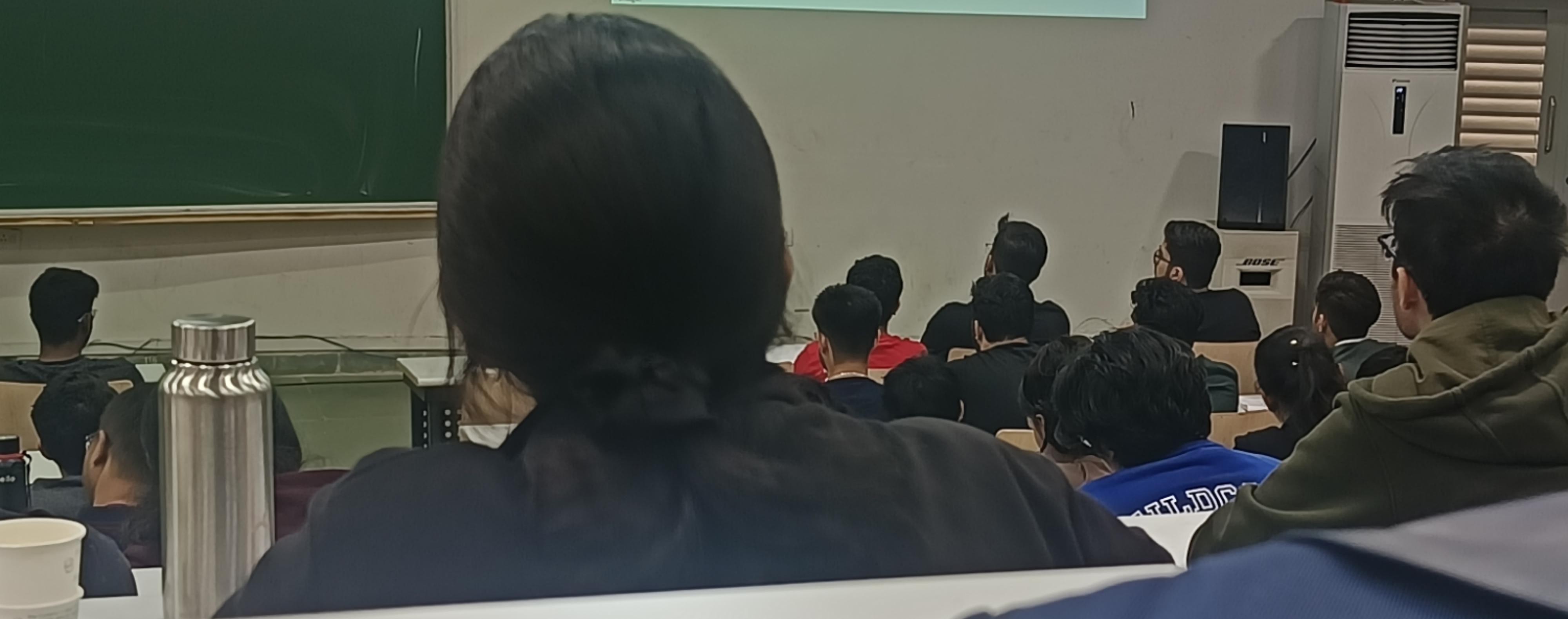
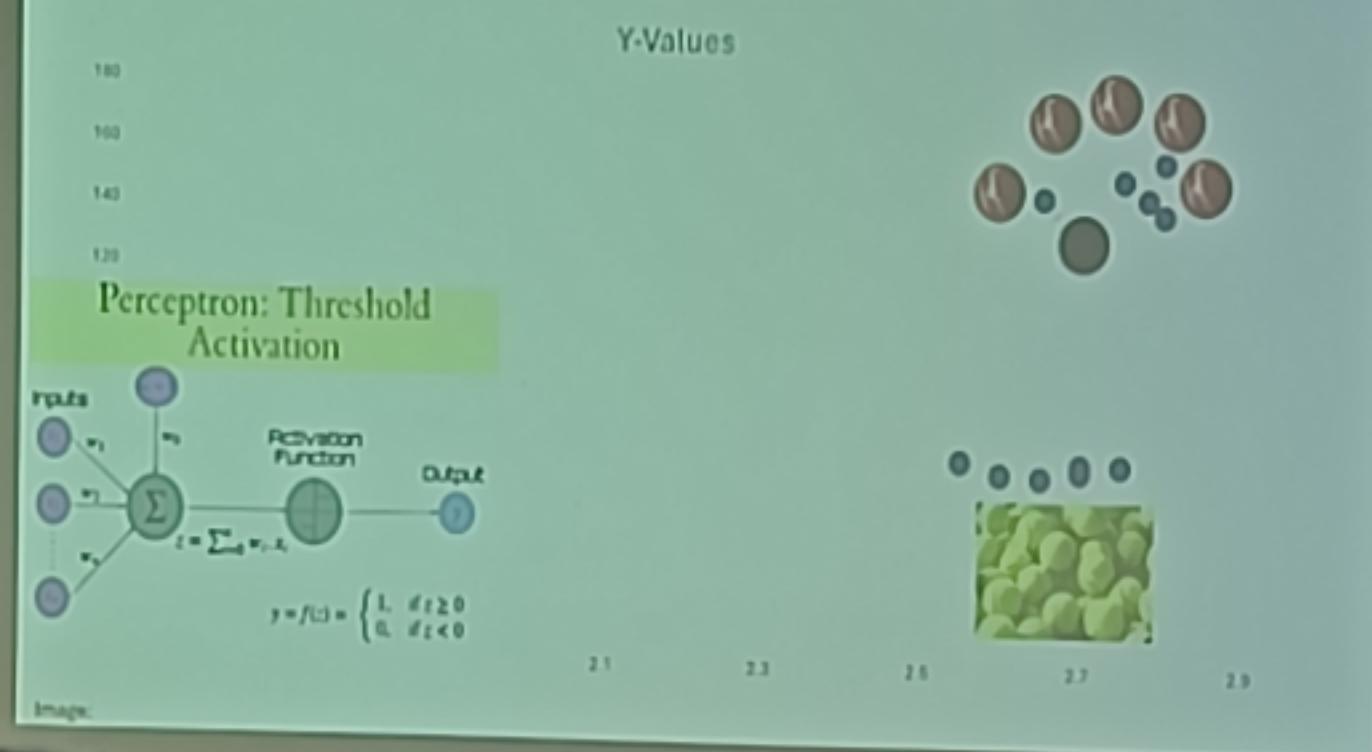
Image credit: <https://www.geekforgeeks.org/>



