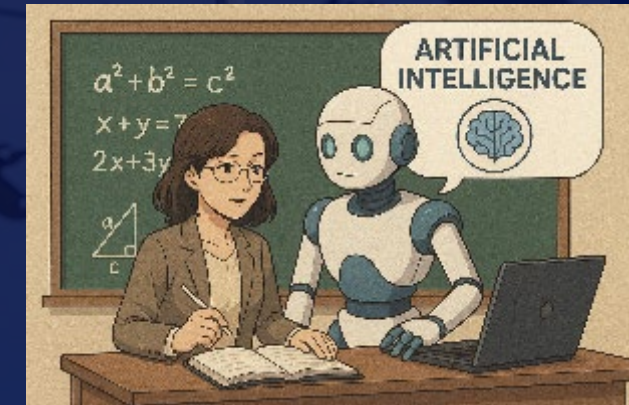


Artificial Intelligence supporting the Mathematics Curriculum in the Primary and Middle Years

Dr Max Stephens - University of Melbourne
Prof. Sebastian Sardiña - RMIT University



Today's focus

1. An introduction to AI & GenAI (20')

- History of AI
- The AI zoo
- Large Language Models (LLM) and Generative AI

1. Practical strategies to support the delivery of the Mathematics Curriculum (in Primary Schools) (35')

- Using GenAI to plan lessons
- To explore teaching ideas
- To develop assessment tools and worksheets





What is Artificial Intelligence, GenAI and LLM?



Sebastian

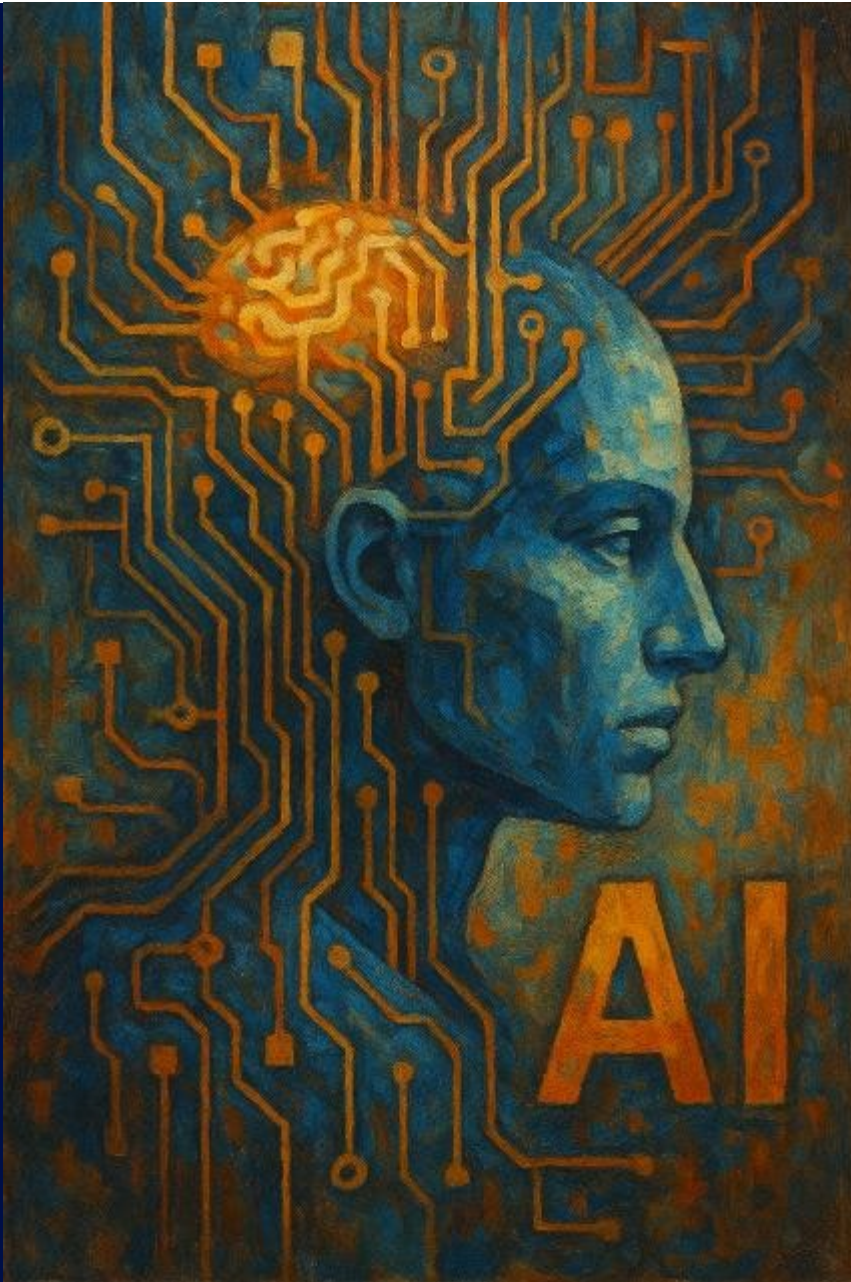


Image created using ChatGPT
*You are a painter. Create an image
representing Artificial Intelligence.*

With many, many, thanks to Diego
Slezak and Marco Montali for sharing
many slides and ideas with me. 🙏

1996



Person of the Year

TIME



"It was a wonderful and extremely human move. I had played a lot of computers but had never experienced anything like this. I could feel —I could smell— a new kind of intelligence across the table"

Garry Kasparov, 1996

2016



"I thought AlphaGo was based on probability calculation and that it was merely a machine. But when I saw this move, I changed my mind. Surely, AlphaGo is creative."

Lee Sedol

Winner of 18 world Go titles

Intelligence or brute force?



Deep Blue
searched 200
million positions
per second.



2022



ARTIFICIAL
INTELLIGENCE



ChatGPT





<https://views4you.com/ai-tools-usage-statistics-report-2025>

Explosion of ChatGPT users

ChatGPT Sprints to One Million Users

Time it took for selected online services to reach one million users



By Invitation | Artificial intelligence

Yuval Noah Harari argues that AI has hacked the operating system of human civilisation

Storytelling computers will change the course of human history, says the historian and philosopher

Share



IMAGE: DAN WILLIAMS

Apr 28th 2023 | 8 min read

*"AI has gained some remarkable abilities to **manipulate and generate language**, whether with words, sounds or images. AI has thereby **hacked the operating system of our civilisation.**"*

*Yuval Harari, historian
2023*



Fello AI

All About AI ▾

Getting Started

Newsletter

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AI Will Replace **90%** Developers

Anthropic CEO Dario Amodei: "AI Will Replace 90% of Developers in 6 Months"

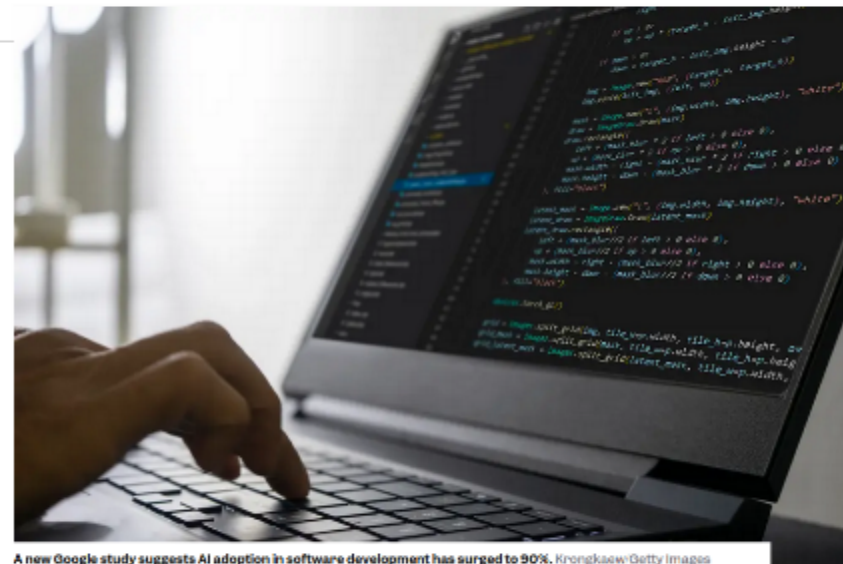
BUSINESS INSIDER

DOW JONES ▼-0.15% NASDAQ ▲+0.18% S&P 500 ▲+0.04% AAPL ▼-0.09% NVDA ▼-0.14% MSFT ▼-0.22% AMZN ▲+0.08% META ▼-0.01%

CAREERS

Google's senior director of product explains how software engineering jobs are changing in the AI era

By Ana Altchek [+ Follow](#)



