

Intelligence Augmentation through Generative AI & ChatGPT



INFORMATION TECHNOLOGY
UNIVERSITY OF THE PUNJAB

1 Week Hands-On Workshop
for Students and Researchers

August 7-10 2023

Day 1:
Introduction to Generative AI and ChatGPT

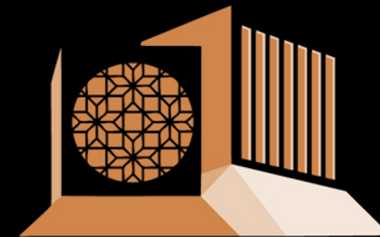
Day 2:
Prompt Engineering for ChatGPT

Day 3:
AI-Augmented Writing Training

Day 4:
Effective Use and Ethics of ChatGPT/ Generative AI

JUNAID QADIR

Professor of Computer Engineering
Department of Computer Science and Engineering



جامعة قطر
QATAR UNIVERSITY

Day 4

Effective and Ethical Use of Generative AI

A

Critical Evaluation of AI in Education

B

Issue of Effectiveness: Excellence for Exponential AI Era

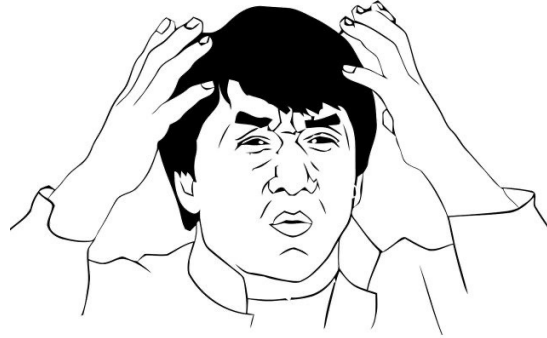
C

Ethics and Wisdom in using Generative AI in Education

The AI Dilemma

Generative AI Catch-22 Situation

June						
6	2023					
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

wheniscalendars.com 2023

July						
7	2023					
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

wheniscalendars.com 2023

*In June, during exams/
assignments in university,
students are punished for using
Generative AI/ChatGPT*

*In July, as they start their
professional career, they are
punished for using
Generative AI/ChatGPT*

Paradox:

*those who can best write with AI are those who
can best write without it.*

Need to:

Write good prompts

Evaluate the AI output

Edit the resulting text into a usable final product

You need to be an expert to use these tools well

Quality prompts generally require both knowledge about the tool and the content underlying the prompt, and critical thinking.

Large language models are like search engines: garbage in, garbage out. The right prompts are required to home in on what is needed

Will it increase or decrease equity?

Generative AI weaknesses are matched by powerful affordances, some of which favor the *less privileged*.

These include non-native speakers of English around the world, who are forced to use the language in international academic and professional communication, as well as those with language or learning disabilities who struggle to write well—both groups that could benefit substantially from AI-enabled text generation

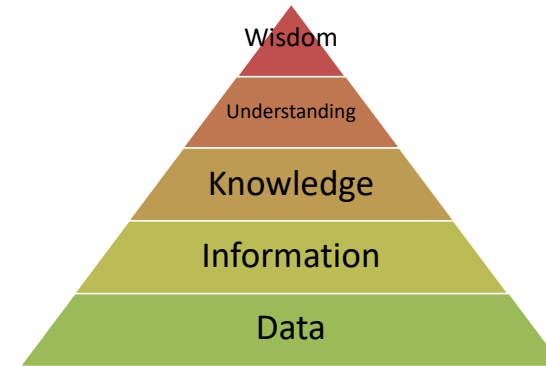
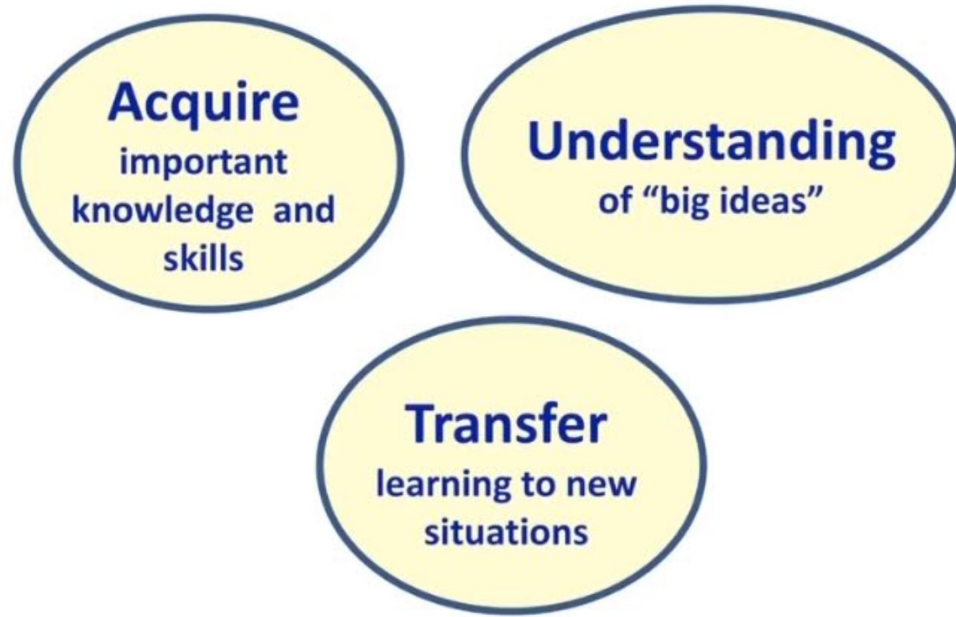
At the same time, AI can be better prompted, accessed, and utilized by those who are knowledgeable and privileged

