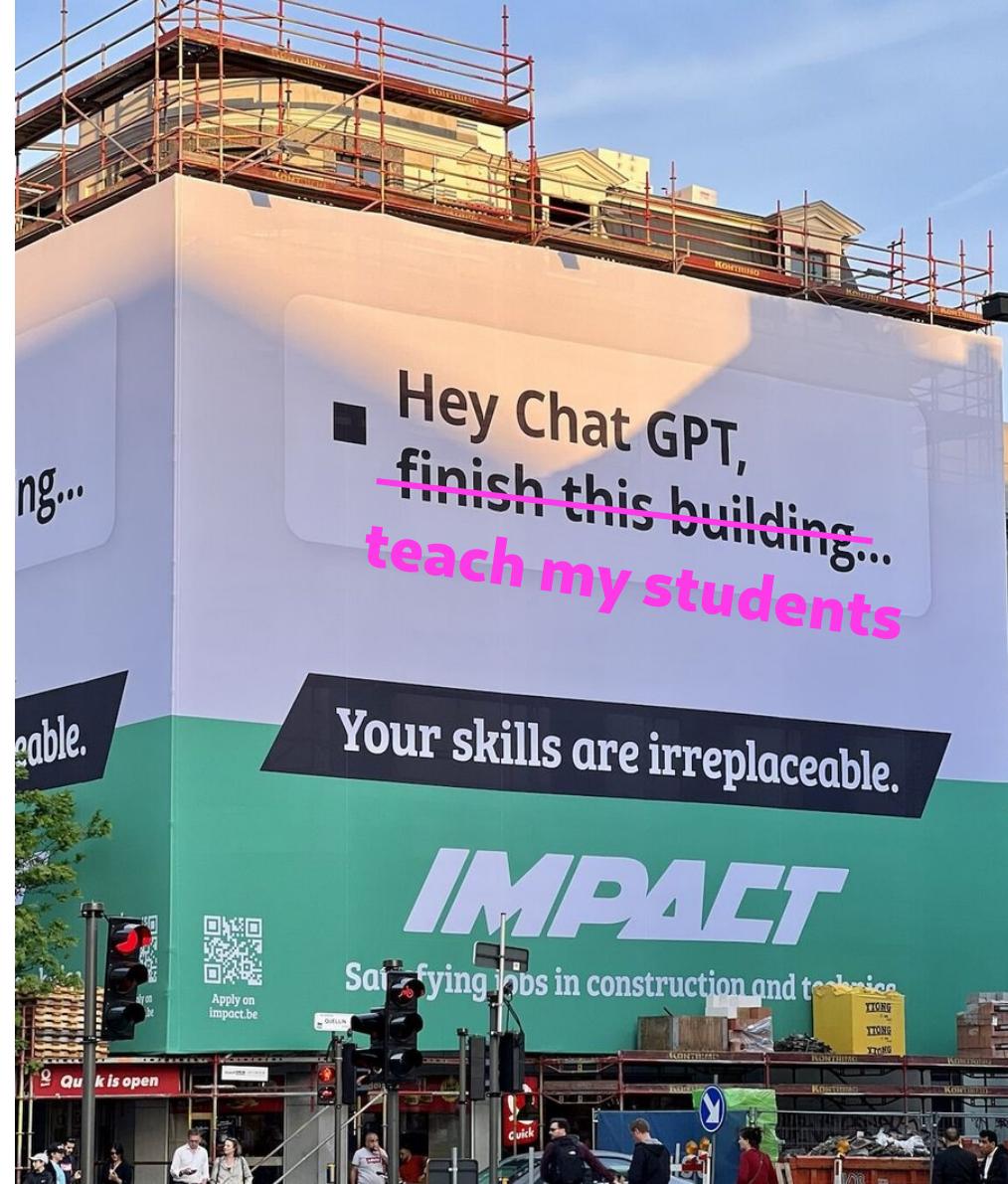


From Chalkboards to Chatbots: Can Education Keep Up?



Pierre Poulain
pierre.poulain@u-paris.fr
Laboratory of Theoretical Biochemistry

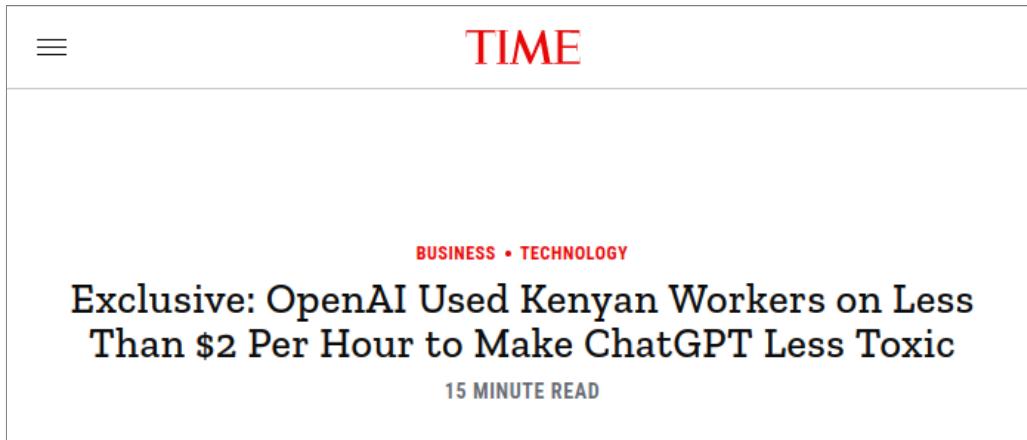


Topics not covered today

'Impossible' to create AI tools like ChatGPT without copyrighted material, OpenAI says

Pressure grows on artificial intelligence firms over the content used to train their products

Source: The Guardian, 2024



The image shows a snippet of the TIME magazine website. At the top left is a menu icon (three horizontal lines). In the center, the word "TIME" is written in red. Below it, the text "BUSINESS • TECHNOLOGY" is in small red capital letters. The main headline reads "Exclusive: OpenAI Used Kenyan Workers on Less Than \$2 Per Hour to Make ChatGPT Less Toxic". Underneath the headline is the text "15 MINUTE READ".