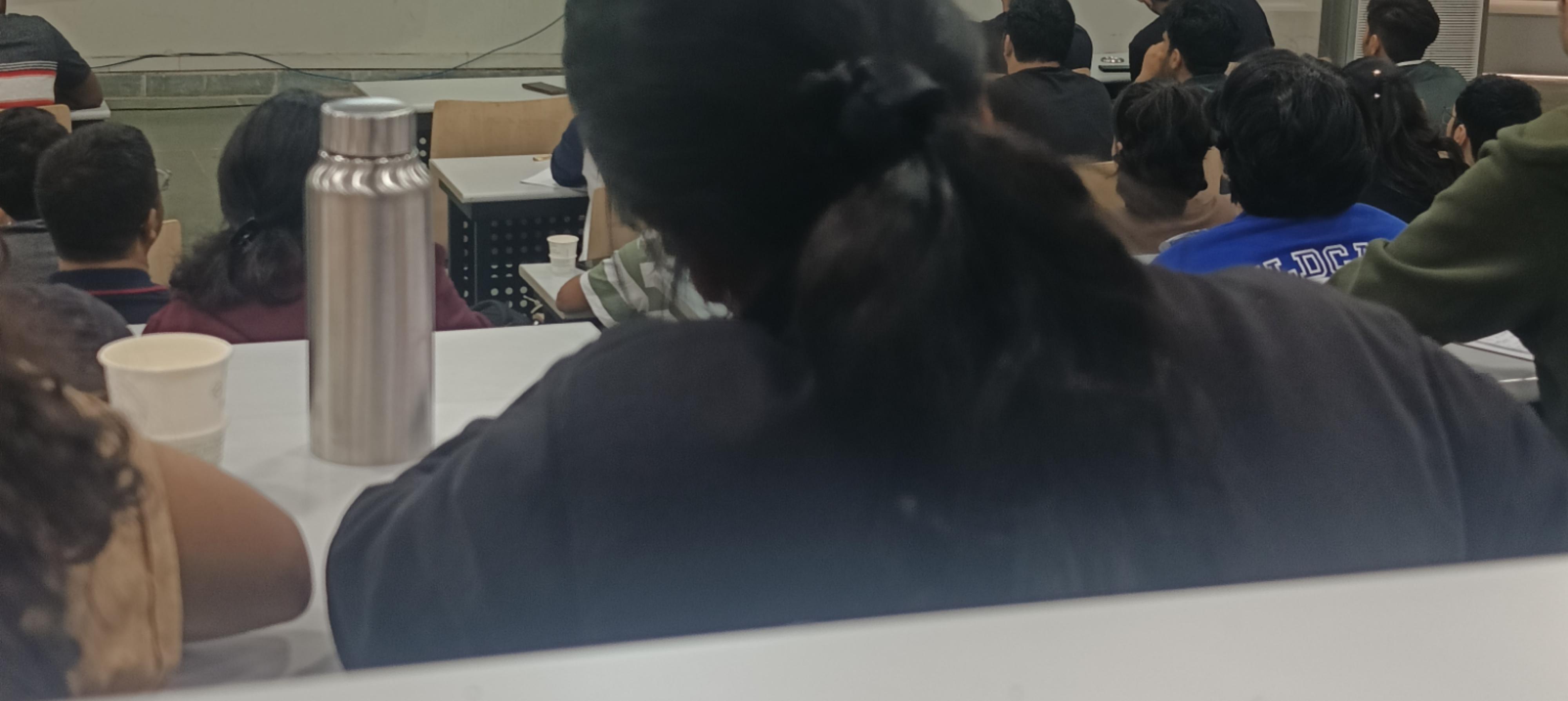
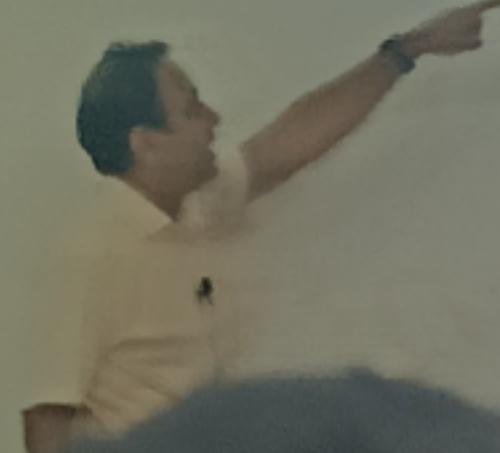
