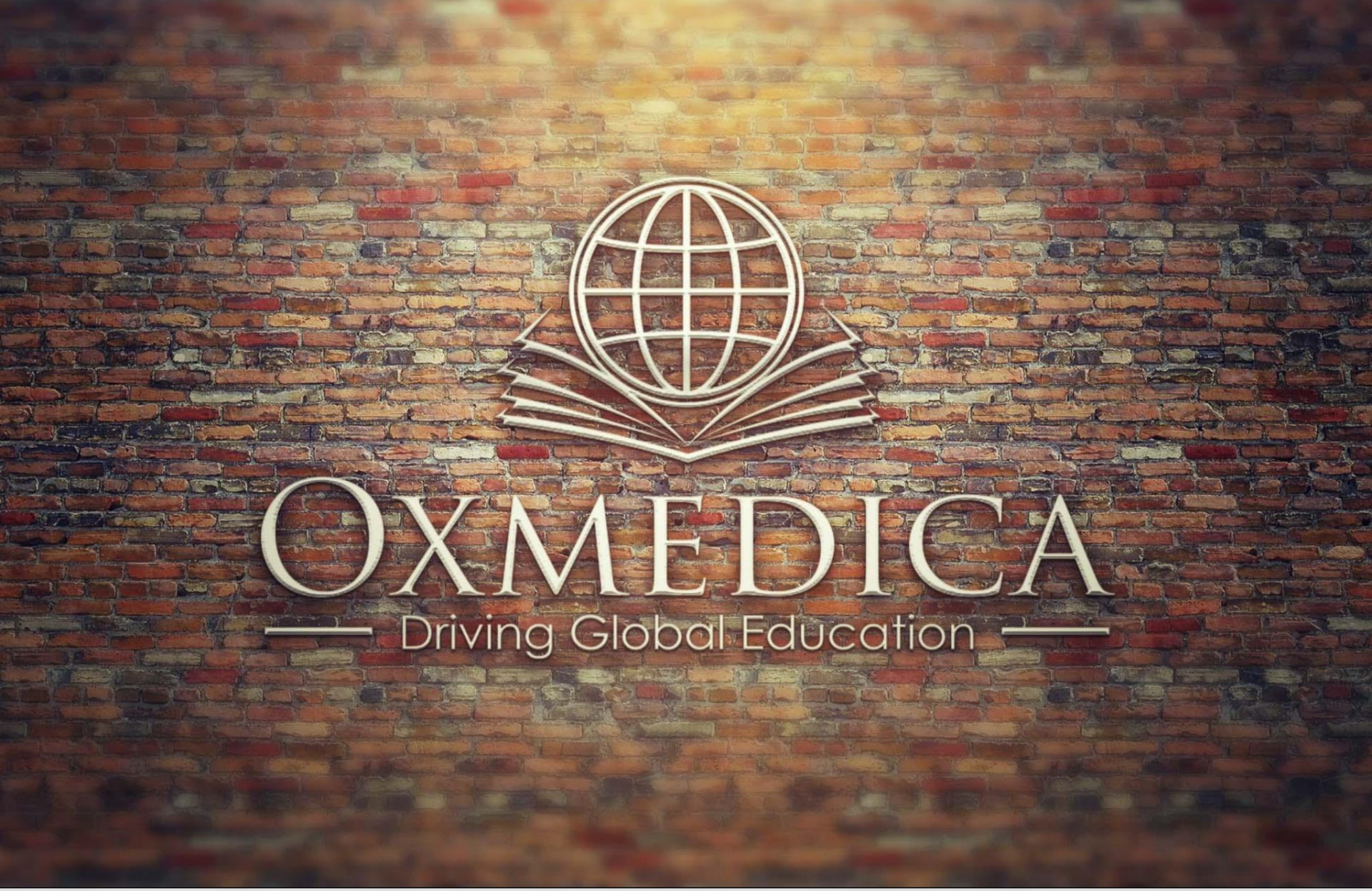


Introduction to AI and Big Data

Welcome!