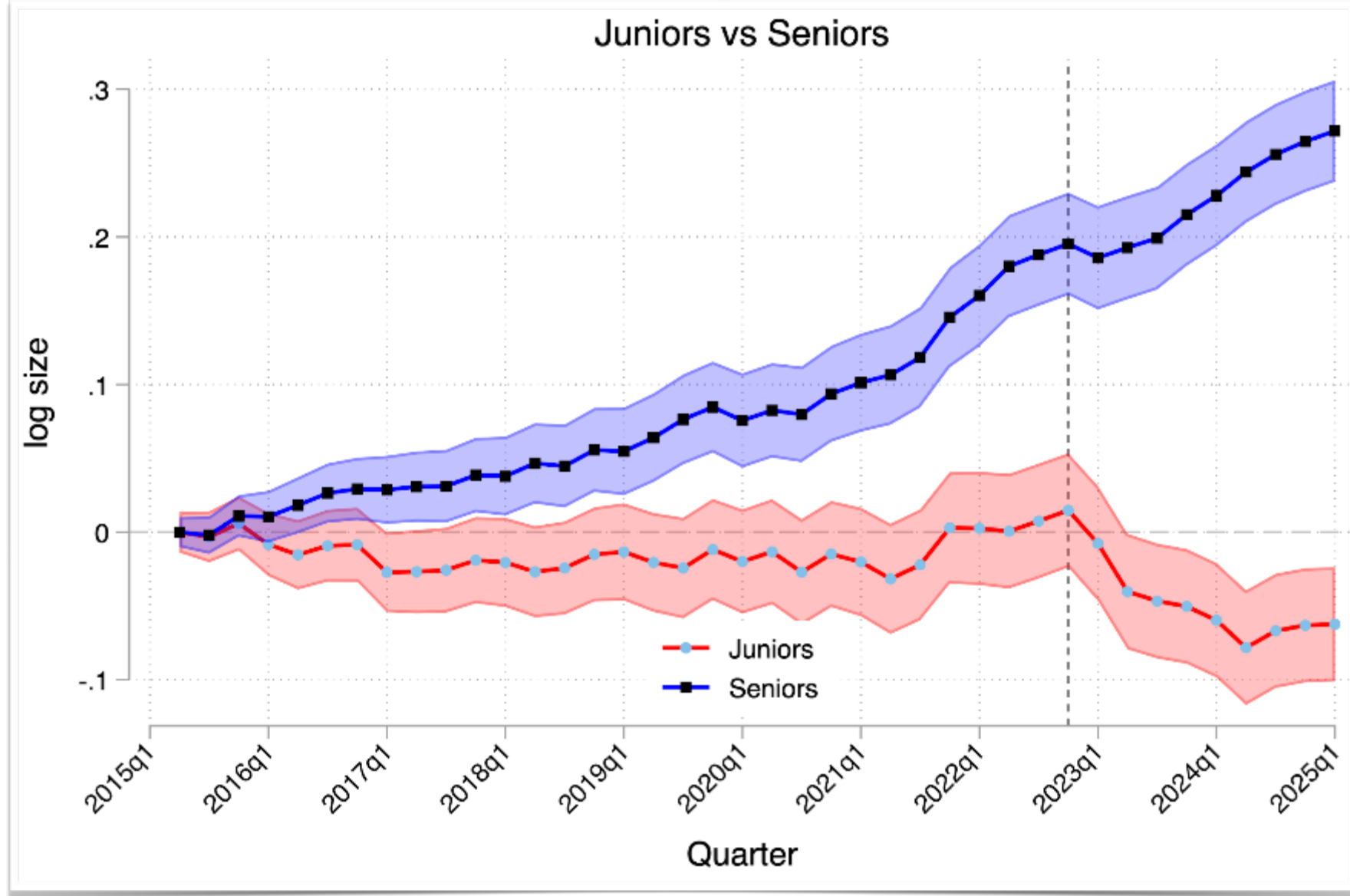
A new Google study suggests AI adoption in software development has surged to 90%. Krongkaew/Getty Images

Sep 24, 2025, 12:10 AM AEST

[Share](#) [Save](#)

- A new [Google study](#) suggests AI adoption in software development has surged to 90%.
- Google's senior director of product says AI means more people will be involved in deploying products.
- He said that knowing programming languages remains critical.

There's no more hiding from AI if you're a software engineer.

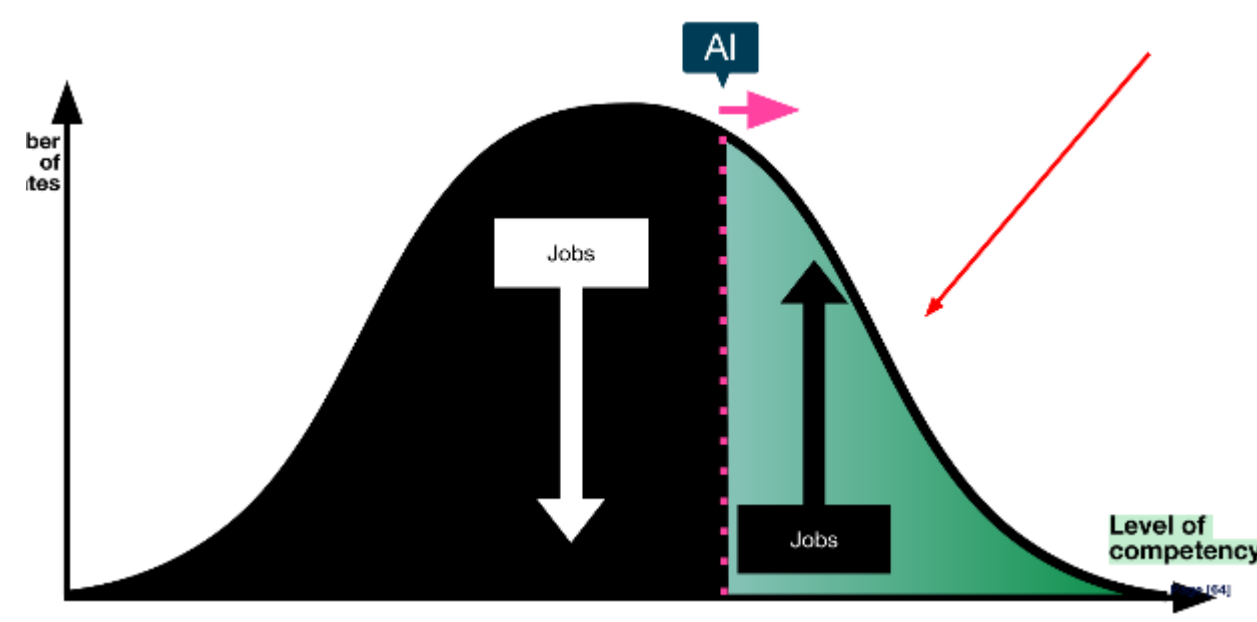


**Generative AI as Seniority-Biased Technological Change:
Evidence from U.S. Résumé and Job Posting Data***

Seyed M. Hosseini[†]

Guy Lichtinger[†]

How to move to the right?



1. Complex Problem-Solving & System Thinking

- Algorithmic thinking beyond standard patterns
- Understanding requirements deeply
- System design and modeling
- Strong technical expertise: judge & evaluate quickly and accurately
- Experimentation and research mindset
- Deep technical learner: learn how to learn

2. Professional and soft skills

- Good communication: oral and writing
- Ethical conduct: promote trust
- Mentoring juniors (even AI-assisted ones)
- Multi-disciplinary approach

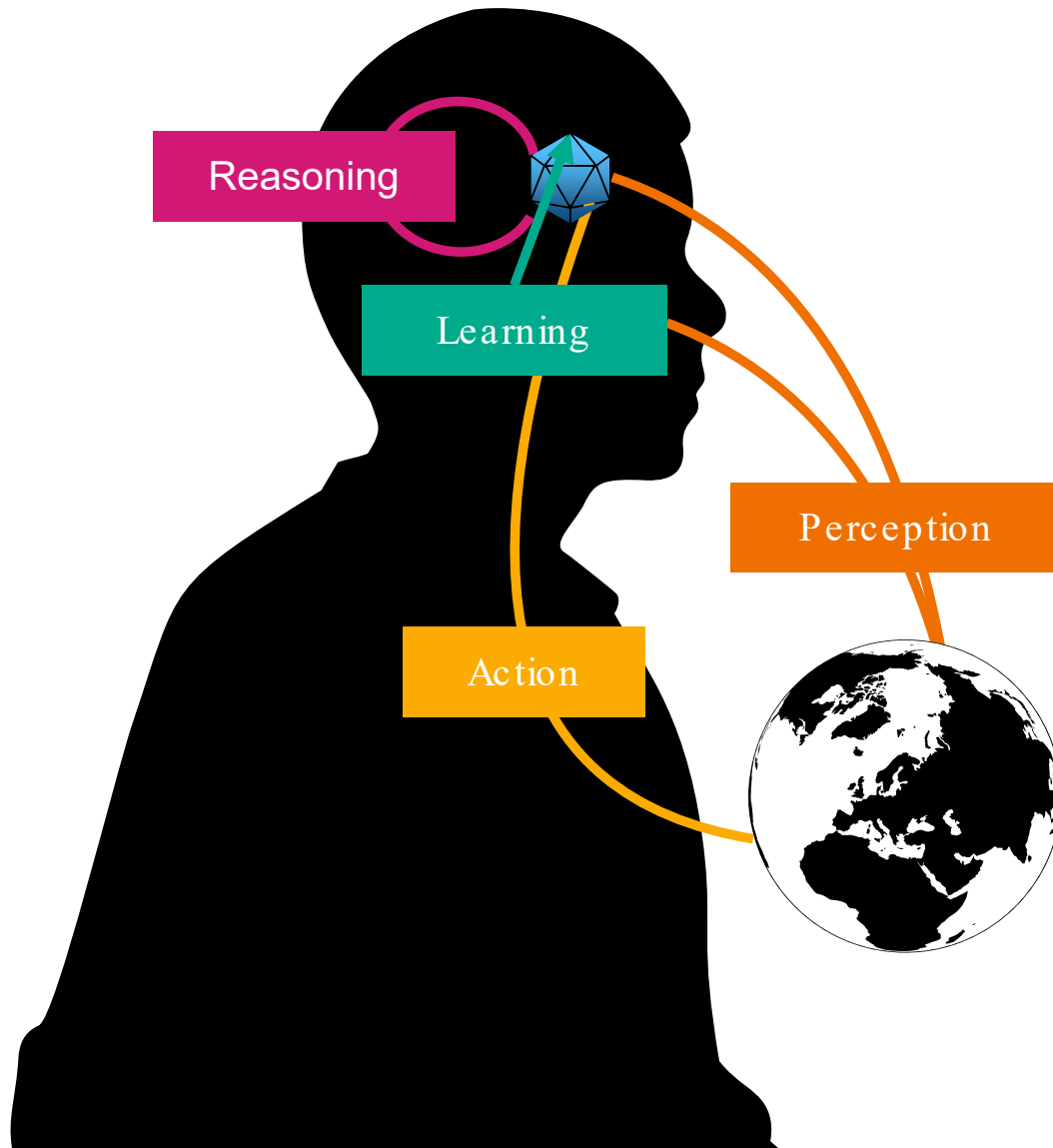
What is AI?



"AI is the study of how to make real computers act like the ones in the movies."

— Bill Bulko

What is Artificial Intelligence?



"AI is the study of *intelligent behavior* achieved through computational means"

— Hector Levesque



Intelligent behavior?

