Artificial Intelligence for Educators

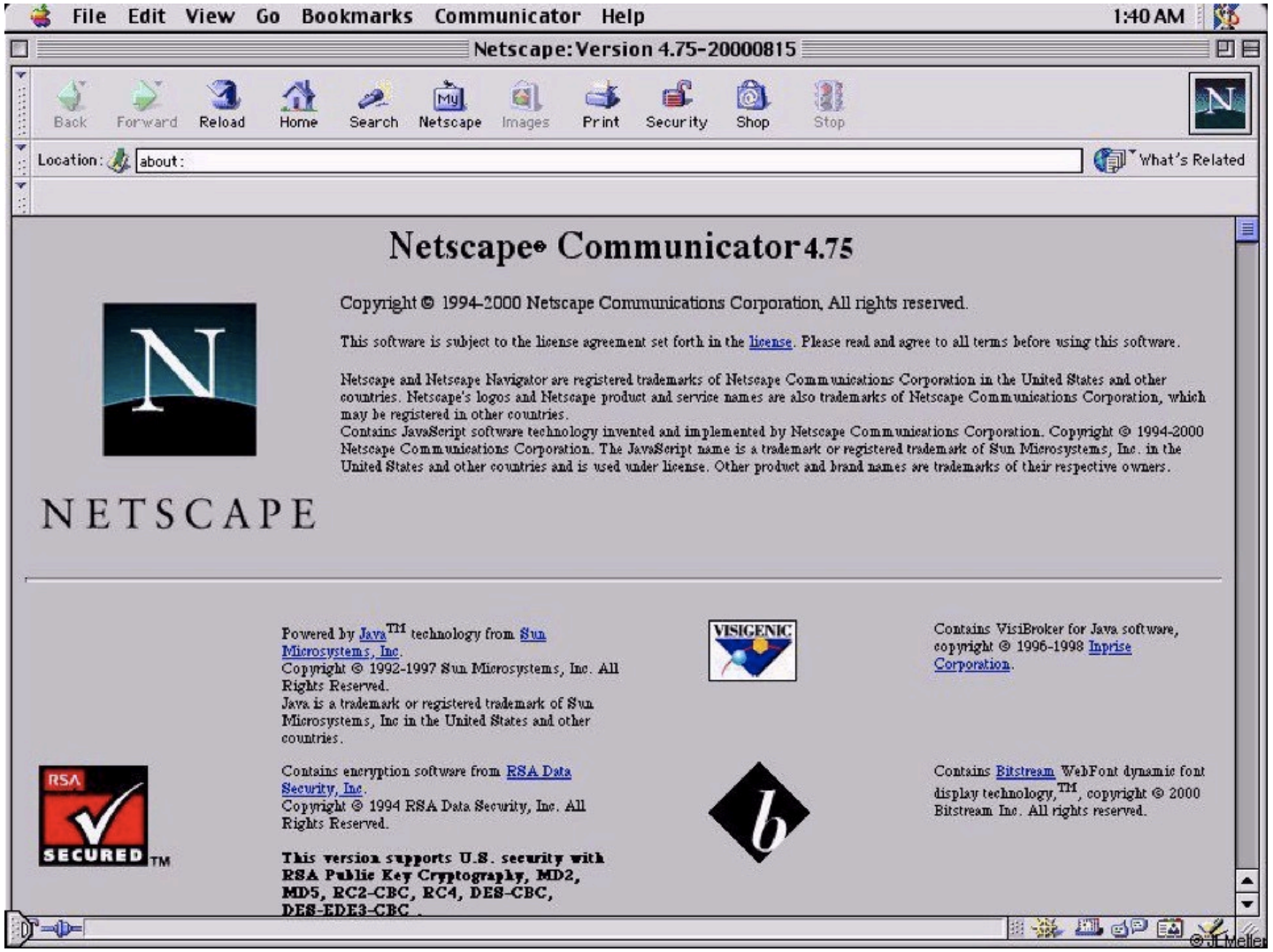
STEM
PRE-ACADEMY

INFORMATION AND COMPUTER SCIENCES
UNIVERSITY OF HAWAI'I AT MĀNOA

We have seen ~4 big tech booms in the last 30 years

What were they?

- 90s: World Wide Web
- Early 2000s: Social media
- Late 2000s/2010s: Mobile connectivity
- 2022: Generative AI



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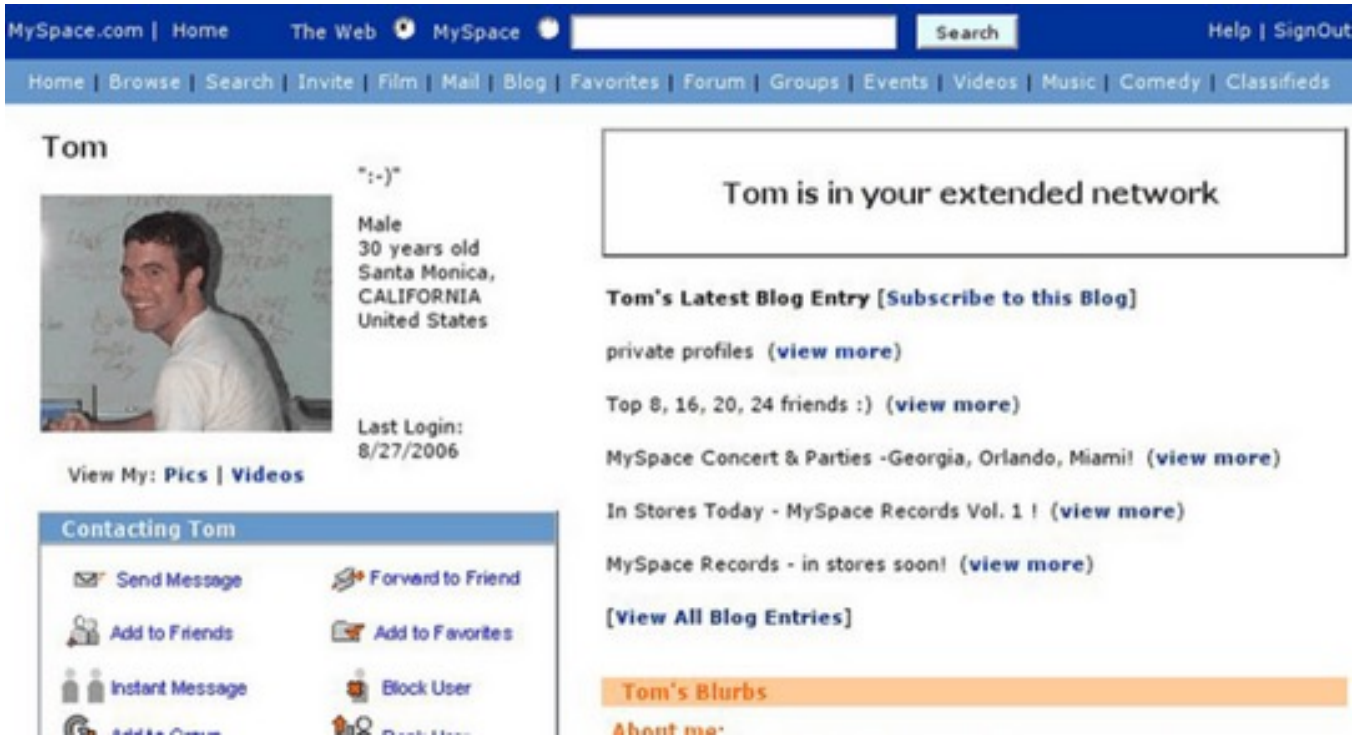

