



Send me a picture!

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Artificial Intelligence

RUSSELL WHITWORTH

NOVEMBER 2024

Outline

2



- ▶ What is AI, and how does it work?
- ▶ What can AI do?
- ▶ AI Chatbots in more detail
- ▶ Challenges
- ▶ Futures
- ▶ Q&A

Background and Introduction



A brief history of AI

4

1943

- McCulloch & Pitts design “artificial neurons”

1950

- Alan Turing – “Turing test”

1956

- John McCarthy coins the term “Artificial Intelligence”

1965

- "ELIZA" - an early chatbot

1972

- Expert Systems

1997

- IBM's Deep Blue defeats Kasparov at chess

2011

- Apple Siri (Google Now - 2012, Amazon Alexa - 2014)

2016

- Google's AlphaGo defeats the world champion in Go

2020

- ChatGPT

AI defined

5

A technology that enables machines to simulate human cognitive functions such as learning from experience, comprehending complex data, and making decisions autonomously

Narrow AI (or weak AI)

Performs specific tasks within a limited context

Most current systems fall into this category

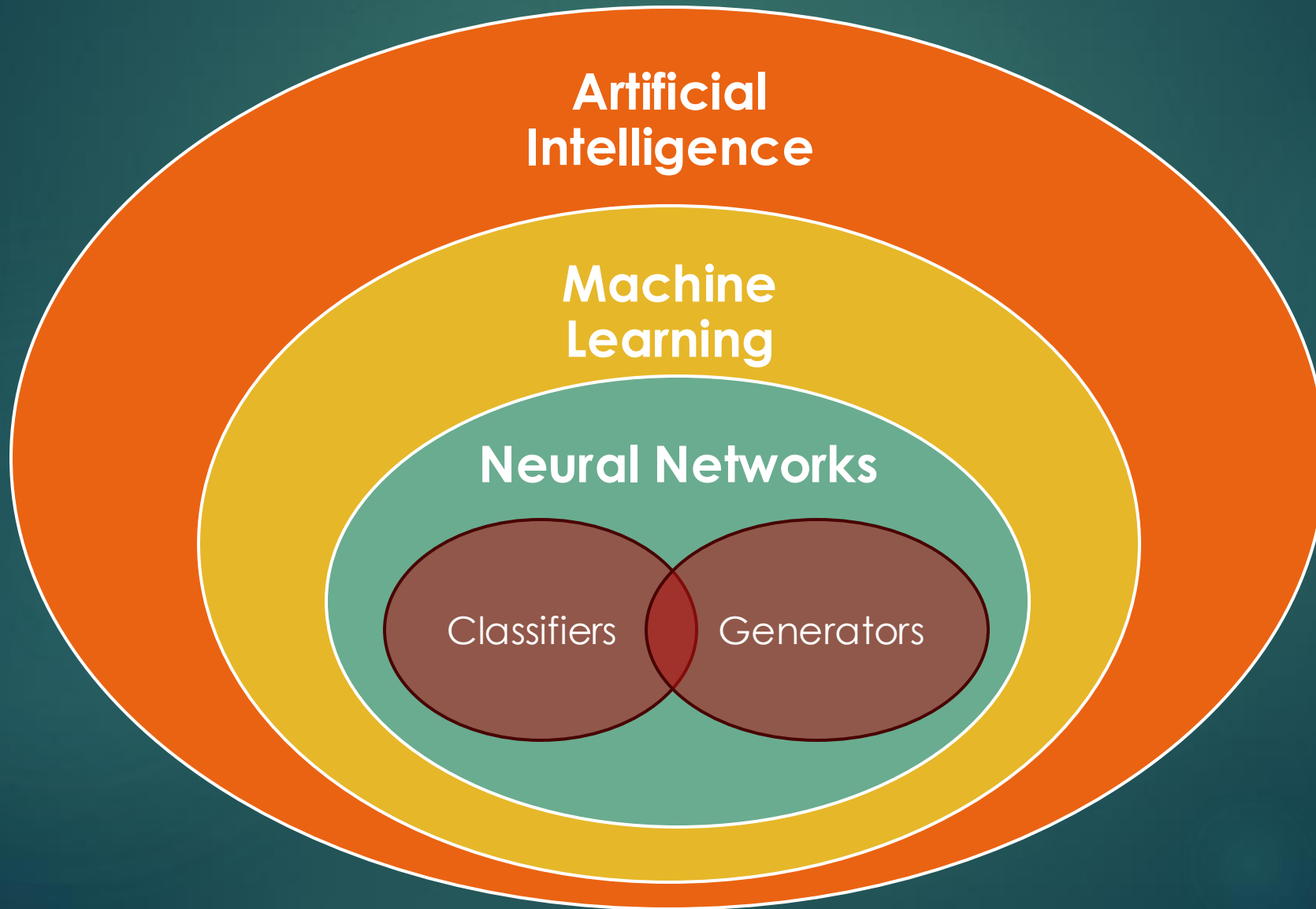
General AI

The ability to understand and learn any intellectual task that a human can do

Does not yet exist

Types of Narrow AI

6



Classifiers



Cat



Dog

Generators

7

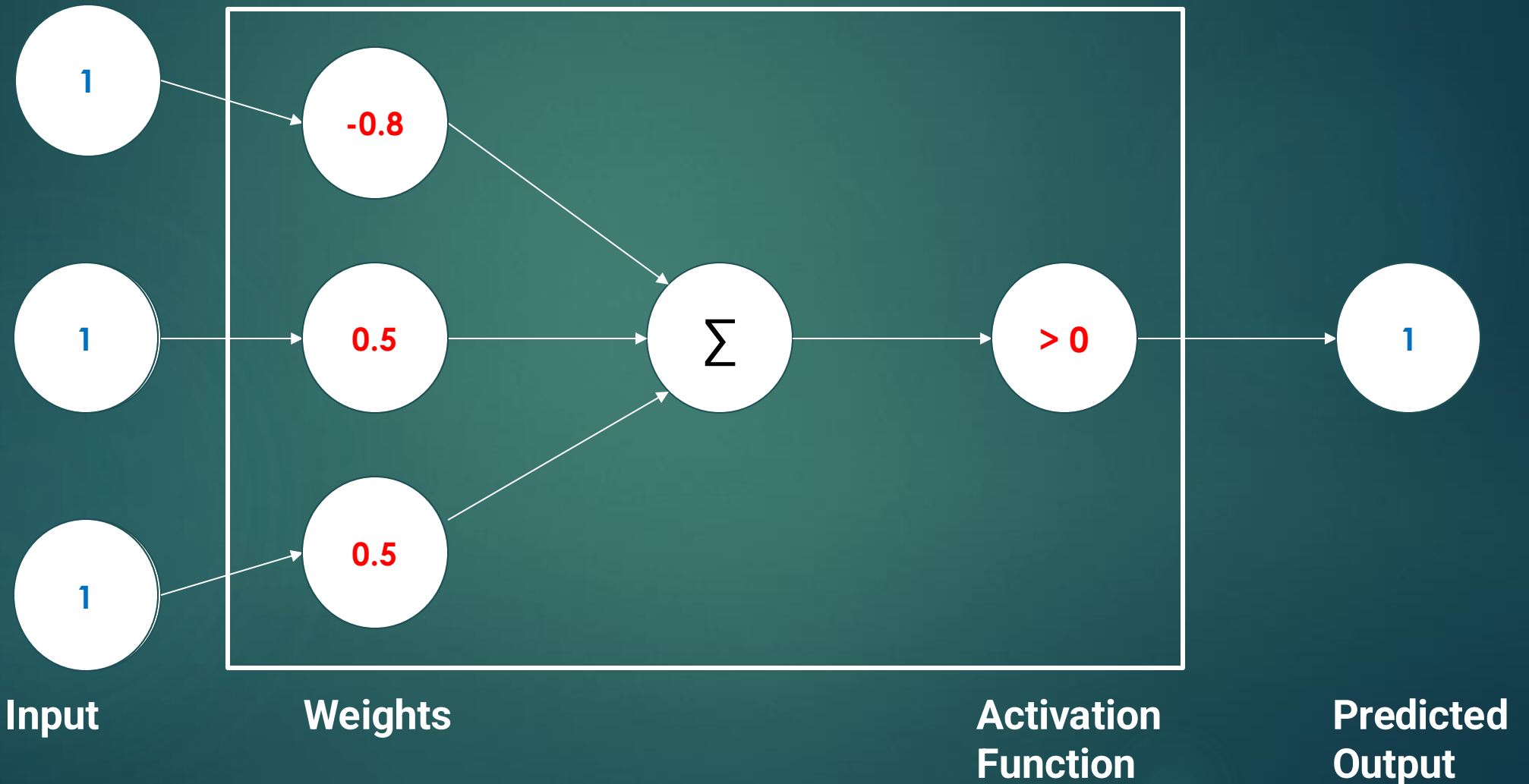


“A cat and a dog in formal dress at a dinner party”