- The capacity to acquire and apply knowledge
- Bringing what you know to bear on what you are doing

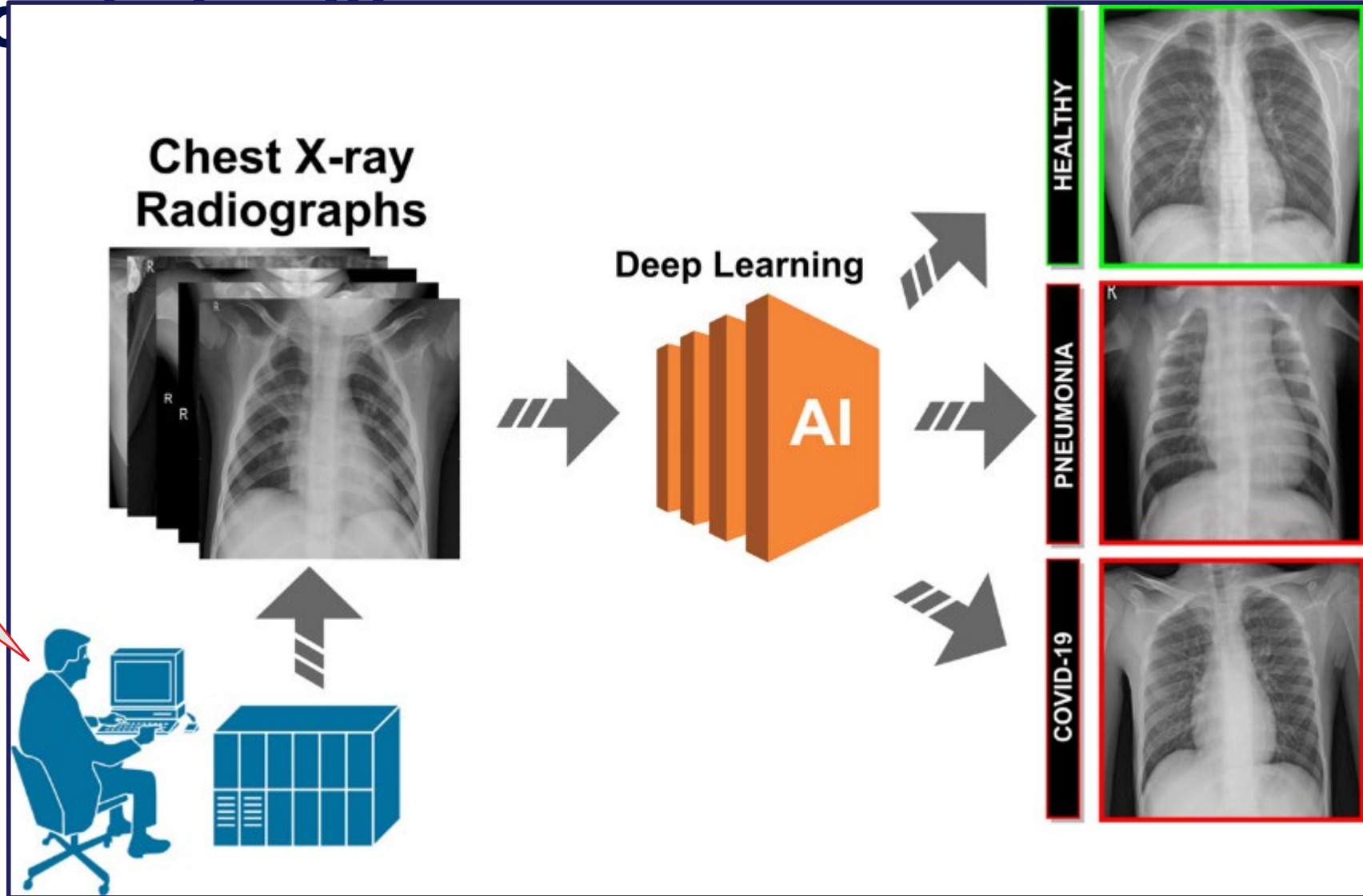
"Ability to *achieve goals* in a wide range of environments." — Legg and Hutter

Generative AI

What is it? How does it work?

Classification

Neural Networks
+
GPU
+
Lots of data (enormous)



SYSTEM 1

Intuition & instinct



Unconscious
Fast
Associative
Automatic pilot



SYSTEM 2

Rational thinking



Takes effort
Slow
Logical
Lazy
Indecisive

THE NEW YORK TIMES BESTSELLER

THINKING, FAST AND SLOW



DANIEL

KAHNEMAN

WINNER OF THE NOBEL PRIZE IN ECONOMICS

LLMs

Source: [link](#)

create a story of a surfer giving a math class to year 12 students

Here's a fun short story:

The Surfer Who Taught Year 12 Maths

The bell rang at 9:00 a.m., and the Year 12 Specialist Maths class filed into Room 204, buzzing with rumours. Their regular teacher, Mr. Patel, was off on a school leadership retreat, and apparently the substitute was... unusual.

When the door slid open, in strolled a tall, tanned man with sun-bleached hair, board shorts, and a surfboard tucked casually under one arm.

"Morning, legends," he said, kicking off his sandals. "Name's Kai. I was catching a few waves down at Bells when the principal rang. Said you needed a maths teacher. So here I am."

The class stared.

"You... surf?" asked Maya.

"I do," Kai said, setting his surfboard against the whiteboard. "I also have a PhD in applied mathematics. Turns out waves are very mathematical."

He grabbed a marker and drew a smooth sine curve, then a tall, sharp one. "Right," he said. "Today—we're doing calculus. But we're doing it Kai-style."

He sketched a perfect wave.

"Surfing is all about understanding oscillations. This," he tapped the curve with the marker, "is a function describing wave height over time. Now the derivative—" He drew a new line. "—tells you the slope of the wave at every moment. If it's too steep, you wipe out. If it's gentle, you ride it."

The class leaned forward. This was... actually interesting.

"Let's talk maxima and minima," Kai continued. "A surfer wants to catch the wave just as it's forming its maximum—when the derivative is zero. That's your sweet spot."

He showed them how to solve for turning points, how to interpret the second derivative, and how to model wave periods using trigonometric functions. He interspersed each theorem with a story of a break he'd

Make a story about Trump visiting Melbourne and eating chinese food

Here's a light, humorous short story:

Trump in Melbourne: The Dumpling Summit

When the former U.S. president Donald Trump arrived in Melbourne for what his staff called a "very special, very important, absolutely tremendous cultural visit," nobody quite knew what that meant. The itinerary had shifted a dozen times — from a golf course tour to an art-gallery walk — until somehow it landed on *dumplings*.

On a breezy afternoon, his motorcade pulled up in front of a small Chinese restaurant in Chinatown. The place was modest, squeezed between a bubble-tea shop and a karaoke bar, with red lanterns swaying above the door. Locals stopped, puzzled, as Trump stepped out, straightened his tie, and announced:

"I've heard Melbourne has the best Chinese food. People tell me this all the time. World-class. Absolutely world-class."

Inside, the owner — Mrs. Liu — greeted him with a mix of curiosity and confusion. She led him to a round table in the back, where a steaming bamboo tower of dumplings waited: pork and chive, prawn har gow, xiao long bao, and even a vegan option that one of his aides insisted he at least *look at*.

Trump leaned over the dumplings, inhaling dramatically.

"These are beautiful," he declared. "Truly beautiful. Better than half the summits I've attended."

Mrs. Liu, unfazed, poured him tea. "Drink slowly," she said. "Or you will burn your tongue."

He didn't drink slowly. He burned his tongue.

"Hot! Very hot! No one told me it would be this hot," he said, fanning his mouth. Mrs. Liu just raised an eyebrow. "I did," she answered.

As the meal went on, word spread. Soon, the front windows filled with people peering in, confused and amused. Tourists held up their phones. A pair of uni students whispered, "Is this real life?" Someone outside started chanting "Give him more dumplings!" as a joke.

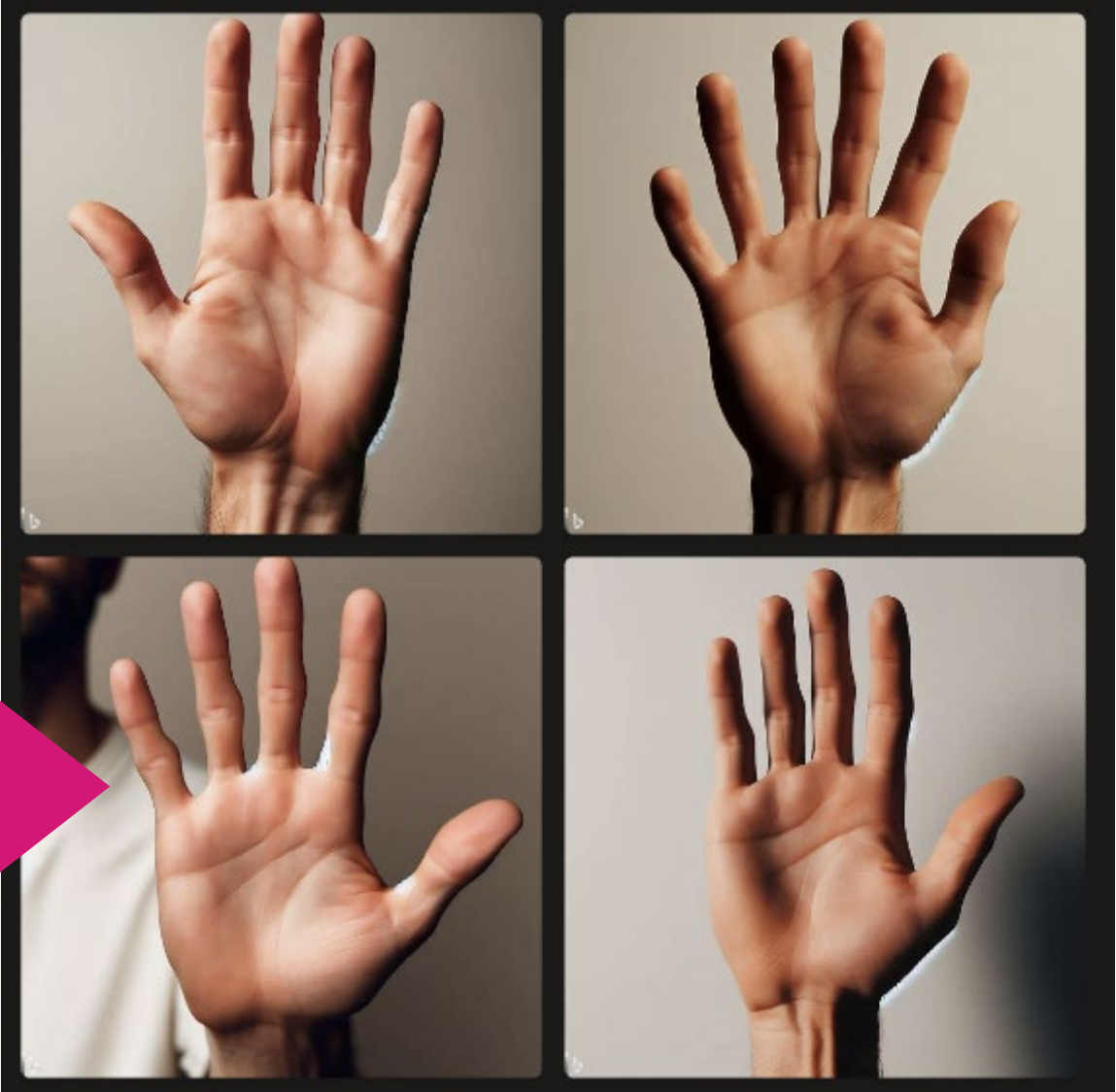
Trump, however, was in his own world, pointing at each dish like a general inspecting a parade.

