

AI: WEEK #2
LARGE LANGUAGE MODELS

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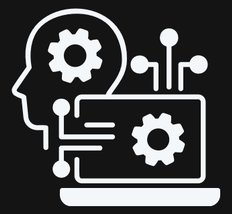
TIMELINE

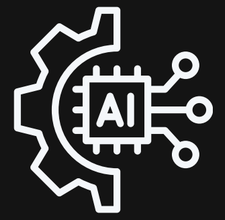
COURSES AND COMPETITIONS

We will continue to work on the courses presented last session as well as introduce some AI-related competitions. These are a great idea for your CV or UCAS statement and will be worked on in parallel with our main topics covered each week.



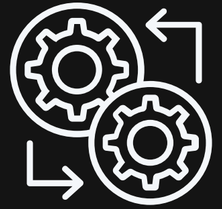
TODAY

LLM's, Chatbots and Neural Networks



WEEK 3

Agentic AI & Diffusion Models



WEEK 4

Natural Language Processing & AI in vision



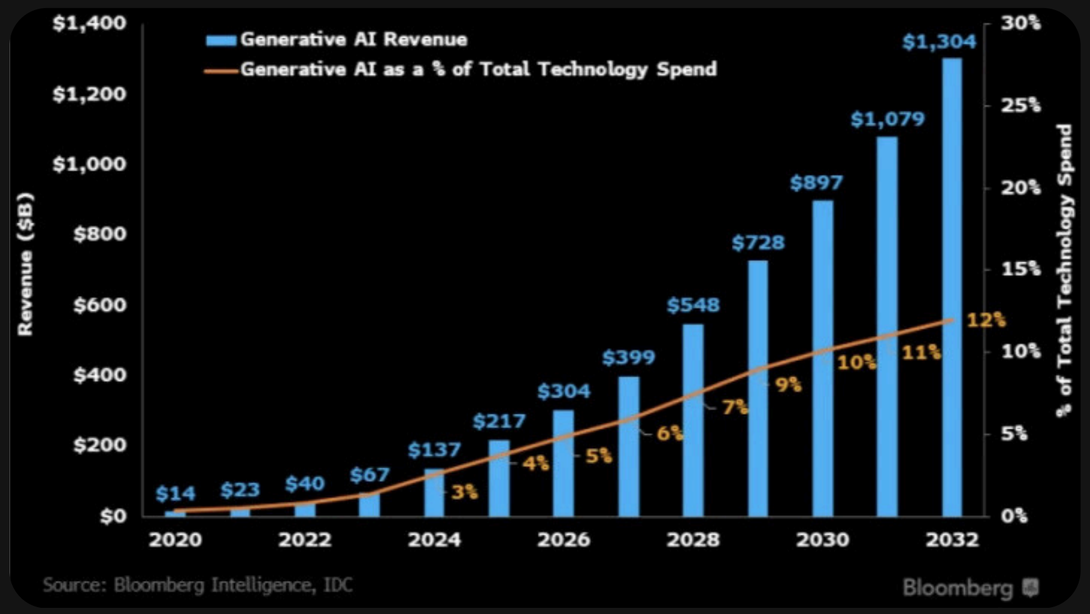
WEEK 5

Ethics & the Future of AI, Cyber Security

Creating Classifier Models & Chatbots

WEEK 6+

THE FUTURE OF AI



Generative AI to become a $1.3 trillion market by 2032

BEYOND FUNDAMENTALS: GENERATIVE AI

We already covered the fundamentals of AI and Machine Learning, and today we will focus on how generative AI functions.

Advancements in Generative AI, Large Language Models (LLMs), and autonomous systems are driving innovation in many industries on a scale unseen before.

These developments may well be a part of our daily lives in the future, and we'll be exploring exactly how they work.

WHAT IS A LARGE LANGUAGE MODEL?

Large Language Model (LLM) is a type of AI built on a deep neural network, trained on a massive dataset of text and code.

Think of it as an incredibly advanced pattern-recognition system for language. Its core function is simple: predict the next most likely word in a sequence.