How AI Works

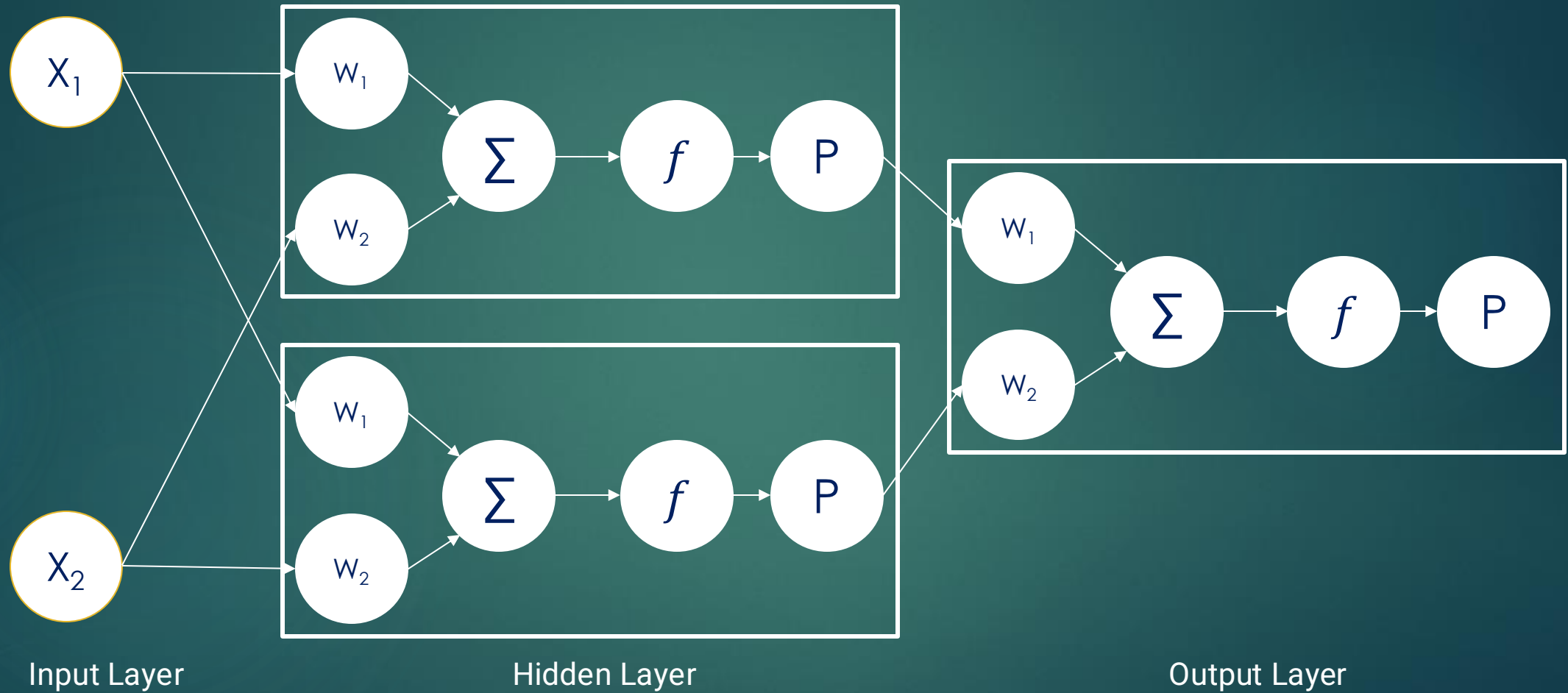


Single Perceptron (or neuron)



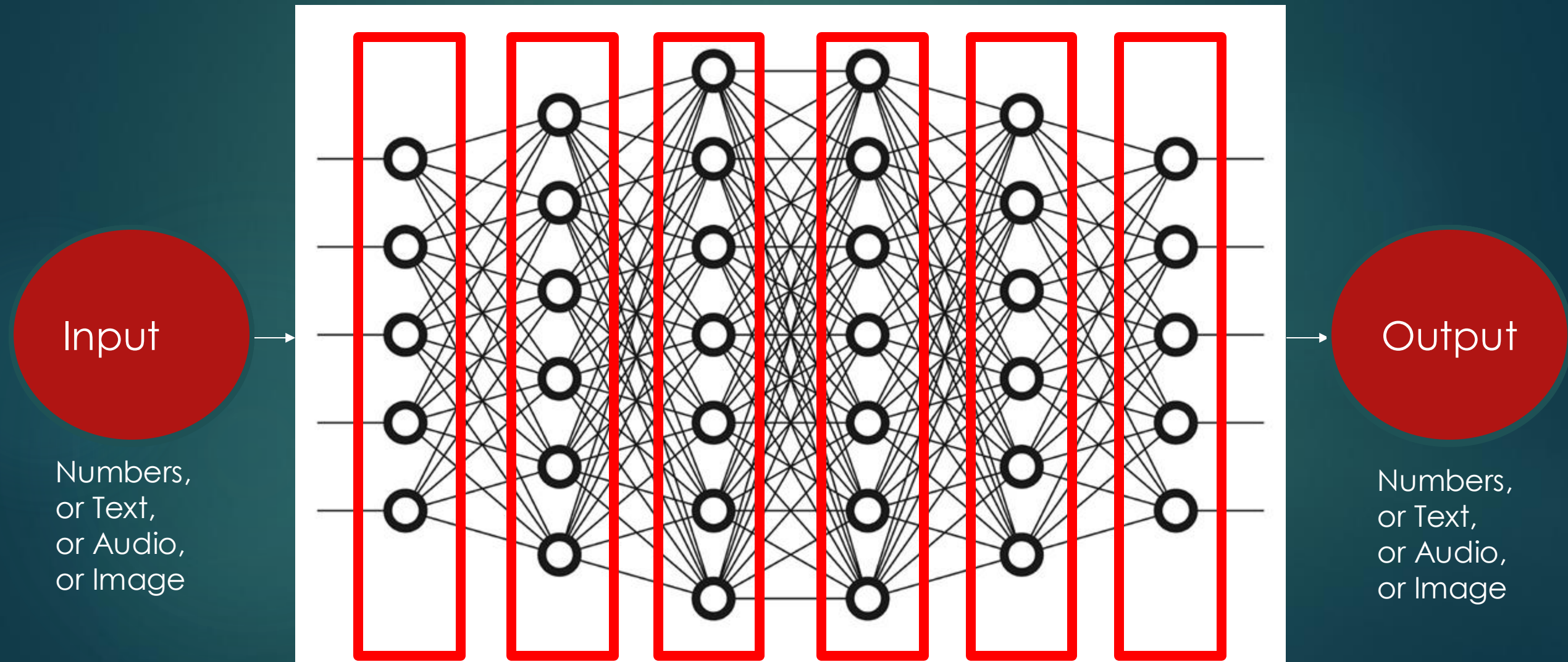
Three Layers

10



n-Layers

11



How many parameters?