"These soup dumplings," he said. "They're incredible. So much soup. The best soup. Other places, you get barely any soup. But these—these really know how to do dumplings."





Photo of a hand with exactly four fingers



Not a brain like ours...

- GenAI is not a (full) brain.
 - **Missing System 2!** The declarative learning and reasoning
- It is great at assembling and ordering information – sometimes “too eager” to help.
 - A fantastic **story-teller** from vast previously seen text.
- No grounding on "**truth**" and "**causality**" — a fiction machine
- **Overreliance** creates dependency of use
 - Impacts our System 2 development



Prompting strategies to support delivery of the mathematics curriculum

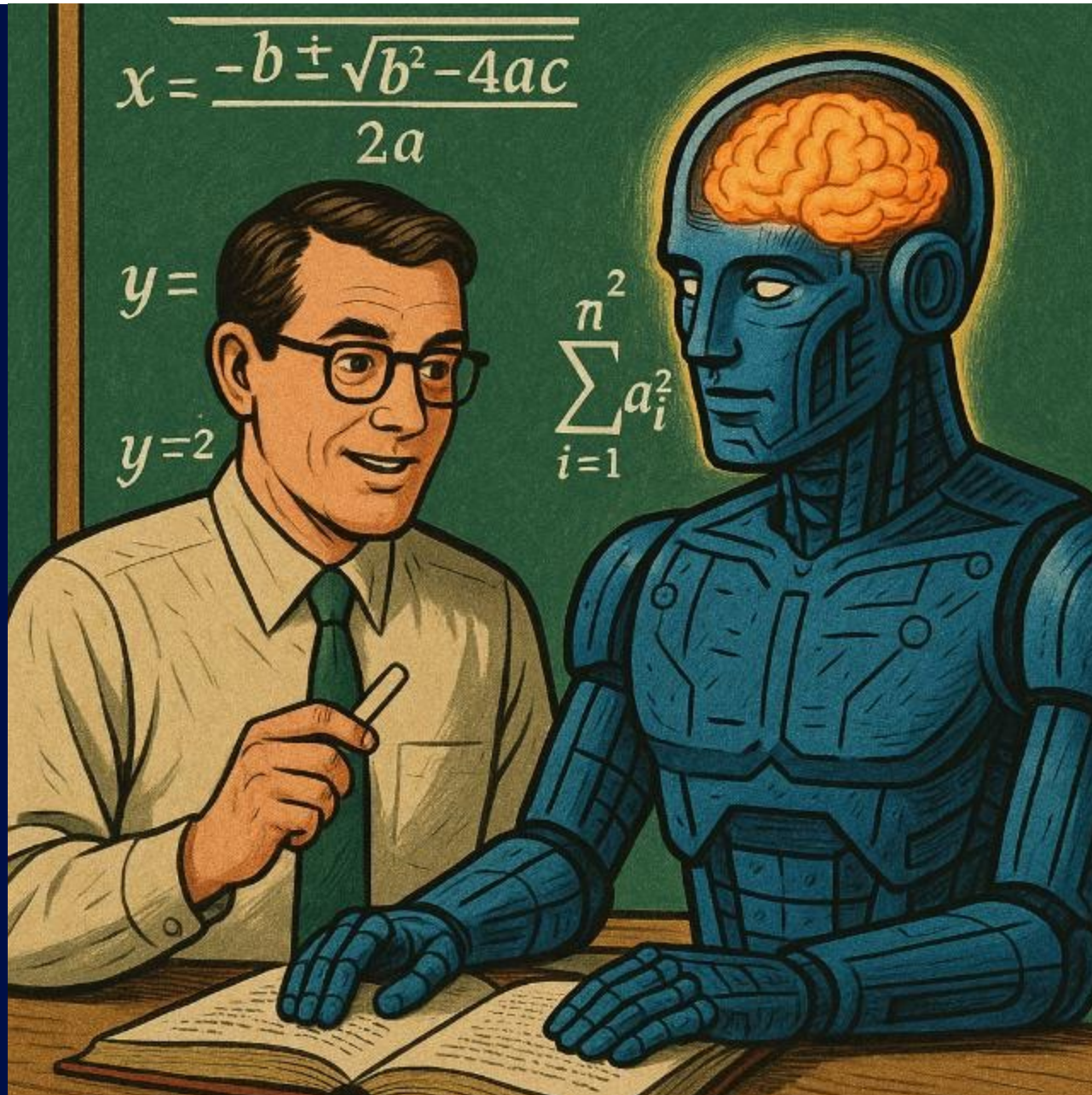
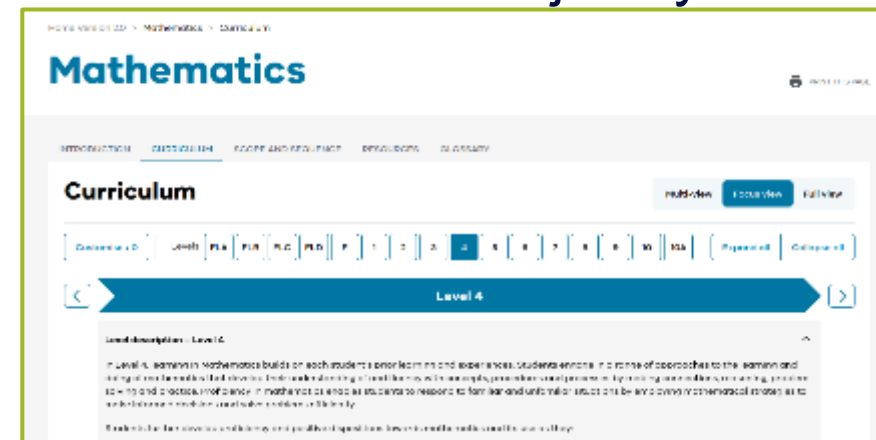


Image created using ChatGPT
You are an artist. Make an image that shows artificial intelligence working alongside a mathematics teacher.

Today's focus: Fractions

- **Victorian Curriculum context:**

- find equivalent representations of fractions using related denominators and make connections between fractions and decimal notation (VC2M4N03)
- compare and order common unit fractions with the same and related denominators, including mixed numerals, applying knowledge of factors and multiples; represent these fractions on a number line (VC2M5N03)
- apply knowledge of equivalence to compare, order and represent common fractions, including halves, thirds and quarters, on the same number line and justify their order (VC2M6N03)



Potential uses for GenAI

(Furze,

2024)

1. **Planning & Reflection:**

Developing lesson plans, resources, etc.

2. **Refreshing:**

Update resources, formatting, file types, etc.

3. **Improvising:**

Developing ideas, considering different approaches, etc.

4. **Personalising:**

Modify resources for particular students, create differentiated activities, etc.

5. **Collaborating:**

Summarise notes from meetings, convert handwritten notes to typed, etc.

6. **Communicating:**

Draft emails, report comments, feedback, etc.

Teacher expertise in the age of AI

Expert teaching

- *“It is what one needs to know, and the skills one needs to command, in order to make and justify the many different kinds of decisions of which teaching is constituted”* (Alexander, 2008, p. 47)
- Characterised by careful management of students and of ideas within classroom discourse (Shulman, 1987)

Pedagogical practices

- Metaphorical description of “deep pool” recognises challenge of capturing classroom practices (Alexander, 2015, p. 253)
- Teachers develop sophisticated practices that represent the accumulated ‘wisdom’ of their professional experiences in the classroom (Shulman, 1987)

GenAI and teacher expertise *

In contrast,

Expected practices evident in AI generated lesson plans will be drawn from existing text-based resources and will be detached from any experiential learning

Consequently,

There may be a disconnect between the pedagogical practices of AI and the pedagogical practices of an experienced classroom teacher

About quality prompting

What is important in framing a prompt for ChatGPT?

Framing a good prompt for ChatGPT is all about clarity, context, and specificity. Here are the key things that matter:

1. **Be Clear and Direct:** Use straightforward language and avoid vague or overly broad questions. The clearer you are, the better the response.
2. **Give Context:** Include any relevant background information to help ChatGPT understand what you need. For example, if you're writing an email, tell it who it's for and why.
3. **Define the Goal:** Say what you want—do you need a summary, an explanation, a creative story, code, or ideas?
4. **Specify Format (if needed):** If you want the answer in a list, table, or specific tone (formal, friendly, etc.), mention that.
5. **Ask for What You Want, Not Just What You Don't Want:** It's more effective to say, *"Write a 3-sentence summary in casual tone"* than *"Don't make it too long or too formal."*

Want an example of how to reframe a vague prompt into a better one?

