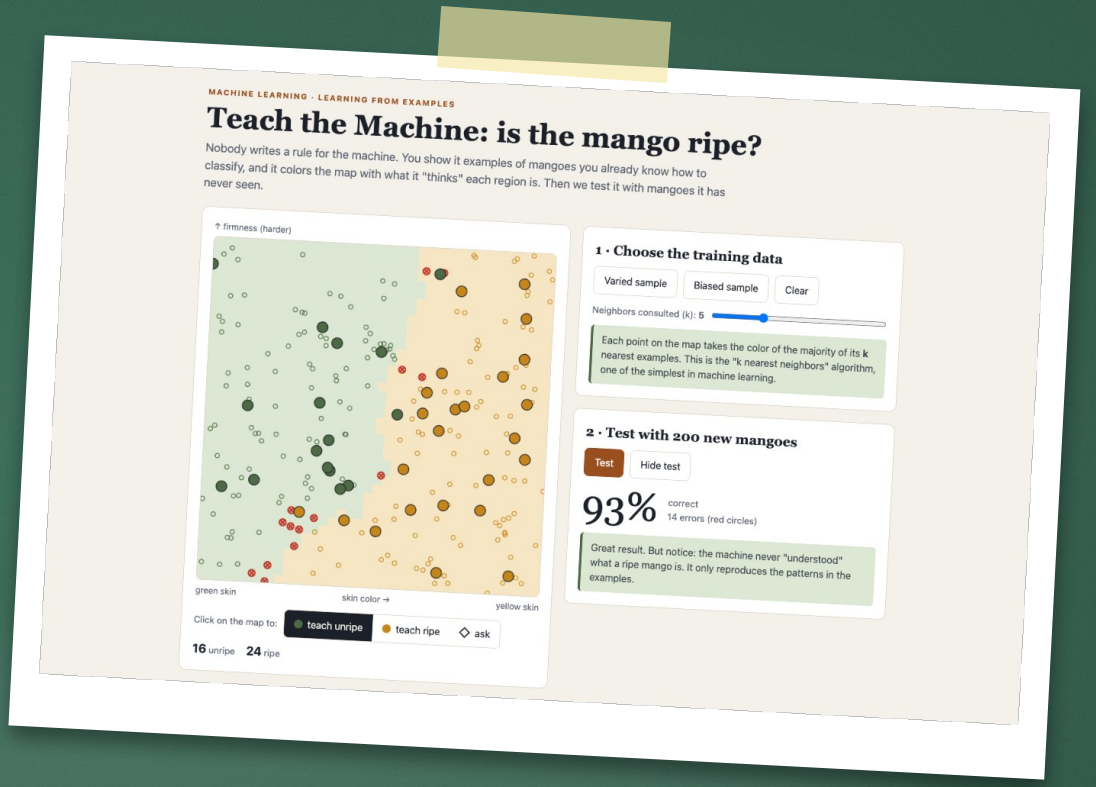
AI FOR TEACHERS

From copying to curiosity

How to use artificial intelligence so that students think, and do not just copy



Teach the Machine: one of today's prototypes

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AIEng4D

Five decades, seven technology waves

1974–77	1978–82	1983–89	1990s	2000s	2010s	2020s
Technical high school (ETEP)	**Engineering (UNIFEI)**	**CDT / Avibras**	**AT&T / NCR**	**Dell / Compaq / IGT**	**Master's (UDD)**	**UNIFEI / AIEng4D**
Digital systems	Fortran, BASIC, and Assembly on the first microprocessors	The C language and the first PCs	Bank automation and the internet	Electronic transactions	Python, data science and machine learning	Professor: AI, Edge AI, and TinyML

I learned each of these technologies along the way, already on the job. With AI, it is no different: nobody here is too late.



TODAY'S QUESTION

If AI can do the assignment on its own, what is that assignment teaching?



Copying is real, and detection does not fix it

WHAT YOU SEE

- Assignments that look very much alike
- Well-written text the student cannot explain
- Answers with no mistakes, but also without the student's voice
- Research handed in within minutes, with no reading

WHY POLICING IS NOT ENOUGH

2023

OpenAI, the maker of ChatGPT, shut down its own text detector for low accuracy.

> 50%

of essays by non-native English speakers were wrongly flagged as AI-written by detectors (Stanford, 2023).

Instead of only policing what is handed in, change the assignment. And for that, understand the machine.

Sources: OpenAI, July 2023 notice on the AI Text Classifier · Liang et al., "GPT detectors are biased against non-native English writers", Patterns, 2023

Three terms, one inside the other

Artificial intelligence

Systems that perform tasks we associate with human intelligence. E.g., the GPS that plans the route.