12

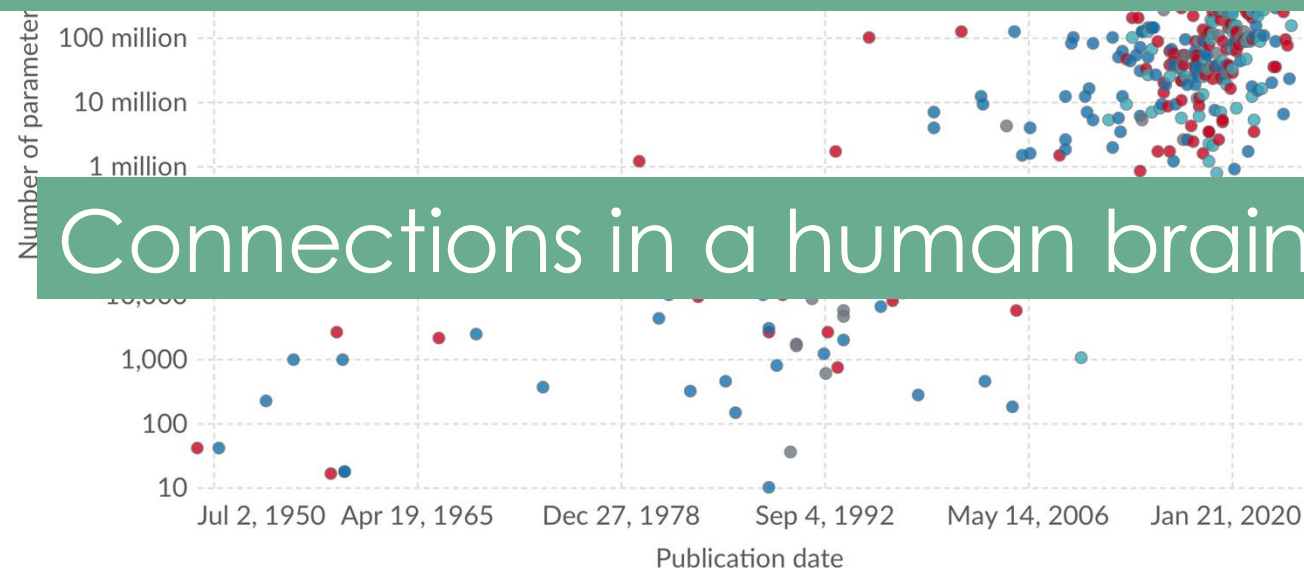
Parameters in notable artificial intelligence systems

Our World
in Data

Parameters are variables in an AI system whose values are adjusted during training to establish how input data gets transformed into the desired output; for example, the connection weights in an artificial neural network.



Parameters in a large Large Language Model: 1 trillion



Connections in a human brain: 100 trillion

Data source: Epoch (2024)

OurWorldinData.org/artificial-intelligence | CC BY

Note: Parameters are estimated based on published results in the AI literature and come with some uncertainty. The authors expect the estimates to be correct within a factor of 10.

How much training data?

13

- ▶ ChatGPT was trained on 570 gigabytes of text
 - ▶ 300 billion words
 - ▶ Web pages – e.g. Reddit links
 - ▶ Internet-based books
 - ▶ Wikipedia
- ▶ The average person reads 700 books in their lifetime
- ▶ ChatGPT has “read” (and retained) the equivalent of 500,000 people each reading 700 *different* books!

ChatGPT is a **Generative Pre-Trained Transformer** developed by Open AI



“AI Everywhere” What can AI do?

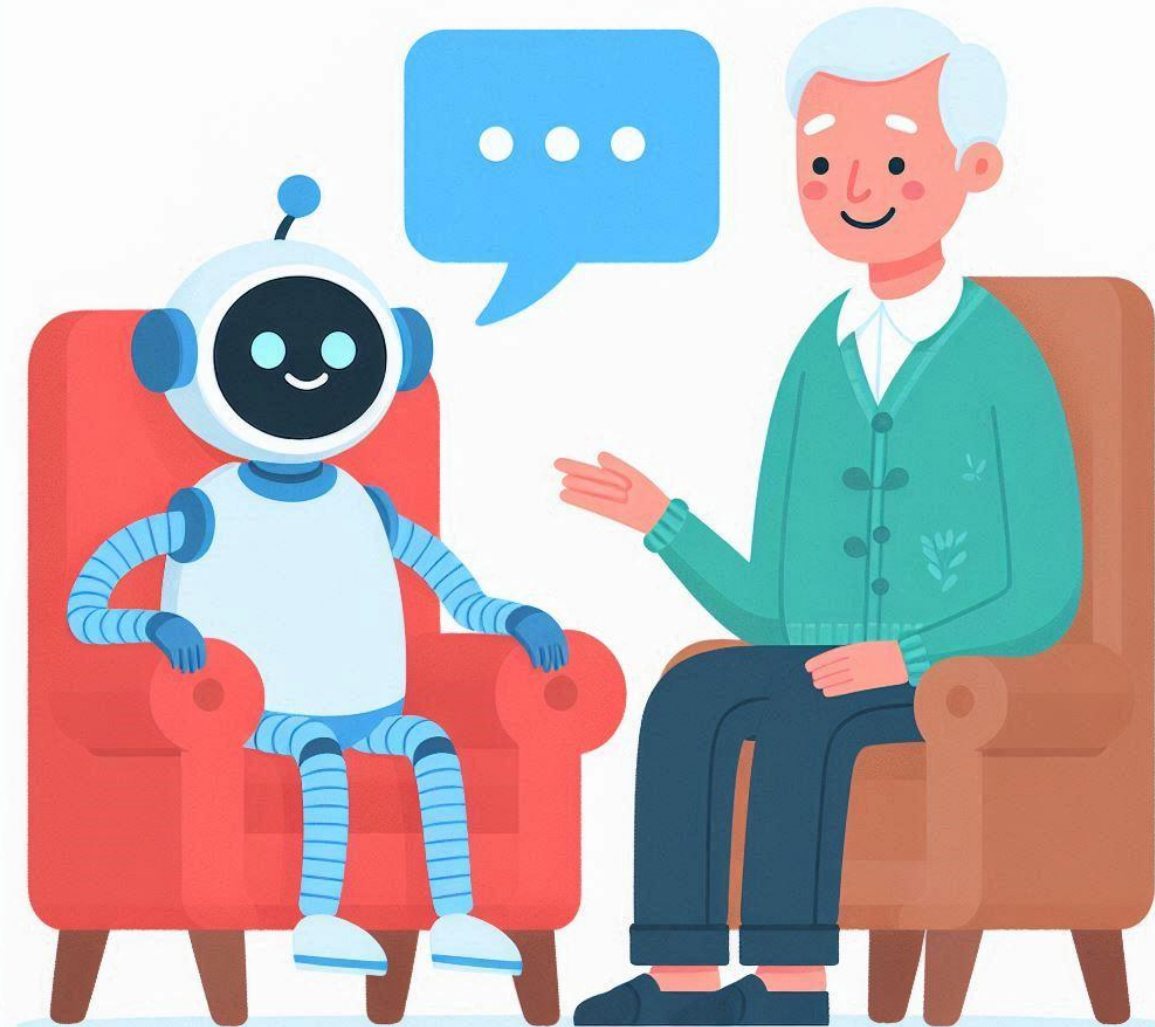
TYPICAL APPLICATIONS



AI Chatbots

15

- ▶ Not to be confused with non-AI scripted Chatbots!
- ▶ ChatGPT, Microsoft Copilot, Google Gemini, Claude AI, Perplexity AI
- ▶ More detail in the next section...