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- ***2022: Generative AI***

Coffee talk points

- What is AI?
- What are GPT?
- What is the impact on the workforce?
- How does GPT influence education?
- How can we get started?

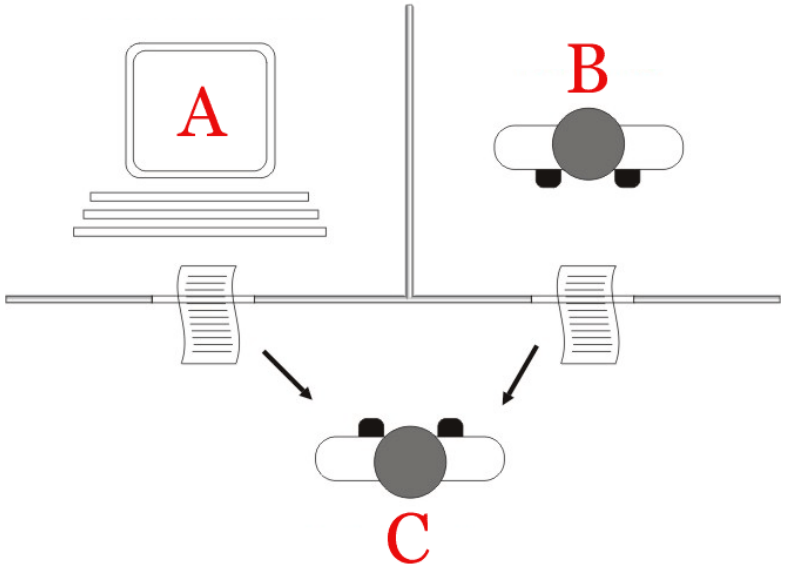
What is artificial intelligence?

What is artificial intelligence?

It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable. (McCarthy, 2007)

Alan Turing (Turing test)

If we have a human operator asking questions in a chat, can it tell the difference between responses generated by a machine or human?



(Wikipedia)

What are GPT?

ChatGPT

Chat*GPT*

GPT: Generative Pre-trained Transformer

- ***G***enerative: Produce new (textual) content
- ***P***re-trained: Trained on a set of data
- ***T***ransformer: Neural network that learns context based on relationships between words in a sentence (data); aka a large language model (LLM)
    - Neural Networks: inspired by the human brain, where this approach is modeled after the signals between biological neurons
- Trained to produce “realistic” text and dialog
- Example: Customer service chatbots
- Trained on large amount of text (usually Internet) to determine patterns in language

How GPT works

- Trained on large amount of text (usually Internet) to determine patterns in language (e.g. ChatGPT 3 includes data through 2021)
- User inputs text
- GPT system analyzes the text and uses a text predictor to create the most likely output
- Works with closed- and open-ended questions