Machine learning

Learns patterns from examples. E.g., the next video on TikTok and YouTube, the spam filter.

Language models (LLMs)

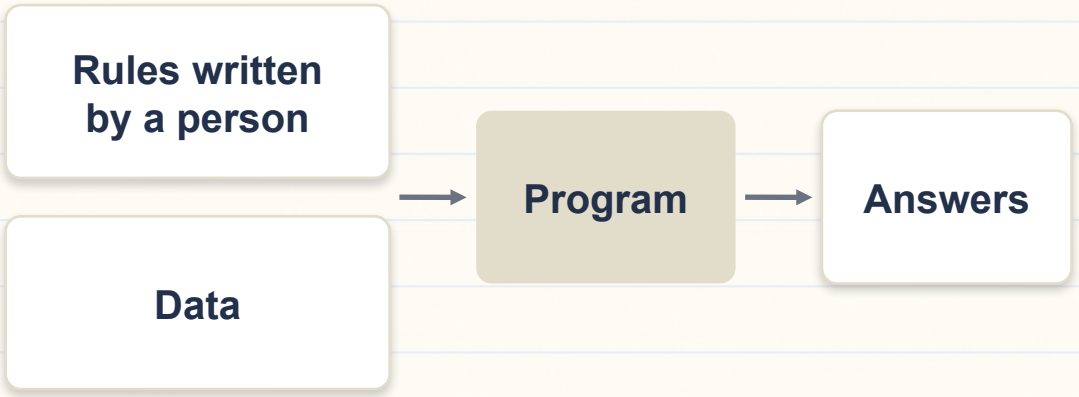
Trained on text at a gigantic scale: they read, write, summarize, and code.

ChatGPT · Gemini · Claude

This is what changed from 2022 on, and what reached the classroom.

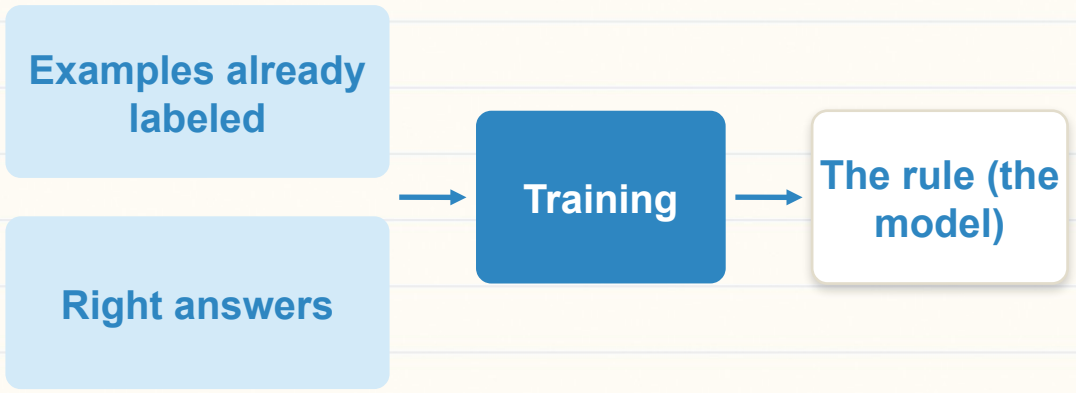
Nobody writes the rule: the machine learns from examples

TRADITIONAL PROGRAM



"If the skin is yellow and the fruit is soft, then it is ripe."