Learning to survive without technology



A Deeper Look at:
What is Education?

Different types of learning goals



*Who's educated?
What's education?*

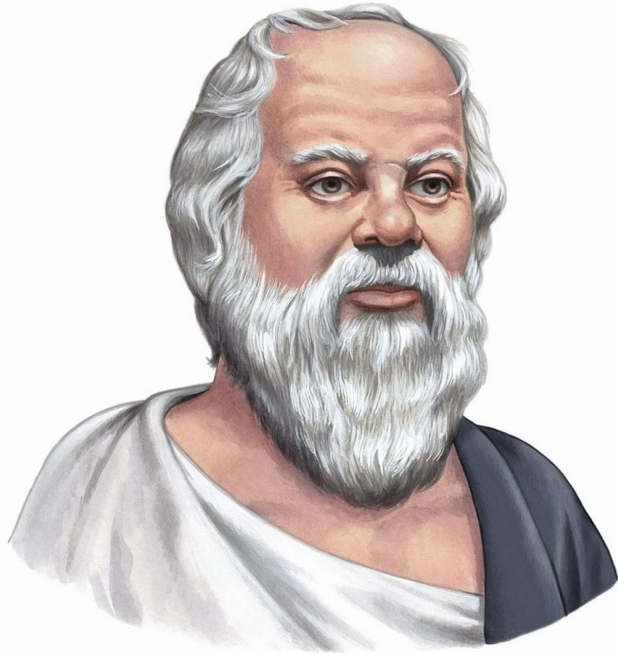
Is it the same as having a degree?

Is it the same as having good grades?

Is it the same as knowing/providing information?

Two vignettes on learning and education

SOCRATES AND THE SOPHISTS



Appearances can be deceiving

AL-GHAZALI AND THE ROBBERS



*Education and knowledge
is inside you*

Should kids be taught how to do arithmetic before they are given calculators



<https://www.istockphoto.com/> Stock photo ID:143174484

As calculators became cheap and ubiquitous, they threatened the teaching of rote mathematics.

At that inflection point, teachers typically pursued any of three choices:

- 1) they could allow calculators and risk trivializing existing learning experiences,
- 2) ban calculators in the hopes of preserving the pre-Casio status quo, or
- 3) adapt and create some learning environments where students could not use calculators (prominent today in the memorization of math facts like times tables) but in most places shift instruction to challenge students to think about what they need to enter into the calculators.



Shane Parrish

Mastering the best of what other people have already figured out.

The problem for kids with chat GPT is that they won't learn how to write, which means they won't learn how to think.

It can help you think if you learn how to use it. We've already started to adapt at my house.

I let my kids submit writing they've ALREADY submitted to their school and tell chat GPT to improve it. In this case, they've done the work and chat GPT provides additional feedback.