1. Introduction to the course
2. What is AI?
3. AI development through time

Part 1
Introduction to the Course

About me

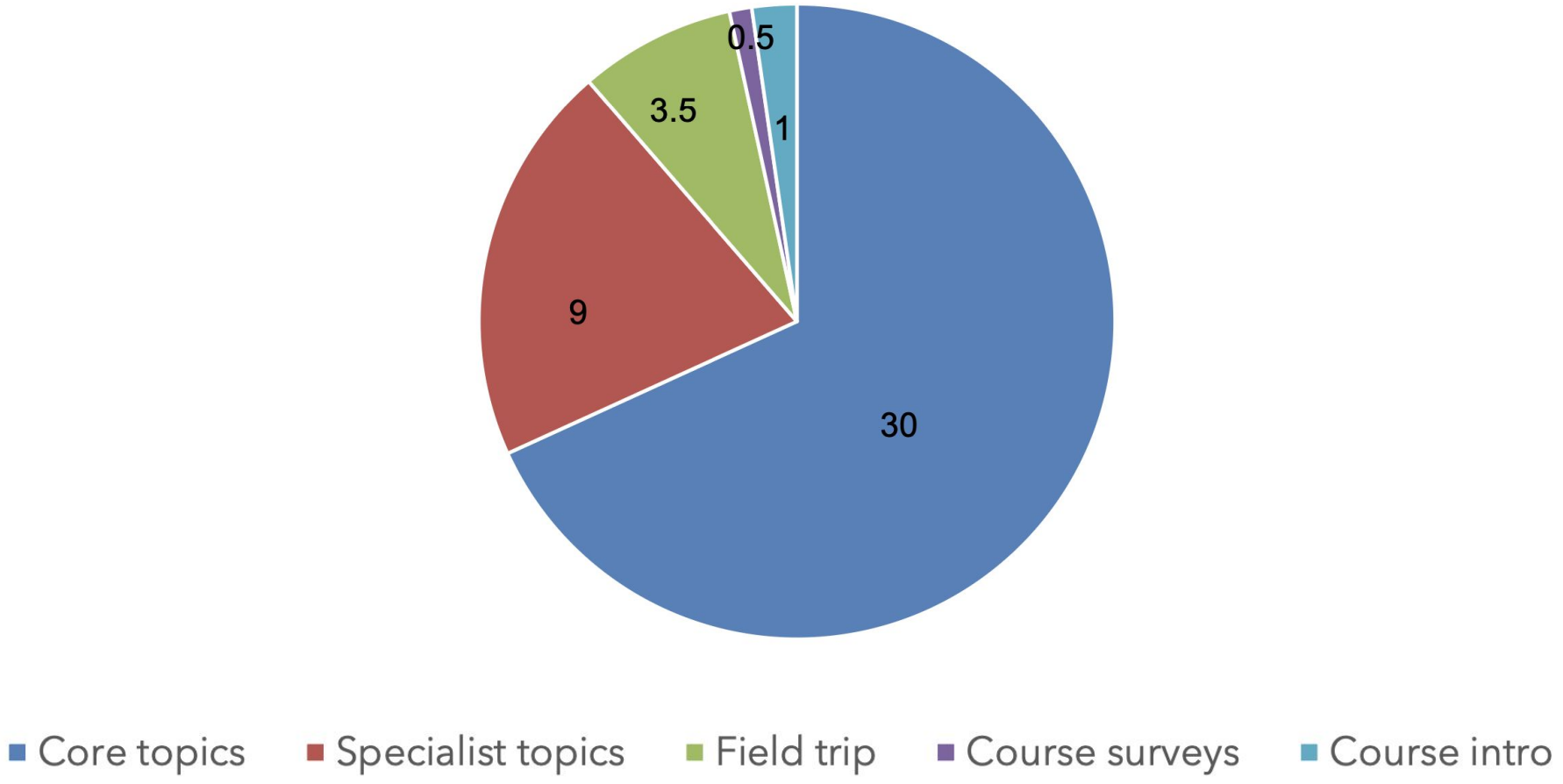
- PhD student at the University of Oxford
- Researcher in large language models
- I teach AI and computer science at the University of Oxford and Stanford University
- Previously at the University of Cambridge (BA) and University of Oxford (MSc)

The course

Welcome!

- Three classes a day with me
  - 08:30 - 10:30 (2 hours)
  - 11:00 - 12:00 (1 hour)
  - 12:15 - 12:30 (30 mins)
- In total we have about 44 hours of teaching!
- Group project session (about half of your are with me)
  - 14:15 - 15:30 (1 hour, 15 mins)

Breakdown of hours



Big overview of the weeks

30th June

18th July

Week 1	Week 2	Week 3
Introduction to the field and the relevant skills.	**Exploring algorithms with maths and code**	**Language models: theory and coding**

Week 1

- Introduction to AI and Big Data
- Overview of machine learning algorithms
- Key algorithms including clustering and linear regression
- An introduction to programming and Python
- Applications of AI in healthcare and finance

Week 2

- More advanced machine learning algorithms
- The benefits and challenges of big data
- Deep learning
- Field trip 👀

Week 3

- Introduction to large language models
- Coding your own chatbots in Python
- The ethics of AI
- Career paths in AI

Aims

By the end of the course you should all have the following skills:

1. Solid understanding of the field of AI
2. Mathematically understand important machine learning algorithms
3. Be able to code basic machine learning applications
4. Think critically about AI and the ethical problems

Expectations

I have 1 expectation of you…

Questions, questions, questions!

Lots of questions = better understanding

What you should expect from me…

Try to answers your difficult questions!