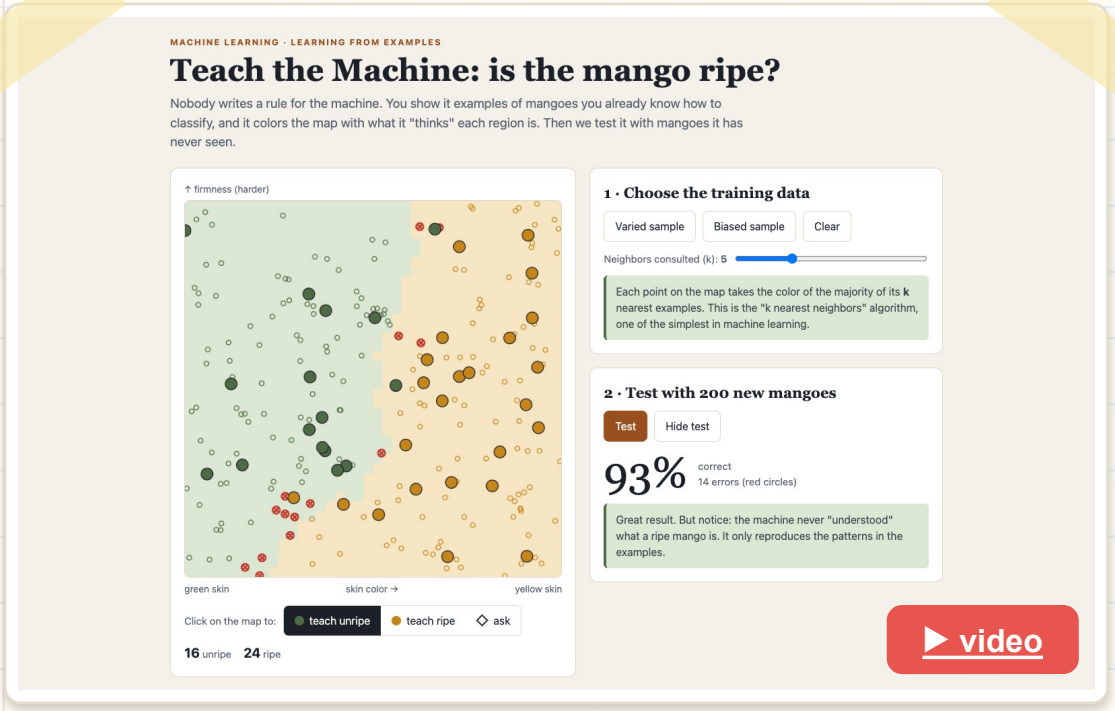
MACHINE LEARNING

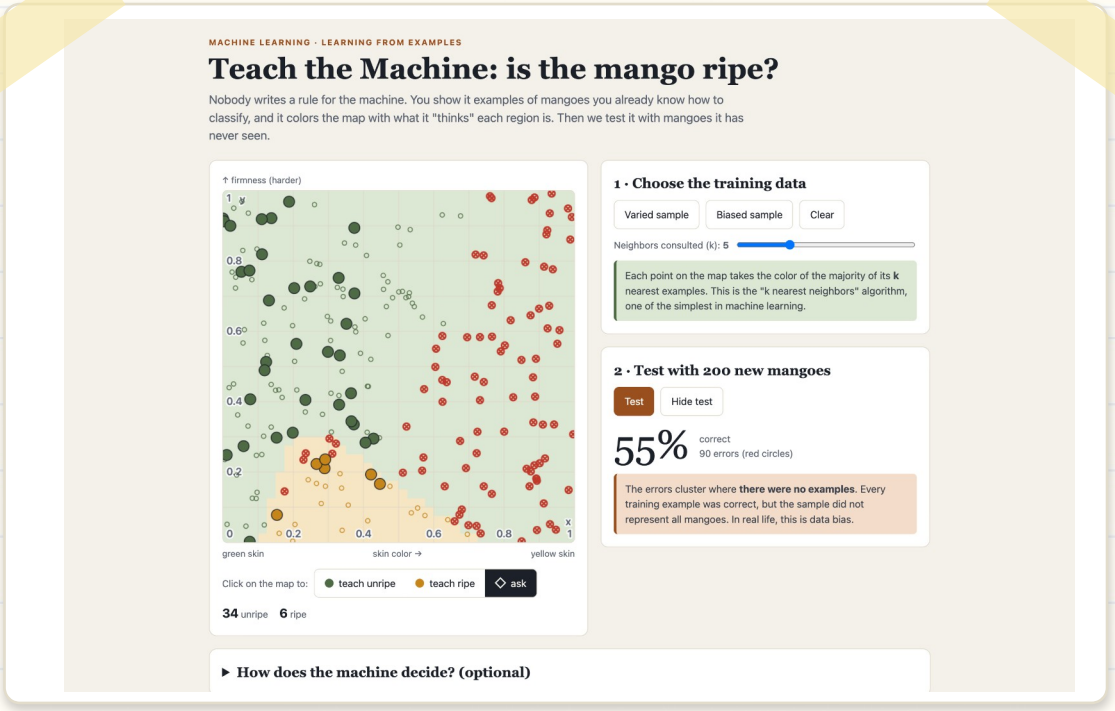


We show 40 labeled mangoes; the machine finds the boundary between unripe and ripe on its own.

Consequence: whoever chooses the examples decides what the machine learns.

