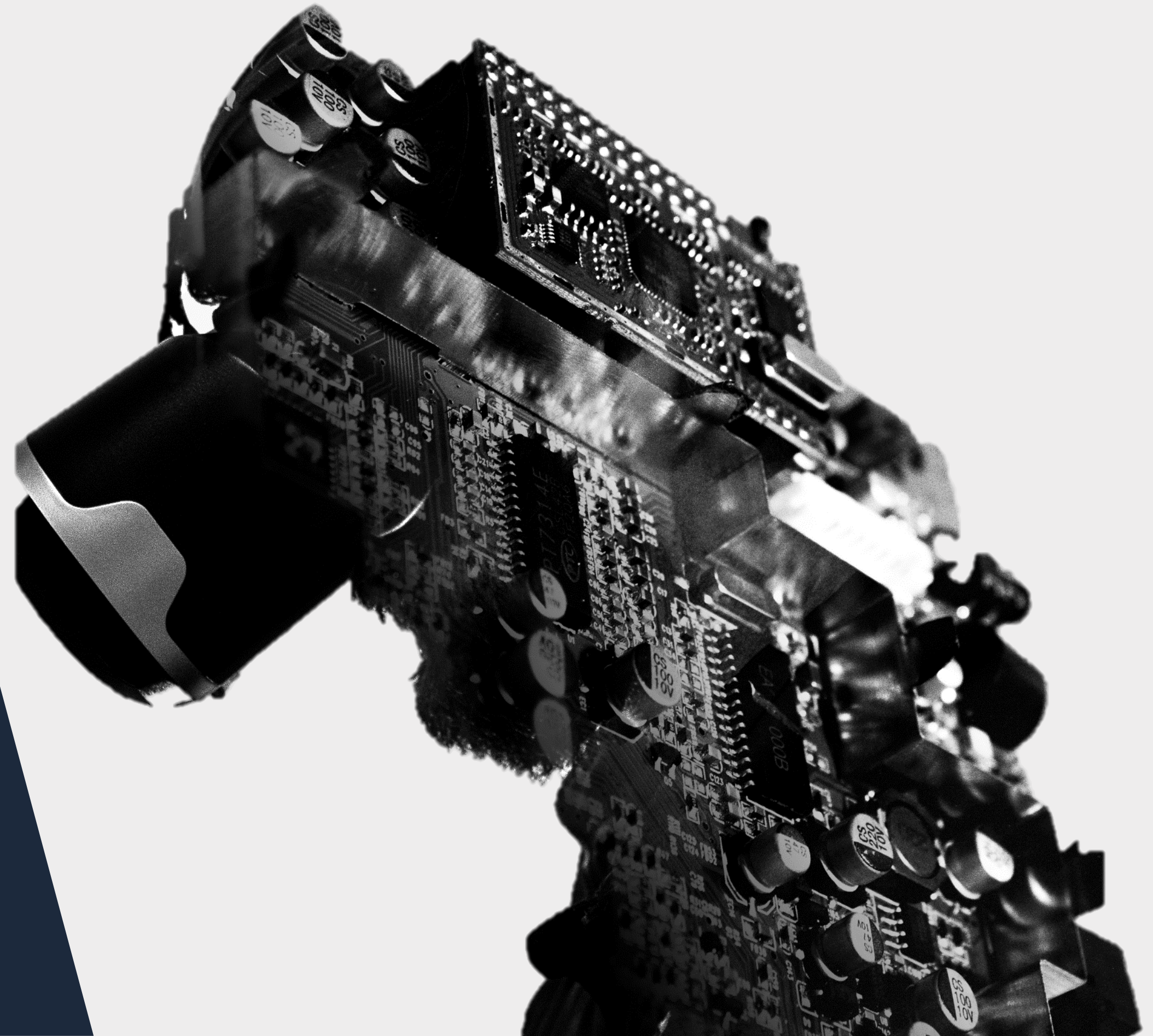


DEMYSTIFYING ARTIFICIAL INTELLIGENCE

Tim Miller

TIET-UQ Chair of Data Science, Professor of Artificial Intelligence
School of Electrical Engineering and Computer Science
The University of Queensland, Australia
E: timothy.miller@uq.edu.au
BSky: @tmiller_uq
W: <https://uqtmiller.github.io/>



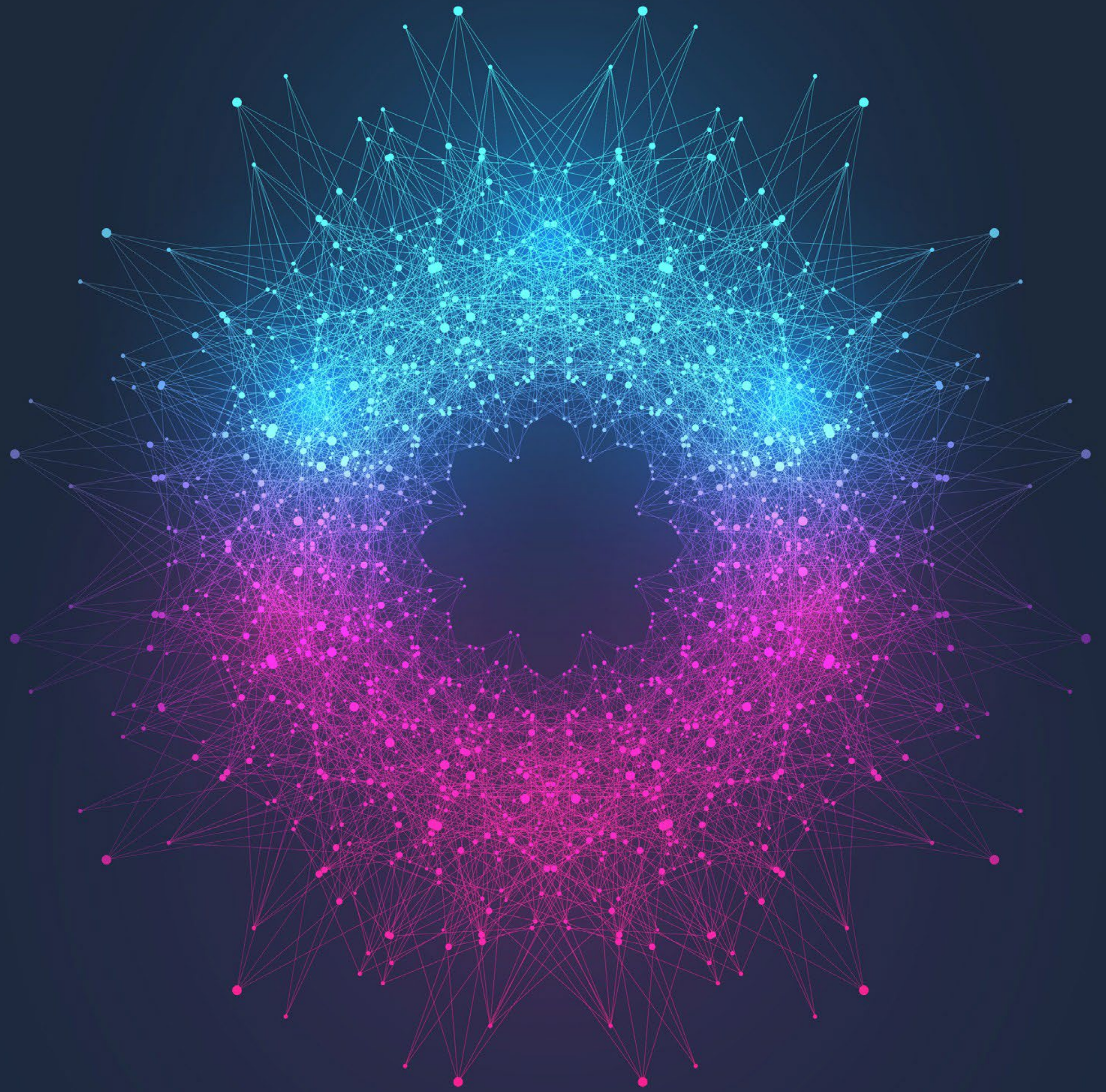
TALK OUTLINE

What is (modern) artificial intelligence?

How does it work?

What are the opportunities and risks of using it in education?