About quality prompting (cont.)

Want to try reframing one of your own prompts? I can help you tweak it.

What is important about comparing size of fractions? please help reframe it.

Sure! Here's a clearer and more effective version of your prompt:

Original Prompt:

"What is important about comparing size of fractions?"

Reframed Prompt:

"Can you explain the key concepts students need to understand when comparing the size of fractions, using simple examples?"

Why it's better:

- Specifies the purpose (*to explain concepts*)
- Mentions the audience implicitly (*students*)
- Asks for examples (*makes it more practical*)

Would you like it to be even more tailored, like for a certain grade level or with visuals?

Show three different representations for comparing fractions suitable for Year 5 student.

Here are **three different visual and conceptual representations** for comparing fractions, suitable for **Year 5 students**:

1. Fraction Strips or Bars

Description: Use colored strips or bars of the same length divided into equal parts.

Example:

Compare $\frac{3}{4}$ and $\frac{2}{3}$

Show two bars of equal length:

- One divided into 4 parts, with 3 shaded (for $\frac{3}{4}$)
- One divided into 3 parts, with 2 shaded (for $\frac{2}{3}$)

Why it's useful: Helps students visually see which fraction is larger by comparing the shaded areas.

2. Number Line

Description: Plot fractions on a number line between 0 and 1.

Example:

Mark $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{2}{3}$ on the same number line.

Why it's useful: Shows the position of fractions relative to each other. Makes abstract fractions more concrete.

3. Using Same Denominator (Equivalent Fractions)

Description: Convert fractions to have the same denominator, then compare numerators.

Example:

Compare $\frac{3}{4}$ and $\frac{2}{3}$

Find common denominator (12):

- $\frac{3}{4} = \frac{9}{12}$
 - $\frac{2}{3} = \frac{8}{12}$
- So, $\frac{3}{4} > \frac{2}{3}$

Why it's useful: Reinforces fraction equivalence and comparison using mathematical reasoning.

Compare the benefits of different visual representations for comparing fractions.

Here's a comparison of the **benefits** of different visual representations for comparing fractions:

1. Fraction Strips (or Bars)

Benefits:

- **Concrete and intuitive:** Helps students clearly see how much of a whole each fraction represents.
- **Easy to manipulate:** Can be used in hands-on activities.
- **Supports part-whole understanding:** Reinforces the idea that fractions are parts of a whole.

Best for:

- Beginners or visual learners.
- Comparing fractions with the same denominator or similar sizes.

2. Number Line

Benefits:

- **Highlights magnitude:** Shows fractions in order and their distance from zero.
- **Reinforces equivalence:** Helps identify equivalent fractions on the same spot.
- **Bridges to decimals:** Supports transition to number sense and placing fractions on a scale.

Best for:

- Showing relationships between multiple fractions.
- Preparing for operations involving fractions.

3. Same Denominator (Equivalent Fractions)

Benefits:

- **Promotes mathematical reasoning:** Encourages calculation and comparison through numerators.
- **Scales well:** Works even for less obvious comparisons.
- **Builds algebraic thinking:** Prepares students for formal methods of comparing unlike fractions.

Best for:

- Developing fluency and efficiency.
- Working with more abstract comparisons or larger denominators.

Summary Table:

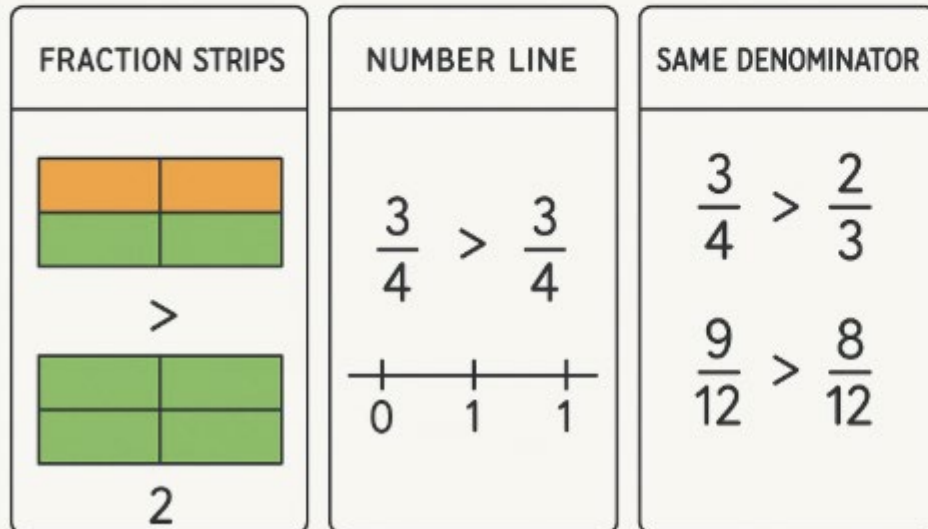
Representation	Best For	Key Benefit
Fraction Strips	Visual comparison of part-whole	Concrete and intuitive visualization
Number Line	Understanding size/order	Emphasizes magnitude and spacing
Same Denominator	Formal comparison and calculations	Supports algebraic thinking

Each method supports a different aspect of understanding, and **using them together** gives a more complete picture of how fractions work.

Would you like visual diagrams for these examples?

Visual examples please.

Image created



Is this nonsense?

(could be shown to students as example of silly responses)

Here's a short 6-item quiz on comparing fractions, suitable for Year 5 students:

Fraction Comparison Quiz

Instructions: Choose the correct answer in each question.

1. Which is greater?

- A. $1/2$
- B. $2/3$
- C. They are equal

3. Which fraction is closest to 1?

- A. $7/8$
- B. $2/3$
- C. $3/4$

5. Arrange these from smallest to largest:

- $1/4, 1/2, 1/3$
- A. $1/2, 1/3, 1/4$
 - B. $1/4, 1/3, 1/2$
 - C. $1/4, 1/2, 1/3$

2. Which is smaller?

- A. $3/4$
- B. $2/5$
- C. $4/5$

4. Which of these fractions is the largest?

- A. $4/6$
- B. $2/3$
- C. $3/5$

6. True or False: $5/6 > 6/7$

- A. True
- B. False

- How might you need to edit the quiz for your class?
- Are the questions produced at the right level for your class?
- Variety, questions you have not thought about.

Here is a more challenging 6-item fraction comparison quiz for advanced Year 5 students:

Challenging Fraction Comparison Quiz

Instructions: Choose the correct answer for each question.

1. Which is greater?

- A. $\frac{5}{8}$
- B. $\frac{2}{3}$
- C. $\frac{7}{12}$

3. Which of these fractions is closest to $\frac{1}{2}$?

- A. $\frac{5}{8}$
- B. $\frac{4}{9}$
- C. $\frac{6}{13}$

5. Arrange these fractions from greatest to smallest:

- $\frac{5}{6}, \frac{4}{5}, \frac{7}{8}$
- A. $\frac{4}{5}, \frac{5}{6}, \frac{7}{8}$
- B. $\frac{7}{8}, \frac{5}{6}, \frac{4}{5}$
- C. $\frac{5}{6}, \frac{7}{8}, \frac{4}{5}$

2. Which is smaller?

- A. $\frac{11}{15}$
- B. $\frac{3}{4}$
- C. $\frac{5}{6}$

4. Which is greater: $\frac{7}{10}$ or $\frac{3}{4}$?

- A. $\frac{7}{10}$
- B. $\frac{3}{4}$
- C. They are equal

6. True or False: $\frac{9}{12} = \frac{3}{4}$

- A. True
- B. False

- What makes this quiz more difficult?
- (larger numbers)
- Q4 includes redundant statement
- Q3 is good!

Give two questions similar to the above asking for students to provide a short explanation.

Here are two **open-ended fraction comparison questions** that ask students to provide a **short explanation**:

1.

Which is greater: $\frac{5}{8}$ or $\frac{2}{3}$?

Explain how you know using a method of your choice (e.g., number line, equivalent fractions, or visual model).

2.

Is $\frac{7}{10}$ greater than $\frac{3}{4}$?

Explain your reasoning. Show how you compared the two fractions.

These types of questions help assess students' **conceptual understanding** and ability to **justify** their answers with reasoning. Let me know if you'd like sample answers.

Would you like me to make a printable mini-assessment or worksheet for this?

Mini assessment worksheet.

Here's your mini assessment worksheet for Grade 5 on comparing fractions:

[Download Comparing Fractions Mini Assessment \(DOCX\)](#)

Let me know if you want an answer key or a version with visuals! [\[-\]](#)

How could this be improved?

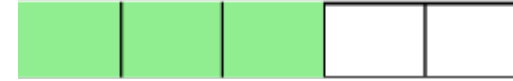
Mark-up your paper copy with your adaptation.

Answer Key – Comparing Fractions Diagram Quiz (Grade 5)

1. Which fraction is greater? (Compare the bars)



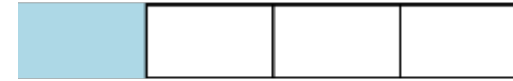
$2/5$



$3/5$

Correct Answer: $3/5$ is greater.

2. Which fraction is smaller? (Compare the bars)



$1/4$



$2/4$

Correct Answer: $2/4$ is greater.

3. Which is closer to 1 whole?



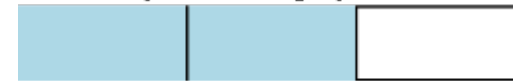
$5/6$



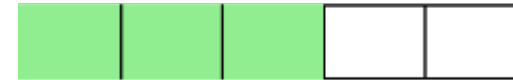
$6/8$

Correct Answer: $5/6$ is greater.

4. Which represents a larger portion?



$2/3$

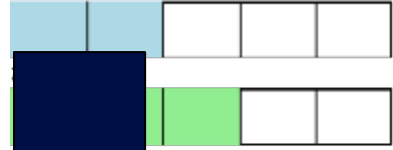


$3/5$

Correct Answer: $2/3$ is greater.