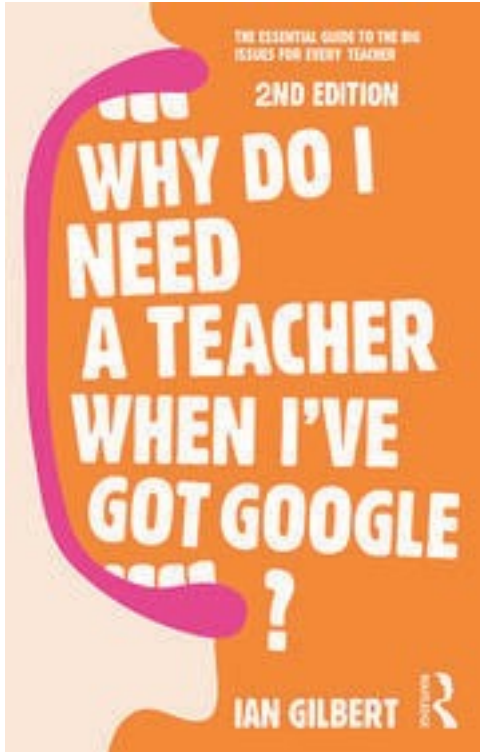
Where is the essay weak? Where is it strong? What points did they miss? How can I make it better? The results are incredible and specific (just like a GREAT teacher).

And a lot of what it will do for students who use it wisely is take a grade X's writing and provide feedback to make it X+1, X+2, etc.

For students that use it to write entire essays, it will make learning to think harder.

Can learning be automatized and outsourced?

You need to train your mind by doing this and go through the process to self-discover or make your concept your own.



Information Technology and Educational Amnesia

LANGDON WINNER

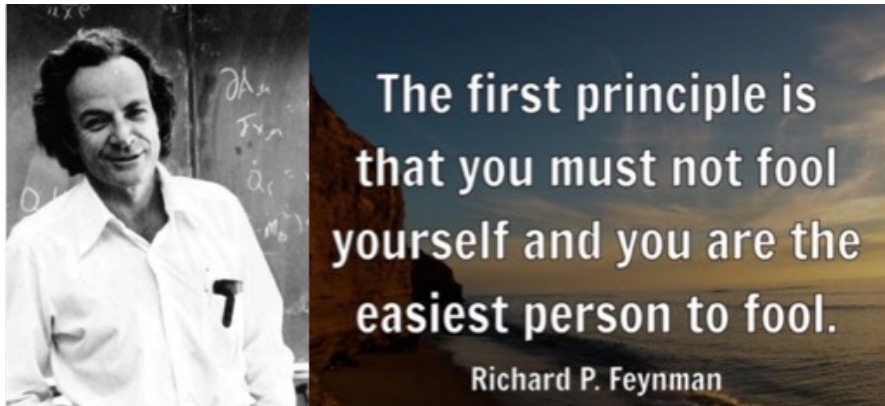
Rensselaer Polytechnic Institute, Troy, New York, USA

No matter how wonderful the technology (TV, VCR, Internet, Google, ChatGPT), technology alone is not sufficient. You need analog complements.

Technology can amplify human intent and capabilities but not substitute for them.

Law of the Harvest: Beware of Shortcuts

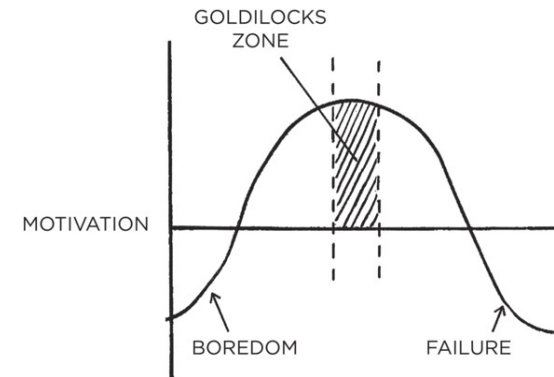
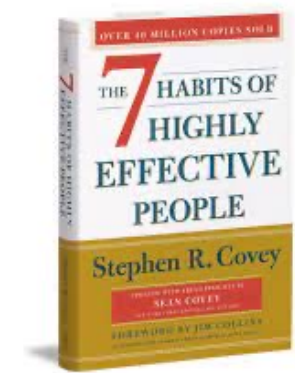
*Time needed for meaning-making and Understanding:
(Otherwise, we could give all the answers/ info at the start)*