Lots of questions = better understanding

Types of tasks we're going to be doing

- Mathematically understanding algorithms. Rigorously!
- Class discussion
- Informal debates
- Presentations
- Quizzes

Slides and note taking

- Slides will be available at my website **www.harrymayne.com**
- Slides for the day will be uploaded every morning
- No expectation to take notes from the slides but if you want to I recommend using **OneNote** (better for annotating PDF slides) or **Notion** (better for general notetaking but bad for slides)
- However, most content will be on the whiteboard so a **pen and paper** will be important for keeping track of things.

Assessment

Assessment method (roughly)

1. Participation in class
2. Weekly written quizzes
3. Frequent short, informal presentations

Final report

Part 2
What is AI?

Individual Task: Preconceptions of AI

Part A: Take 5 minutes to write down everything you know about AI so far. Just make a massive, unstructured list.

Part B: Then after 5 minutes, you're going to write a short, succinct paragraph about how you would answer the question "What is AI?"

We'll revisit these in week 3…

Discussion

Some key definitions

Artificial Intelligence (AI)

- Very broad and poorly defined concept
- “Intelligence exhibited by machines/computer systems”
- E.g. visual perception, speech recognition, decision-making, and language translation.

Machine Learning

- A subfield of AI, which involves learning patterns from lots of data
- Learns rules without the rules being explicitly programmed
- Behind almost all modern AI systems

AI is much more than ChatGPT!

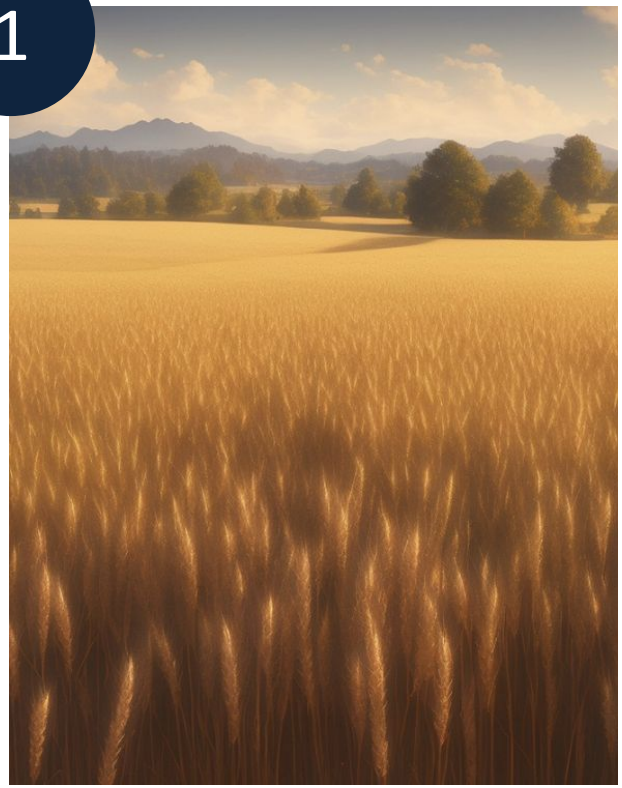
- Language models like ChatGPT are just one type of AI!
- AI is much (much!) wider than language models and also includes:
  - Vision-based models e.g. facial recognition on phones
  - Robotics applications e.g. self-driving cars
  - Medical research e.g. drug discovery

Individual Task: AI vs Human

- Sheet with 10 questions on it
- In each question, you have to guess which is AI.
- Write down on the sheet whether number 1 or 2 is AI generated!

AI vs Human: Practice question

1



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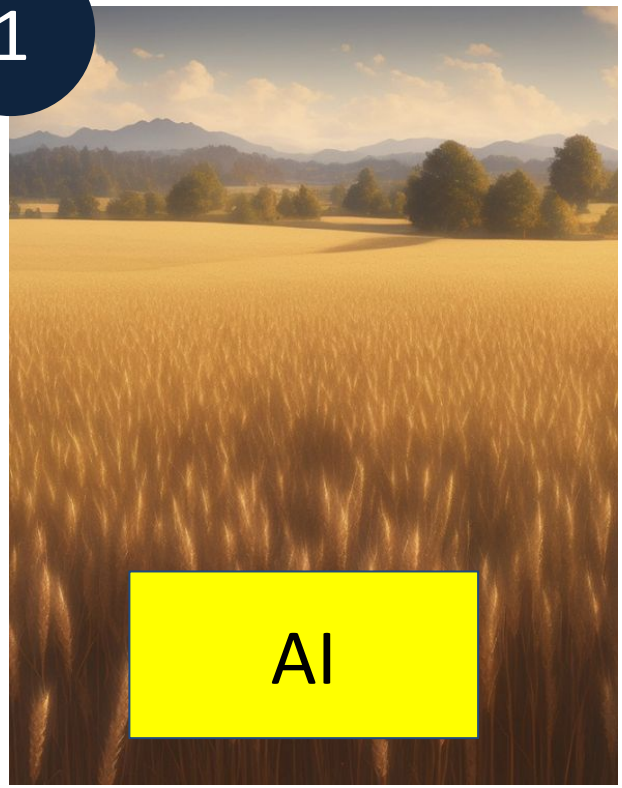
AI vs Human: Practice question