Source: Time, 2023.

Joule

COMMENTARY | VOLUME 7, ISSUE 10, P2191-2194, OCTOBER 18, 2023

[Download Full Issue](#)

The growing energy footprint of artificial intelligence

Alex de Vries  

Published: October 10, 2023 • DOI: <https://doi.org/10.1016/j.joule.2023.09.004>  •

Source: Joule, 2023.



Source: DALL.E, 2024-07-10, prompt: "Make a picture of a surgeon"

Source: DALL.E, 2024-07-10, prompt: "Make a picture of a nurse"

The ChatGPT (r)evolution

From a research result to a mass-market product

Attention Is All You Need

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Abstract

The dominant sequence transduction models are based on complex recurrent or convolutional neural networks that include an encoder and a decoder. The best performing models also connect the encoder and decoder through an attention mechanism. We propose a new simple network architecture, the Transformer, based solely on attention mechanisms, dispensing with recurrence and convolutions entirely. Experiments on two machine translation tasks show these models to be superior in quality while being more parallelizable and requiring significantly less time to train. Our model achieves 28.4 BLEU on the WMT 2014 English-to-German translation task, improving over the existing best results, including ensembles, by over 2 BLEU. On the WMT 2014 English-to-French translation task, our model establishes a new single-model state-of-the-art BLEU score of 41.8 after training for 3.5 days on eight GPUs, a small fraction of the training costs of the best models from the literature. We show that the Transformer generalizes well to other tasks by applying it successfully to English constituency parsing both with large and limited training data.

*Equal contribution. Listing order is random. Jakob proposed replacing RNNs with self-attention and started the effort to evaluate this idea. Ashish, with Illia, designed and implemented the first Transformer models and has been crucially involved in every aspect of this work. Noam proposed scaled dot-product attention, multi-head attention and the parameter-free position representation and became the other person involved in nearly every detail. Niki designed, implemented, tuned and evaluated countless model variants in our original codebase and tensor2tensor. Llion also experimented with novel model variants, was responsible for our initial codebase, and efficient inference and visualizations. Lukasz and Aidan spent countless long days designing various parts of and implementing tensor2tensor, replacing our earlier codebase, greatly improving results and massively accelerating our research.

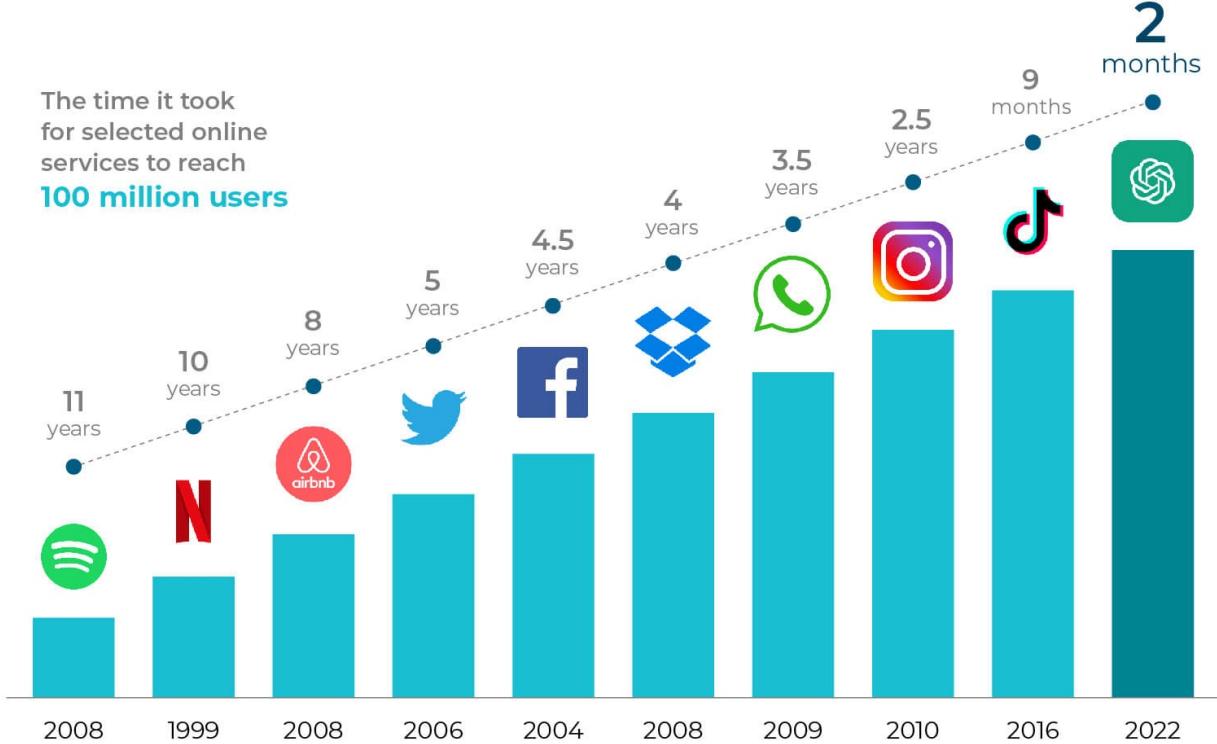
†Work performed while at Google Brain.

‡Work performed while at Google Research.

31st Conference on Neural Information Processing Systems (NIPS 2017), Long Beach, CA, USA.