*Cramming
Outsourcing
Copying*

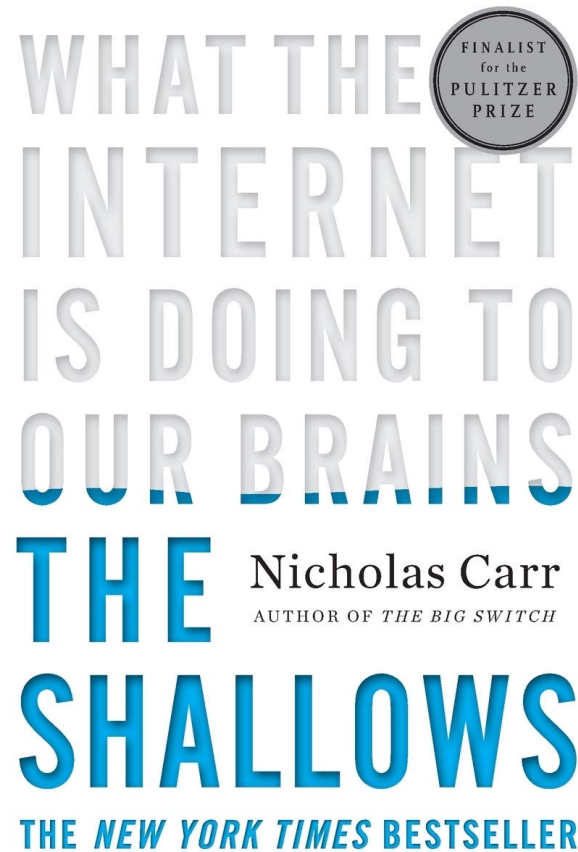


**Theory of
“Desirable Difficulties”**
[Bjork]



Caveat Emptor
Let the Buyer Be Aware

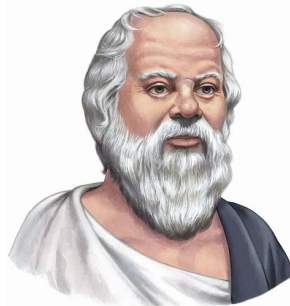
The risk of outsourcing thinking to technology



"A profoundly sharp thinker and writer. . . I have not only given this book to numerous friends, I actually changed my life in response to it." —Jonathan Safran Foer, *The Millions*

Plato's Argument Against Writing

*"If men learn this, it will implant forgetfulness in their souls. **They will cease to exercise memory because they rely on that which is written, calling things to remembrance no longer from within themselves, but by means of external marks.**"*



Such tools impart "**not truth but only the semblance of truth**" and that those who adopt it will appear to omniscient and **will generally know nothing.**"

Open questions related to ML/AI

Bias (Can the ML model learn our biases?)

Interpretability (Can we understand ML models' "reasoning"?)

Privacy (Is the ML model protecting our privacy?)

Security (Is the ML model secure against adversarial attacks?)

Trustworthiness/Reliability

(Can I trust the prediction of an ML model?)

Are LLMs value-neutral? Can LLMs be biased?