The machine only knows what it has seen





93% correct with 40 mangoes of every kind

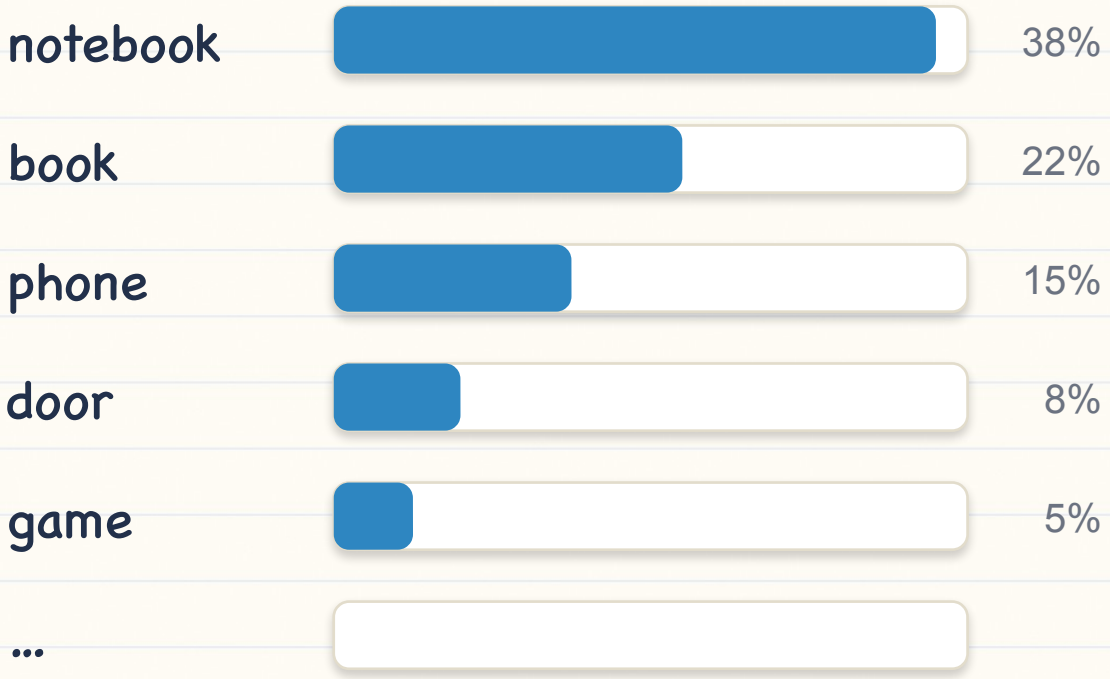
55% with 40 correct mangoes, but only green-skinned ones. The errors (red) are where there were no examples.

DEMO · *Teach the Machine* · open it on your computer: mjrovai.github.io/simuladores-interativos/ai-for-teachers/teach-the-machine.html