WHAT IS ARTIFICIAL INTELLIGENCE?



WHAT IS ARTIFICIAL INTELLIGENCE?



WHAT IS ARTIFICIAL INTELLIGENCE?

“To make computer programs that can solve problems and achieve goals in the world as well as humans”

JOHN MCCARTHY (1956)

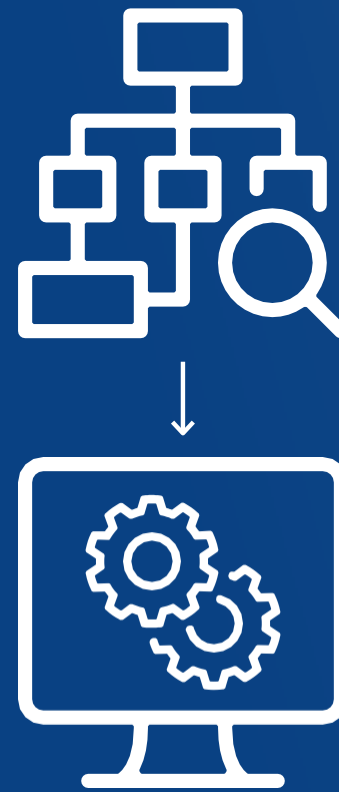
“Computer science is writing programs that can automatically solve problems.

Artificial intelligence is writing programs that can automatically write programs to automatically solve problems”

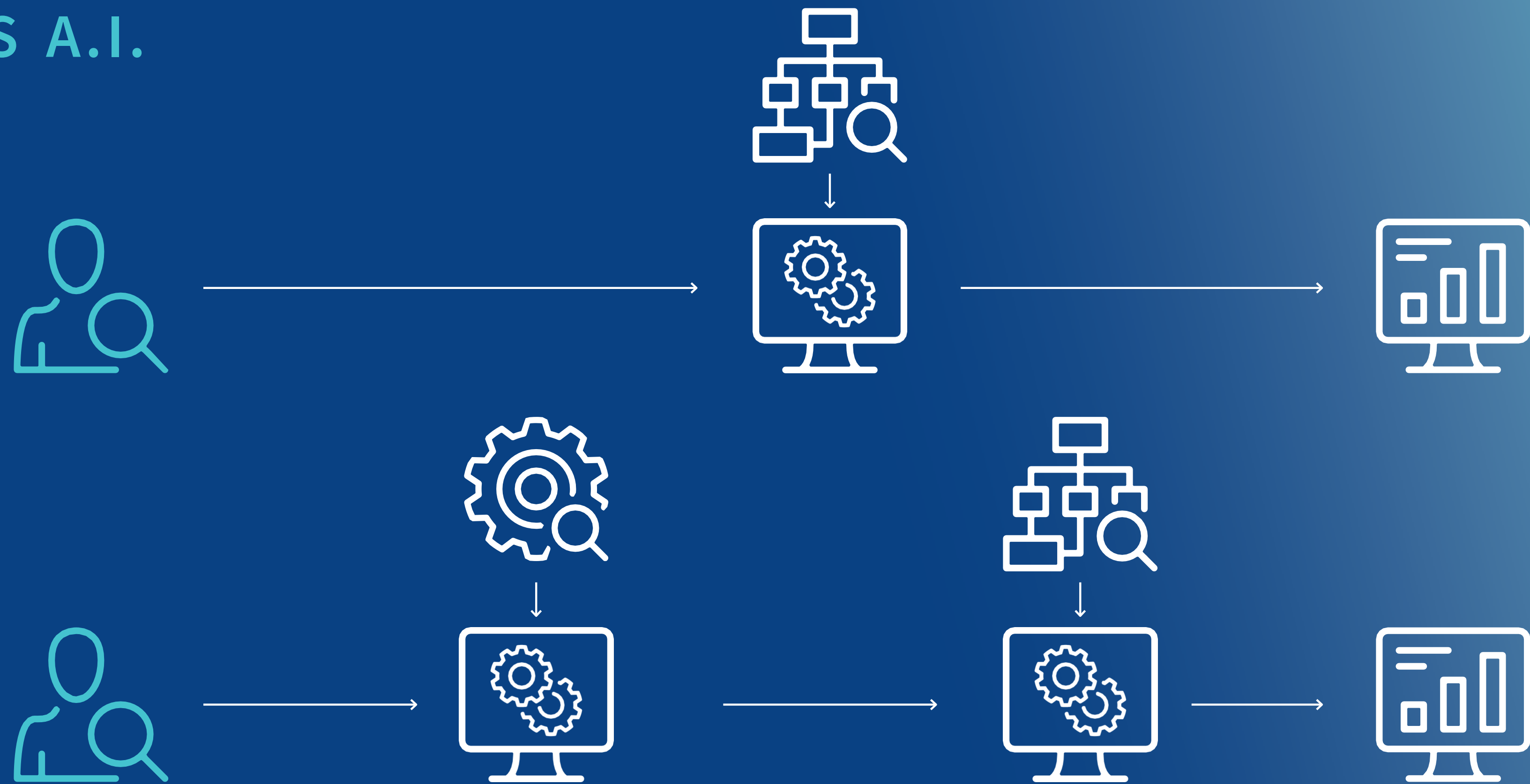
TIM MILLER (2024)



COMPUTER SCIENCE VS A.I.

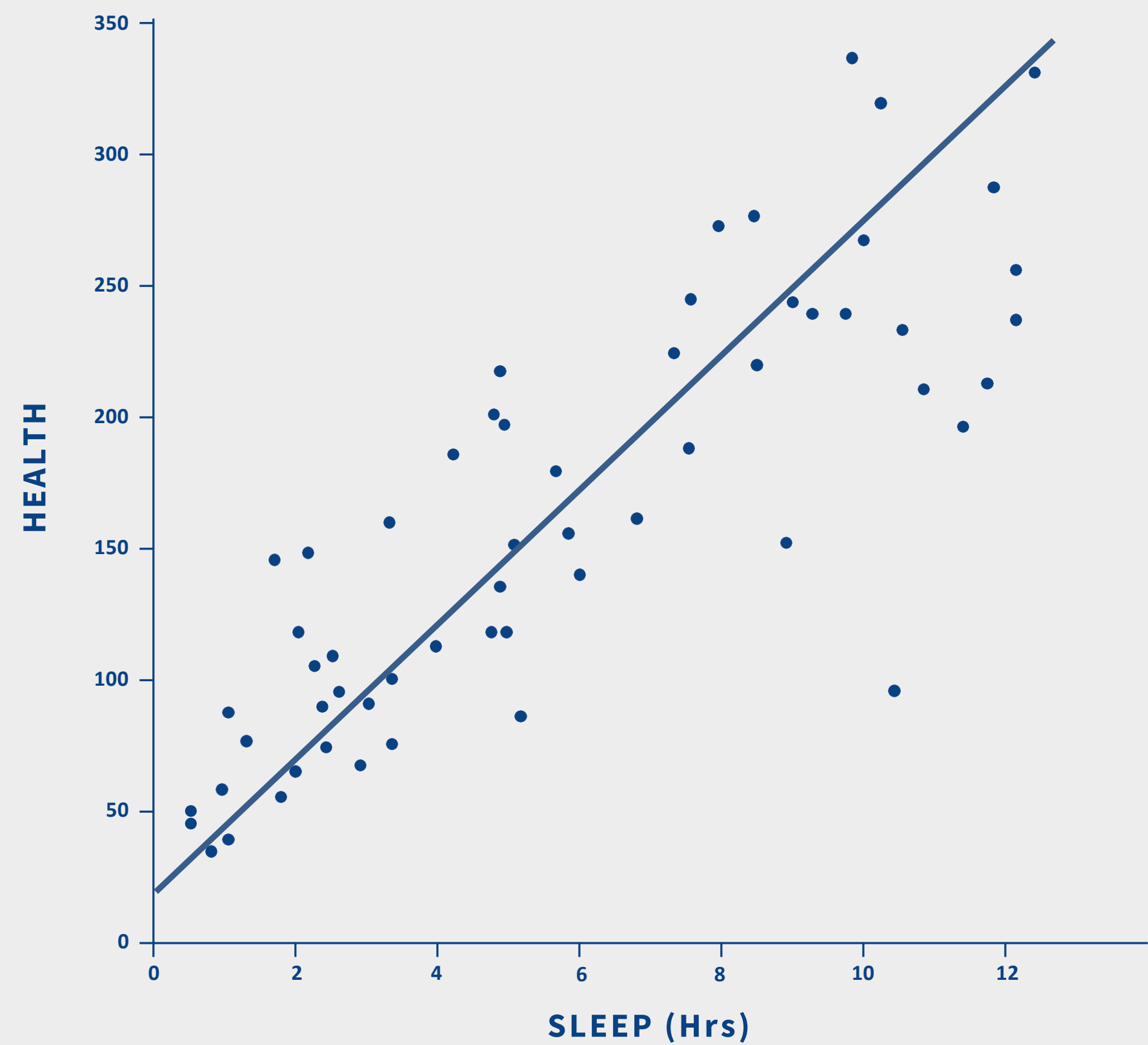


COMPUTER SCIENCE VS A.I.