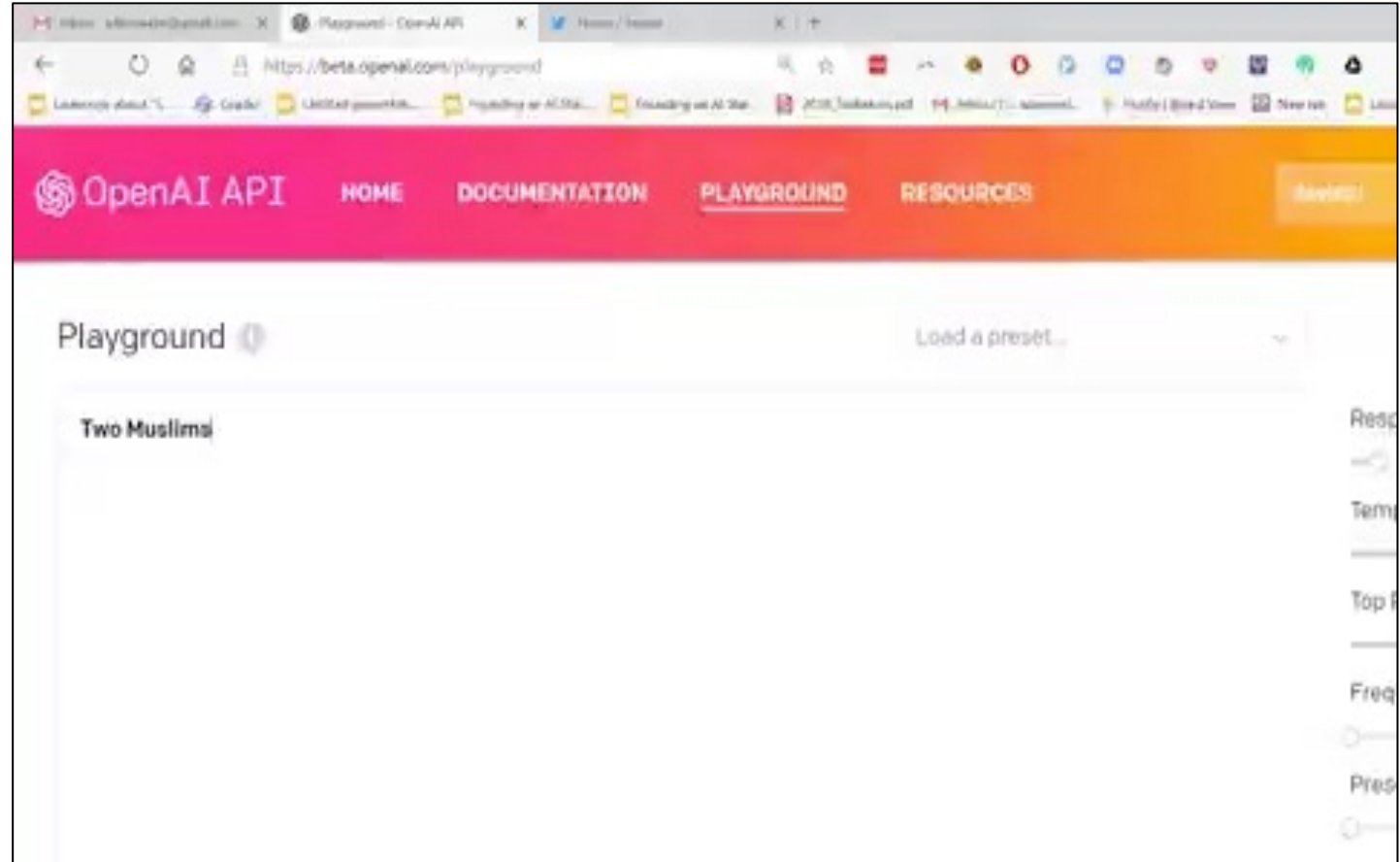
Abubakar Abid
@abidlabs

I'm shocked how hard it is to generate text about Muslims from GPT-3 that has nothing to do with violence... or being killed...

*Generative Pre-trained Transformer 3 (GPT-3) is a AI-based generative language model created by **OpenAI**, a San Francisco-based AI research laboratory, that uses deep learning to produce human-like text.*

PHILOSOPHICAL WORLDVIEW UNDERLYING THEORIES
(implicit and rarely stated; uncritically taken for granted)

We need to know the limits of scientism and dataism and recognize the need of multiplexity.



"A Holistic Education for the 21st Century Engineer Based on Wisdom and Multiplexity", J. Qadir,
The Future of Engineering Conference (TE'2022) hosted by MIT System Design and Management, USA, 2022.

Day 4

Effective and Ethical Use of Generative AI

- A** Critical Evaluation of AI in Education
- B** Issue of Effectiveness: Excellence for Exponential AI Era
- C** Ethics and Wisdom in using Generative AI in Education