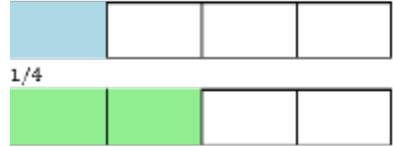
Answer Key – Comparing Fractions Diagram Quiz (Grade 5)

1. Which fraction is greater? (Compare the bars)



Correct Answer: $3/5$ is greater.

2. Which fraction is smaller? (Compare the bars)

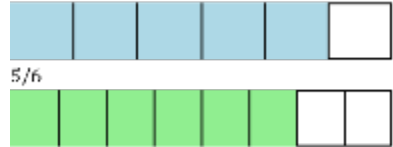


$1/4$

$2/4$

Correct Answer: $2/4$ is greater.

3. Which is closer to 1 whole?



$5/6$

$6/8$

Correct Answer: $5/6$ is greater.

4. Which represents a larger portion?



$2/3$

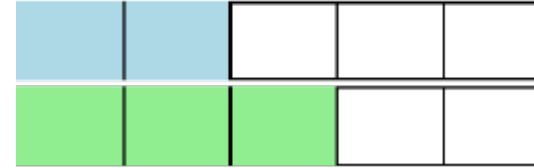
$3/5$

Correct Answer: $2/3$ is greater.



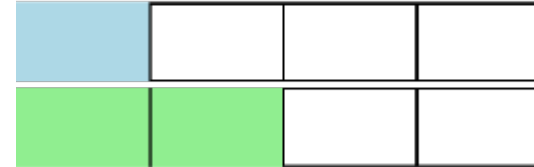
Edited Answer Key – Comparing Fractions Diagram Quiz (Grade 5/6)

1. Which fractions are represented below? Which is greater?



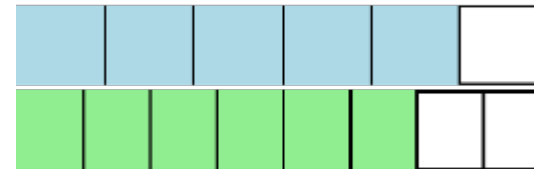
Correct Answer: $3/5$ is greater.

2. Which fractions are represented below? Which is smaller?



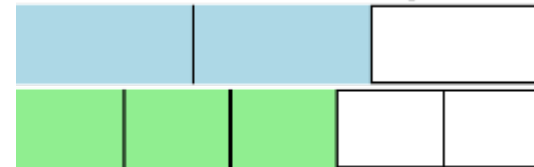
Correct Answer: $1/4$ is smaller.

3. Which fraction is closer to 1 whole?



Correct Answer: $5/6$ is closer to 1 whole.

4. Which fraction shown below is greater?



Correct Answer: $2/3$ is greater.

Why is this a better quiz?

Find good metaphors...

provide three metaphors about variables in algebra that is appropriate for year 6 students

Here are three simple, year-6-friendly metaphors for variables in algebra:

1. A variable is a mystery box.

It's a little box with something inside, but you don't know the number until someone tells you or you figure it out.

2. A variable is a placeholder name-tag.

It's like writing a name on a chair to save the seat. The letter (like x) saves a place for whatever number will sit there later.

3. A variable is a blank in a puzzle.

Just like a blank space in a crossword or number puzzle, the variable stands for the number you need to find to make everything fit.

If you want, I can also give examples using these metaphors!

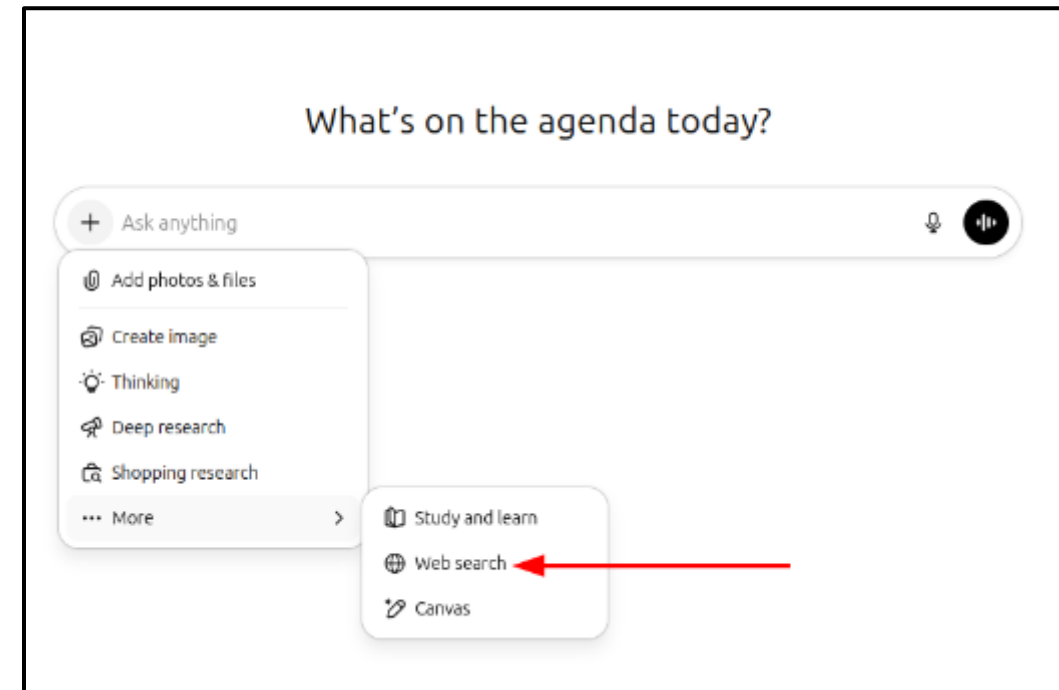
Using 'web search' facility about fraction misconceptions

Tell me about fraction misconceptions

Here's a summary of what research (and practice) tells us about **fraction misconceptions** — the kinds of misunderstandings students often have, how they show up, why they happen, and some implications for teaching. If you like, I can also pull together a list of diagnostic questions or tasks to unearth these misconceptions in the classroom.

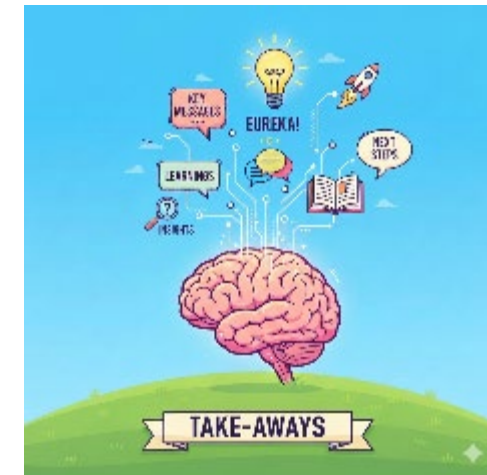
What are fraction misconceptions?

A *misconception* is a stable, incorrect or incomplete understanding or belief about a mathematical concept. With fractions, many students hold systematic misconceptions that interfere with their ability to work with fractions confidently and correctly.



Key take-aways

1. GenAI can be a useful 'teaching assistant' with its capacity to draw upon a range of examples that a single teacher may not consider or have time to locate, but.....
 - Carefully considered prompts are needed
 - Outputs need to be carefully reviewed and refined before being used in the classroom
 - GenAI responses are not perfect, and re-prompting may be needed
2. **Teacher expertise is needed to...**
 - Decide whether GenAI response is **appropriate** for your students
 - Check the mathematical **accuracy** of GenAI responses
 - Ask for **further clarification** of the GenAI responses
 - Ask for **simplifications** and **extensions** where necessary



Gemini img

Key take-aways

- At the end of the day GenAI is just making decisions based on statistics and likelihood wrt (lots of) previously seen text
- So, it's very important to understand that it can give lots of false and/or unevaluated information as well -
- GenAI/LLM is just a "story-teller" or a "fiction machine"
- Teachers therefore must be careful about the quality and specificity of their prompts
- Teachers also must have enough understanding/competence of the context to assess the accuracy of the output from GenAI

AI Smart Kids (and thinking teachers too)



- This important message for students
- Is also an important message for teachers
- Copying and pasting is not teaching
- Teaching is about:
 - Thinking first
 - Asking questions
- AI can help create informed critical knowledge



Relevant Resources

Cameron, S., & Mesiti, C. (2025). *Navigating AI in Mathematics Education—Insights for all educators* [Podcast].

<https://education.unimelb.edu.au/talking-teaching>

Cameron, S., & Mesiti, C. (2024). What Kind of Mathematics Teacher is ChatGPT? Identifying the Pedagogical Practices Preferred by Generative AI Tools When Preparing Lesson Plans. In J. Višňovská, E. Ross, & S. Getenet (Eds.), *Surfing the waves of mathematics education. Proceedings of the 46th annual conference of the Mathematics Education Research Group of Australasia*. MERGA.

Commonwealth of Australia (2023). *Australian Framework for Generative Artificial Intelligence (AI) in Schools*. Commonwealth of Australia.

<https://www.education.gov.au/download/17416/australian-framework-generative-artificial-intelligence-ai-schools/35400/australian-framework-generative-ai-schools/pdf>

Furze, L. (n.d.). *Leon Furze*. <https://leonfurze.com/blog/>

Furze, L. (2024). *Practical AI strategies*. Amba Press.