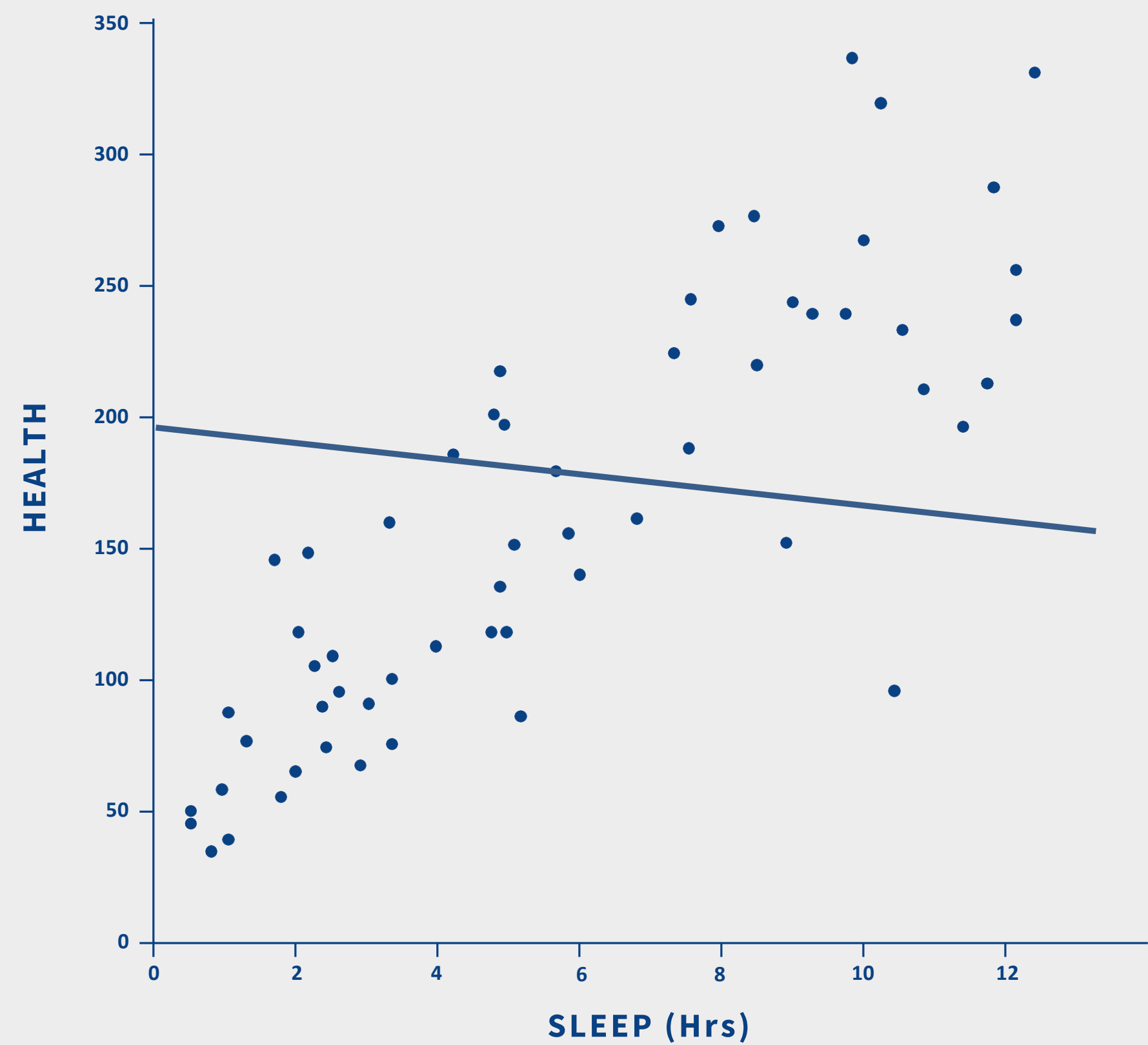
MACHINE LEARNING

$y = ax + b$



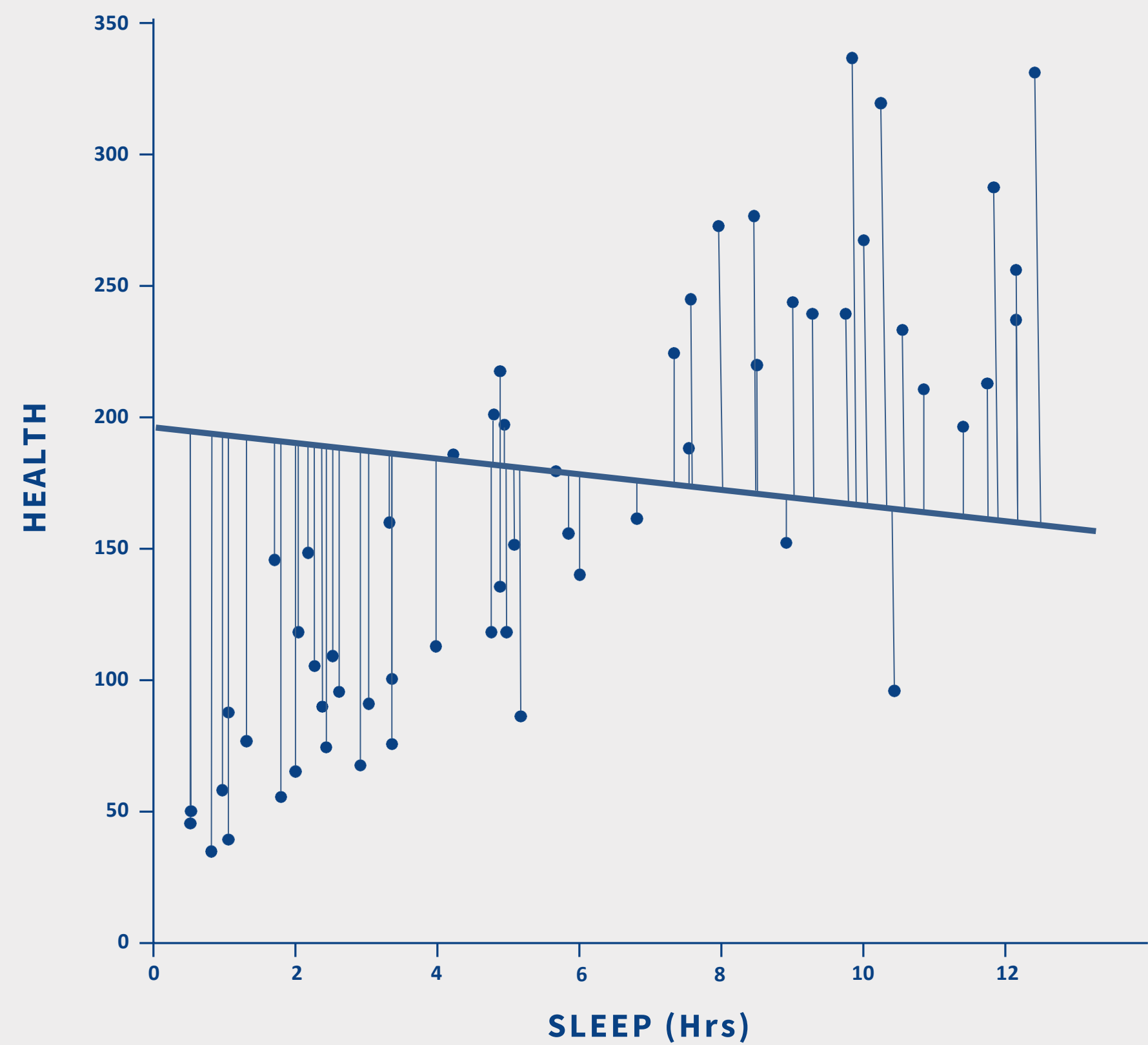
MACHINE LEARNING

$y = ax + b$



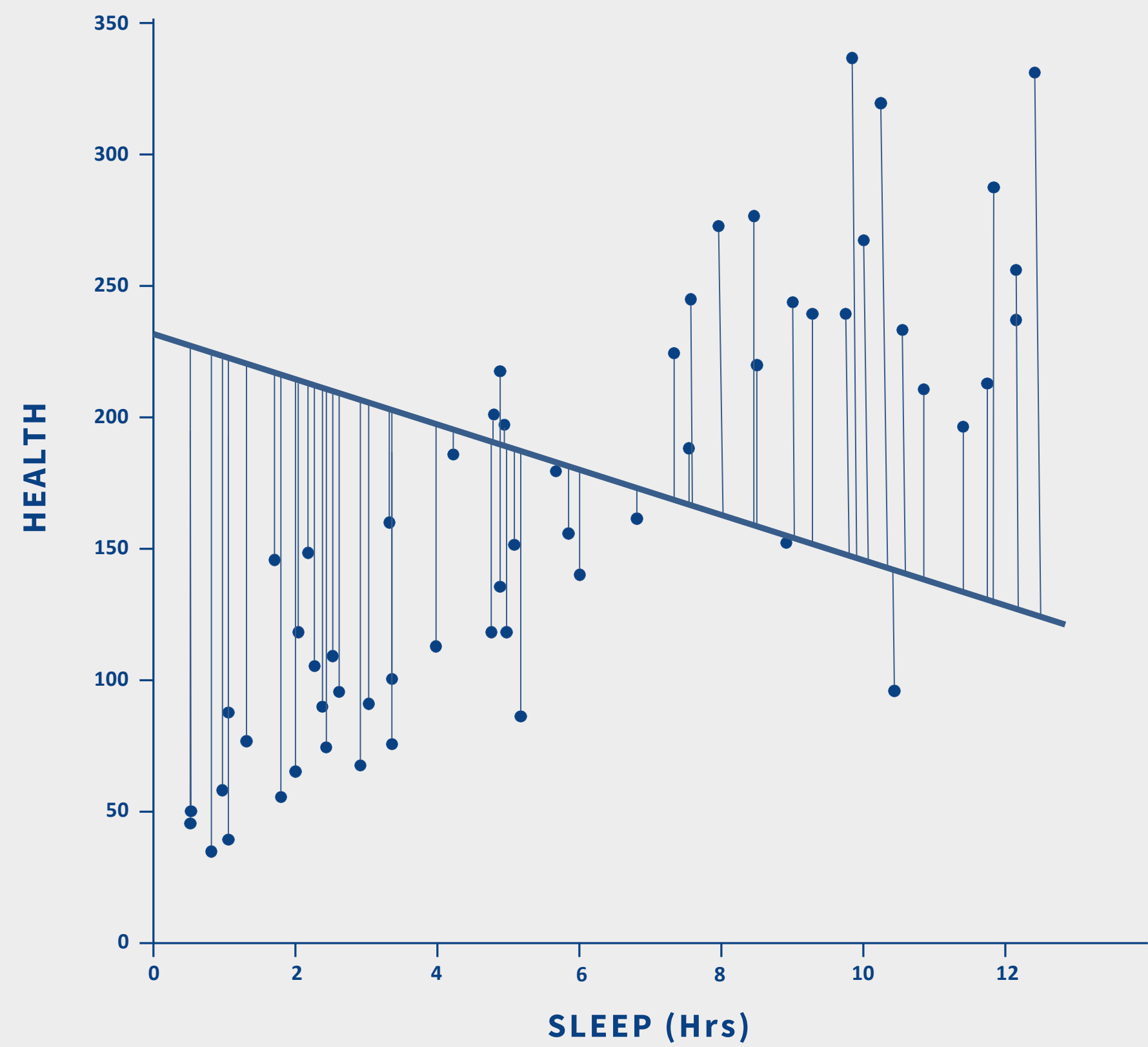
MACHINE LEARNING

$y = ax + b$



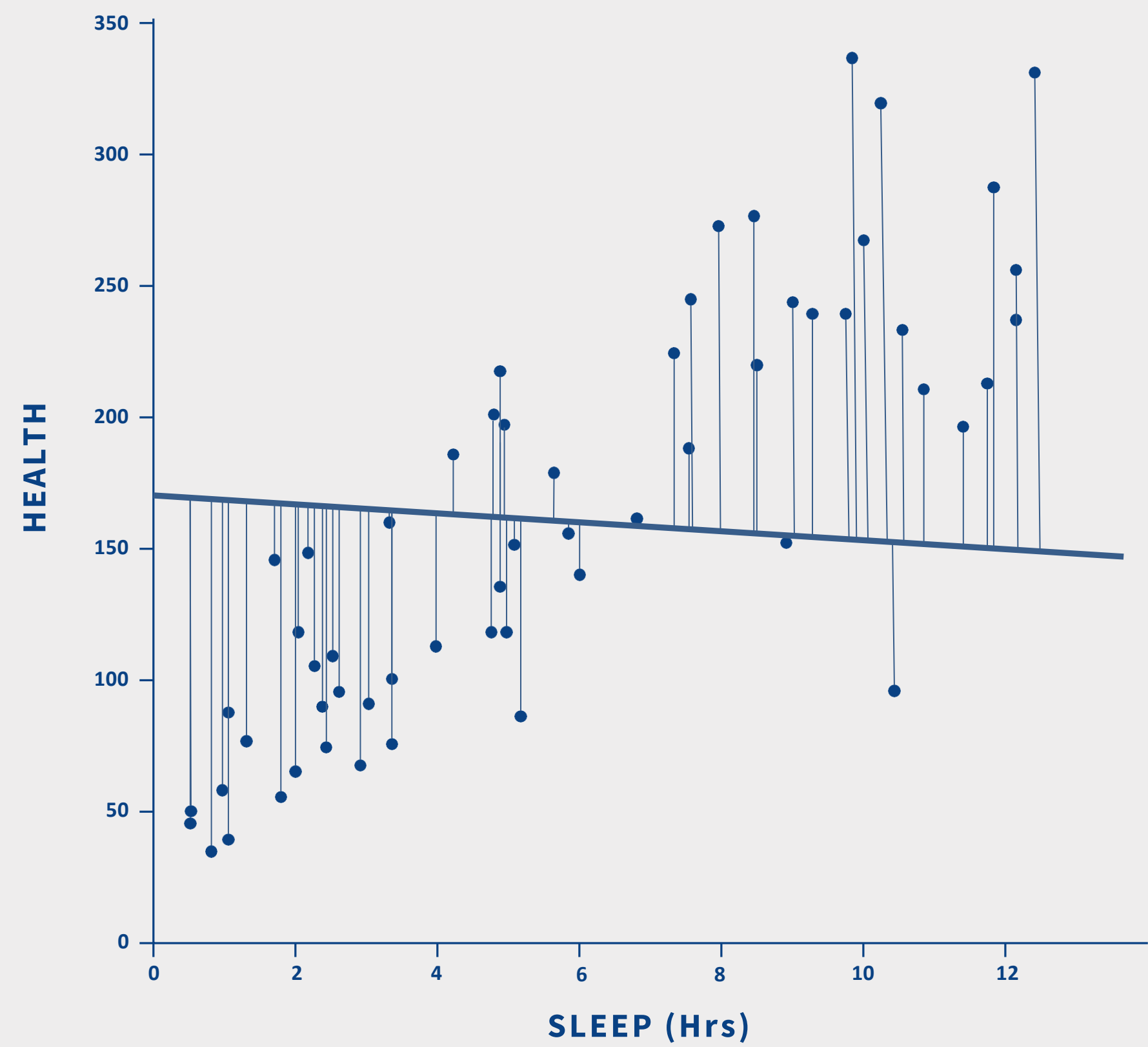