AI Art

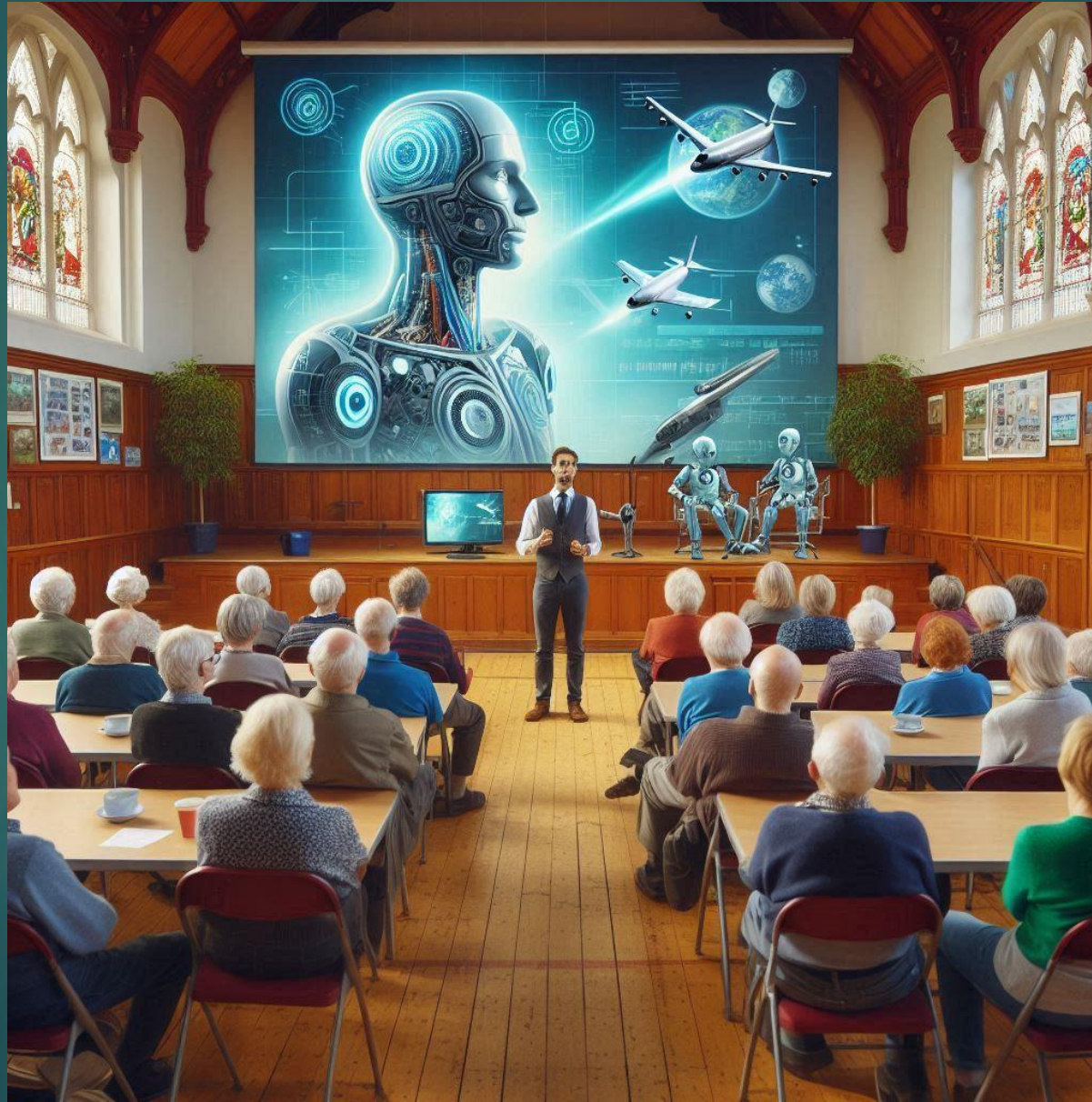
16

- ▶ Most of images in this presentation were generated by Microsoft Bing
 - ▶ Unique
 - ▶ Free of copyright
 - ▶ Consistent look
- ▶ Other services
 - ▶ Midjourney.com, Leonardo.AI, Ideogram.AI
- ▶ US copyright law only applies to human-generated images – so AI images are inherently copyright-free, but...
- ▶ Be careful of producing images “in the style of” artists or corporations that protect their copyright



“A u3a audience sitting in Weald Memorial Hall listening to me presenting to a Science Group on the topic of artificial intelligence”

17



AI Music

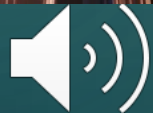
18

- ▶ AI can write songs!
- ▶ Examples:
 - ▶ Suno.AI
 - ▶ Udio.com
- ▶ The input is a text prompt describing the theme and style



A song in a jazz fusion style about the joys of the M25 motorway

19



On the M25, where the traffic's a game,
Bumper to bumper, yet never the same.
Round and round, in a tireless spin,
Finding joy in the chaos we're in.

Signals flashing, a neon ballet,
Drivers waltzing in an endless relay.
With a horn's gentle hum, and a brake's soft tap,
We cruise through the madness, embrace the mishap.

Oh, the M25, it's our circular friend,
A loop with no start and a journey no end.
In the blur of the headlights, we find our delight,
In the dance of the wheel and the taillights' bright light.

A song in a jazz fusion
style about the joys of
the M25 motorway

20



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Self-driving Cars

21

- ▶ Waymo taxi service currently in San Francisco and Phoenix, AZ
- ▶ Tesla Cybercab has been announced – with no manual controls!
- ▶ UK passed legislation in May 2024 to allow self-driving cars





AI Video

23

- ▶ Text-to-video (similar to text-to-image) is now possible, although it requires considerable processing power
- ▶ It is within reach for Hollywood studios to produce entirely AI-generated complete scenes
- ▶ The recent actors' strike (July-November 2023) was in part to protect actors' rights to their own likeness... triggered by the Black Mirror episode "Joan is Awful"



Data analysis

24

- ▶ AI can be trained to analyse vast quantities of data
- ▶ Very effective at spotting patterns in complex images – such as analysing medical diagnostic scans



AI Chatbots in
more detail...



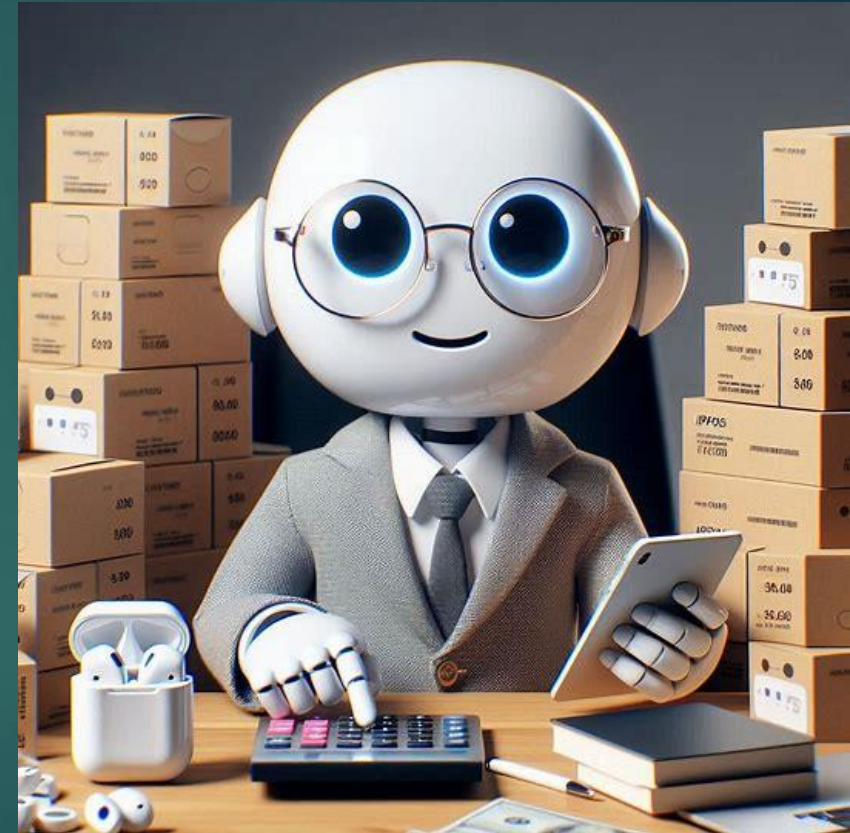
What is it good for?

1. Complex Queries

- You can describe your query in much more than you can get from a search engine like Google.
- You can continue the conversation with subsequent clarifying questions.
- You can ask it to respond whilst adopting a particular role or persona.

An example:

“Estimate the number of Apple AirPods sold”



The global annual sales of Apple AirPods fluctuated between 2017 and 2022. After peaking at 114 million unit sales in 2020, the annual sales of Apple's earpods decreased. In 2022, this number amounted to **82 millions**. 21 Feb 2024



Apple AirPod

People also

How many App

How many iPh

How many Air

How many pai



[OC] AirPod

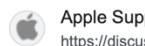
In FY2019, App

(both are my est

How to **determin**

Bought used air

More results from



Apple Support Community
<https://discussions.apple.com/thread>

Airpods Sales Estimates

19 Mar 2017 — So **how many AirPods** are actually **selling**? There are roughly 500 stores. It is hard to know **how many AirPods** are received in each store daily.

3 answers · Top answer: Yep.Apple Support Communities Use Agreement



estimate the number of apple airpods sold



All Shopping Images Videos News Web Books : More

Tools

The global annual sales of Apple AirPods fluctuated between 2017 and 2022. After peaking at 114 million unit sales in 2020, the annual sales of Apple's earpods decreased. In 2022, this number amounted to **82 millions**. 21 Feb 2024



Statista

<https://www.statista.com> > ... > Consumer Electronics

Apple AirPods sales 2017-2022 - Statista

 About featured snippets •  Feedback

Estimate the total number of AirPods sold

Pro Search

Sources

eset W

Answer



AirPods

Wireless Bluetooth earbuds designed by Apple Inc.

Based on the available data, we can estimate that Apple has sold approximately 150 million AirPods units by the end of 2023 ² ⁴. This figure represents the cumulative sales since the product's launch in 2016.

million AirPods units by the end of 2023 ² ⁴. This figure represents the cumulative sales since the product's launch in 2016.