By repeating this simple task billions of times, it gains emergent abilities to generate entire essays, translate languages, write software, and hold complex conversations.

Key Components:

- The Architecture: Most modern LLMs are Transformers, a specific neural network design that's exceptional at understanding context.
- The Data: The training data consists of a huge portion of the internet -books, articles, websites, and code - allowing it to learn grammar, facts, and reasoning styles.
- The Parameters: These are the "weights" or internal values (billions of them) that the model adjusts during training. Parameters are where the model "stores" its learned knowledge.

HOW DOES A LLM WORK?

From your input to its output, the process involves a few key steps. A prompt follows these stages:.



THE PROMPT (INPUT):

It all starts with your instruction. This can be a question, a command, or a request for a story.



THE TOKENIZER (TRANSLATION)

The model can't read "words." It reads numbers. The tokenizer breaks your prompt down into "tokens" (pieces of words) and converts each token into a unique numerical ID.



THE NEURAL NETWORK (PROCESSING)

These numbers are fed into the massive neural network. Its "attention" mechanism weighs the importance of each token to understand the full context of your request.



THE OUTPUT (GENERATION)

The model calculates the probability for the next most likely token. It selects one, adds it to the sequence, and runs the entire process again—using its own generated word as new context to predict the next word.

NEURAL NETWORKS

A neural network allows a model to produce predictions based on specific categories, much like the human brain.
It is formed of an **input**, **hidden** and **output layer**.

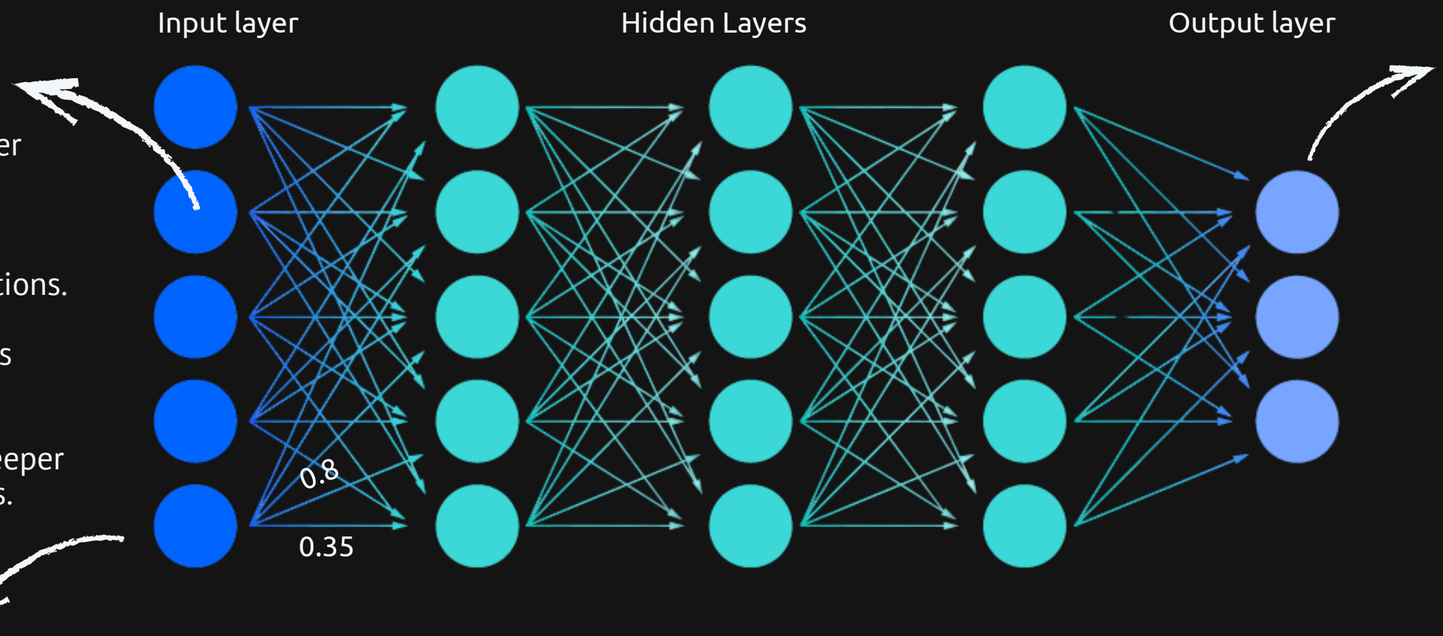
NEURONS

Neurons receive data in the Input layer e.g. pixel values in an image

Hidden Layers transform this data by applying weights and activation functions.