1



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Art

AI vs Human: Question 1

1

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2

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AI vs Human: Question 2

1

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2

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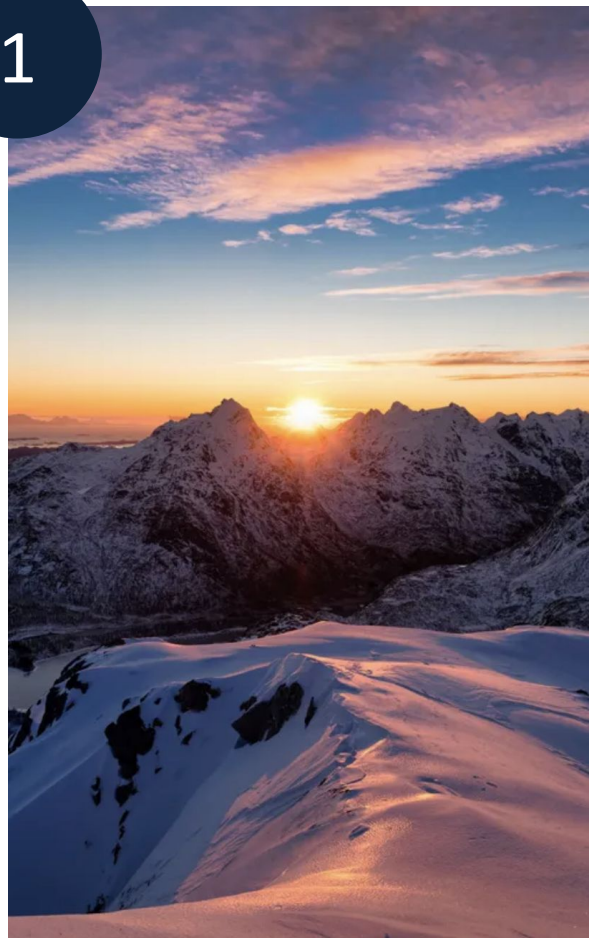
AI vs Human: Question 3

1



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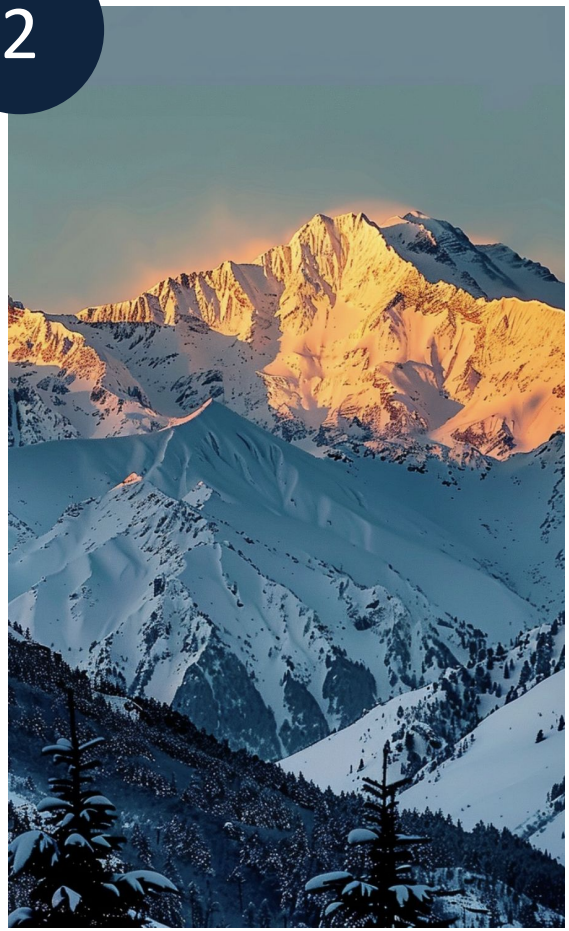

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Writing

AI vs Human: Question 4

1

Kylian Mbappe has signed a contract to join Real Madrid on a free transfer when his Paris St-Germain deal expires on 30 June.

The France striker verbally agreed to move to the Bernabeu in February and the announced in May he would leave PSG at the end of the season.

Mbappe, 25, has now signed terms with Real Madrid and will move to Spain when the La Liga transfer window opens on 1 July.

Link to original source

2

In a highly anticipated move, Kylian Mbappé has signed a contract to join Real Madrid on a free transfer once his Paris Saint-Germain deal expires on June 30. The French striker, 25, who is widely regarded as one of the brightest talents in world football, verbally agreed to move to the Bernabéu in February. In May, he publicly announced his intention to leave PSG at the end of the season. With terms now officially signed, Mbappé will transition to the Spanish giants when the La Liga transfer window opens on July 1. This transfer heralds a new era for Real Madrid, with fans eager to see how Mbappé's explosive speed and clinical finishing will enhance the team's attacking prowess.