MACHINE LEARNING

$y = ax + b$



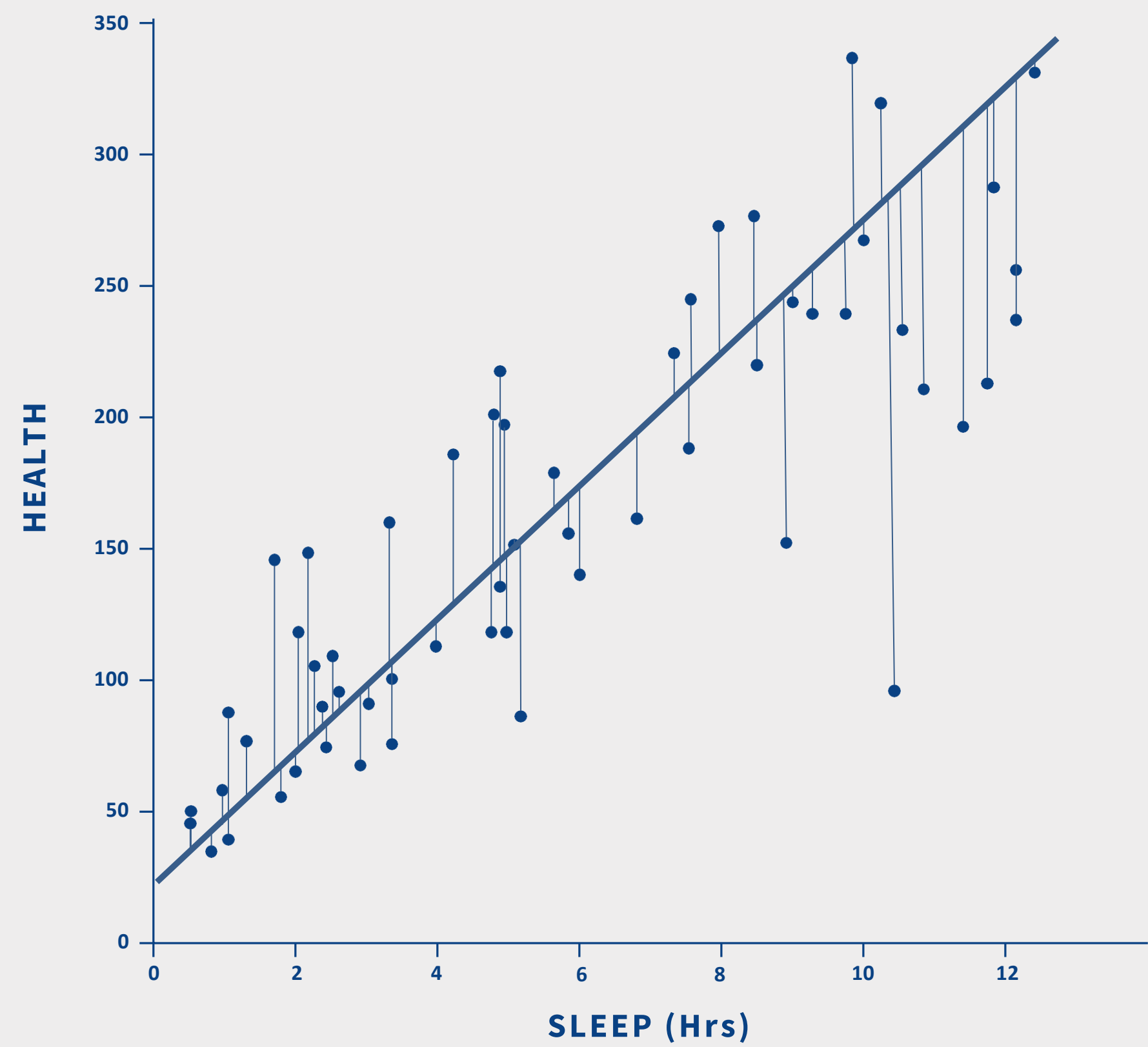
MACHINE LEARNING

$y = ax + b$

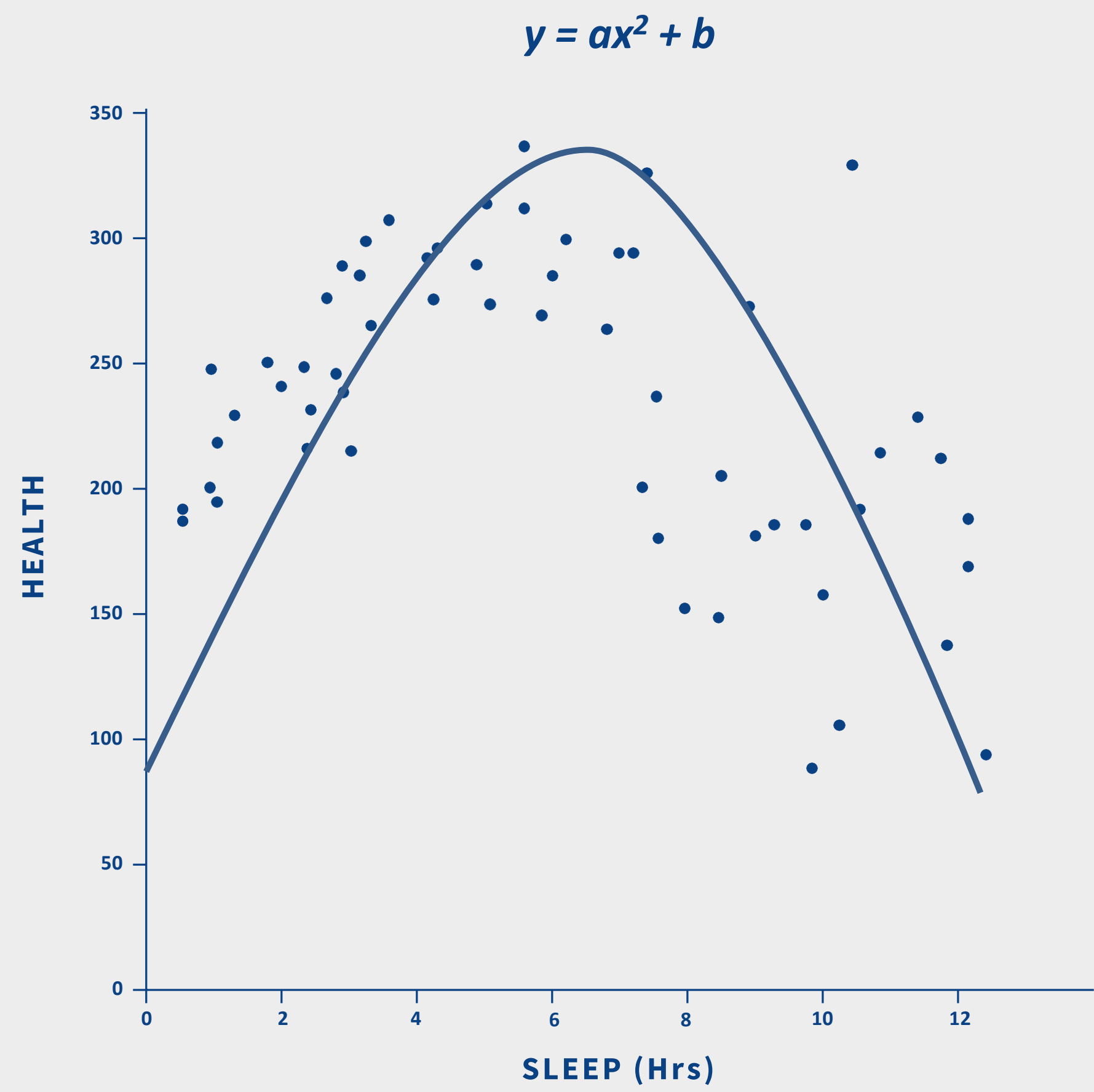


MACHINE LEARNING

$y = ax + b$

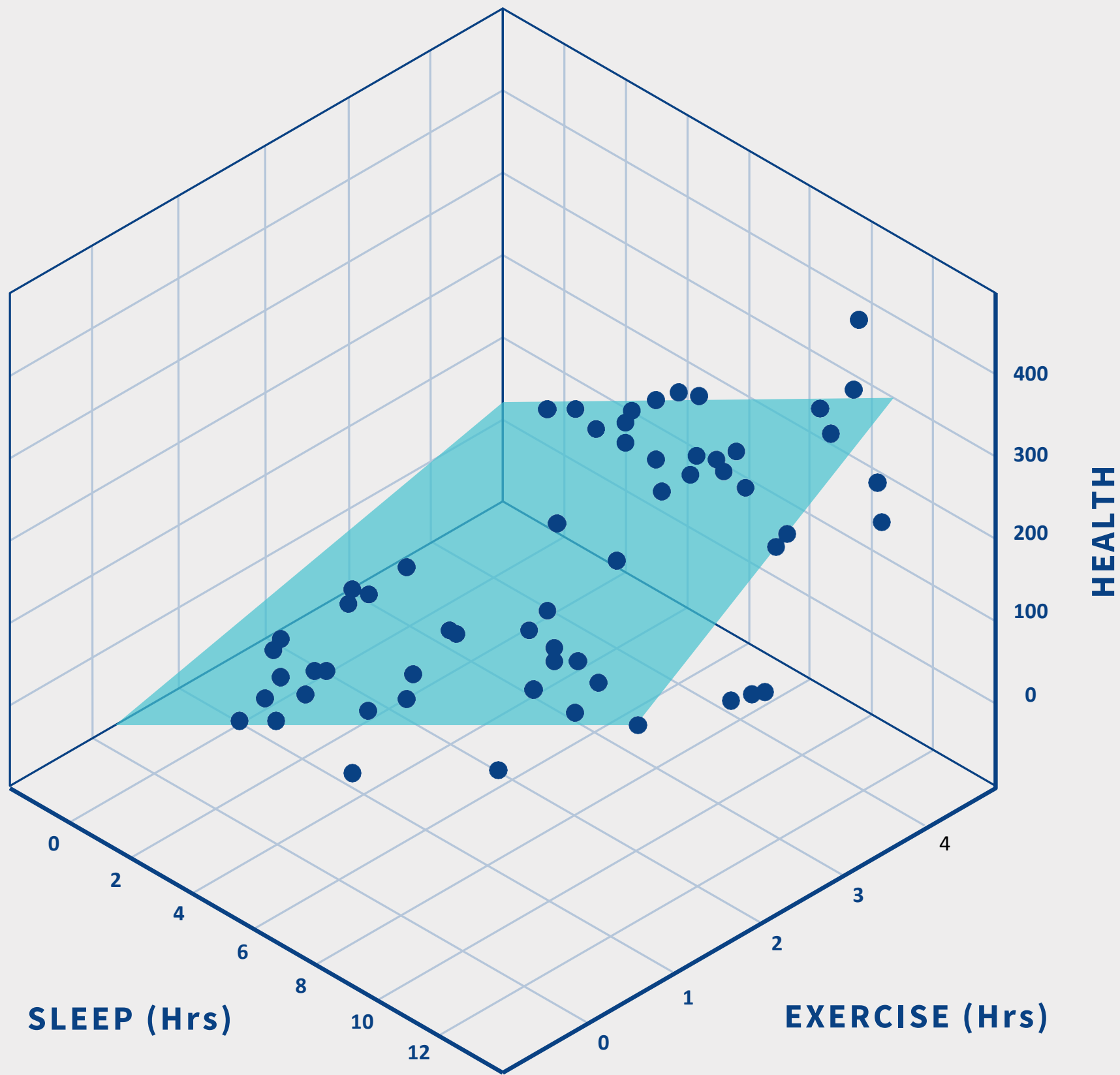


MACHINE LEARNING