To break down the sales trajectory:

1. By the end of 2020, Apple had sold approximately 100 million units of AirPods ².
2. Sales continued to grow in subsequent years, with Apple selling around 82 million units in 2022 alone ¹.
3. The most recent estimate puts the total sales at about 150 million units by the end of 2023 ².

It's worth noting that AirPods have been a significant success for Apple, contributing

Ask follow up...

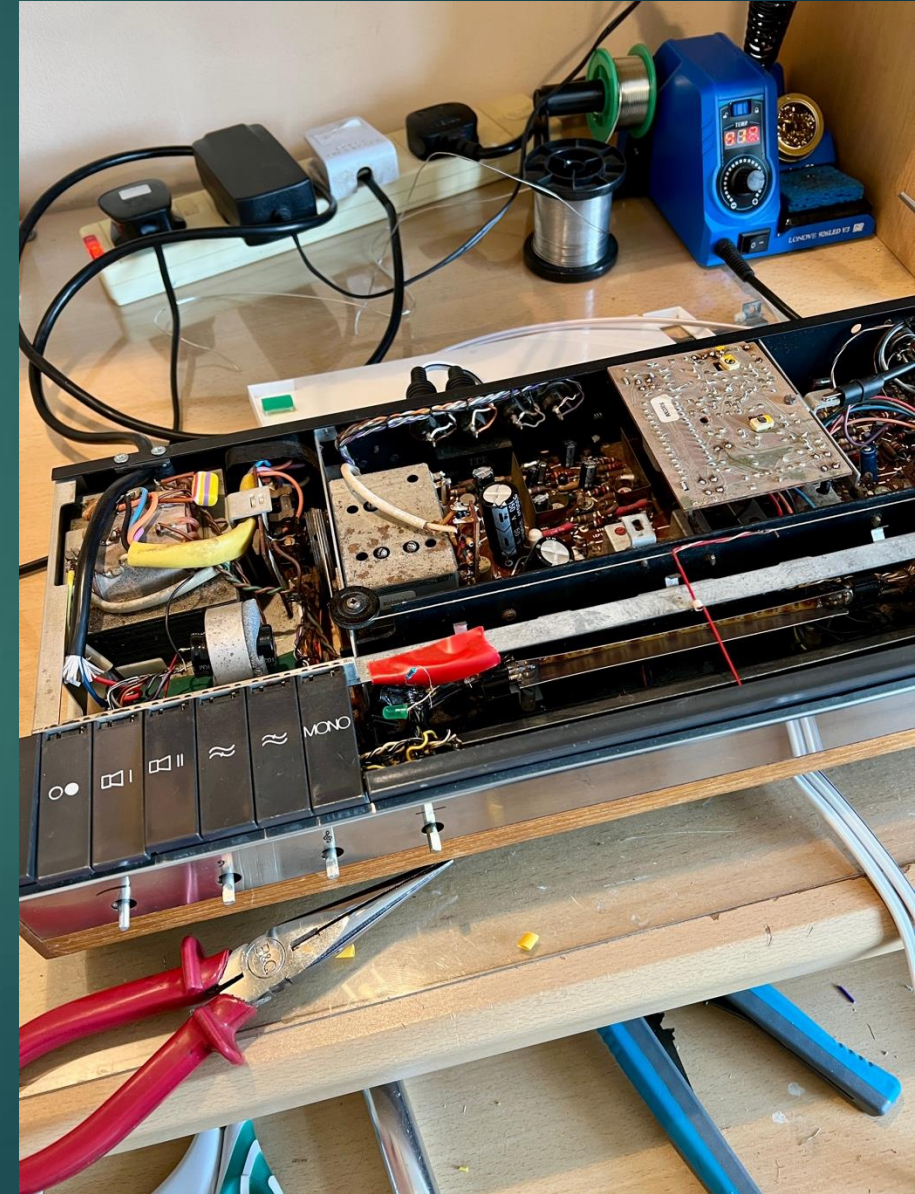


in 2020, AirPods generated about \$12 billion in revenue ¹.

What is it good for?

2. Follow-up questions

- I am repairing a 1970-vintage B&O amplifier
- I think a transistor needs replacing, but an exact replacement is expensive
- Can I use a modern equivalent?



Suggest some modern equivalents for a bc154 transistor

Pro Search

3 steps ▾

Sources



= Answer

specifications. Here are some suitable modern equivalents:

- **BC559:** This is a common modern equivalent for PNP transistors like the BC154. It has similar voltage and current ratings and is widely used in various applications 4 .
- **2N3906:** Another potential substitute, the 2N3906 is a general-purpose PNP transistor. While it might be slightly noisier in some applications, it is a robust choice for many circuits 4 .

- **2N3906:** Another potential substitute, the 2N3906 is a general-purpose PNP transistor. While it might be slightly noisier in some applications, it is a robust choice for many circuits 4 .

Before substituting, ensure that the replacement transistor's pinout matches the

Ask follow up...



response.

Will any of the bc547, bc548

31

When considering modern alternatives for the BC154 transistor, it's important to match the specifications such as polarity, voltage, current ratings, and package type. The BC154 is a PNP transistor, so suitable replacements should also be PNP transistors. Here's an analysis of the options you provided:

- **BC327:** This is a PNP transistor with a maximum collector-emitter voltage of 45 V and a collector current of 800 mA, making it a suitable replacement for the BC154, especially in applications requiring higher current capacity ² ³ .
- **BC337:** This is an NPN transistor, so it is not suitable as a direct replacement for the PNP BC154.
- **BC517:** This is an NPN transistor with a high current gain, so it is not suitable as a direct replacement for the PNP BC154 ⁴ .
- **BC547, BC548, BC549, BC550:** These are all NPN transistors, so they are not suitable replacements for the PNP BC154 ¹ .
- **BC556, BC557, BC558:** These are PNP transistors with similar voltage and current ratings to the BC154, making them good potential replacements. The BC557, for instance, has a collector-emitter voltage of 45 V and a collector current of 100 mA, aligning well with the BC154's specifications ⁵ .

In summary, the **BC327**, **BC556**, **BC557**, and **BC558** are suitable modern alternatives for the BC154 transistor, with the BC327 being particularly useful for applications requiring higher current handling.



What is it good for?

3. Generating ideas and outlines

Please give me an outline for a 30 minute presentation on "Introduction to AI Chatbots". The audience are U3A members (retired and semi-retired), mostly with basic understanding and limited experience of digital devices, and many will not have used AI before.



 Sources

Artificial Intelligence - U3A

 u3a.org · 1

AI for everyone - U3A Communities

 u3acommunities · 2

Introduction to ChatGPT and AI chatbots - Hwb - gov.wales

 hwb.gov · 3

An Introduction to AI Chatbots - OracleCMS

 oraclecms · 4

 Perplexity

Outline for a 30-Minute Presentation on "Introduction to AI Chatbots"

1. Introduction (5 minutes)

- Provide examples of tasks AI chatbots can perform, such as answering FAQs, guiding users through processes, and providing recommendations ⁴.

• Potential Benefits

- Highlight benefits like efficiency, availability, and personalized user experiences ⁴.

4. Considerations and Concerns (5 minutes)

- Safety and Privacy Concerns

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 u3a.org · 1

AI for everyone - U3A Communities

 u3acommunities · 2

Introduction to ChatGPT and AI chatbots - Hwb - gov.wales

 hwb.gov · 3

An Introduction to AI Chatbots - OracleCMS

 oraclecms · 4

- Differentiate between AI chatbots and traditional scripted chatbots ⁴.

• Popular AI Chatbots

- Introduce well-known AI chatbots like ChatGPT and Google Bard ³.
- Discuss their capabilities and limitations, such as providing context-rich answers and learning from interactions ³.

3. Applications of AI Chatbots (5 minutes)

• Everyday Uses

- Discuss common applications in customer service, e-commerce, and personal assistance ⁴.

Encourage Exploration

- Encourage the audience to explore AI chatbots further and consider their potential uses in daily life.

• Q&A Session

- Open the floor for questions and provide answers to any queries the audience may have.

This outline provides a structured approach to introducing AI chatbots to an audience with limited digital experience, focusing on clarity and engagement.

What is it good for?