Link to original source

AI vs Human: Question 5

1

Matrix multiplication involves combining two matrices to produce a third matrix. Each element of the resulting matrix is calculated by taking the dot product of corresponding rows from the first matrix and columns from the second matrix.

To compute the dot product, you multiply corresponding elements from the row of the first matrix and the column of the second matrix, then sum those products. This process is repeated for each element in the resulting matrix.

It's important to note that the number of columns in the first matrix must match the number of rows in the second matrix. This ensures that the matrices can be combined correctly and the multiplication is valid.

Link to original source

2

Matrix multiplication, also known as matrix product and the multiplication of two matrices, produces a single matrix. It is a type of binary operation.

If A and B are the two matrices, then the product of the two matrices A and B are denoted by:

X = AB

Hence, the product of two matrices is the dot product of the two matrices.

Link to original source

AI vs Human: Question 6

1

Five English proverbs

1. Many hands make light work
2. Strike while the iron is hot
3. The grass is always greener
4. Don’t judge a book by its cover
5. An apple a day keeps the doctor away

Link to original source

2

The top five English proverbs:

1. Actions speak louder than words.
2. A silent cat catches no mice.
3. A picture is worth a thousand words.
4. When in Rome, do as the Romans do.
5. The stone that rolls grows no moss.

Link to original source

AI vs Human: Question 7

1

Hey there! We're hosting a barbecue this Saturday at 5 PM and would love for you to join us. We'll have plenty of delicious food, drinks, and good company. It's a great chance to relax, enjoy some tasty barbecue, and get to know each other better. Feel free to bring anyone along if you'd like. Hope you can make it! Let me know if you can come. 😊🍔🌭

Link to original source

2

Hey! Hope you're well! Just getting in touch as we're having a BBQ in our garden in a few weeks and would love for you to come. The date is the 2nd August and come any time from 15:00 - hopefully it's good weather 🤞 Bring the kids as well if they're about!