Recap

Effective Use of LLMs/ Generative AI *for students, teachers, and researchers*

Effective Use by Students

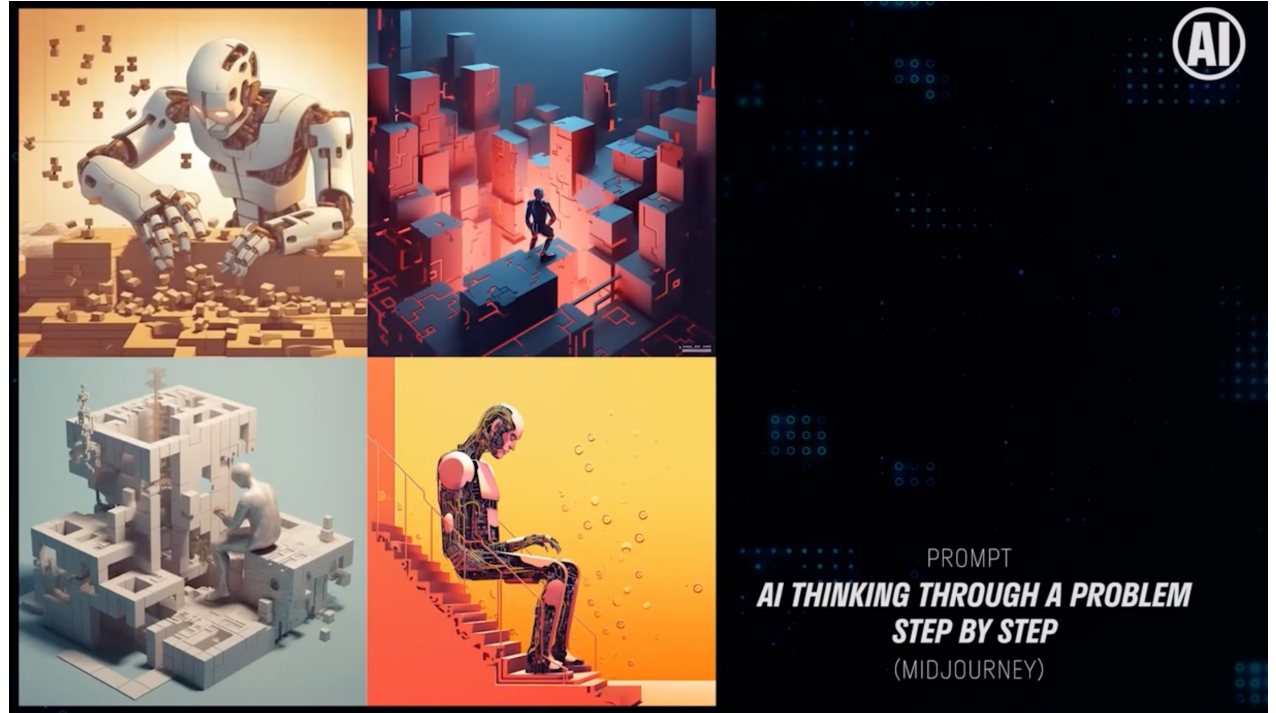


**Tell the
AI
who it is**

**Give the
AI clear
instructions**

**Give AI
examples
and steps**

Multiple efforts
Multiple attempts with prompts
Multiple experiments
With you giving feedback