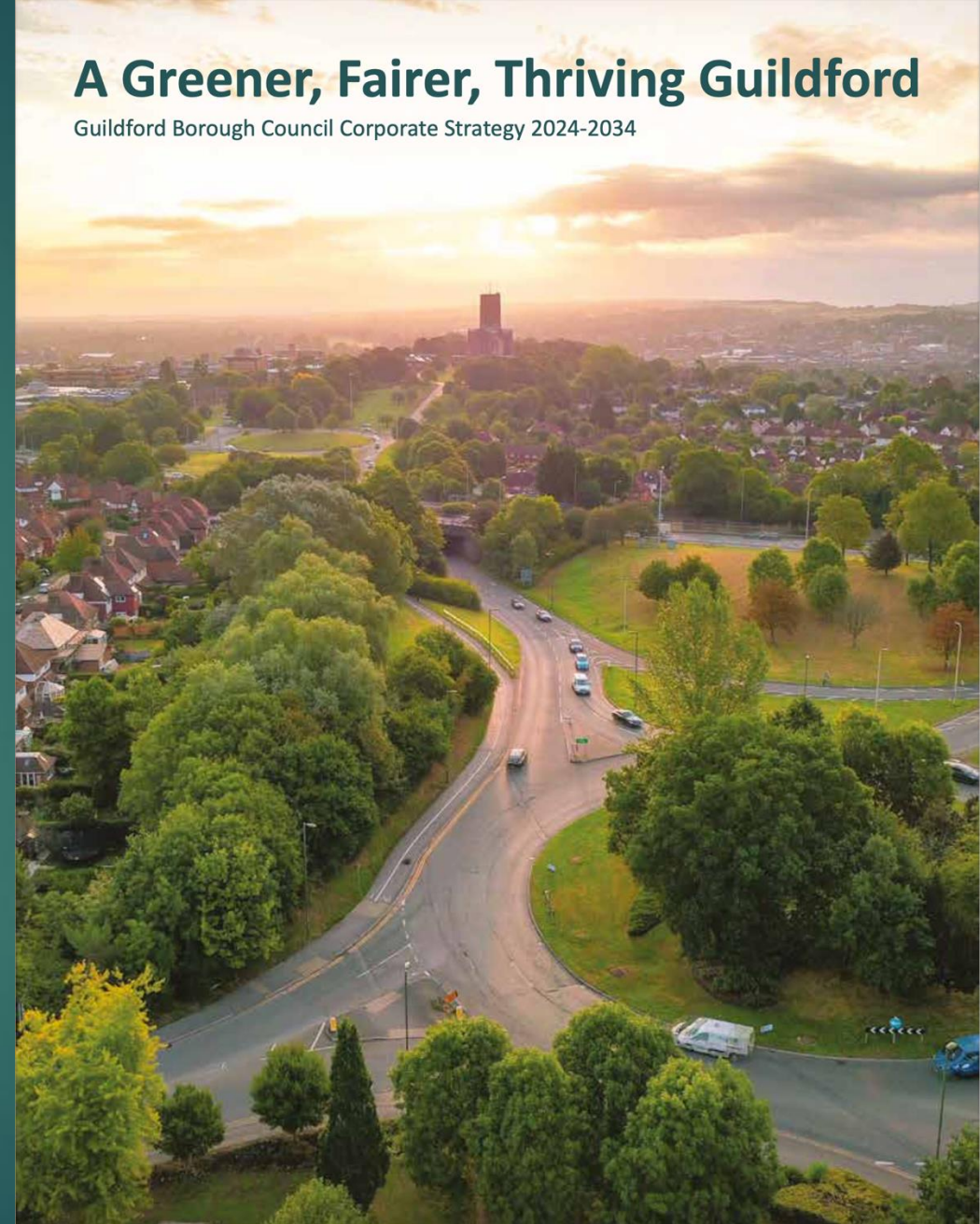
4. Summarising

Provide a 4-paragraph summary of the attached document, particularly emphasising how it might impact retired members of the community

(Attachment: 17-page PDF)

A Greener, Fairer, Thriving Guildford

Guildford Borough Council Corporate Strategy 2024-2034



GUILDFORD
BOROUGH

The document, titled "A Greener, Fairer, Thriving Guildford," outlines the Guildford Borough Council's Corporate Strategy for 2024-2034. The strategy is centered around five key priorities: sustainability, prosperity, inclusivity, housing, and resilience. The council aims to create a more sustainable borough by achieving net-zero carbon emissions by 2030 and working collaboratively with communities to maintain environmental benefits. This focus on sustainability includes reducing the council's environmental impact through a comprehensive Climate Change Action Plan. Additionally, the strategy emphasizes economic growth by attracting investment and supporting local businesses to ensure that the benefits are shared among all residents.

For retired members of the community, the strategy's emphasis on inclusivity and affordable housing is particularly relevant. The council aims to create a welcoming environment where diverse identities are respected and represented. This includes ensuring that all community members, including retirees, have a voice and can contribute to the community's success. The commitment to providing decent and affordable homes is another crucial aspect, as it addresses the basic human need for secure housing. By leveraging its role as a social housing provider and planning authority, the council seeks to ensure that local residents, including retirees, have access to affordable housing options.

The strategy also highlights the importance of a resilient and well-managed council, which is committed to serving its residents effectively. This includes prudent financial management, ensuring that public funds are spent wisely, and providing high-quality services. For retired individuals, this focus on efficient service delivery and value for money is significant, as it ensures that the council can continue to support essential services that they may rely on, such as healthcare, transportation, and community facilities. The collaboration with Waverley Borough Council to share resources and best practices further strengthens the council's ability to sustain and improve local services.

Overall, the Guildford Borough Council's Corporate Strategy for 2024-2034 aims to create a thriving community by focusing on sustainability, economic growth, inclusivity, housing, and resilience. For retired members of the community, the strategy's commitment to inclusivity, affordable housing, and efficient service delivery is likely to have a positive impact, ensuring that they can enjoy a high quality of life in a supportive and well-managed environment.

Redbox

37

- ▶ A closed Generative AI system for civil servants
- ▶ Certified up to “Official-Sensitive”



Redbox



Chat with
Government
Documents



Generate
Summaries



Security + Safety

The incubator for

What is it good for?

5. Interpreting/Explaining

Please interpret and explain this letter in simple, layman's terms



Handwritten

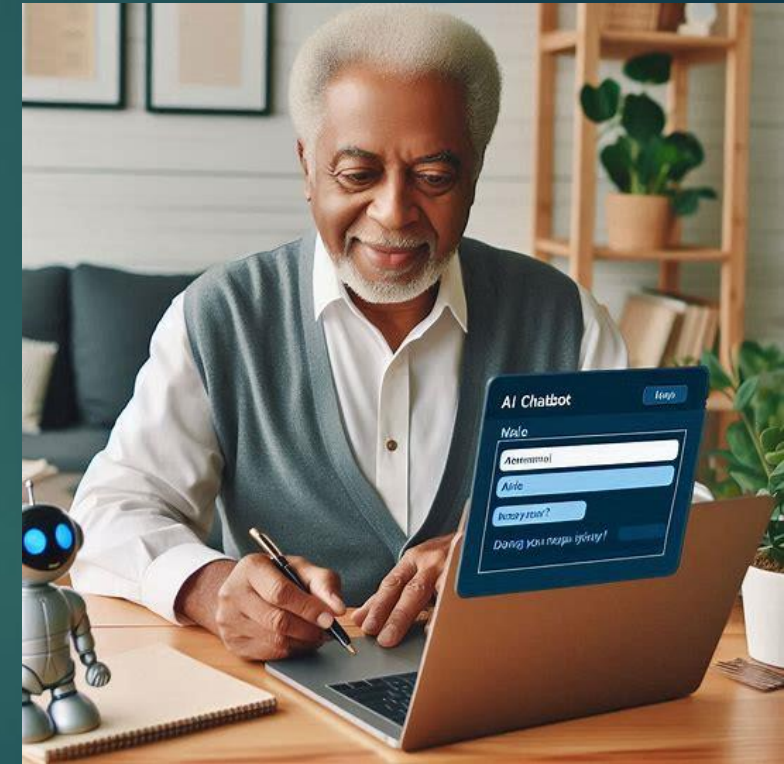
The letter is a medical communication from Miss Hasni Hasni, a specialist in ophthalmology, to Dr. C F Han regarding a patient named Russell Whitworth. Here's a simplified explanation of the contents without including the date of birth:

- **Patient Information:** The letter concerns Russell Whitworth, who lives at 2 Frogmore Gardens, Merrow, Guildford, Surrey.
- **Diagnosis:** Mr. Whitworth has been diagnosed with glaucoma, a condition that can damage the optic nerve and lead to vision loss if not managed properly.
- **Current Treatment:**
 - Mr. Whitworth is currently using Fixapost eye drops in both eyes at night.
 - A new medication, Trusopt (preservative-free), has been added for the left eye to be used twice a day. This addition is due to a worsening of his visual field, meaning he is experiencing more difficulty seeing in certain areas, and he has noticed a shadow in his left eye.
- **Eye Examination Results:**
 - The pressure inside Mr. Whitworth's eyes (intraocular pressure) is measured at 17 mmHg in the right eye and 18 mmHg in the left eye. These values are within a normal range, but the left eye's visual field is deteriorating.
 - The right eye's visual field is normal, indicating no current issues with vision there.
 - An MRI scan of the left eye's orbit has been requested to check for any possible issues affecting the optic nerve, such as a compressive lesion.
- **Additional Findings:**
 - There is a developing cataract in the center of Mr. Whitworth's left eye. However, since his vision is still quite good (measured at 6/7.5), he does not qualify for cataract surgery under the NHS guidelines at this time.
- **Follow-Up and Requests:**
 - Miss Hasni plans to review Mr. Whitworth's condition in eight weeks.
 - She requests that Dr. Han continue to provide prescriptions for Mr. Whitworth's medications and promises to provide Dr. Han with the results of the MRI.