Chat-GPT sprints to 100 million users

The time it took
for selected online
services to reach
100 million users



Source: arXiv, 2017

Source: World of Statistics

Students are already using gen. AI/LLMs

Survey: "**Impact of generative AIs on students**" (France, 02/2024)

- 92% regular use
- 79% improve their ability to solve complex problems

Source: Pôle Léonard de Vinci, 2024.

Survey: "**Provide or punish? Students' views on generative AI in higher education**" (UK, 02/2024)

- More than half of students (53%) have used generative AI to help them with assessments. The most common use is as an 'AI private tutor' (36%), helping to explain concepts.

Source: HEPI, 2024.

Technology and education: promises and threats

Books will soon be obsolete in the public schools. Scholars will be instructed through the eye. It is possible to **teach** every branch of human knowledge with the **motion picture**. Our schools system will be completely changed inside of ten years.

-- Thomas Edison, 1913

Source: Thomas Edison, interview to The New York Dramatic Mirror, 1913.



PUSH-BUTTON EDUCATION Tomorrow's schools will be more crowded; teachers will be correspondingly fewer. Plans for a push-button school have already been proposed by Dr. Simon Ramo, science faculty member at California Institute of Technology. Teaching would be by means of sound movies and mechanical tabulating

machines. Pupils would record attendance and answer questions by pushing buttons. Special machines would be "geared" for each individual student so he could advance as rapidly as his abilities warranted. Progress records, also kept by machine, would be periodically reviewed by skilled teachers, and personal help would be available when necessary.

Source: Push-button education, Arthur Radebaugh, The Chicago Tribune, 1958.

Technology and education: promises and threats

Page 10A The Daily Item — Sumter, S.C. Saturday, April 5, 1986



AP photo

Elementary school teachers picket against use of calculators in grade school
The teachers feel if students use calculators too early, they won't learn math concepts

Math teachers protest against calculator use

By JILL LAWRENCE

"My older kids don't pay any strate," he said. "Teachers are attention to an answer being absurd."

Source: Twitter/X, 2023

Is ChatGPT the new calculator?

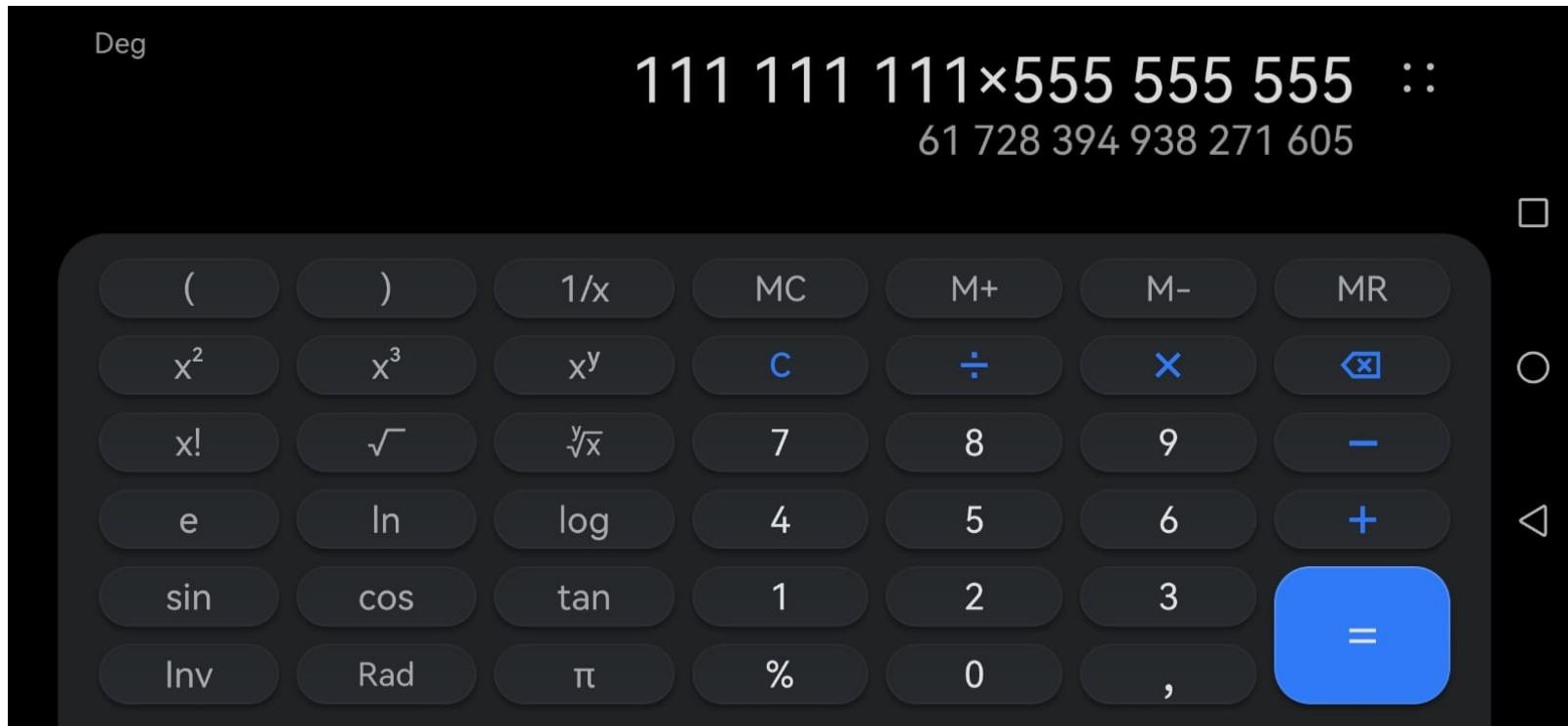
"Generative text is something we all need to adapt to," he said.
"We adapted to **calculators** and changed what we tested for in
math class, I imagine. This is a **more extreme version of that**, no
doubt, but also the benefits of it are more extreme, as well."

-- Sam Altman, 2023

Source: interview: StrictlyVC in conversation with Sam Altman, part two (OpenAI), 2023.