A ChatGPT is a machine that predicts the next word

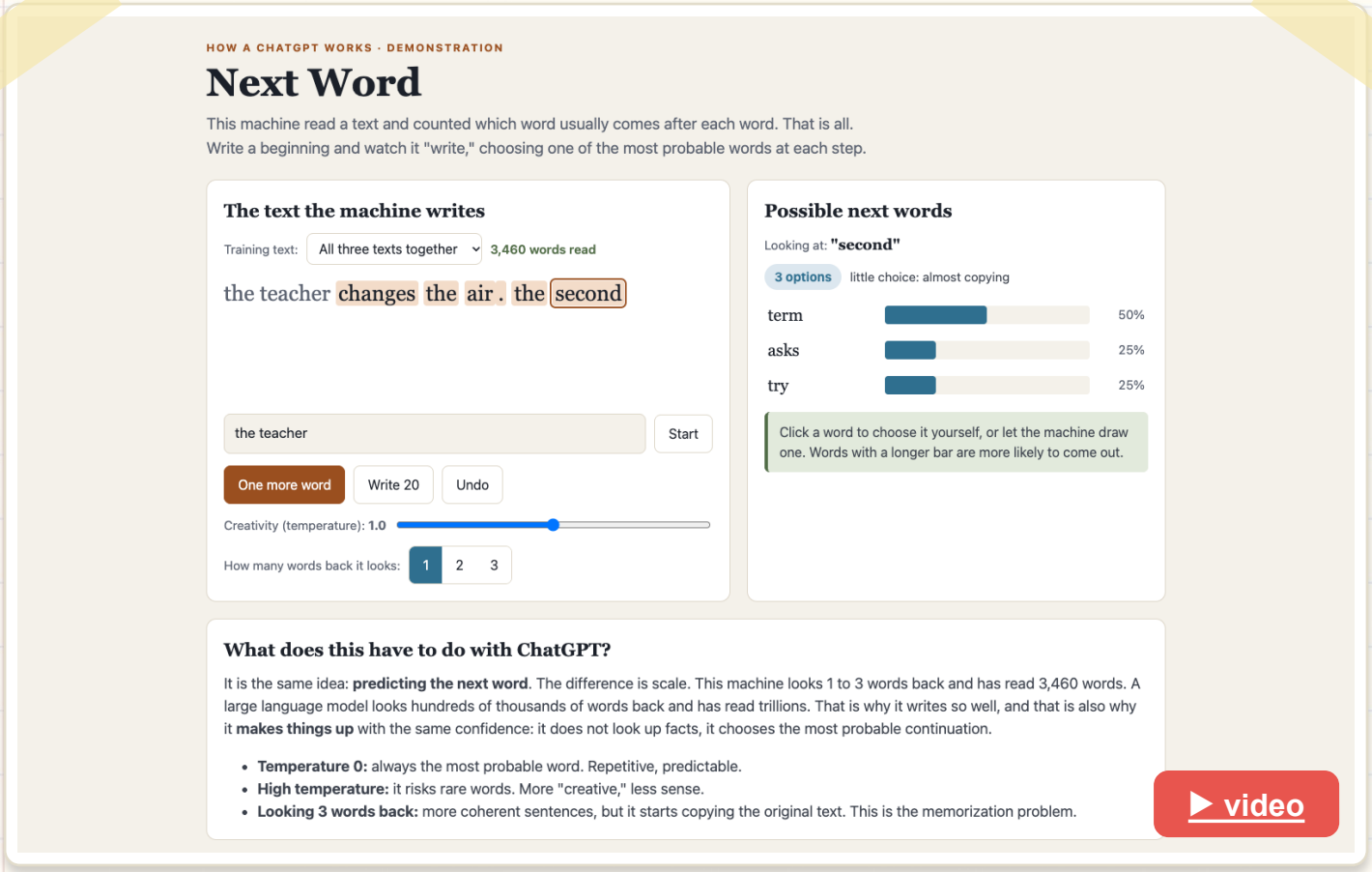
The student opened the ___

It calculates the chance of each word, picks one, adds it to the text, and repeats. Word by word, from a poem to a college admission essay.



Illustrative probabilities

A miniature version, to see inside



TRY THIS

Temperature 0

Always the most probable word: repetitive.

High temperature

It risks rare words: turns into nonsense.

Look 3 words back

Better sentences, but it starts copying the original text.

Change the text

Paste a poem or a chapter and train it again.

DEMO · *Next Word* · open it on your computer: mjrovai.github.io/simuladores-interativos/ai-for-teachers/next-word.html

Same idea, another scale

OUR MACHINE

3,460

words read in training

3

words of context, at most

same idea

A LARGE MODEL (GPT, Claude)

trillions

of words read in training

> 100,000

words of context: a whole book at once

To go deeper: Transformer Lab and Jules Verne Bot, on the simulators page.

It chooses the probable word, not the true one

1

It writes well about any topic

Because it has seen a lot of well-written text about almost everything.

2

It makes things up with the same confidence

Sources, dates, and numbers: it does not look up facts, it continues the text.

3

An AI answer is a draft, not a source

A simple rule to teach students. And our opportunity.

PART 2

From copying to curiosity

If the assignment asks for a product that AI delivers ready-made, copying is the most rational choice for the student.

The same assignment, redesigned

AI DOES IT ALONE	AI BECOMES STUDY MATERIAL
Summarize chapter 3.	AI wrote this summary. What did it leave out? Prove it with the text.
Research measles.	Adjust the simulator until the epidemic stops. Explain why it worked.
Write an essay on the topic.	Write it, ask AI for a critique, and hand in both versions: what you accepted, what you rejected, and why.
Solve exercises 1 to 10.	AI solved all ten and got two wrong. Which ones? Where did it go wrong?

Five ways for AI to make students think

1

Auditor

The class gets an AI text with planted errors. Whoever finds them and proves it with a source wins.

2

A tutor that asks

AI is told not to give the answer: only questions and hints.

3

Debate the machine

AI defends a position; the class prepares the rebuttal.

4

The request is an essay

Describing what you want from AI is writing with an audience, a goal, and constraints.

5

Process journal

AI is allowed, but students hand in the history: what they asked, accepted, rejected, and why.

In all of them, we assess the process, not just the product.