This letter is intended to provide Dr. Han with information about Mr. Whitworth's condition and treatment plan, and to coordinate ongoing care.

Try it out!

- Most are “freemium” services, i.e. the basic service is free, and a more advanced service is available for a subscription.
- They require a simple sign-up, usually with an email address, or with a Google, Microsoft or Apple account.
- ChatGPT – the best known
- Microsoft Bing Image Creator – good for images
- Claude AI – good for writing and reviewing code
- Perplexity – my favourite, because it provides links to its sources



Challenges



“Hallucination” or “making stuff up”

43

- ▶ Large Language Models will always give you an answer... even if it doesn't know!
- ▶ It doesn't really understand time. Information can be out-of-date.
- ▶ It's reasoning skills are verbal rather than mathematical. It makes arithmetical errors.
- ▶ It can exhibit bias (race, religion, politics), reflecting the material it has been trained on.
- ▶ Think of ChatGPT as a very knowledgeable 4-year old, or a very skilled but ignorant librarian!
- ▶ It can make up scientific references; it can make up legal cases
- ▶ AI developers now employ thousands of humans to fix errors – by hand!
- ▶ For anything important... always check the sources!



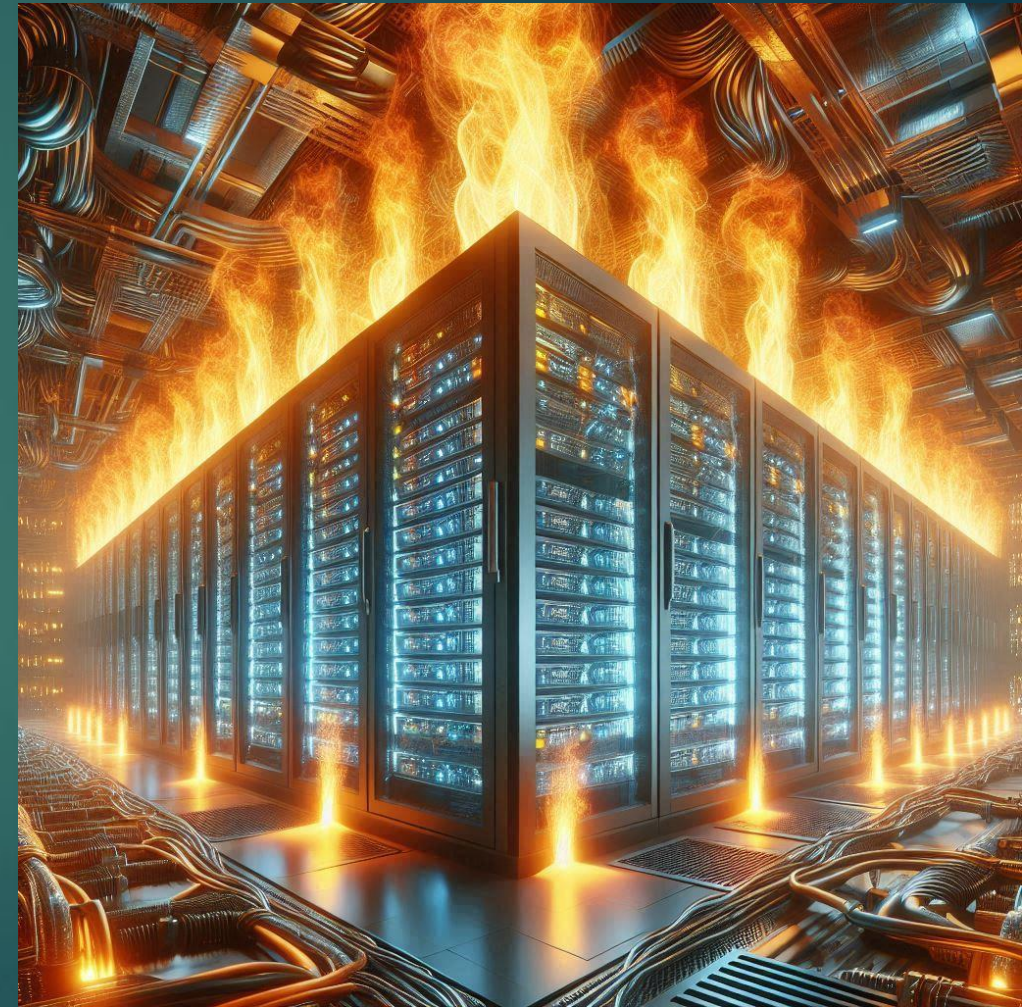
Use of Power

44

- ▶ AI data centres consume huge amounts of power
- ▶ There are two aspects: Training, and Usage
- ▶ Commercial companies do not publish this data
- ▶ A ChatGPT query perhaps uses 30-40x the energy use of a Google search

But...

- ▶ Many of these companies are investing in renewable electricity. Apple claims to be 100% renewable.
- ▶ For some applications, e.g. image generation, the carbon footprint may be less than traditional methods
- ▶ Efficiency is improving
- ▶ AI is being used in the power industry to optimise generation and transmission



Jobs

45

- ▶ Like any “revolution” jobs are lost, and new jobs are created
- ▶ "Prompt Engineer" – a job that didn't exist 3 years ago
- ▶ AI's best role is as an assistant to a human expert (medical, legal, financial, marketing,...)

But...

- ▶ The jobs that are being lost are typically intern or assistant roles
- ▶ Where will the next generation of experts gain their experience?

Job description

Prompt Engineer

- Opportunity for a Prompt Engineer to join a market leading Software Development service
- Based in Reigate, Surrey
- Salary up to 70,000 + fantastic benefits
- Apply online or contact Chelsea Hackett via (see below)

ABOUT THE CLIENT:

My client provides businesses with tools to enhance the effectiveness of customer communications. Their services include tracking phone interactions, analysing conversations, and linking them to online activities. By extracting valuable insights from incoming calls, they aim to drive improvements in marketing strategies, sales performance, and customer support. Operating for more than ten years, they cater to sectors like retail, finance, and healthcare, with a presence in both the UK and the US.

THE BENEFITS:

- Early finish Friday's
- Options to buy additional holidays
- Private medical insurance
- Tech scheme loan
- Hybrid working
- Employee assistance programme
- Life insurance

THE PROMPT ENGINEER ROLE:

In this role, you will craft, refine, and optimise the prompts that shape AI-generated responses, directly influencing user experience and product success. Collaborating with AI researchers, data scientists, and product teams, you will contribute to cutting-edge solutions in a fast-paced, forward-thinking environment.