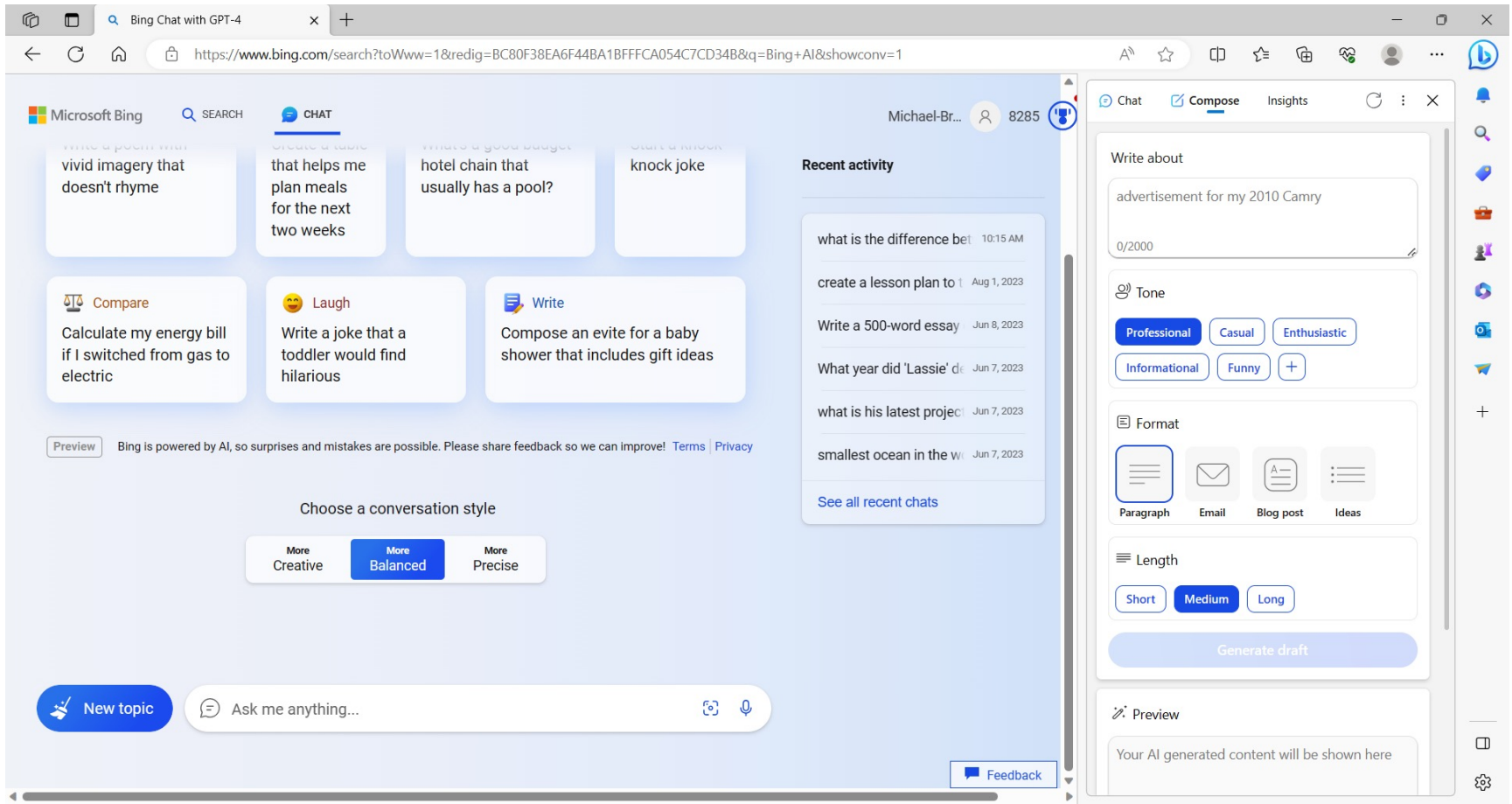
General GPT search concerns

- Limited to trained data set
- Machine learning bias based on training data
- May not answer your question directly
  - Does the user know how to verify the answer
  - Can the user adjust the input to match the desired output

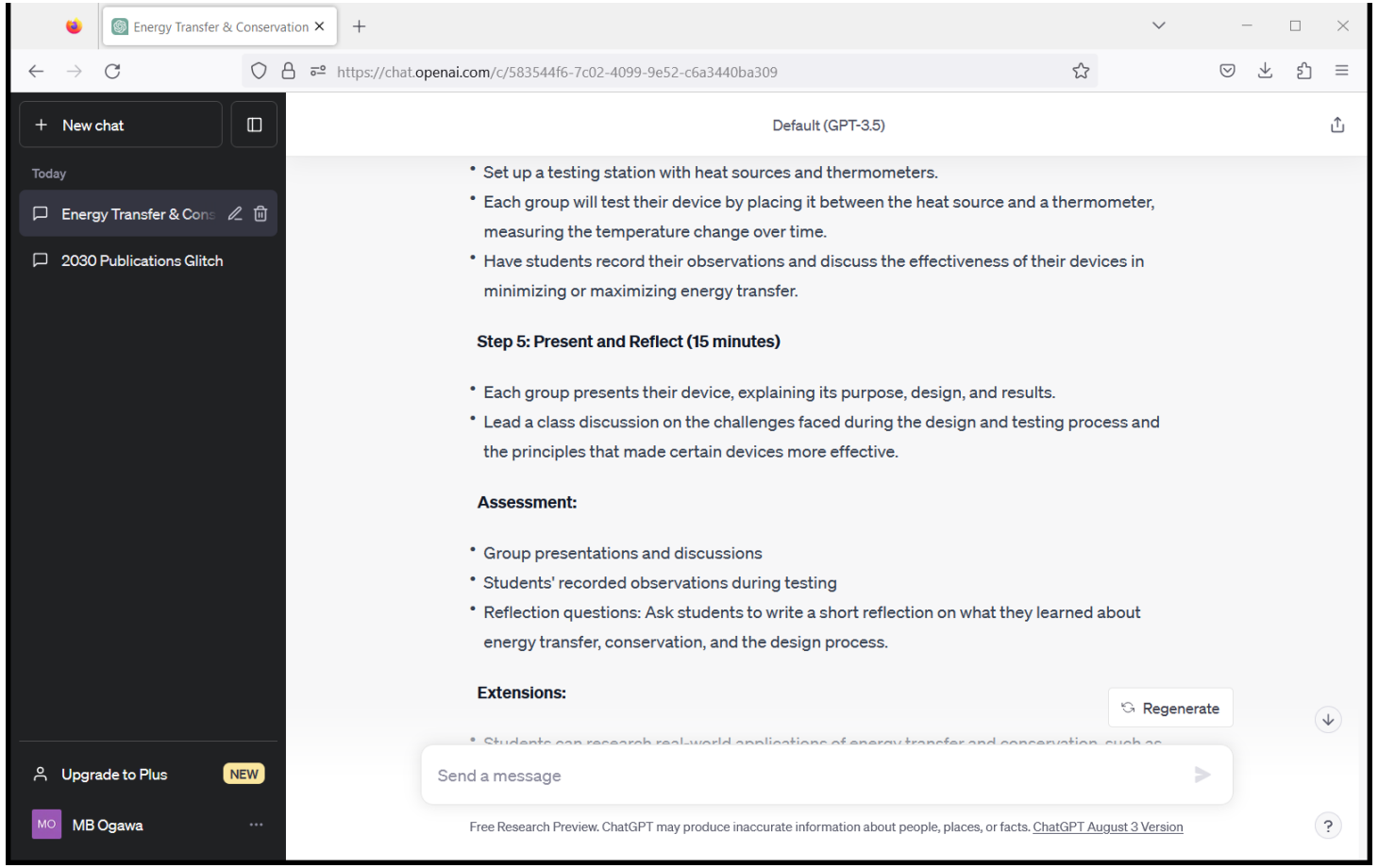
GPT Applications

- Chatbots: Chat-based query-response systems (ChatGPT, Bing Chat, etc.)
- Art generators: Generating art through keywords (Image creator by Bing, Midjourney, etc.)
- Image editing: Generative image editing (Adobe Photoshop / Firefly)
- Productivity content: Creating productivity-oriented content and information (Microsoft Copilot)
- Pair programming: generate programs with a developer (GitHub Copilot)
- And much much more…