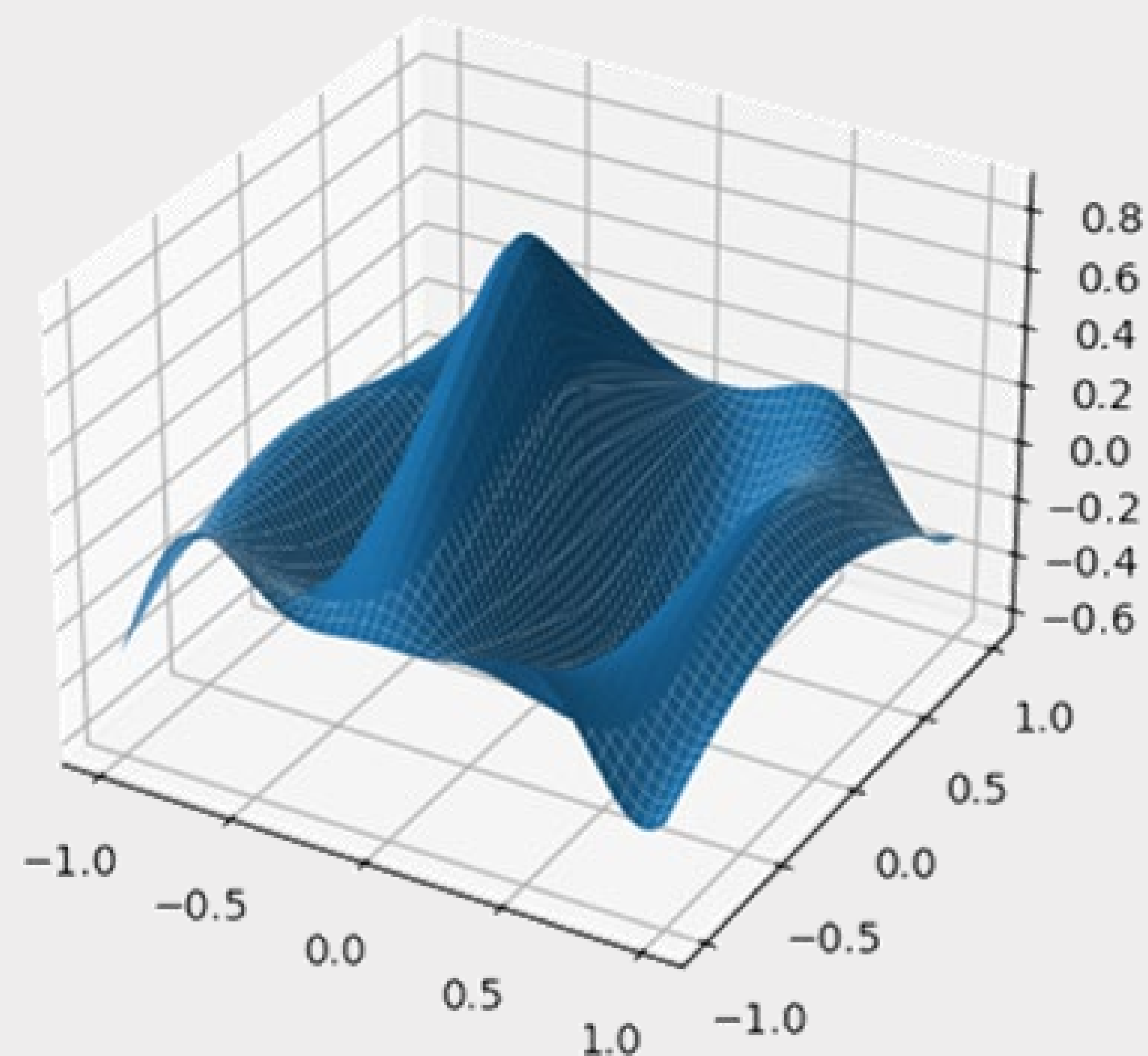


MACHINE LEARNING

$y = ax + by + c$



MACHINE LEARNING



LARGE LANGUAGE MODELS

<https://chat.openai.com/>

Q: Give me an overview of the schooling system in Queensland, Australia? What levels of school are there and what grades each at each level?

LARGE LANGUAGE MODELS

<https://chat.openai.com/>

Q: I have 419 red apples and 201 green apples. I eat 300 of the apples. How many apples to I have left?

A: You have a total of 419 red apples + 201 green apples, which equals 620 apples initially.