- ▶ *“AI technology is more likely to amplify existing cyber threats than create wholly new ones but it will almost certainly sharply increase the speed and scale of some attacks”*
- NCSC Annual Review 2023

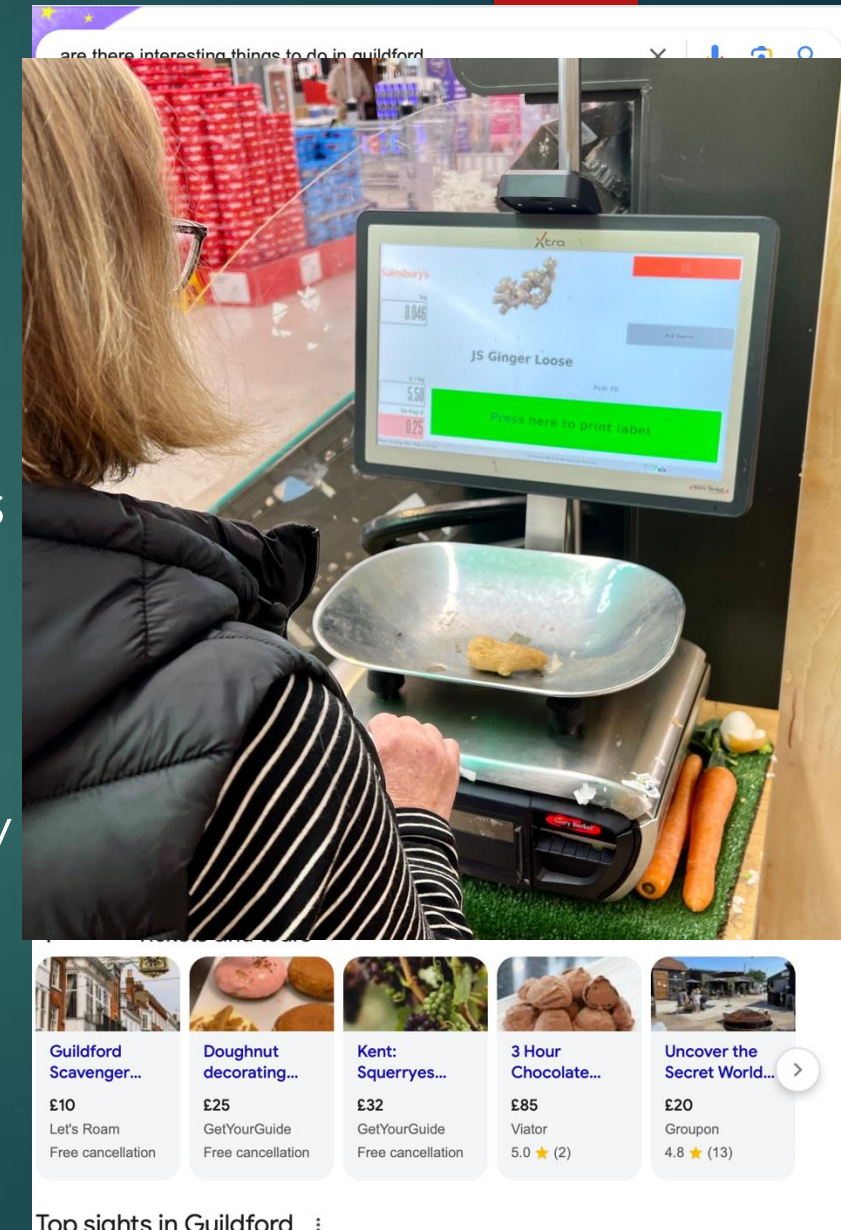
Future Adoption and Trends



It's tough to make predictions, especially about the future...

48

- ▶ Generative AI may have plateaued. There will be incremental improvements, but no more giant leaps.
- ▶ Generative AI is not a stepping stone towards Artificial General Intelligence. Other breakthroughs are needed.
- ▶ Search engines (Google, Bing, etc) will adopt AI features and eventually merge
- ▶ Small, on-device models are an area of development, e.g. "Apple Intelligence"
- ▶ The next steps are in *adoption* of the capabilities already identified, particularly in medicine, education, legal, environment, government.
- ▶ Legal battles over copyright will continue to make the news



 Guildford Scavenger... £10 Let's Roam Free cancellation	 Doughnut decorating... £25 GetYourGuide Free cancellation	 Kent: Squerrys... £32 GetYourGuide Free cancellation	 3 Hour Chocolate... £85 Viator 5.0 ★ (2)	 Uncover the Secret World... £20 Groupon 4.8 ★ (13)
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Top sights in Guildford



Questions?

Backup

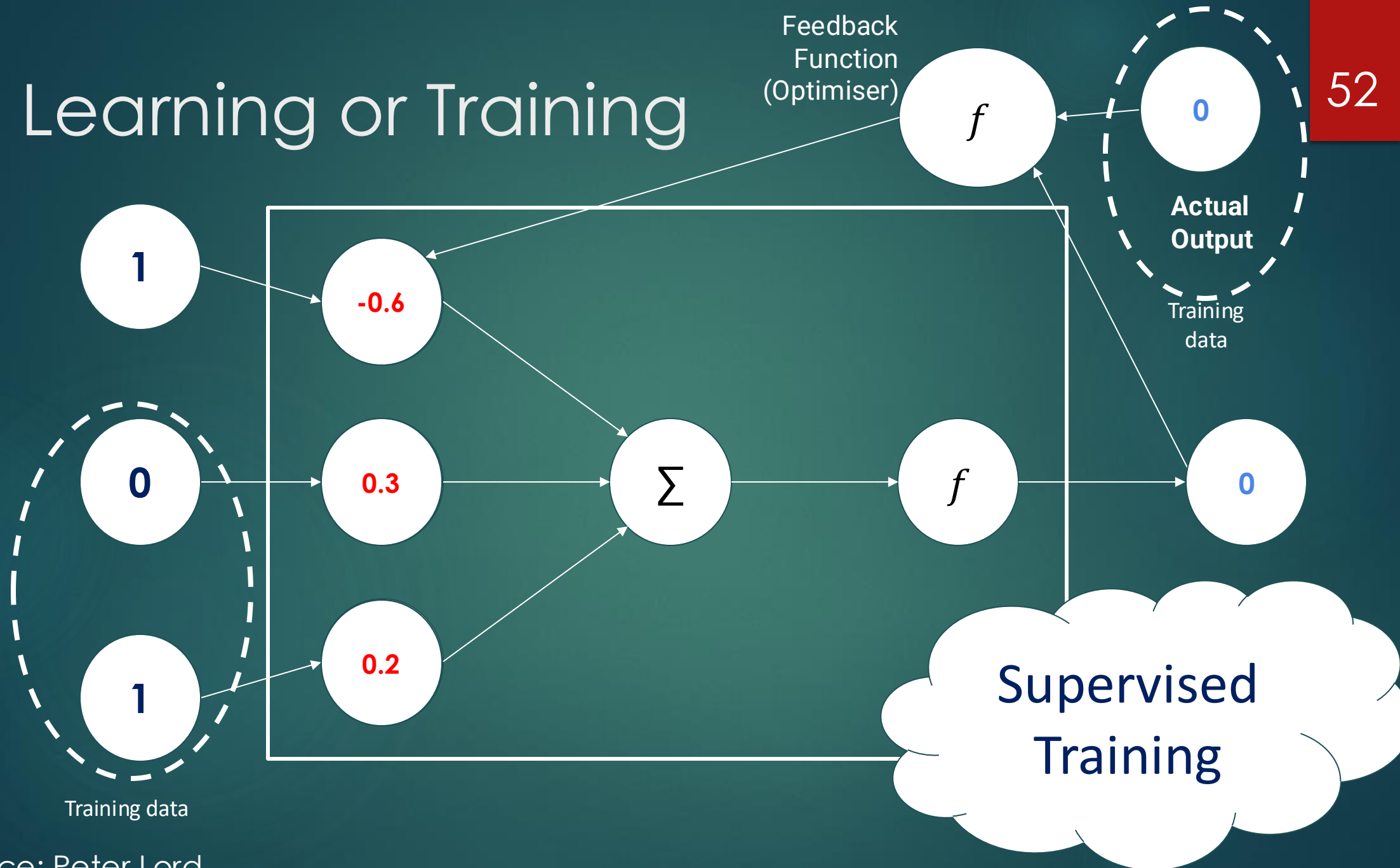
About Me

- B.Sc. Physics and M.Sc. Communications Engineering – Imperial College
- A career in Telecommunications – mainly mobile
- BP, ICL, PA Consulting Group, Questus, Deutsche Telekom (T-Mobile), followed by 10 years of independent consulting
- Network Design, 2G and 3G licence bids, marketing, finance
- Project Management best practice and coaching
- Agile (Scrum) and DevOps best practice and coaching
- Experience of working in over 25 countries
- Member of Guildford U3A (Group Coordinator for the Science faculty)
- Member of U3A's "AI for Everyone" project team

Learning or Training

Feedback
Function
(Optimiser)

52



Conclusions and Q&A



Things to try

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- ▶ Try perplexity.ai for general use
- ▶ Try Bing Image Creator for images
- ▶ Try Claude AI for code generation
- ▶ Try the ChatGPT app for a voice conversation