Is ChatGPT the new calculator? Hold my beer!

How much is 111111111 times 555555555?



Is ChatGPT the new calculator? Hold my beer!

How much is 111111111 times 555555555?

From chatterbox to bullshitter....

Le chat, Mistral
12/06/2025

How much is 111111111 times 555555555?

 The result of multiplying 111111111 by 555555555 is $6.172839506 \times 10^{16}$.
⚡ • 22:53



Claude 4 Sonnet
12/06/2025

How much is 111111111 times 555555555?

 $111111111 \times 555555555 = 61,728,395,061,728,395$ 

This can also be written as approximately 6.17×10^{16} or about 61.7 quadrillion.



   Réessayer ▾

Claude peut faire des erreurs. Assurez-vous de vérifier ses réponses.

Correct answer: 61,728,394,938,271,605

From chatterbox to bullshitter....

Llama4-Maverick (Groq)

12/06/2025

How much is 11111111 times 555555555?

Step 1: Understand the problem

The task is to calculate the product of 111,111,111 and 555,555,555.

Step 2: Calculate the product

To find the product, we simply multiply the two numbers: 111,111,111 * 555,555,555.

Step 3: Perform the multiplication

$111,111,111 * 555,555,555 = 61,728,395,061,728,395$.

The final answer is: 61728395061728395



Correct answer:

61,728,394,938,271,605

Deepseek-R1 (Groq)

12/06/2025

How much is 11111111 times 555555555?

Thinking Done (6.212s)

The product of 111,111,111 and 555,555,555 is calculated as follows:

1. Recognize that 555,555,555 is 5 times 111,111,111.
2. Therefore, the problem becomes $111,111,111 \times 5 \times 111,111,111$.
3. Calculate the square of 111,111,111, which is 12,345,678,987,654,321.
4. Multiply this result by 5 to get the final product.

The final product is:

61,728,395,483,827,105



From chatterbox to bullshitter....

ChatGPT 3.5 10/07/2024

How much is 111111111 times 555555555?

To find the product of 111111111 and 555555555, we can perform the multiplication directly:

$$111111111 \times 555555555$$

Let's break down the multiplication:

$$111111111 \times 555555555 = (111111111 \times 5) \times 111111111$$

First, calculate 111111111×5 :

$$111111111 \times 5 = 555555555$$

Now multiply this result by 111111111:

$$555555555 \times 111111111$$

To simplify this, notice that multiplying 555555555 by 111111111 is essentially squaring 555555555:

$$555555555 \times 111111111 = (555555555)^2$$

Now compute $(555555555)^2$:

$$555555555^2 = 308641975308641975$$

Therefore, the product $111111111 \times 555555555$ is 308641975308641975.



ChatGPT 4o 12/06/2025

How much is 111111111 times 555555555?

The result of multiplying 111,111,111 by 555,555,555 is:

61,728,394,938,271,605

Let me know if you want to see the detailed steps or pattern behind this number—it's a neat example of numeric symmetry!



□ ↻ ⌂ ⌃ ⌄ ⌅ ⌆

Correct answer:
61,728,394,938,271,605

Read the small print!

0 Message ChatGPT



Les chats de l'espace de travail de LLM@UPCITE ne sont pas utilisés pour entraîner nos modèles. ChatGPT peut commettre des erreurs.

Posez n'importe quelle question !



Model: Large ▾

Ceci est une version bêta

Les réponses peuvent contenir des inexactitudes.



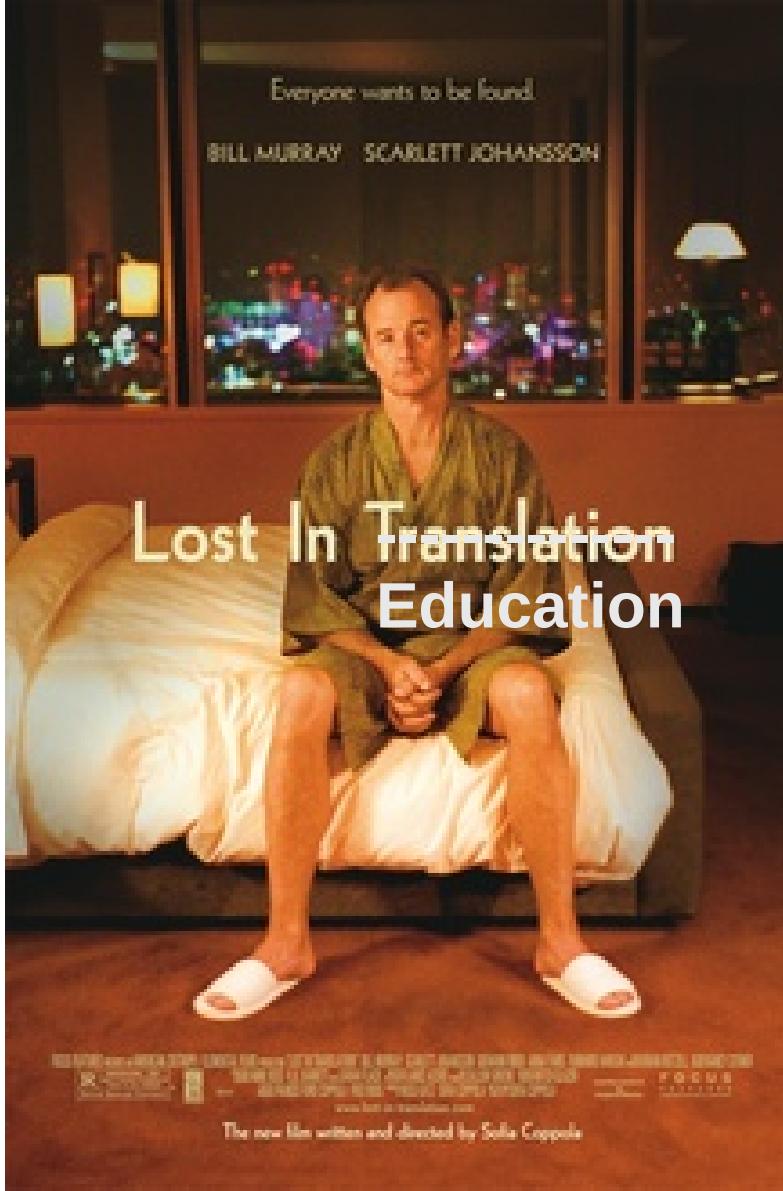
Copy



Claude can make mistakes. Please double-check responses.