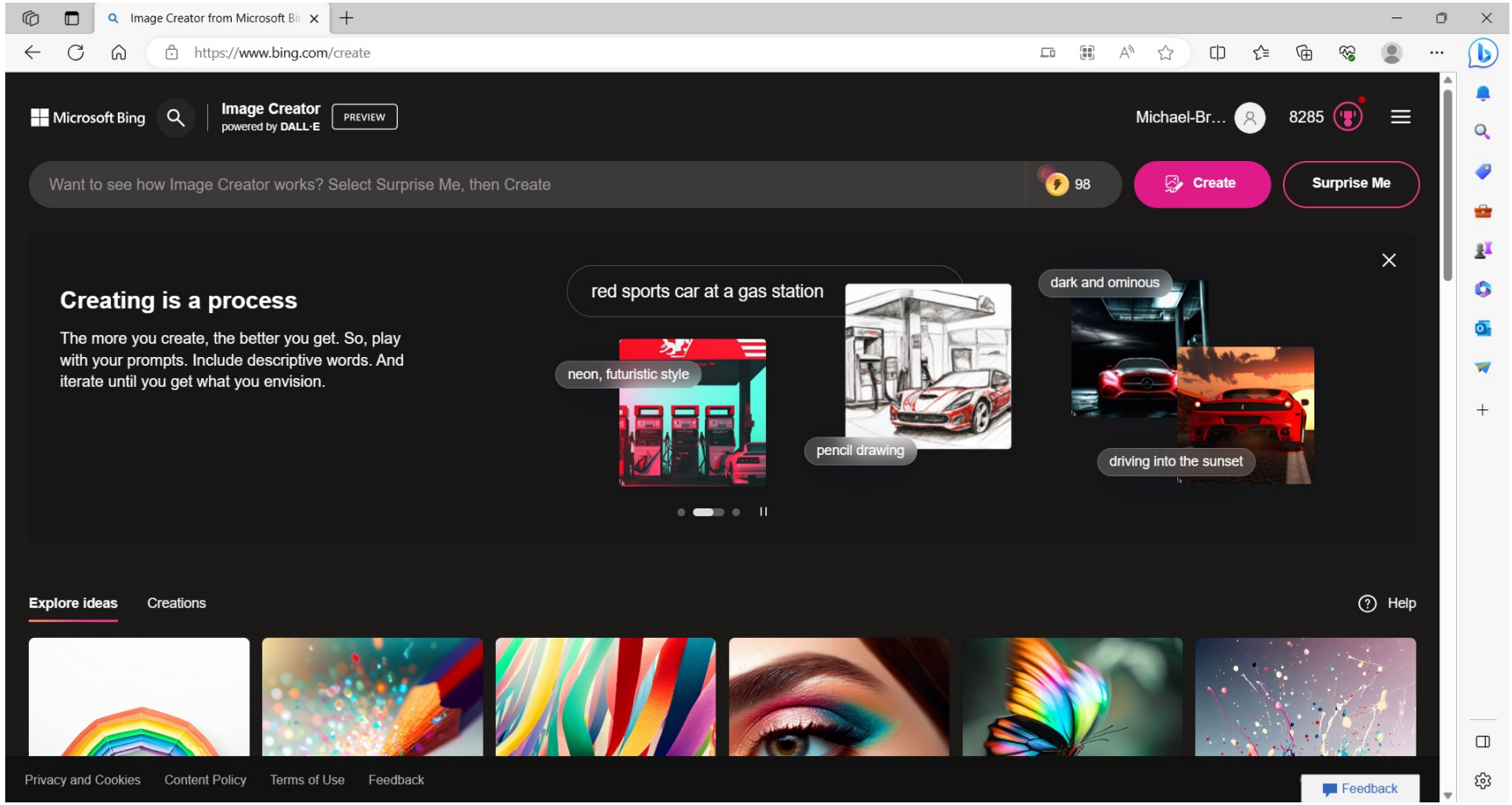
In action: Bing Chat (powered by GPT-4)



In action: ChatGPT (powered by GPT-3.5)