If you eat 300 apples, subtract that from the initial count:

$620 \text{ (initial count)} - 300 \text{ (eaten)} = 320 \text{ apples left.}$

So, you have 320 apples left after eating 300 of them.

LARGE LANGUAGE MODELS

<https://chat.openai.com/>

Q: I have 419 red apples and 201 green apples. I eat 300 of the apples. How many red apples do I have left?

A: You initially had 419 red apples. After eating 300 apples from your total count, you have:

419 (initial red apples) - 300 (eaten) = 119 red apples left.

So, you have 119 red apples left.

LARGE LANGUAGE MODELS

<https://chat.openai.com/>

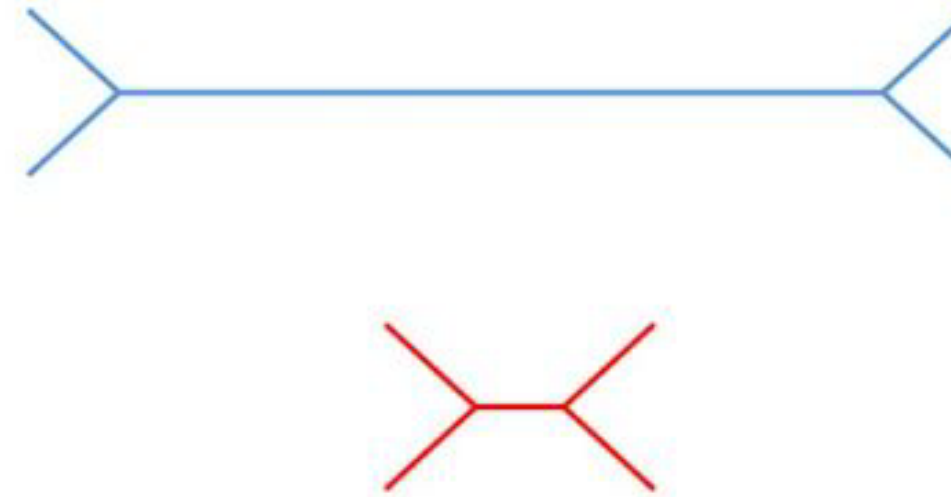
Q: I have 419 red apples and 201 green apples. I eat 300 of the apples. How many green apples do I have left?

A: You initially had 201 green apples. After eating 300 apples from your total count, you have:

$201 \text{ (initial green apples)} - 300 \text{ (eaten)} = -99 \text{ green apples.}$

It appears that you've eaten more green apples than you initially had, so you have a negative balance of 99 green apples. In reality, you don't have any green apples left, and you're left with only the remaining 119 red apples.

LARGE LANGUAGE MODELS



which line is longer, the red line or the blue line?

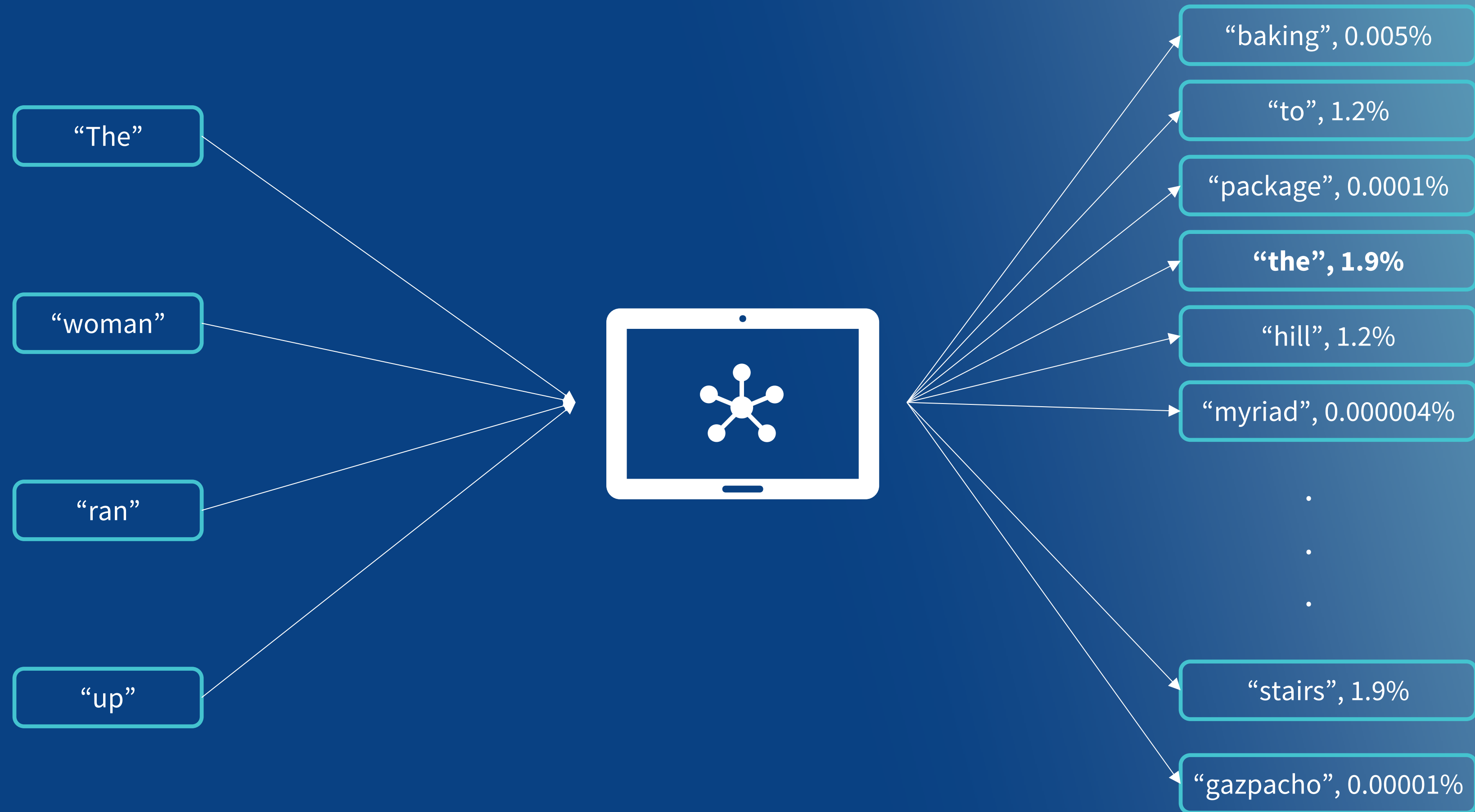


This image demonstrates the **Müller-Lyer illusion**, where the lines appear to be of different lengths due to the direction of the arrowheads. However, both the red and blue lines are actually the same length. The illusion is caused by the context created by the arrowheads pointing inward or outward.

ACTIVITY: HOW DO THESE LANGUAGE MODELS WORK?

“The woman ran up the _____”

LARGE LANGUAGE MODELS



LARGE LANGUAGE MODELS



HOW DO THESE LANGUAGE MODELS WORK?

“The woman ran up the _____”

“What did the woman run up? _____”

CUSTOMISATION: PROMPT ENGINEERING TIPS AND TRICKS



SOME TIPS FOR PROMPT ENGINEERING

TACTIC 1: USE DELIMITERS

- a) Summarise the following: """" ...""""
- b) ... format it as follows: """"On [DATE], [NAME] ...

TACTIC 2: ASK FOR STRUCTURED OUTPUT

- a) ... Put these into a table. The table should have three columns
- b) ... format it as follows: """"On [DATE], [NAME] ... """"

TACTIC 3: SPECIFY STEPS REQUIRED

TACTIC 4: ITERATE

INITIAL PROMPT:

The following is a set of answers from a short answer quiz question that asks for people to agree or disagree with a statement, and give a short justification. Summarise these.

TACTIC 5: ASK TO CHECK WHETHER CONDITIONS ARE SATISFIED

PROMPT:

The following is a set of answers from a short answer quiz question that asks for people to agree or disagree with a statement, and give a short justification.

Step 1: For each answer, classify it as agree, disagree, or a neither.

Step 2: Put together a table that contains three columns. Column 1 has the student ID. Column 2 has each comment (one per row), column 3 has whether it agrees or not, and column 4 provides a few words summarising the primary argument.