LPU™ AI INFERENCE ENGINE

Meta-based chatbot. Accuracy, correctness or appropriateness cannot be guaranteed.



Source: poster of the movie Lost in Translation.

How could we take advantage of LLMs to improve learning and teaching experiences?

Source: College Teaching, 1993

From Sage on the Stage to Guide on the Side

Alison King

In most college classrooms, the professor lectures and the students listen and take notes. The professor is the central figure, the "sage on the stage," the one who *has* the knowledge and transmits that knowledge to the students, who simply memorize the information and later reproduce it on an exam—often without even thinking about it. This model of the teaching-learning process, called the transmittal model, assumes that the student's brain is like an empty container into which the professor pours knowledge. In this view of teaching and learning, students are passive learners rather than active ones. Such a view is outdated and will not be effective for the twenty-first century, when individuals will be expected to think for themselves, pose and solve complex problems, and generally produce knowledge rather than reproduce it.

According to the current constructivist theory of learning, knowledge does not come packaged in books, or journals, or computer disks (or professors' and students' heads) to be transmitted intact from one to another. Those vessels contain information, not knowledge. Rather, knowledge is a state of understanding and can only exist in the mind of the individual knower; as such, knowledge must be constructed—or re-

constructed—by each individual knower through the process of trying to make sense of new information in terms of what that individual already knows. In this constructivist view of learning, students use their own existing knowledge and prior experience to help them understand the new material; in particular, they generate relationships between and among the new ideas and between the new material and information already in memory (see also Brown, Bransford, Ferrara, and Campione 1983; Wittrock 1990).

When students are engaged in actively processing information by reconstructing that information in such new and personally meaningful ways, they are far more likely to remember it and apply it in new situations. This approach to learning is consistent with information-processing theories (e.g., Mayer 1984), which argue that reformulating given information or generating new information based on what is provided helps one build extensive cognitive structures that connect the new ideas and link them to what is already known. According to this view, creating such elaborated memory structures aids understanding of the new material and makes it easier to remember.

In contrast to the transmittal model illustrated by the classroom lecture-note-taking scenario, the constructivist model places students at the center of the process—actively participating in thinking and discussing ideas while making meaning for themselves. And the professor,

instead of being the "sage on the stage," functions as a "guide on the side," facilitating learning in less directive ways. The professor is still responsible for presenting the course material, but he or she presents that material in ways that make the students do something with the information—interact with it—manipulate the ideas and relate them to what they already know. Essentially, the professor's role is to *facilitate* students' interaction with the material and with each other in their knowledge-producing endeavor. In the constructivist model the student is like a carpenter (or sculptor) who uses new information and prior knowledge and experience, along with previously learned cognitive tools (such as learning strategies, algorithms, and critical thinking skills) to build new knowledge structures and rearrange existing knowledge.

But how do we get from transmission of information to construction of meaning? Such a change can entail a considerable shift in roles for the professor, who must move away from being the one who has all the answers and does most of the talking toward being a facilitator who orchestrates the context, provides resources, and poses questions to stimulate students to think up their own answers.

Change is never easy; usually, however, changes are easier to bring about by modifying existing practices than by starting afresh. So, we will begin by looking at some practical active-learning activities that can be incorporated into a typical lecture; then we will move on to

Alison King is an associate professor of education in the College of Education at California State University in San Marcos.

The homework apocalypse

*"To be clear, AI is not the root cause of cheating. Cheating happens because **schoolwork is hard and high stakes**. And schoolwork is hard and high stakes because learning is not always fun and forms of **extrinsic motivation**, like grades, are often required to get people to learn."*

-- Ethan Mollic

Source: Post-apocalyptic education, 2024

The detection illusion



Cold
Spring
Harbor
Laboratory

BMJ Yale

Delving into PubMed Records: Some Terms in Medical Writing Have Drastically Changed after the Arrival of ChatGPT

Kentaro Matsui

Source: medRxiv, 2024.

arXiv > cs > arXiv:2406.07016

Computer Science > Computation and Language

[Submitted on 11 Jun 2024 (v1), last revised 3 Jul 2024 (this version, v2)]

Delving into ChatGPT usage in academic writing through excess vocabulary

Dmitry Kobak, Rita González-Márquez, Emöke-Ágnes Horvát, Jan Lause

Source: arXiv, 2024.

Pro tip: remove ‘delve’, ‘crucial’, ‘potential’, ‘significant’, ‘intricate’ from your (possibly AI-generated) papers.

The detection illusion

**GENAI DETECTION TOOLS, ADVERSARIAL TECHNIQUES AND IMPLICATIONS
FOR INCLUSIVITY IN HIGHER EDUCATION**

A PREPRINT

Mike Perkins ^{1*}, Jasper Roe ², Binh H. Vu ¹, Darius Postma ¹, Don Hickerson ¹, James McGaughran¹, Huy Q. Khuat ¹

¹ British University Vietnam, Vietnam.

² James Cook University Singapore, Singapore.