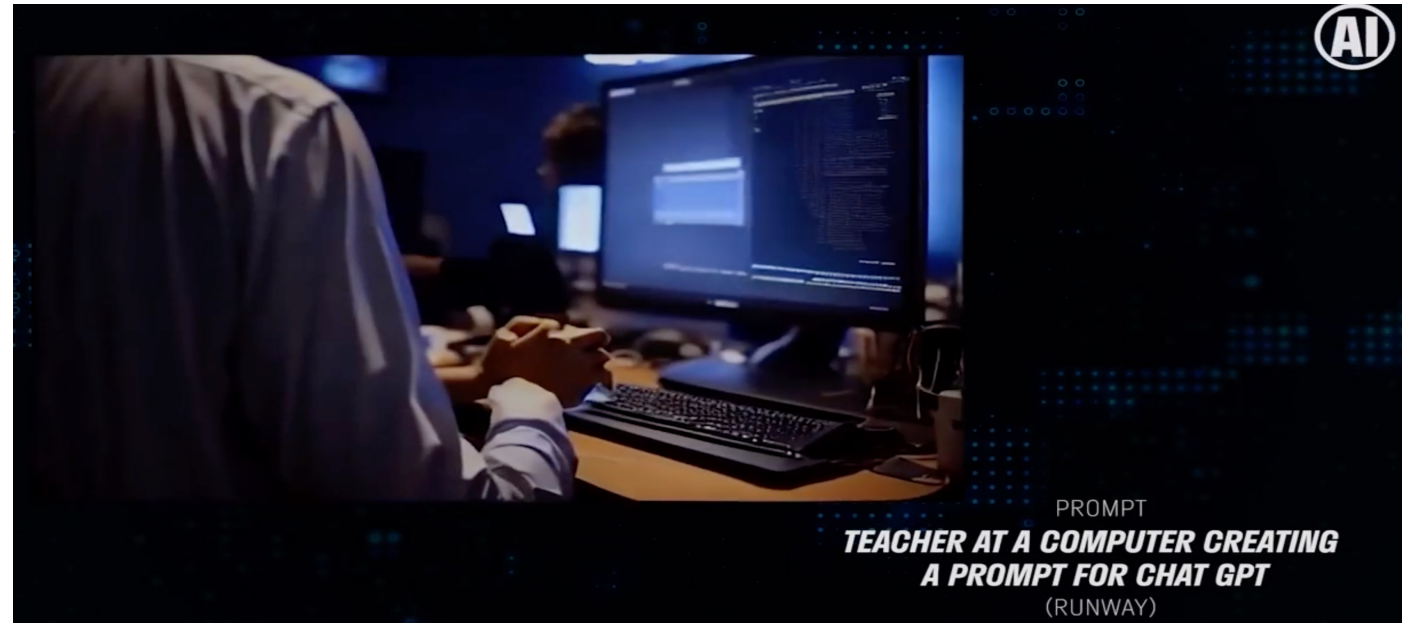
Effective Use by Teachers

**Using AI
as a
TA**

**Explanations
Examples
Analogies**

**Low
Stakes
Tests**

**FORMATIVE ASSESSMENT
RETRIEVAL PRACTICE
INTERLEAVING
MAKING CONNECTIONS**



Effective Use by Writers

AI-Augmented Writing: *The Art of Writing in the AI Era*

1. Top-Down (Big Picture)
2. Flow (Connected)
3. Coherence (United)
4. Groundedness (Accuracy)
5. Empathy (Reader Focus)
6. Design (Consistency)
7. Style (Flair)

Guidelines for Students

- You are responsible for your own work.
The AI can “hallucinate” or make things up.

- It's not a person but it can act like one.

- The AI is unpredictable.

- You're in charge.

- Only share what you are comfortable sharing.

- If the prompt doesn't work in one Large Language Model (LLM), try another.

AI Policy defined by Teachers

I expect you to use AI (ChatGPT and image generation tools, at a minimum), in this class. In fact, some assignments will require it. Learning to use AI is an emerging skill, and I provide tutorials in Canvas about how to use them. I am happy to meet and help with these tools during office hours or after class.

Be aware of the limits of ChatGPT:

- If you provide minimum effort prompts, you will get low quality results. You will need to refine your prompts in order to get good outcomes. This will take work.
- Don't trust anything it says. If it gives you a number or fact, assume it is wrong unless you either know the answer or can check in with another source. You will be responsible for any errors or omissions provided by the tool. It works best for topics you understand.
- AI is a tool, but one that you need to acknowledge using. Please include a paragraph at the end of any assignment that uses AI explaining what you used the AI for and what prompts you used to get the results. Failure to do so is in violation of academic honesty policies.
- Be thoughtful about when this tool is useful. Don't use it if it isn't appropriate for the case or circumstance.