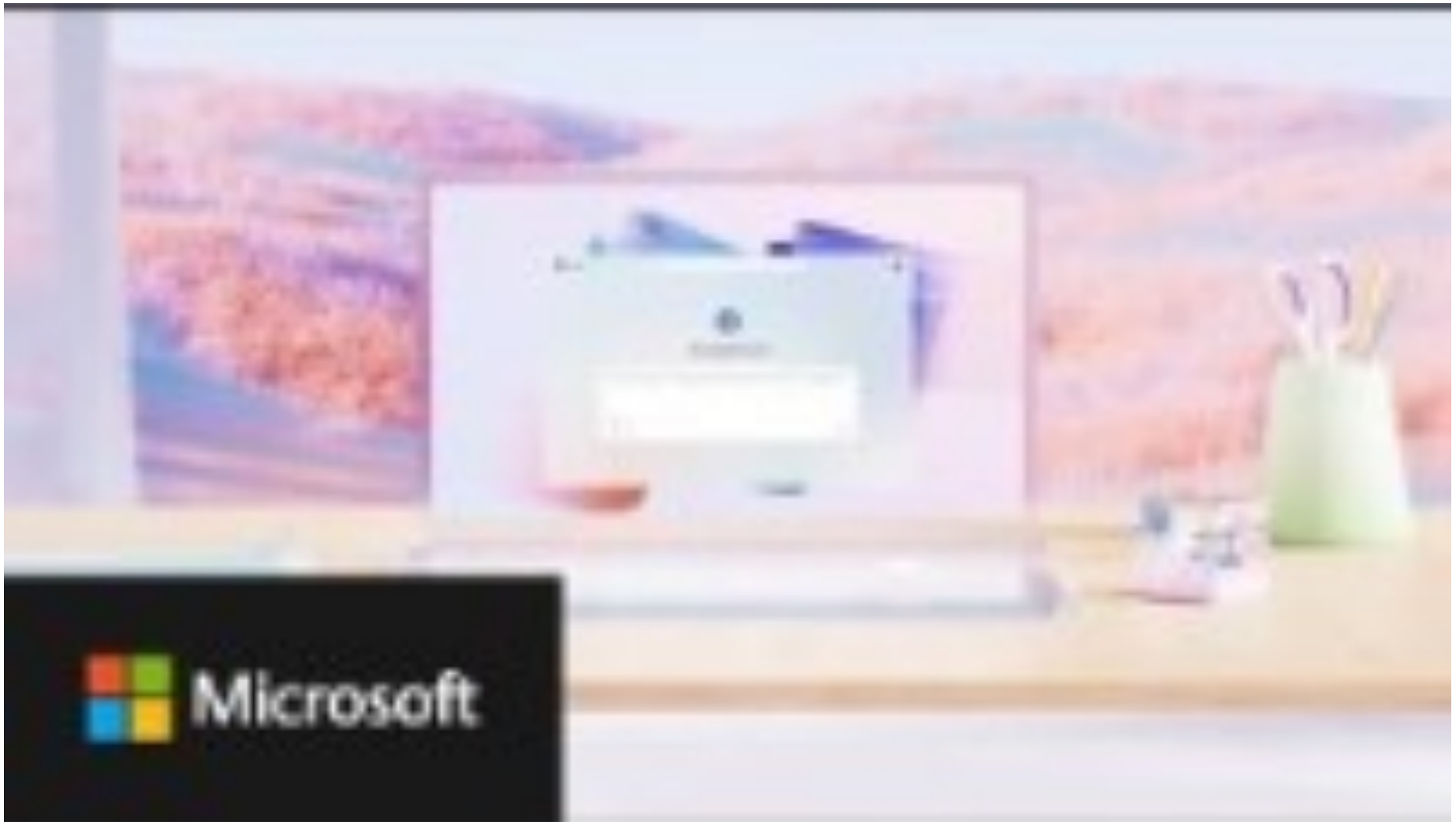
In action: Image Create



In action: Image editing

https://youtu.be/IVTyLYupECI

In action: Microsoft Copilot



https://youtu.be/S7xTBa93TX8

In action: GitHub Copilot

Sample use cases

- Generate code (GitHub Copilot) aligning code to coding standards and goals are a challenge)
- Create content for various outputs
  - Social media
  - Journalistic
- Data analytics
- Generative image editing
- Deep fake video/audio

Let’s illustrate GPTs

Which one was created by an AI art generator?

A.

B.

Slightly deeper explanation

(Chai, You-Fan, 2023)

What is the impact on the workforce?

Workforce: a few job examples

- Programmers: ~92% of programmers reported using AI in their work (such as GitHub Copilot)
- Security experts use ChatGPT to draft security company/organization policies
- Attorneys use GPT sources to draft legal briefs
- Professors use GPT to start parts of their work (publications, grants, student feedback, etc.)
- Writing articles for media outlets
- Creating illustrations for media
- Using generative AI in post-production for media

AI Content Specialist

Boostability
Lehi, UT

Full-Time

Job Description

The Role and Mission...
We are looking for AI Content Specialists to join our AI Content team! Our AI Content team works with Jasper AI to generate blog posts on behalf of our clients. The AI Content Specialist is primarily responsible for generating AI content and editing that content for our clients. We want candidates who have strong AI skills as well as strong writing/editing skills, and who are creative enough to research and learn about a lot of different topics in various industries. If you meet these qualifications, apply to become an indispensable part of our team.
There is a permanent work-from-home option for this role.
Why Boostability?

- Option to work from home, in our UT office, or hybrid. Your choice!
- Full-time employees are eligible for:
    - Paid time off, 10 paid holidays, and a paid floating holiday
    - Health, dental, orthodontia, vision, EAP, and 401k benefits
    - Internet allowance
    - HSA company match

from Ziprecruiter

Workplaces: a few job examples

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- Writing articles for media outlets
- Creating illustrations for media
- Using generative AI in post-production for media
- Questions:
  - What issues come up with these examples?
  - What do these workplace examples have in common?

Issues

- Programmers: Can have AI take them down path different than the goal (takes much longer to complete the work)
- Attorneys: Lawyer used a chatbot to write a legal brief, which included “fabricated cases”
- AI art wins art contest: A person submitted AI art (indicating it is AI art) to a Colorado State Fair competition. Many folks accused him of “cheating”

Théâtre D’opéra Spatial by Jason Allen via Midjourney

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- FraudGPT: “…can be used to ‘write malicious code, develop undetectable malware, and identify leaks and vulnerabilities.’”

What do these workplace examples have in common… when used well?

Commonality when used well

People with a strong background augmenting their intelligence and workflow (not replacing it)…

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Computers are intelligence augmenters. We need to learn to use technology to augment our abilities.