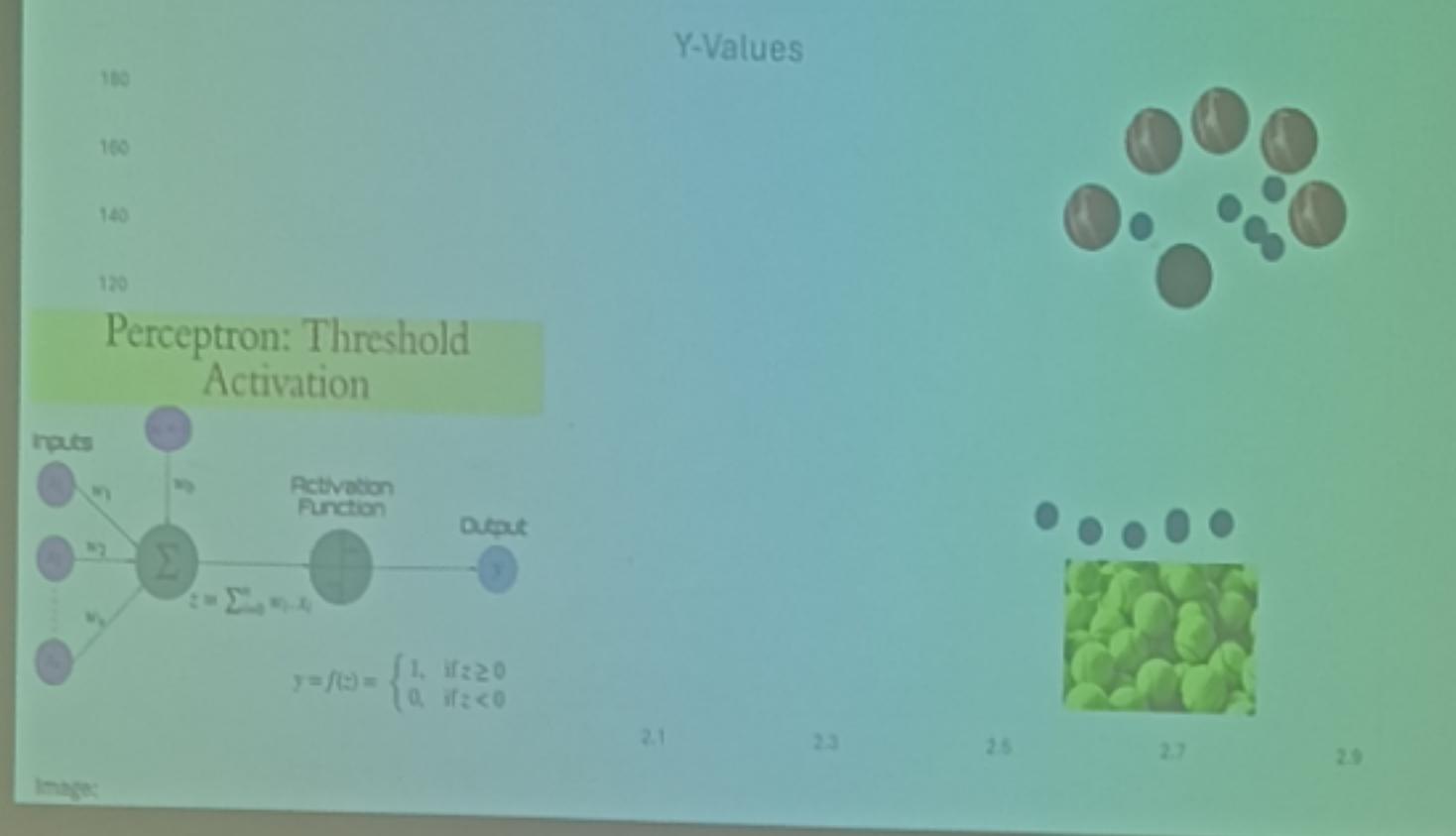