Harvard University Information Technology. (n.d.). Getting started with prompts for text-based Generative AI tools. <https://huit.harvard.edu/news/ai-prompts>

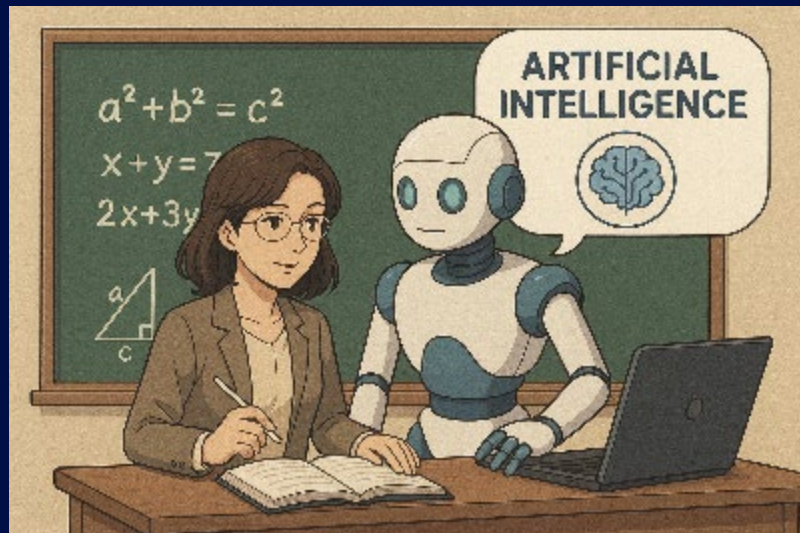
Lovell, O. (2025). Benjamin Riley on the Dangers of AI in Education. *Education Research Reading Room*. <https://www.ollielovell.com/benriley/>

Stephens, M. (2025). AI and the Curriculum: Preparing the next generation of teachers. <https://youtu.be/eX8svsMubvA?si=HPLGjNonEJPITV4r>

Thank you!

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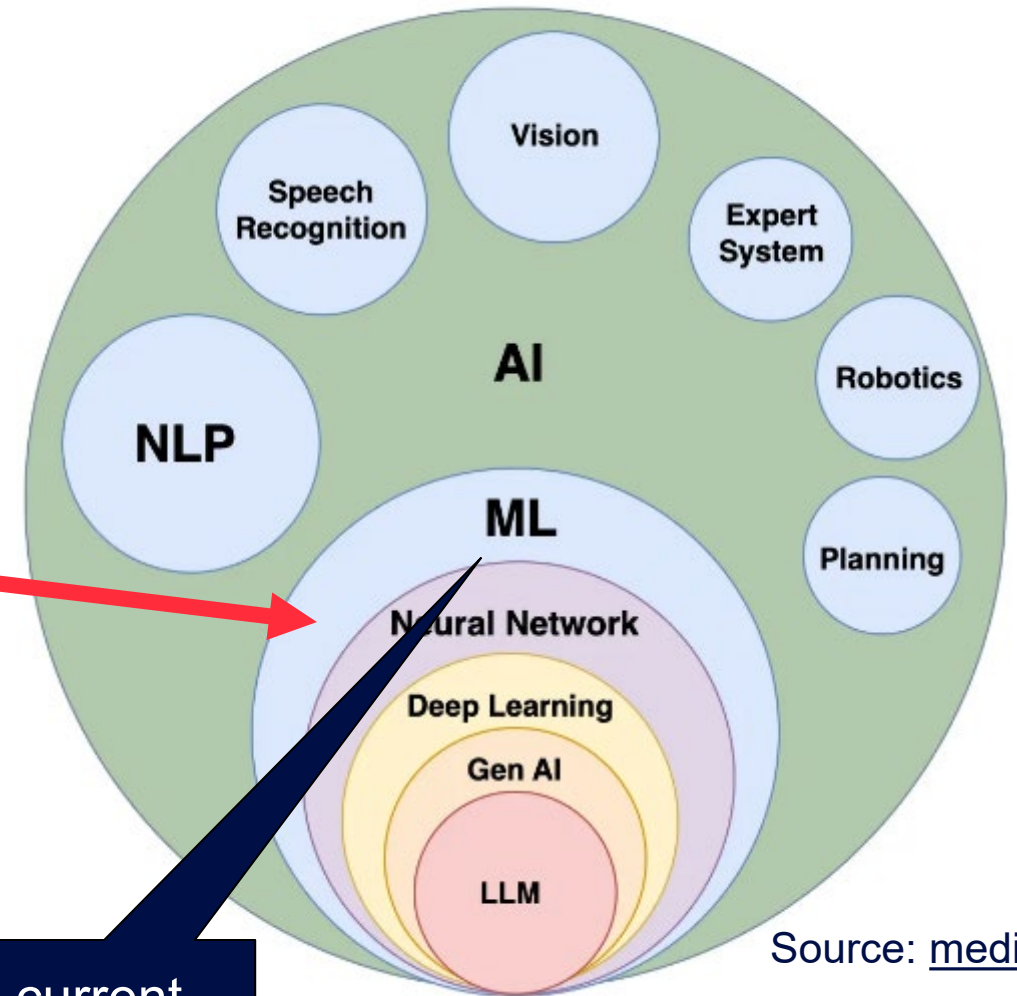
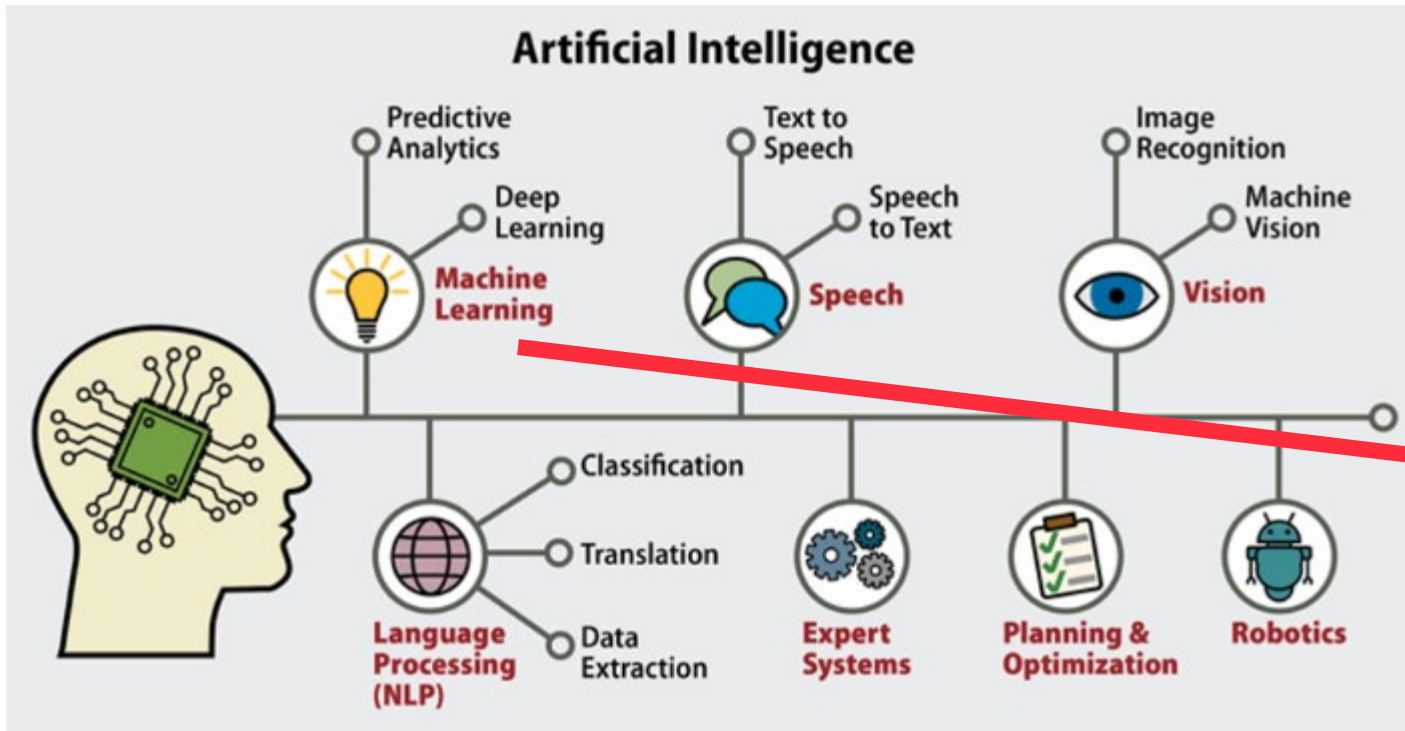
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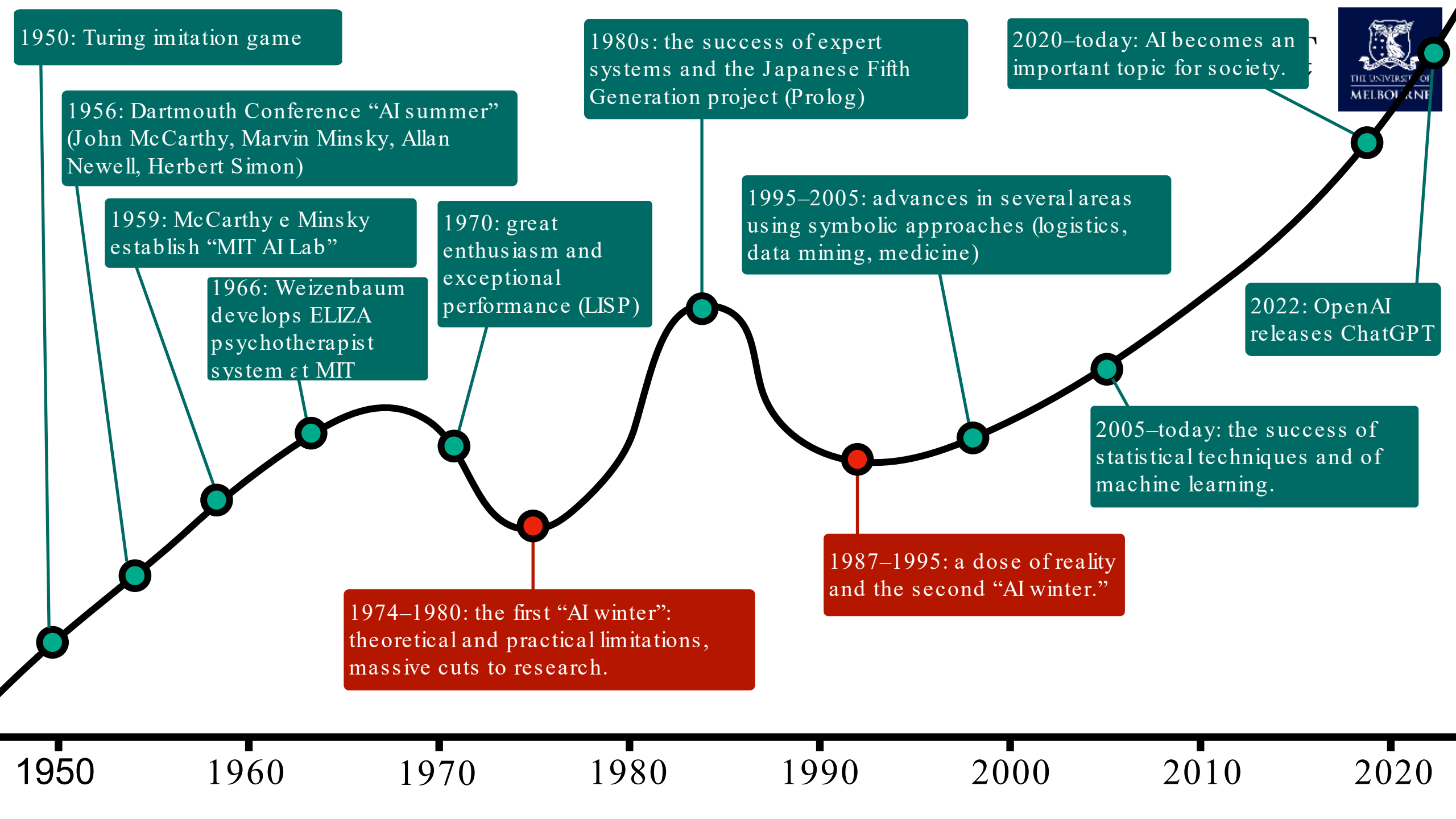
Appendix