*Corresponding Author: Mike.p@buv.edu.vn

March, 2024

Source: arXiv, 2024

This study investigates the efficacy of six major Generative AI (GenAI) text detectors when confronted with machine-generated content that has been modified using techniques designed to evade detection by these tools (n=805). The results demonstrate that the detectors' already low accuracy rates (39.5%) show major reductions in accuracy (17.4%) when faced with manipulated content, with some techniques proving more effective than others in evading detection.

Illusion of competence

Experience embracing genAI in an engineering computations course: What went wrong and what next

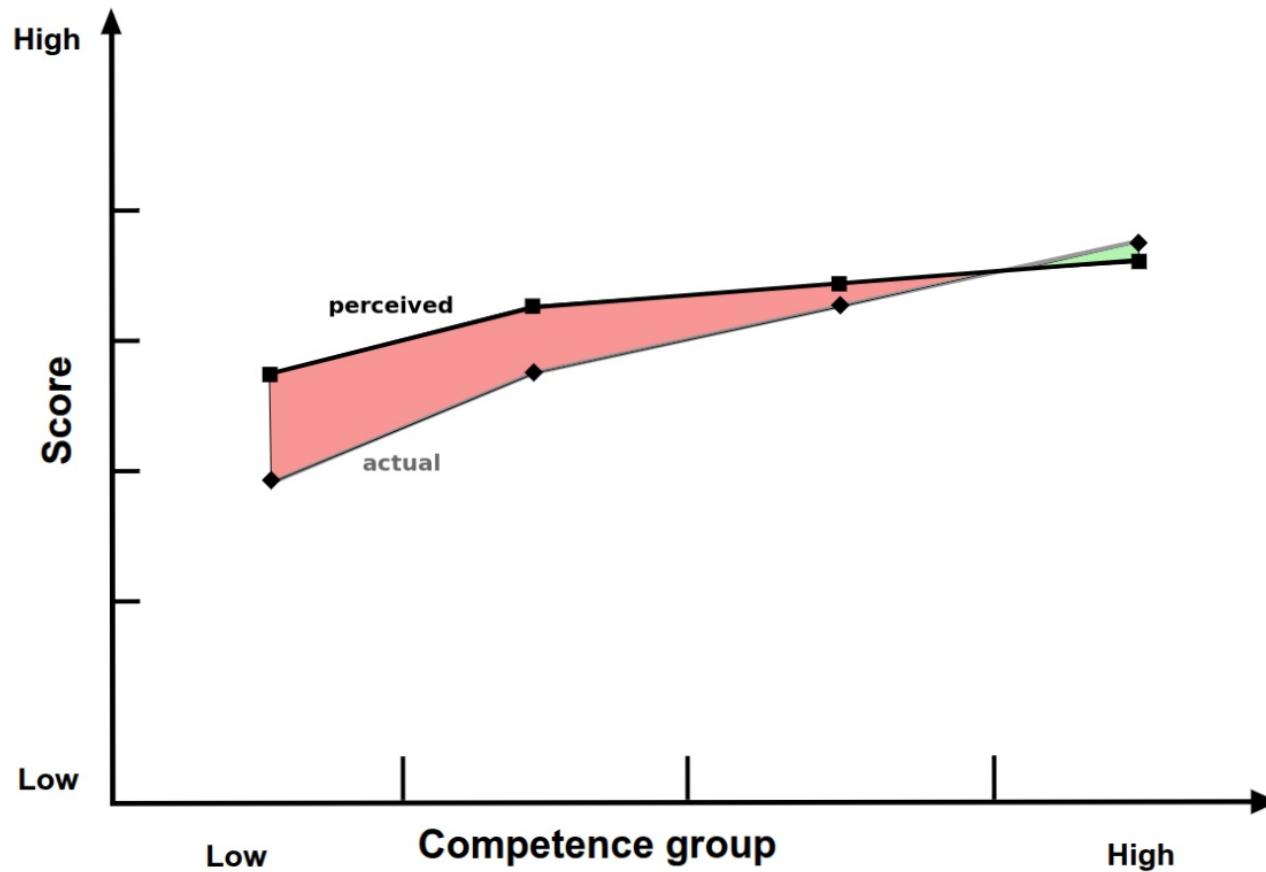
Lorena A. Barba¹

March 2025

Source: figshare, 2025

The illusion of competence is a cognitive bias that leads a learner to overestimate their knowledge or skill. It occurs when knowledge sits temporarily in short-term memory, but is not retained in long-term memory. Transfer of knowledge to long-term memory occurs via learning processes that involve forgetting, recall, and repetition—all under conditions of desirable difficulty. Many techniques that students use, such as re-reading and highlighting, are in fact not effective because they do not involve that necessary cognitive effort. Yet, stu-

Dunning-Kruger effect



Illusion of competence and weight lifting

While my student made the decision to successfully complete his assignment in an honest manner, this example does provide a peak into the dark side of AI usage in education. When AI is a shortcut to thinking and it does the effortful cognitive lifting, it isn't a tool for learning. It is a cheat code. It would be like me walking into a gym, using a hydraulic press to lift the weights, and expecting to see muscular gains. It's not going to happen. And I'd only be fooling myself if I expected anything different. And our students are only fooling themselves if they are using AI incorrectly and expecting cognitive gains.

Source: The effortful educator, 2025

AI workout

Targeted mentoring: leverage AI to reword assessment items for improved clarity. Utilize AI to provide explanations of code snippets.

Guided exploration: encourage AI to propose a variety of possible solutions to a problem, fostering divergent thinking.

Critical evaluation: compare AI-generated outputs to detect possible gaps or inaccuracies.

Develop critical thinking

*"30 minutes to ask questions to ChatGPT 'to generate a conversation that repeats what was said in class the week before' and that requires them to have understood and '**to ask the right questions to get the right answers**'; 20 minutes then to work on the text's bibliography and **verify the accuracy** of ChatGPT's responses."*

-- Antonio Casilli

Source: Le parisien étudiant, 2023.