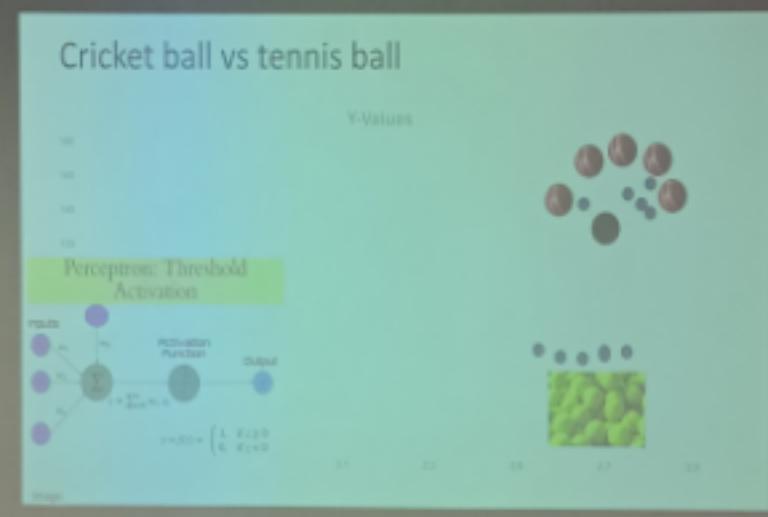


## Cricket ball vs tennis ball



## Cricket ball vs tennis ball



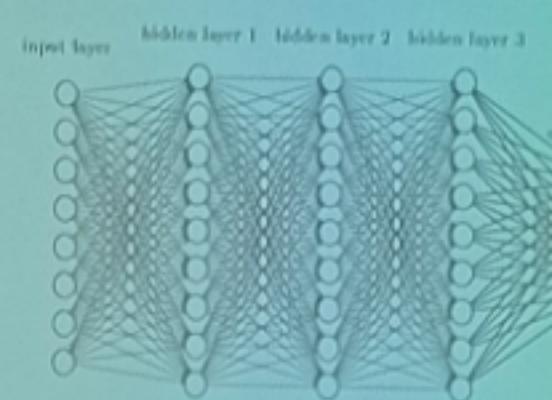


statement(s)  
False

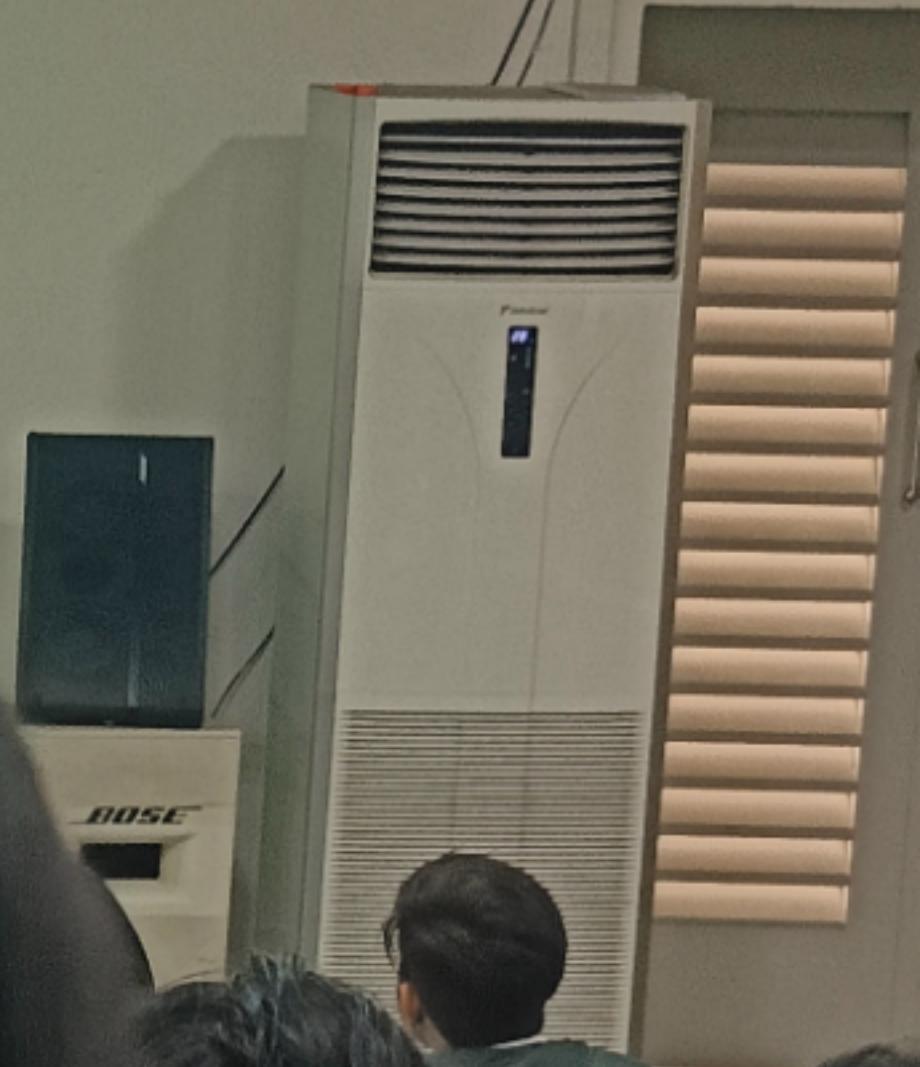


## Neural Networks and Deep Learning

+Replicate neurons in human brains (Neural Network)



$w_2 = 0$   
 $w_2 x_2$   
parameters.