Link to original source

Music

AI vs Human: Question 8

Link

Link

AI vs Human: Question 9

Link

Link

AI vs Human: Question 9

Link

Link

AI vs Human: Question 3

1

Link to original source

2

Link to original source

Results

AI vs Human: Question 1

1

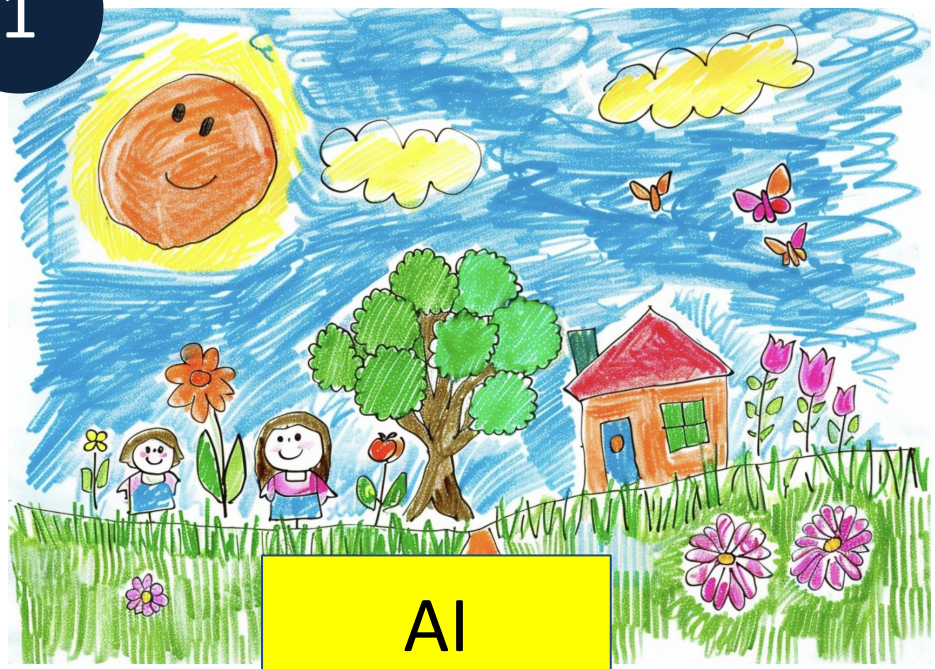
Link to original source

2

Link to original source

AI vs Human: Question 2

1



AI

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2

Human

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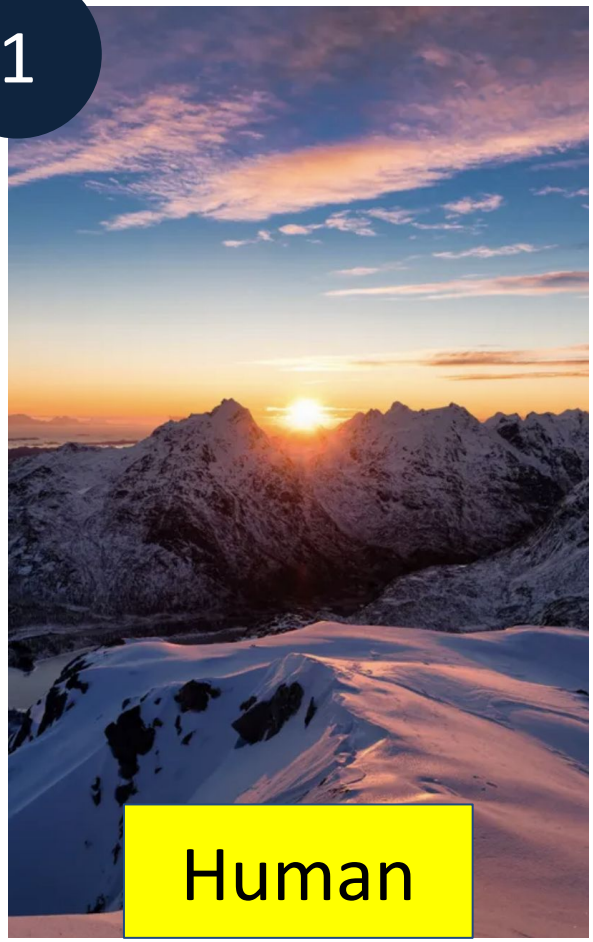
AI vs Human: Question 3

1



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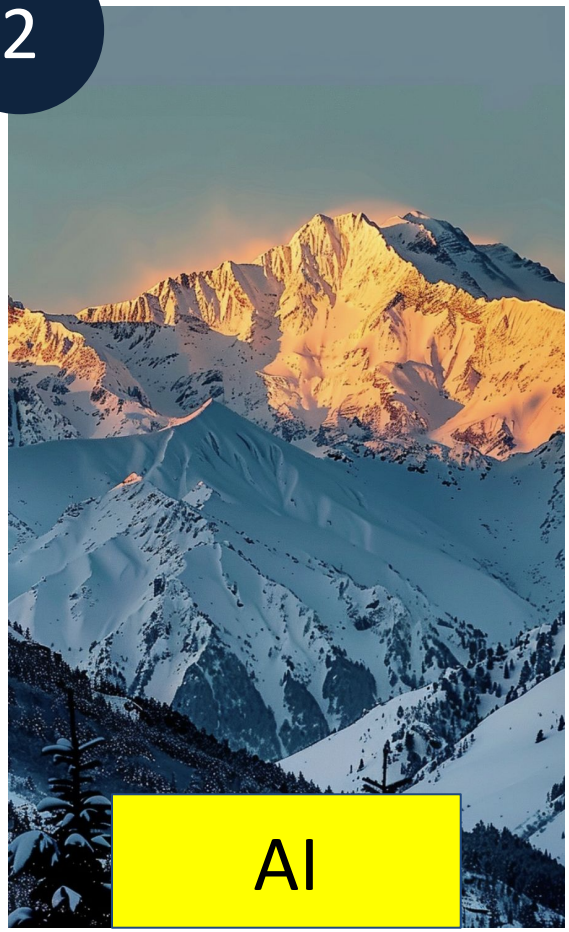

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AI vs Human: Question 8

Link

AI

Link

Human

AI vs Human: Question 9

Link

Human

Link

AI

AI vs Human: Question 9

Link

AI

Link

Human

AI vs Human: Question 3

1

Link to original source

2

Link to original source

AI

Human

Discussion

The **Turing test** as a test of machine intelligence

- A test proposed by Alan Turing (British scientist) in 1950
- Measure of a machine's ability to exhibit intelligent behaviour. A test of indistinguishability
- Need a judge (human), a human and a machine.
- The judge talks to both the human and the machine and the task is to work out which is which
- Early benchmark of intelligence

Strengths and weaknesses of the Turing test

Strengths:

- Very simple and easy to do
- Can be easily modified to do across different disciplines

Weaknesses:

- Focus is on imitation, not real intelligence
- Limited scope of all possible behaviours

Newer, improved tests to benchmark models

Task in pairs: Research

- Spend 10 minutes researching the application of AI in a specific fields.