Course chatbot

Cours de Python

Introduction à la programmation Python pour la biologie

Patrick Fuchs et Pierre Poulain

prénom [point] nom [arobase] u-paris [point] fr

 python™

Version du 13/11/2024 | [PDF du cours](#)



La seconde édition de notre livre « [Programmation en Python pour les sciences de la vie](#) » est parue aux éditions Dunod en juin 2024.

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- +400 pages
- 27 chapters

<https://python.sdv.u-paris.fr/>



ChatPDF

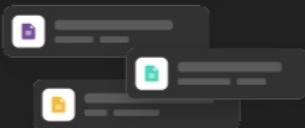
+ Upload PDF

New Folder



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EN ▾



DRAG + DROP YOUR
PDF FILE HERE



Click to upload, or drag PDF here

Upload PDF



BioPyAssistant

<https://biopyassistant.sdv.u-paris.fr>

The screenshot shows the BioPyAssistant platform. At the top, there's a logo with two green ducks and the text "BioPyAssistant". Below it, a message says: "BioPyAssistant est un assistant pédagogique pour le [cours de programmation Python](#) pour les biologistes de Patrick Fuchs et Pierre Poulain. N'hésite-pas à le solliciter en lui posant tes questions." There are two tabs: "Discuter avec le cours" and "Discuter avec le cours (battle)". The "Discuter avec le cours" tab is active, showing a "Chatbot" icon and the message "Bonjour, comment puis-je t'aider ?" with a like/dislike button below it. A user message "Quelle est la différence entre une liste et un set ?" is shown with a reply from the bot: "La différence principale entre une liste et un set en Python réside dans leur structure et leur comportement :". The bot then lists three points: 1. Ordre et indexation, 2. Unicité des éléments, and 3. Types de données contenus. Each point has a corresponding list of bullet points. At the bottom, there's a summary: "En résumé... utilisez une liste lorsque vous avez besoin de maintenir l'ordre ou de contenir des doublons, et un set..." and a "Pose-moi une question sur le cours !" input field with a checkmark icon.

LLM@UPCité
(D. Janiszek, S.
Bottani, PP)

Work by
E.Touami

BioPyAssistant

<https://biopyassistant.sdv.u-paris.fr>



La différence principale entre une liste et un set en Python réside dans leur structure et leur comportement :

1. Ordre et indexation :

- Une liste est ordonnée et indexable, ce qui signifie que les éléments ont un ordre défini et peuvent être accédés par leur position (index).
- Un set est non ordonné et non indexable, ce qui signifie qu'on ne peut pas accéder à ses éléments par leur position.

2. Unicité des éléments :

- Une liste peut contenir des éléments en double.
- Un set ne peut contenir que des éléments uniques. Si vous ajoutez des doublons, ils seront automatiquement éliminés.

3. Types de données contenus :

- Les listes peuvent contenir des éléments de types mixtes, y compris d'autres listes.
- Les sets ne peuvent pas contenir de types non hachables, comme les listes elles-mêmes.

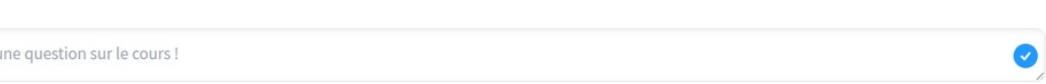
En résumé, utilisez une liste lorsque vous avez besoin de maintenir l'ordre ou de contenir des doublons, et un set lorsque vous avez besoin de garantir l'unicité des éléments.

Pour plus d'informations, je t'invite à consulter les rubriques suivantes du [cours en ligne](#) :

- Chapitre [14 Conteneurs](#), rubrique [14.4.1 Définition et propriétés](#)
- Chapitre [14 Conteneurs](#), rubrique [14.4.2 Utilité](#)



Pose-moi une question sur le cours !



14. Conteneurs

Cours de Python
Python

- 4. Listes
- 5. Boucles et comparaisons
- 6. Tests
- 7. Fichiers
- 8. Dictionnaires et tuples
- 9. Modules
- 10. Fonctions
- 11. Plus sur les chaînes de caractères
- 12. Plus sur les listes
- 13. Plus sur les fonctions
- 14. Conteneurs
- 15. Création de modules
- 16. Bonnes pratiques en programmation Python
- 17. Expressions régulières
- 18. Jupyter et ses notebooks
- 19. Module Biopython
- 20. Module NumPy
- 21. Module Matplotlib

14.4.1 Définition et propriétés

Les objets de type `set` représentent un autre type de conteneur qui peut se révéler très pratique. Ils ont la particularité d'être modifiables, non hachables, non ordonnés, non indexables et de ne contenir qu'une seule copie maximum de chaque élément. Pour créer un nouveau `set` on peut utiliser les accolades :

```
1 >>> set1 = {4, 5, 5, 12}
2 >>> set1
3 {12, 4, 5}
4 >>> type(set1)
5 <class 'set'>
```

Remarquez que la répétition du chiffre 5 dans la définition du `set` ligne 1 produit finalement un seul chiffre 5, car chaque élément ne peut être présent qu'une seule fois. Comme pour les dictionnaires (jusqu'à la version 3.6), les sets sont non ordonnés. La manière dont Python les affiche n'a pas de sens en tant que tel et peut être différente de celle utilisée lors de leur création.