A tutor that asks instead of answering

PASTE AT THE START OF THE CHAT

```
You are a [Physics] tutor for 11th grade students.
Never give the final answer, even if I ask for it.
Ask one question at a time to help me reach the
answer on my own. If I make a mistake, do not
correct it directly: ask something that makes me
notice it. When I get it right, ask me to explain in
my own words why it is right.
```

Works in any chat

ChatGPT, Gemini, DeepSeek, or Claude, including the free versions.

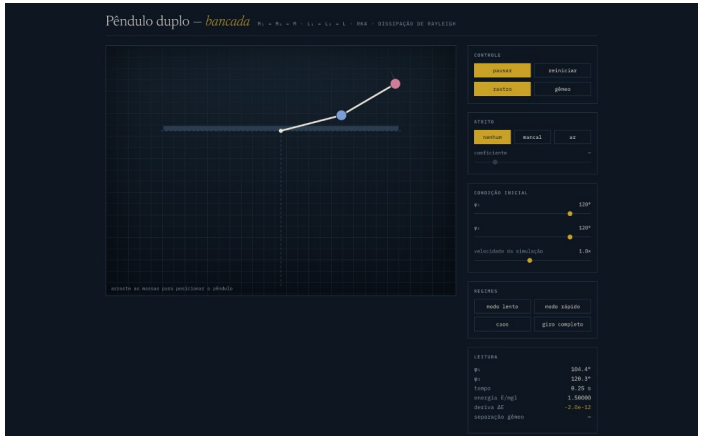
Replace what is in brackets

Subject, grade, and, if you like, the topic of the lesson.

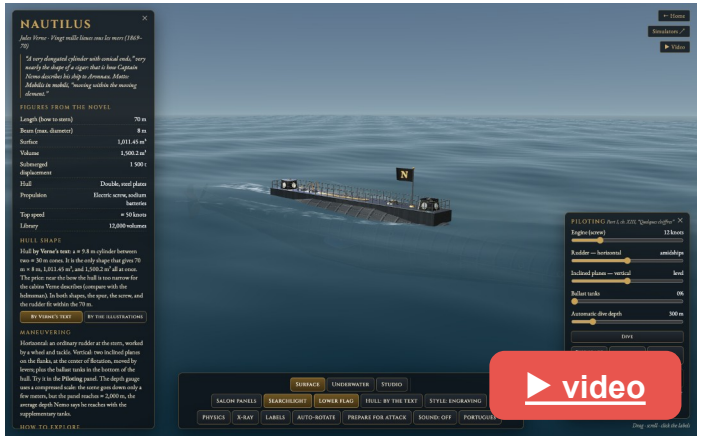
Test it before the class does

Try to talk it into giving the answer. Students will try.

Simulators made with AI, under my direction



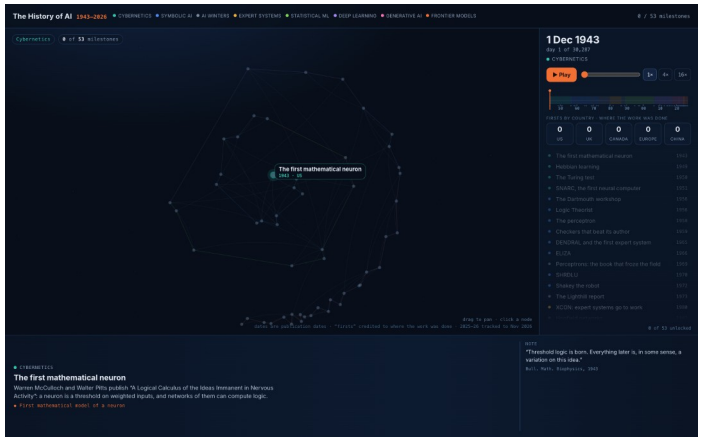
Double pendulum · **Physics**



Nautilus · **Literature and Physics**



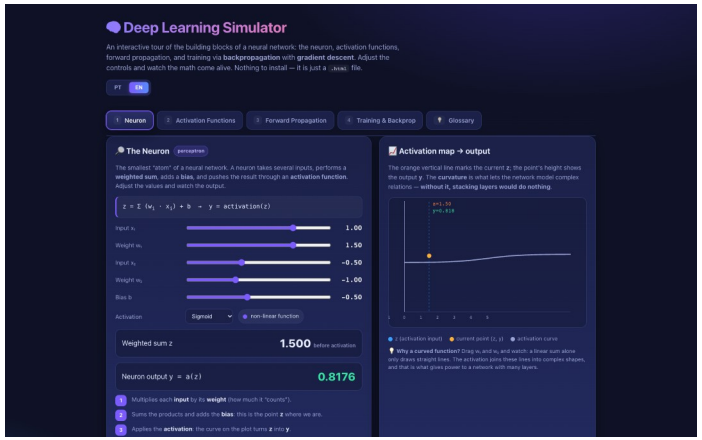
14-Bis **(Santos-Dumont)** · **History**