Sport	Coding
Music	Film
Construction	Transport
Law	Security
Food	Pharmaceuticals

Discussion

Part 3
AI development through time

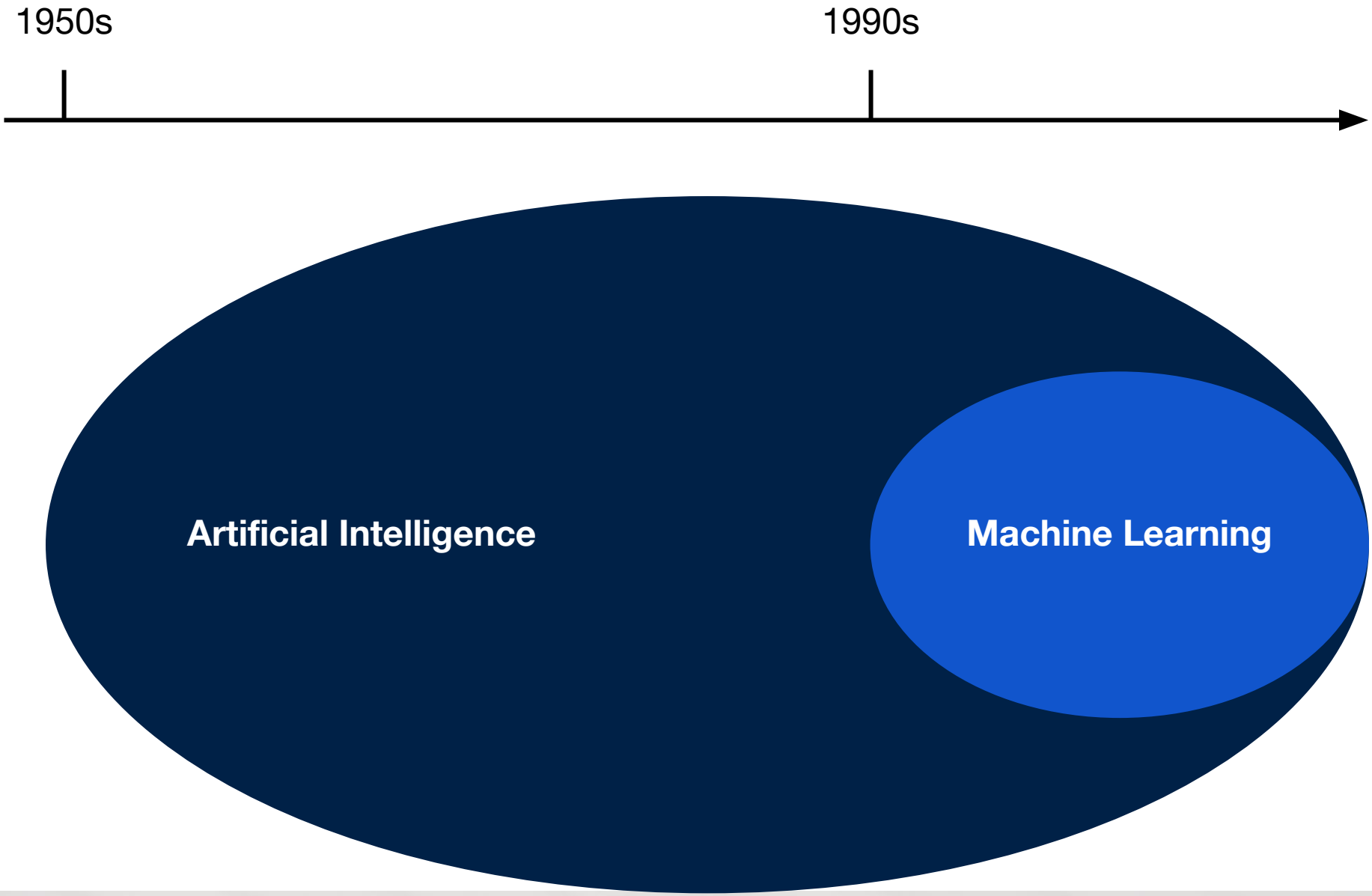
Recap on definitions

Artificial Intelligence (AI)

- Very broad and poorly defined concept
- “Intelligence exhibited by machines/computer systems”
- E.g. visual perception, speech recognition, decision-making, and language translation.

Machine Learning

- A subfield of AI, which involves learning patterns from lots of data
- Learns rules without the rules being explicitly programmed
- Behind almost all modern AI systems