The AI Diversity



A current "revolution"

Source: [medium](#)



1950: Turing imitation game

1956: Dartmouth Conference "AI summer" (John McCarthy, Marvin Minsky, Allan Newell, Herbert Simon)

1959: McCarthy and Minsky establish "MIT AI Lab"

1966: Weizenbaum develops ELIZA psychotherapist system at MIT

1970: great enthusiasm and exceptional performance (LISP)

1974-1980: the first "AI winter": theoretical and practical limitations, massive cuts to research.

1980s: the success of expert systems and the Japanese Fifth Generation project (Prolog)

1995-2005: advances in several areas using symbolic approaches (logistics, data mining, medicine)

1987-1995: a dose of reality and the second "AI winter."

2005-today: the success of statistical techniques and of machine learning.

2020-today: AI becomes an important topic for society.

2022: OpenAI releases ChatGPT



1950 1960 1970 1980 1990 2000 2010 2020

Any sufficiently advanced

TECHNOLOGY

is indistinguishable from

magic.

- Arthur C. Clarke

risk of trusting
the "magic"
without
questioning!!

We must
have some
(basic)
knowledge

What's the next word

In recess, the children went...

In recess, the children went **outside** ...

In recess, the children went outside **to** ...

In recess, the children went outside to **play** ...

In recess, the children went outside to play **in** ...

In recess, the children went outside to play **in the** ...

In recess, the children went outside to play **in the playground.**



What about the following continuations...

In recess, the children went outside...

In recess, the children went outside **banana** ... ?

In recess, the children went outside **recess** ... ?

In recess, the children went outside to play **quicklyly** ... ?



Generative AI and LLM: What do they do?

A way of learning:

$$P(\text{next word} \mid \text{context words})$$

In recess, the children went...

In recess, the children went **outside** ...

In recess, the children went outside **to** ...

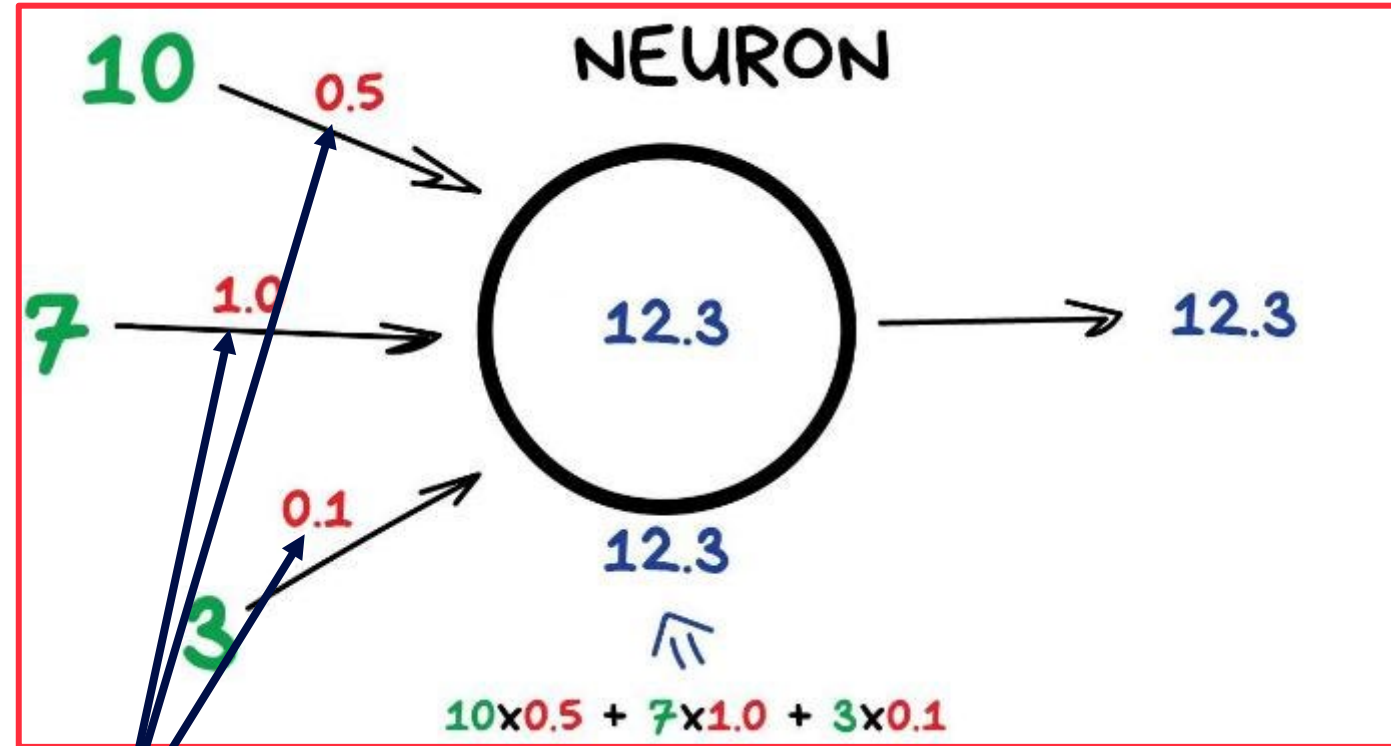
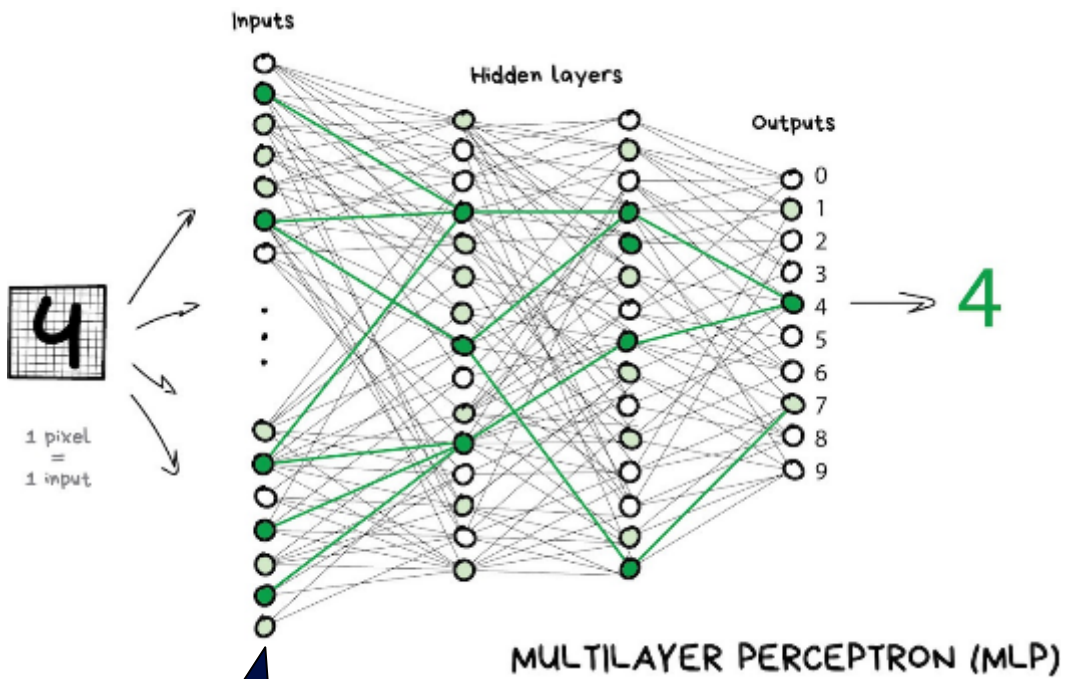
In recess, the children went outside to **play** ...

In recess, the children went outside to play **in** ...

In recess, the children went outside to play **in the** ...

In recess, the children went outside to play **in the playground.**

Neuron: linear combination of input values



$$x_1 n_1 + x_2 n_2 + \dots + x_{384} n_{384}$$

weight parameters to learn!

by training and testing on LOTS of known examples!!

Learning & Teaching in the era of AI (video)

Large Language Model

DECLARATIVE

AUTOMATIC

The diagram shows a profile of a human head with a brain. A yellow cartoon character is inside the brain, holding a blue chain. Red arrows point from the hippocampus to the basal ganglia and from the basal ganglia to the corpus callosum. The word 'DECLARATIVE' is written in blue on the left, and 'AUTOMATIC' is written in red on the right. The video shows a woman with glasses and a black jacket speaking and gesturing with her hands.