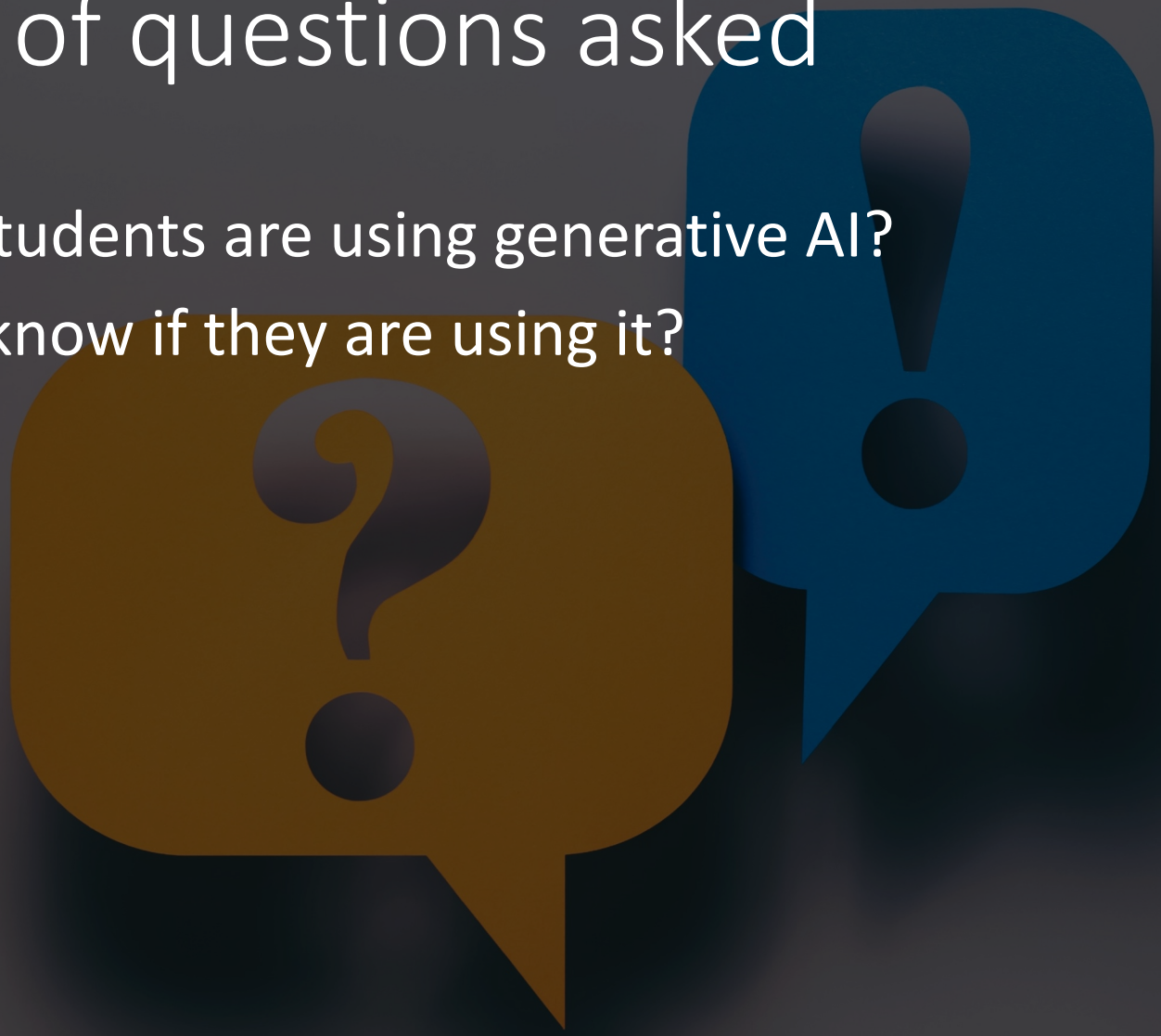
(Streveler, D.)

An example we commonly see is students and teachers using ChatGPT

How does GPT influence education?

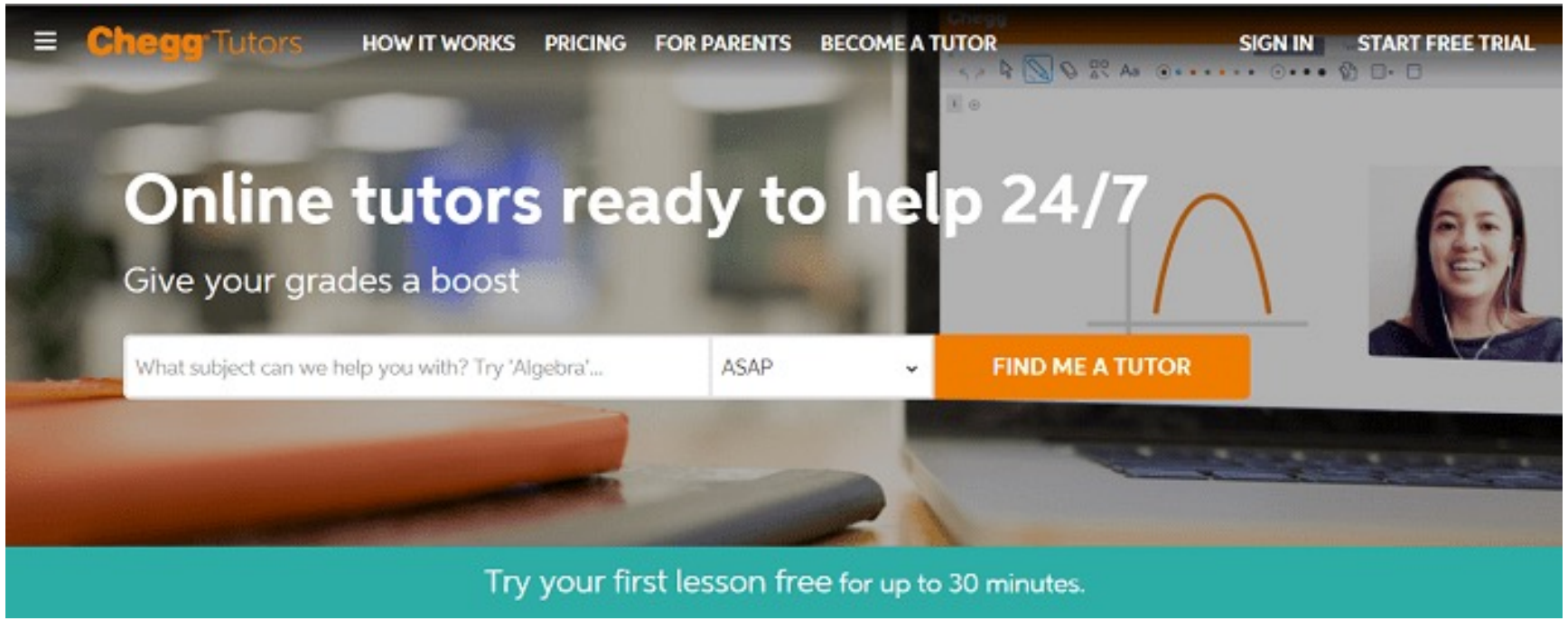
First sets of questions asked

- How many students are using generative AI?
- How do we know if they are using it?