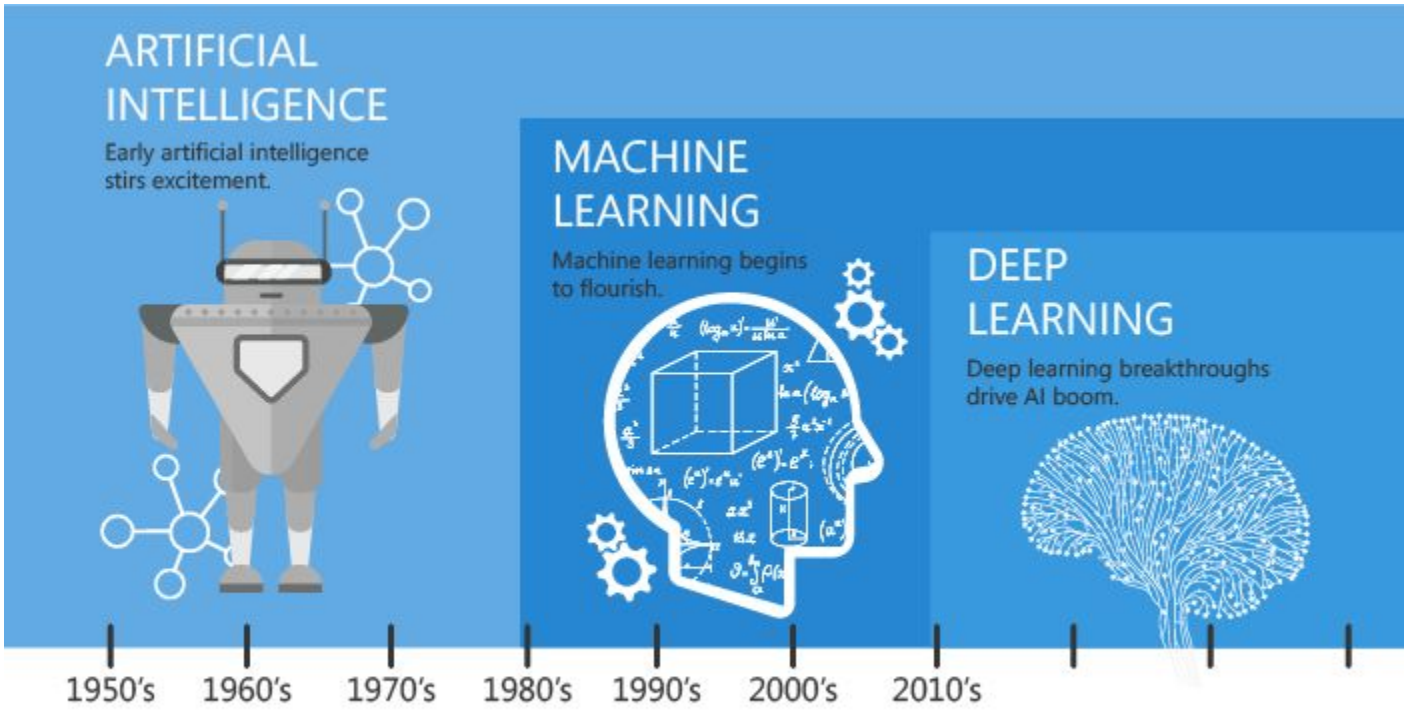

1950s
1990s
Artificial Intelligence
Machine Learning

More definitions

Deep Learning

- A subfield of machine learning
- Uses a specific family of models called artificial neural networks (neural networks) which are inspired by biological brains.
- All success in the last 10 years has come from deep learning

Add in deep learning



Since an early flush of optimism in the 1950's, smaller subsets of artificial intelligence - first machine learning, then deep learning, a subset of machine learning - have created ever larger disruptions.

Classical AI vs Modern AI (machine learning)

If all modern AI is machine learning, what is the classical, traditional approach to AI?

Classical Artificial Intelligence (Not machine learning)

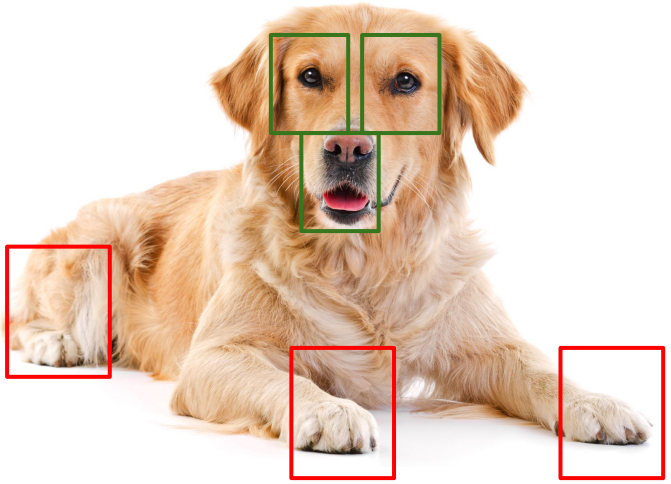


Photo source

Photo source

Dog ✅

Photo source

Not Dog ✅

Photo source

Dog ❌

Machine Learning AI

\+ Other images of dogs

Dog

Photo source

Photo source

Photo source

Not Dog

Photo source

Dog ✅

Photo source

Not Dog ✅

Photo source

Not Dog ✅

Discussion

Are modern AI systems like ChatGPT just machine learning models?

Yes!

- Just very similar idea but scaled up to trillions of data points
- Not particularly complicated bizarrely
- Combines different types of machine learning (which we will see in time)

Recap questions

1. What is the Turing test?
2. What is AI?
3. How is machine learning defined?
4. What is deep learning?
5. When was AI first coined as a concept?
6. Give 5 examples of AI which isn't ChatGPT!