## Complexity of neural networks

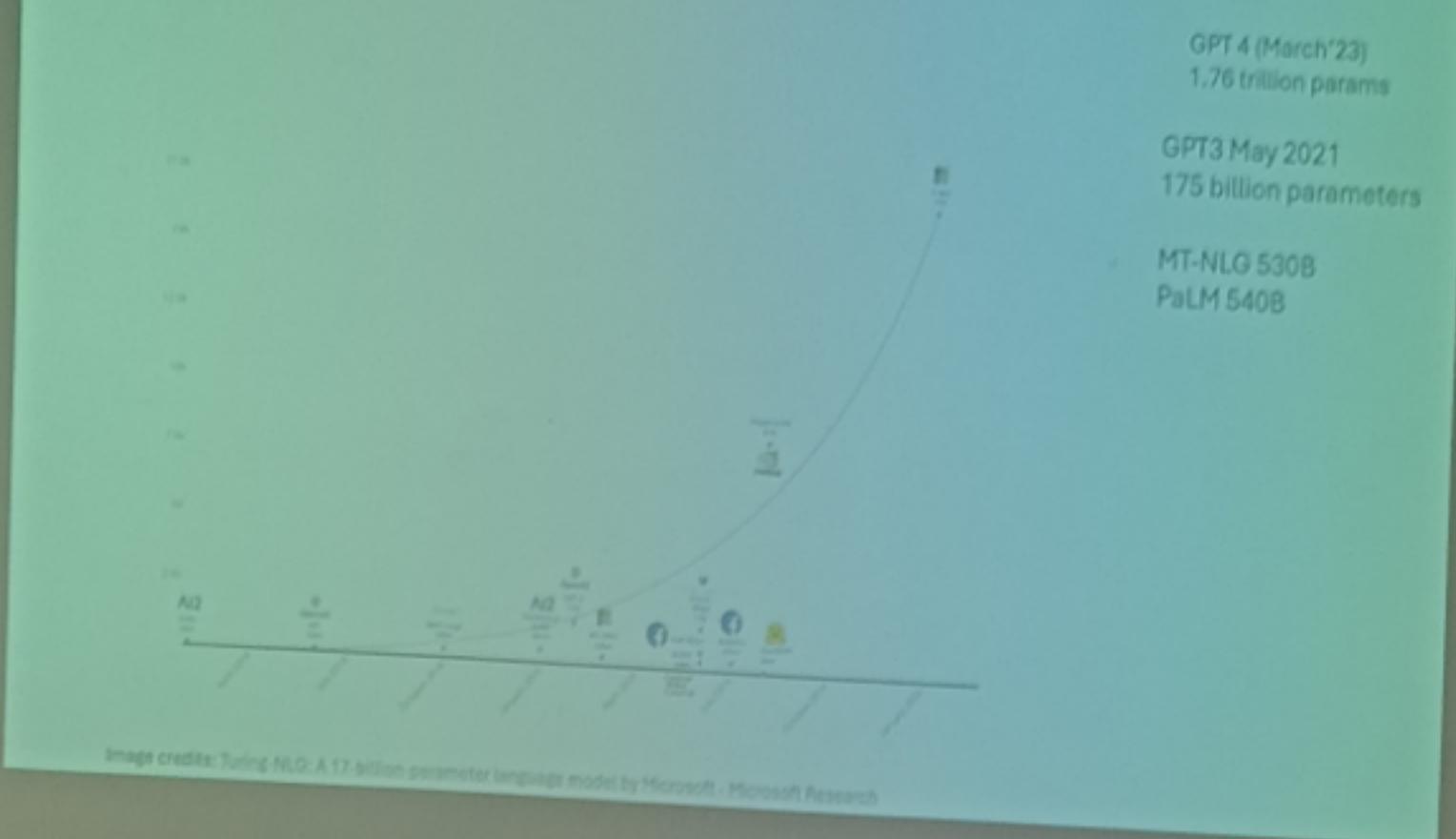


$$\omega_0(x_0) + \underline{\omega}_1 x_1 + \underline{\omega}_2 x_2$$

- 100 + x\_1 \text{ wt} \quad \text{diameters}



## Complexity of neural networks



$$\begin{aligned} w_2 &= 0 \\ \underline{w}_2 x_2 &\uparrow \\ \text{diameters.} \end{aligned}$$



## In Summary, Where Does AI Stand Today?

- AI has made a significant progress in the last three decades in the areas of computer vision, natural language processing, speech recognition
- AI is touching the lives of billions of people through new era applications such as Cortana, Siri, Copilot, Gemini which run even on smart phones
- ...we are far from making machines that match human capabilities