Chegg

- Get 24/7 Homework Help



(Yahoo Finance)

How do we know if they are using ChatGPT?

- Researchers have a decent idea of text that is ChatGPT created
- Developed DetectGPT model (based on GPT-2)
- Possibility of GPT text watermarking themselves

Algorithm 1 DetectGPT model-generated text detection

Input: passage x, source model p_θ, perturbation function q, number of perturbations k, decision threshold ϵ
$\tilde{x}_i \sim q(\cdot \mid x),\ i \in [1..k]$ // mask spans, sample replacements
$\tilde{\mu} \leftarrow \frac{1}{k} \sum_i \log p_\theta(\tilde{x}_i)$ // approximate expectation in Eq. 1
$\hat{\mathrm{d}}_x \leftarrow \log p_\theta(x) - \tilde{\mu}$ // estimate $\mathrm{d}\,(x, p_\theta, q)$
$\tilde{\sigma}_x^2 \leftarrow \frac{1}{k-1} \sum_i (\log p_\theta(\tilde{x}_i) - \tilde{\mu})^2$ // variance for normalization
if $\frac{\hat{\mathrm{d}}_x}{\sqrt{\tilde{\sigma}_x}} > \epsilon$ **then**
  return `true` // probably model sample
else
  return `false` // probably not model sample

$$\frac{-\mathrm{tr}(H) f(x)}{2} \approx f(x) - \mathbb{E}_{\mathbf{z}} f(x + \mathbf{z}).$$

(Mitchell, Lee, Khazatsky, Manning, Finn, 2023)

What is happening in education from a bird's eye view in CS?

- Many are debating the core concepts students learn
- Current focus on programming concepts and generation
- Future concern is if the focus should be on computational thinking/program comprehension and testing
- Do learning objectives and goals need to be modified?
- Some in industry are concerned about novice use to generate without knowing what they want

The University of Hawaii's view

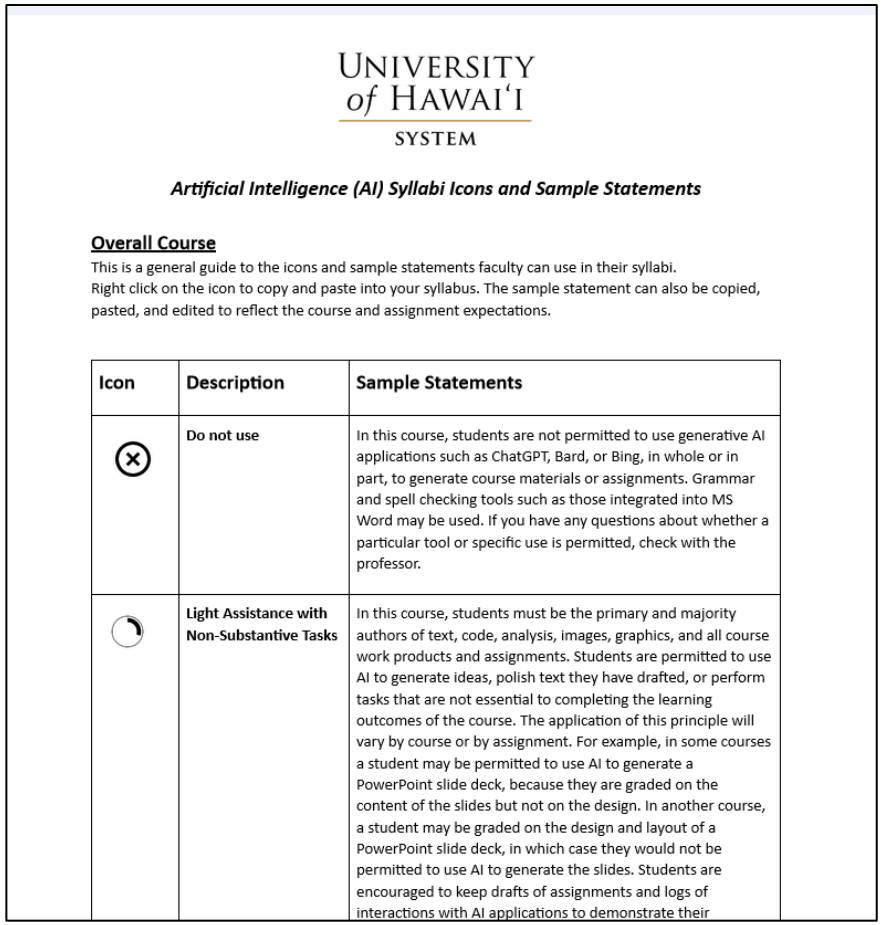
- Decentralized decision-making approach
- Prioritization to instructor autonomy to consider benefits, limitations, and ethical considerations for academic disciplines
- No formal policy

https://www.uhonline.hawaii.edu/administration/ai

The University of Hawaii's view

- Educate: focus on expectations, ethics, and limitations
- Leverage: tutoring, language learning, personalized recommendations, intelligent feedback, chatbots, and virtual assistants
- Assess: Assignments that focus on critical thinking, tailor work to specific scenarios and case studies, focus on open-ended prompts encouraging original thought and thoughtful reflection

University of Hawaii's view: Sample statements



UNIVERSITY of HAWAI'I SYSTEM

Artificial Intelligence (AI) Syllabi Icons and Sample Statements

Overall Course

This is a general guide to the icons and sample statements faculty can use in their syllabi.
Right click on the icon to copy and paste into your syllabus. The sample statement can also be copied, pasted, and edited to reflect the course and assignment expectations.