The History of AI · **History**

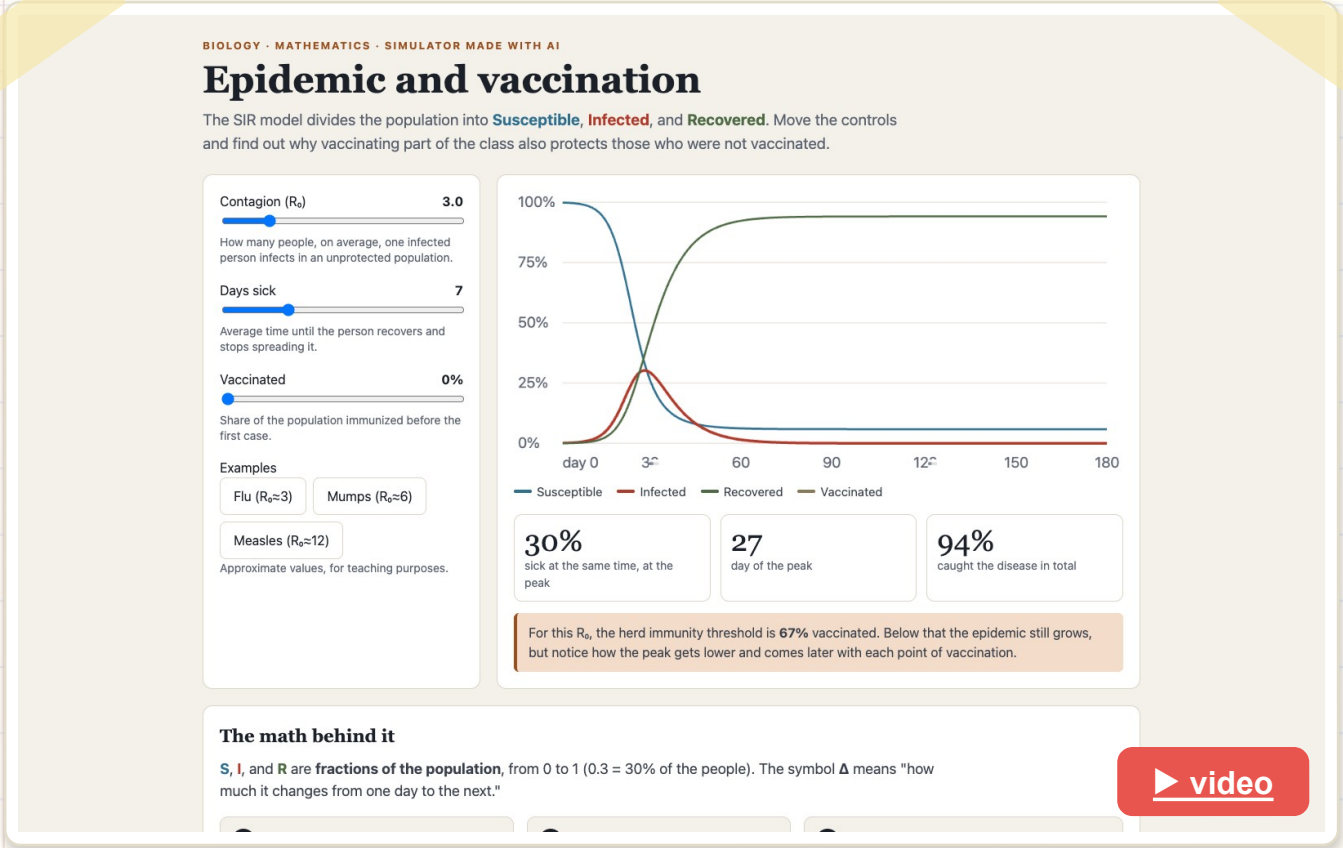


Oscilloscope · **Physics**



Deep Learning · **Mathematics**

In a simulator, there is nothing to copy



The question is no longer

~~"What is herd immunity?"~~

but becomes

"What is the lowest vaccination rate that stops a measles epidemic?"

Predict **Test** **Explain**

Ask in plain words, then check the science.