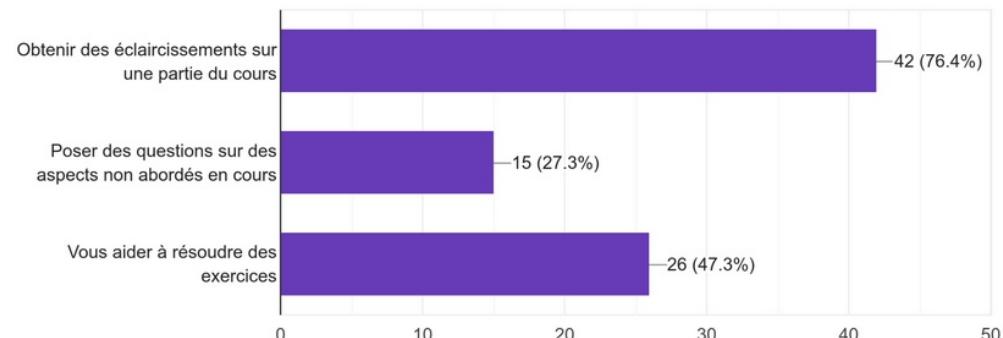
Les `sets` ne peuvent contenir que des objets **hachables**. On a déjà eu le cas avec les clés de dictionnaire. Ceci optimise l'accès à chaque élément du set. Pour rappel, les objets hachables que nous connaissons sont les chaînes de caractères, les tuples, les entiers, les `floats`, les booléens et les `frozensests` (voir plus bas). Les objets non hachables que l'on connaît sont les listes, les sets et les dictionnaires. Si on essaie tout de même de mettre une liste dans un `set`, Python renvoie une erreur :

BioPyAssistant

From 70 M1/M2 students in 2024-2025...

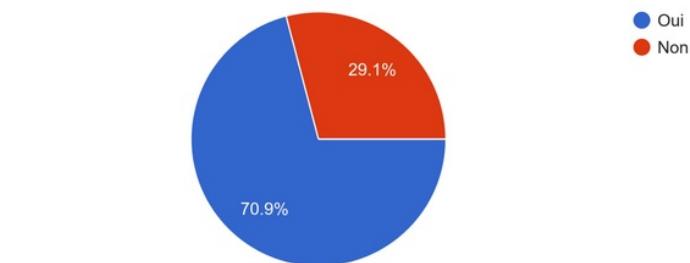
Avez-vous utilisé cet assistant pour :

55 responses



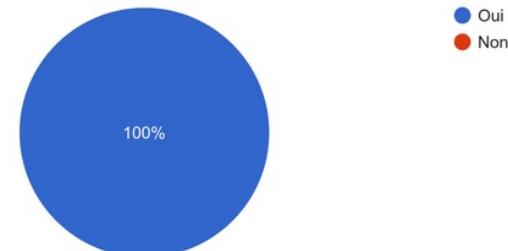
Avez-vous utilisé les liens vers le cours en ligne qui étaient fournis à la fin de chaque réponse de l'assistant ?

55 responses



Pensez-vous que cet assistant soit adapté à des étudiant.e.s débutant.e.s en programmation Python ?

55 responses



...to 400 L2/L3 students in 2025-2026

AI-validate student productions?



Grading student papers written by AIs

Asking an AI to grade student papers written by AIs.

Source: Twitter/X, 2023

La correction des copies assistée par l'IA, nouveau terrain de jeu pour les start-up

La start-up Ed.ai, qui vient de lever 1,7 million d'euros, a développé une solution qui accélère la correction des copies et génère des exercices personnalisés. Dans l'edtech, PyxiScience et Logbook inventent aussi des outils pour les professeurs.

Source: Les Echos, 2025

L'intelligence artificielle pour corriger des copies dix fois plus vite : une innovation testée par une cinquantaine de professeurs

Écrit par
[Juliette Pommier et Fleur De Boer](#)
Publié le 15/09/2024 à 06h45



Source: France Info, 2024

The screenshot shows a digital platform interface for grading student work. A question asks: "Question 1: Définissez la révolution industrielle." Below it, a student's response is shown: "Réponse de l'élève: La révolution industrielle est une période de transformation massive des économies occidentales, qui débute à la fin du XVIIIe siècle en Angleterre. Elle est caractérisée par une croissance rapide et un accès à une énergie abondante. Une économie dominée par la fabrication en série et la division du travail. Ce phénomène est marqué par des avancées technologiques, notamment dans le domaine de la production manufacturière, et a conduit à une urbanisation massive ainsi qu'à une transformation des conditions de vie." Another question follows: "Question 2: Nommez deux inventions majeures de la révolution industrielle et leur importance respective." The student's response is: "Réponse de l'élève: La machine à vapeur inventée par James Watt, est l'une des inventions les plus importantes de la révolution industrielle. C'est une machine à vapeur créée par Samuel Crompton, qui a révolutionné la production de textile. Il est plus rapide et plus efficace." A note at the bottom right says: "Grâce au logiciel, les enseignants devraient consacrer trois minutes à la relecture d'une copie, contre 30 min en moyenne. © FTV".

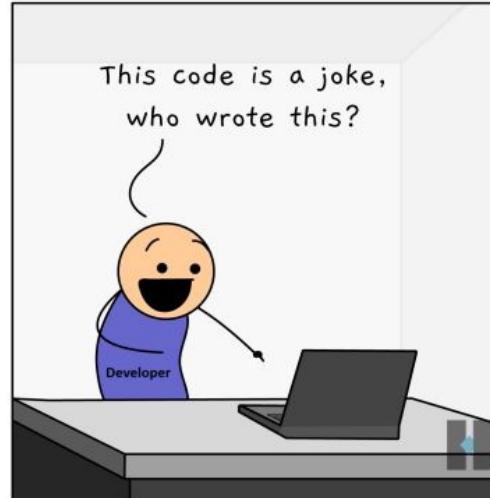
L'entreprise Compilatio, basée à Annecy (Haute-Savoie), a mis au point un logiciel capable de corriger les copies des élèves, grâce à l'intelligence artificielle. Une innovation qui représente un vrai gain de temps pour les professeurs : ils passent en moyenne 125 heures par an et par classe sur les corrections.

Experiment... Wisely!



Source: DALL.E, 2024-07-10, prompt: "Make a picture of crazy male and female scientists Making experiments "

After few months of coding using GenAI



Source: X/Twitter, 2024