$$\underline{w_1} \underline{x_1} + \underline{w_2} \underline{x_2}$$

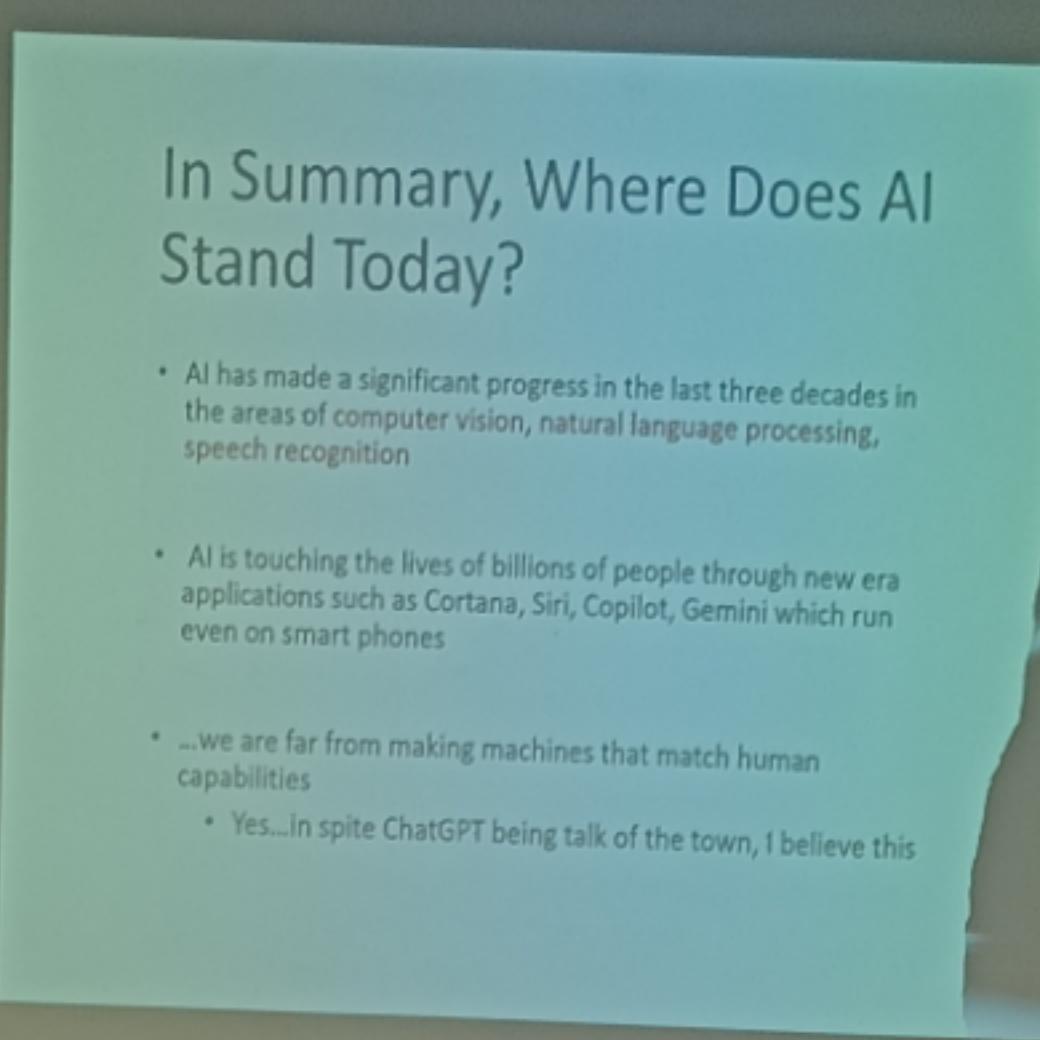
↓ wt      ↓ diameter



## In Summary, Where Does AI Stand Today?

- AI has made a significant progress in the last three decades in the areas of computer vision, natural language processing, speech recognition
- AI is touching the lives of billions of people through new era applications such as Cortana, Siri, Copilot, Gemini which run even on smart phones
- ...we are far from making machines that match human capabilities
  - Yes....in spite ChatGPT being talk of the town, I believe this

$$\omega_0(x_0) + \underline{\omega}_1 x_1 + \underline{\omega}_2 x_2 \\ - (OC + x_1) \text{ wt} \quad \text{diameters.}$$



- Fairness/Ethical Issues
- Who takes responsibility of AI fails
  - The person who wrote the code? Or the organization who sold the AI software? The person who bought the software?
- Uber Car Accident in 2018

$$\omega_2 = 0$$
$$C + \omega_1 x_1 + \omega_2 x_2$$

wt                          diameter