Each neuron detects different features (edges, shapes, colours)

As data flows through the network deeper layers capture more complex patterns.



MODEL PREDICTION

The output layer produces the final prediction based on the mathematical weightings of the hidden layers.

For binary classification the result can be a range between 0 to 1 as the probability of an event.

This can be used for multi-class classification to produce a probability for each class of item.

WEIGHTING

Weights are the values assigned to each neuron in the network to fine-tune the final prediction of the model. Depending on what the model is searching for the importance of aspects such as colours or shapes in an image has to be considered - this is calibrated when the model is trained. The model can effectively reevaluate those weights when trained, usually this is done through an optimizer software.

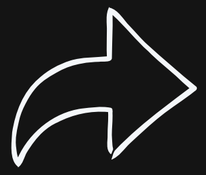
AI APPLICATIONS

It’s easy to look at AI as a **threat**, especially since public perception regards it in many cases as a negative influence on jobs, privacy and creativity. Media often focuses on worst case scenarios and AI replacing humans moving forward.
In reality, AI is a tool that can, as anything be used in positive and negative ways.

What would you want to do in the future?

AI literacy is a growing importance in industry and may be a skill just as required as teamwork or public speaking in the future.
AI is more than a simple chatbot, and plays vital roles in sectors such as medicine, engineering or creative fields.

For example:



- Treating Alzheimer’s patients by matching cases against previous scenarios
- Rolls-Royce uses AI to predict when failures in equipment will happen before they actually do
- Image editing software like Adobe Photoshop uses AI to remove backgrounds and suggest design elements
- NASA uses machine learning to analyse satellite imagery for detecting wildfires





AI & DATA PRIVACY

THE ROLE OF DATA IN AI

Ai learns from massive datasets - including user inputs. It's important to consider that while useful, AI can be used in malicious ways.
Always think before you share personal information.

SMART INPUTS

Don't enter names, passwords, school details, or private messages into AI tools.

ETHICAL USE

Respect copyright, avoid plagiarism, and give credit when AI helps with work (**Study Skills Survivors** should know this tip).

DIGITAL FOOTPRINT

Everything types or uploaded online can be stored or analysed - use AI responsibly.

TRUST AND CONTROL

Choose AI tools that are transparent about data use and allow you to control your privacy settings.



AI & LEARNING

One sector that AI can be extremely useful is in learning, monitoring how you use AI helps you study smarter, not lazier - making sure it boosts understanding and skills rather than **dependence.**

- ## ACCURACY CHECKS

  Making sure AI answers are correct - fact-check and compare with trusted sources.

- ## EFFICIENCY GAINS

  Using it to save time: summarising notes, generating practice questions, or breaking down hard topics to automate.

- ## LEARNING IMPACT

  AI tools can be used for the most specific content, and can tailor questions to your strengths and weaknesses.

- ## PROMPTING

  Refining prompts and being as specific to your request as possible.

COURSES & COMPETITIONS



https://cs50.harvard.edu/ai/notes/0/



https://developers.google.com/machine-learning/resources/prompt-eng?_gl=1*be3me*_up*MQ..*_ga*NzA5ODU1NDQuMTc2MjQxODk0Mw..*_ga_SM8HXJ53K2*czE3NjI0MTg5NDIkbzEkZzAkdDE3NjI0MTg5NDIkajYwJGwwJGgw



https://www.skills.google/paths/118/course_templates/539/documents/598828

All of this has been posted on teams and more, let us know if you are not on it yet.