Step 3: If the comment is neither agrees or disagrees, write a short comment noting that the response should have committed to one side (in column 3). **If the answer is blank,** no need to leave any comment in column 3.

TACTIC 6: SPECIFY PERSONAS OR ROLES

TACTIC 7: BE AS SPECIFIC AS POSSIBLE

Act as a ***role***, do ***task***, in a ***format*** using a ***tone***. The main objective is to ***objective***, don't use ***restrictions***.

PROMPT:

The following is a comment from an author outlining their opinion about a review from another researcher. Act as a **journal editor**, and **perform** the following actions using a **professional** tone:

1.
Respond to the author acknowledging their concerns.
2. Politely tell them that the other reviewers agree with the limitations of the paper, so you will not be asking for a new review.
3. Do not use more than **500 words**.

WHAT ARE THE OPPORTUNITIES IN EDUCATION?



ACTIVITY: GENERATION

SYLLABUS PLANNING

1. Define a fictitious but realistic idea for a lesson for one of your classes.
2. Using Copilot (<https://copilot.microsoft.com/>), ChatGPT (<https://chat.openai.com/>), or your favourite large language model, input a short course description and ask for a syllabus including learning outcomes, topics to cover, and some questions to test the students' understanding. Specify the background of the students in the class.

TIPS

1. Use delimiters such as "..."
2. Ask for structured output
3. Specify steps
4. Iterate
5. Ask to check if conditions are satisfied
6. Specify personas, roles, etc
7. Be specific

SUMMARISING

STUDENT ANSWERS, STUDENT FEEDBACK

PROMPT:

The following is a set of answers from a short answer quiz question that asks for people to agree or disagree with a statement, and give a short justification.

Step 1: For each answer, classify it as agree, disagree, or a neither.

Step 2: Put together a table that contains three columns. Column 1 has the student ID. Column 2 has each comment (one per row), column 3 has whether it agrees or not, and column 4 provides a few words summarising the primary argument.

Step 3: If the comment is neither agrees or disagrees, write a short comment noting that the response should have committed to one side (in column 3). **If the answer is blank,** no need to leave any comment in column 3.

ACTIVITY: FEEDBACK

FEEDBACK ON COURSE MATERIALS

1. Upload one of your upcoming classes, worksheets, or tests/exams.
2. Ask your LLM for feedback on the document. Be specific about what you would like feedback on.

TIPS

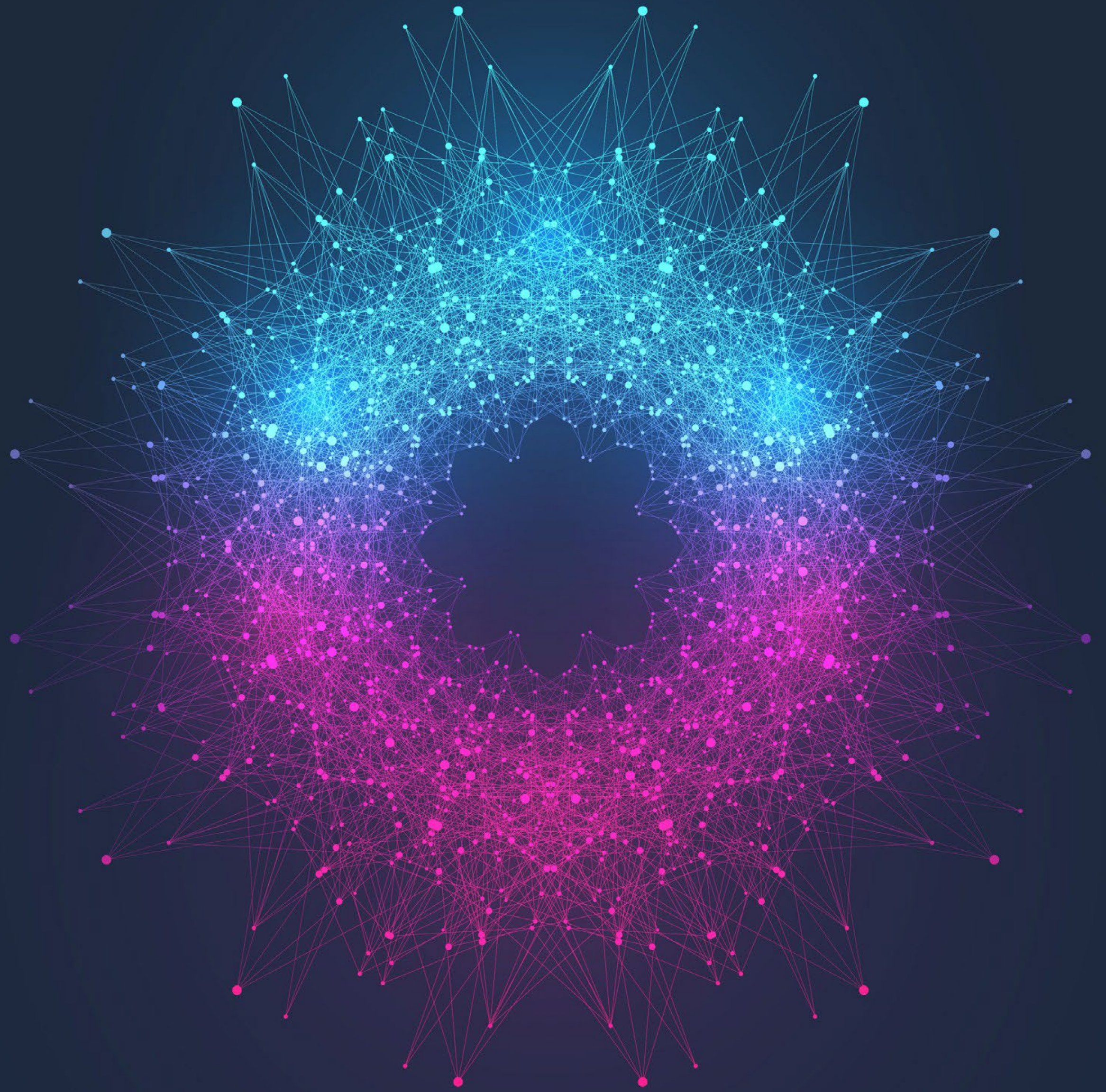
1. Use delimiters such as "..."
2. Ask for structured output
3. Specify steps
4. Iterate
5. Ask to check if conditions are satisfied
6. Specify personas, roles, etc
7. Be specific

DEMO: SAVING YOUR JOB

Here is an email to a university student in my course who has messaged me asking for clear direction on what to do in my course. They have not been attending and haven't been reading announcements or course material. As a **professional academic, write an email** response in a **professional tone**, making it clear that they need to **take responsibility** for their own learning.

"FFS!! You haven't been paying attention to any of the announcements, and it is clear you are not attending lectures or tutorials. The quality of your submission is just terrible -- you are doing the absolute minimum amount of work to write some words on a page, without even trying to engage with the material. Now that you realise you are failing, you want me to spend my time helping you when I already gave that time to you in lectures, but you didn't feel like attending? Start attending, start paying attention, engage with the material, talk to your tutor about what you have missed, and get started on the next assignment NOW"

LANGUAGE MODELS AS TOOLS FOR THOUGHT



DEMO/ACTIVITY: GENERATION USING A “TOOL FOR THOUGHT”

EXPERIMENT PLANNING

I need to define a human behavioural experiment to test whether a decision support tool improves decision making. Help me to design this experiment.

You should not give me the answer: you should ask me questions and then give feedback on the answers that I give.

Give me pointers if I have missed out ideas that are important.

KEY TAKEAWAYS

ARTIFICIAL INTELLIGENCE IS NOT MAGIC

Machine learning = computing + statistics

Machine learning allows us to infer missing data

Large language models infer missing words

BUT IT CAN STILL BE HELPFUL

Summarising and filtering

Generating and re-wording

Tools for thought

THANK YOU

Tim Miller

TIET-UQ Chair of Data Science, Professor of Artificial Intelligence
School of Electrical Engineering and Computer Science
The University of Queensland, Australia
E: timothy.miller@uq.edu.au
BSky: @tmiller_uq
W: <https://uqtmiller.github.io/>