Icon	Description	Sample Statements
⊗	**Do not use**	In this course, students are not permitted to use generative AI applications such as ChatGPT, Bard, or Bing, in whole or in part, to generate course materials or assignments. Grammar and spell checking tools such as those integrated into MS Word may be used. If you have any questions about whether a particular tool or specific use is permitted, check with the professor.
◔	**Light Assistance with Non-Substantive Tasks**	In this course, students must be the primary and majority authors of text, code, analysis, images, graphics, and all course work products and assignments. Students are permitted to use AI to generate ideas, polish text they have drafted, or perform tasks that are not essential to completing the learning outcomes of the course. The application of this principle will vary by course or by assignment. For example, in some courses a student may be permitted to use AI to generate a PowerPoint slide deck, because they are graded on the content of the slides but not on the design. In another course, a student may be graded on the design and layout of a PowerPoint slide deck, in which case they would not be permitted to use AI to generate the slides. Students are encouraged to keep drafts of assignments and logs of interactions with AI applications to demonstrate their

https://docs.google.com/document/d/1XWGyroCg0BndoJW3MaN8T-Fj_YQBPULYbLPrP8JpGsI/edit

In the classroom: How it impacted me

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- Asked Bing Chat to give feedback to student work
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  - *I modified my writing assignments to include oral components, where Q&A helped to demonstrate knowledge of their writing*

In the classroom

- In general having GPT complete work for students is not seen as acceptable
  - Most do not want students typing in a prompt to submit written work
- How can we leverage GPT to improve learning?

Commonality when used well

People with a strong background augmenting their intelligence and workflow (not replacing it)…

Information literacy as a core concept to GPT-usage

- Understanding GPT-based results and checking that it is accurate is critical
- Knowing how to use a tool as a support for learning
  - How do we ask good questions (revising prompts) for GPT?
  - How do we edit outputs?

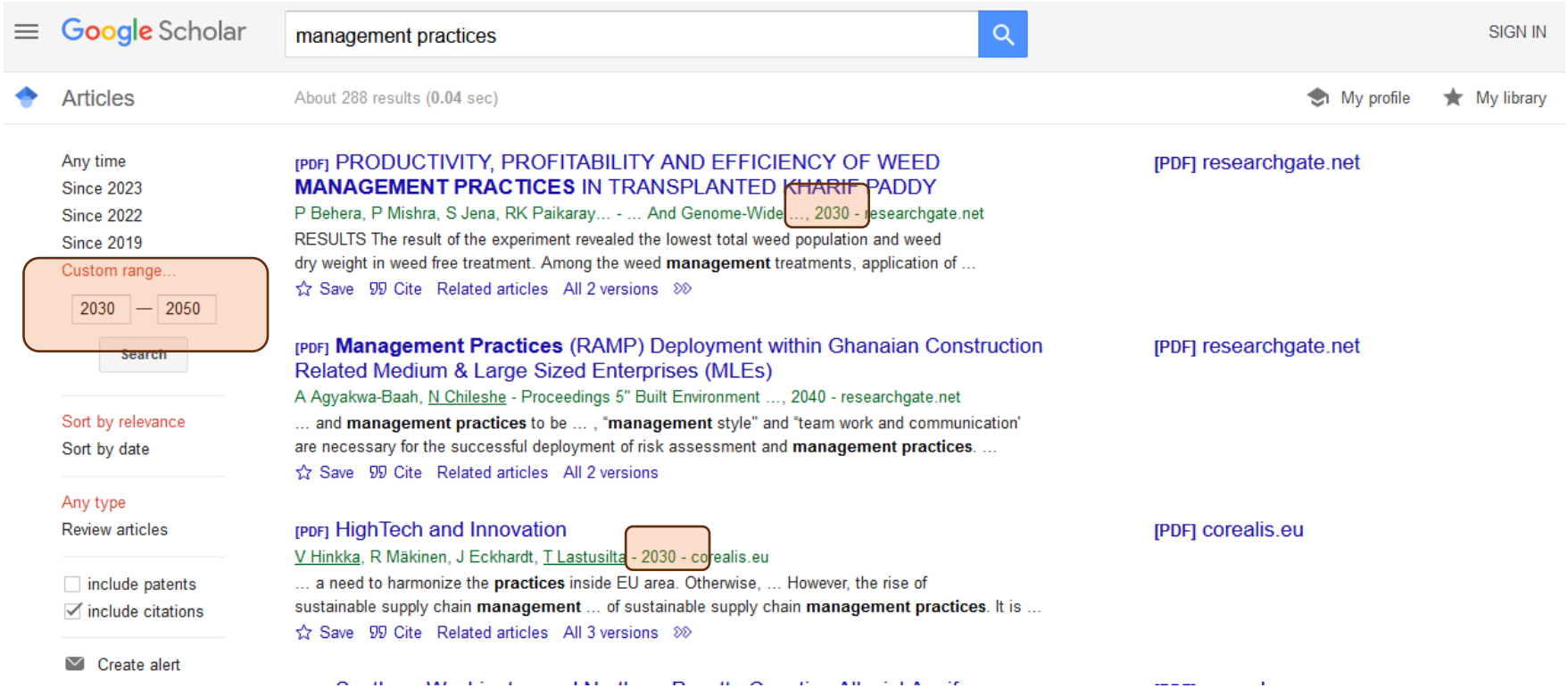
History instructional design example

- Teacher traditionally assigns a paper on a historical event
- ChatGPT adaptation
  - Has ChatGPT write a paper for the students
  - Assignment 1: Students review all of the sources and determines why they are strong sources and how the information is contextually accurate (review original source)
  - Assignment 2: Have students identify additional sources that could be useful to support an argumentative paper on the subject.
  - Assignment 3: Write a final paper using all sources gathered (both independently and through ChatGPT)

How can we get started?

Let’s try

- Example together: Let’s find out why Google Scholar has articles published in the year 2030



Try a Generative AI tool to support your classroom

- Tools for reference
  - Chatbots: ChatGPT (chat.openai.com), Bing Chat (bing.com/chat),
  - Art generators: Image creator by Bing (bing.com/create)
  - Pair programming: GitHub Copilot
- Consider
  - How could I use the tool to help me teach?
  - How would my students likely use the tool?
- Report back (in chat or in person)
  - What tool did you use?
  - How does it impact you as an educator?
  - How does it impact your students?


Questions?

Feedback, Please!

https://go.hawaii.edu/Bfy

Thank you!

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