DEMO · *Epidemic and vaccination* · open it on your computer: mjrovai.github.io/simuladores-interativos/ai-for-teachers/epidemic-sir.html

Describing has become programming

TOPIC	the SIR model of epidemics, with vaccination
FOR WHOM	11th grade, Biology and Mathematics
WHAT STUDENTS CHANGE	R_0, days sick, % vaccinated
WHAT APPEARS	S, I, and R curves; peak; total sick
THE QUESTION	why does vaccinating part of the population protect those who were not vaccinated?
EXTRAS	large fonts for projecting; a single HTML file, nothing to install

The skill is teaching

Knowing what students need to see and handle in order to understand.

Then, adjust in plain language

"The chart is cut off," "add a pause button."

The teacher checks the science

AI can get a formula wrong.

The full request

PASTE INTO THE CHAT

```
Create an interactive simulator in a single HTML file (HTML,
CSS, and JavaScript together, no external libraries and no
server), in English. Reply only with the complete code, in a
single block, from <!DOCTYPE html> to </html>, without using
Python and without creating files.

TOPIC: [the SIR model of epidemics, with vaccination]
FOR WHOM: [11th grade] students, subjects [Biology and
Mathematics].
WHAT THE STUDENT CAN CHANGE: [sliders for R₀ (from 1 to 18, to
include measles), days sick, and % vaccinated].
WHAT APPEARS ON SCREEN: [the S, I, and R curves over time, the
infection peak, and the total number of people who got sick].
QUESTION THE SIMULATOR HELPS ANSWER: [why does vaccinating
part of the population protect those who were not vaccinated?]
EXTRAS: a "Reset" button, a short text explaining the model,
large fonts for projecting in class.
```

Replace what is in brackets

Topic, grade, subject, controls, and question.

The result: open and test it

Save the reply as simulator.html and open it in the browser · text to copy: mjrovai.github.io/simuladores-interativos/ai-for-teachers

From chat to agent

Model

predicts the next word

→

+ tools

browser, files, code

→

+ a loop

plan, do, check, redo

A chat answers. An agent receives a goal and works until it delivers.

THREE WAYS TO USE ONE

In the browser

The chats you already use (ChatGPT, Gemini, Claude) are getting an agent mode.

On your computer

Claude Code and Codex work with the files in your folder.

Open

DeepSeek Harness and Hermes, with a cheap model or one running on your own computer.

The links are on the talk page: mjrovai.github.io/simuladores-interativos/ai-for-teachers

Ideas for your school

Biology	*Epidemic and vaccination*	▶ video	ready
Mathematics	*Trigonometric functions* (a, b, c, and d) · compound interest and credit (to create)	▶ video	ready
Physics	*Double pendulum* · *oscilloscope and Lissajous figures* · projectile motion (to create)		ready
Chemistry	Balancing equations with a visual scale · dilution and pH · atomic structure		to create
History and Geography	How your own city grew: a timeline and a map of its neighborhoods		to create
Language Arts	*Next Word* trained on a poem chosen by the class	▶ video	ready

Three cautions

Student data stays out of the chat

Names, grades, reports, photos, messages. Privacy laws apply here too.

Always check

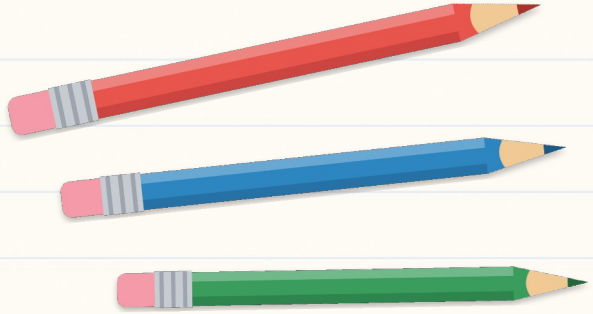
Science, sources, math, and dates. AI is wrong with confidence.

Agree with the class

When AI is allowed, for what, and how to declare its use. A clear rule works better than a total ban.

For your next class

1 **Show *Next Word***
and talk with the class about why AI makes things up.



2 **Redesign an assignment**
that AI does on its own, so that it becomes study material.

3 **Ask for a simulator**
for your subject, with the six-field template.

Everything shown today: mjrovai.github.io/simuladores-interativos/ai-for-teachers

TO CLOSE

The question is not whether students will use AI. It is whether they will learn with it.

Questions?

mjrovai.github.io/simuladores-interativos/ai-for-teachers
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Slides, prototypes, and simulators generated with Claude (Anthropic) under the direction of Marcelo Rovai.