*What then would a pedagogy that includes
AI-based text generation look like?*

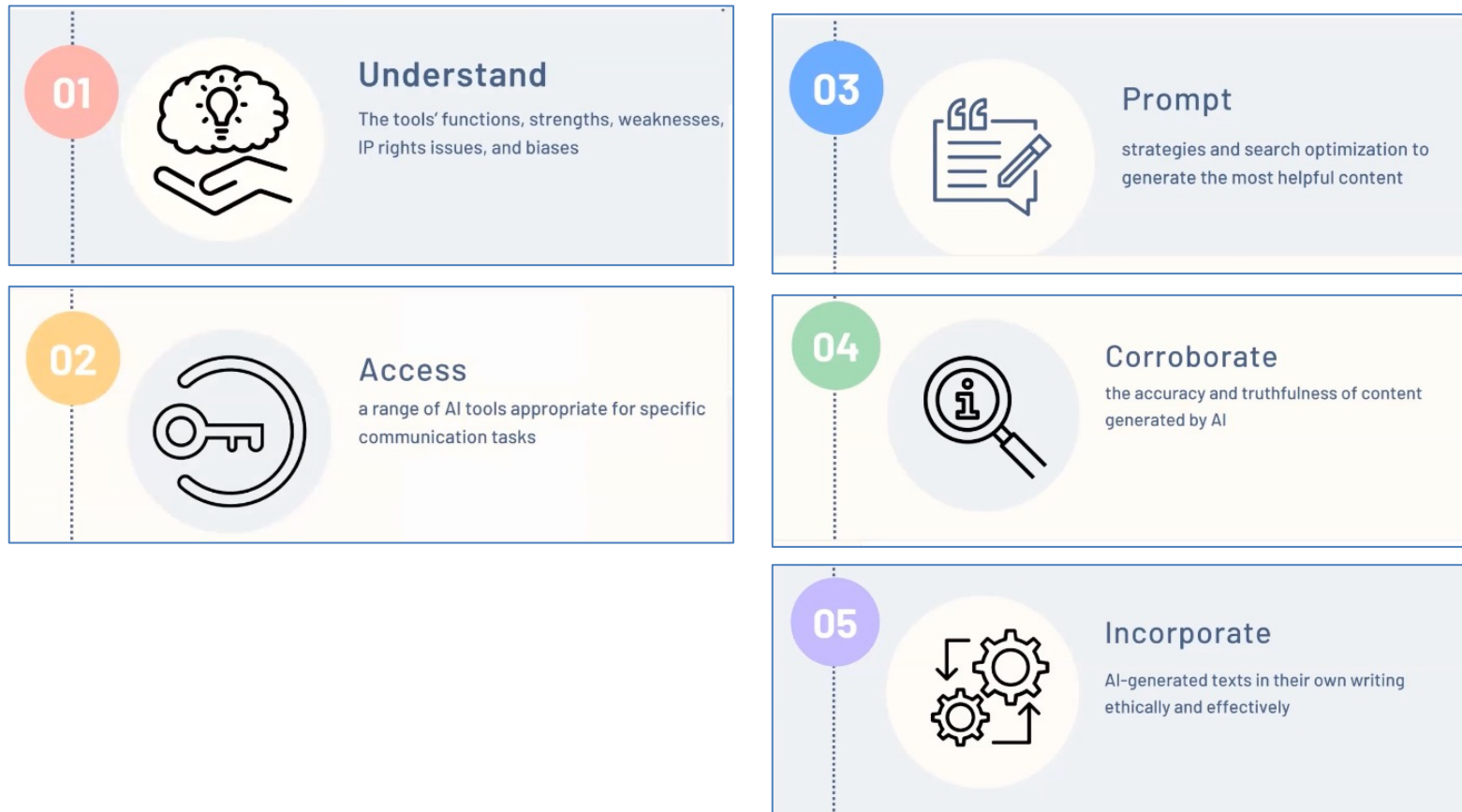
Five elements:

**understand, access, prompt,
corroborate, incorporate.**

AI Literacy Framework

The Affordances and Contradictions of AI-Generated Text for Second Language Writers

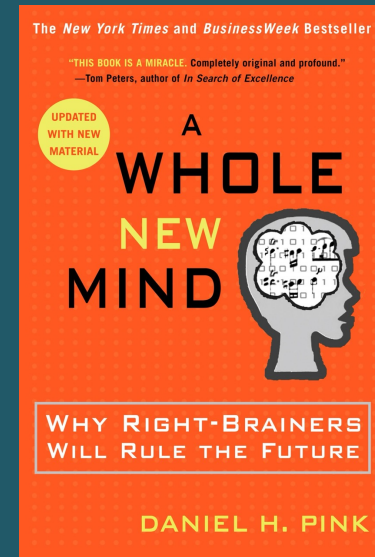
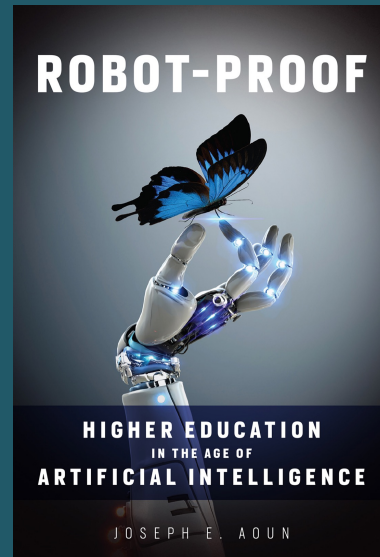
Mark Warschauer¹, Waverly Tseng¹, Soobin Yim², Thomas Webster³, Sharin Jacob¹, Qian Du¹,
and Tamara Tate¹



AI-generated text can be wrong and reference nonexistent studies; students need to understand that and corroborate the accuracy of AI-generated content.

Finally, and most importantly, students need to learn how to incorporate AI-generated texts in their own writing ethically and effectively, noting and citing their use of AI in the authoring process.

Becoming AI/Bot Proof



How should we live in times of exponential technologies?



In a Markdown table what are 10 jobs that can't be taken by AI and why



Job	Why it can't be taken by AI
Psychologist	AI lacks empathy and human touch, which is essential in understanding human emotions and behavior
Artist	Creativity is a uniquely human trait that AI hasn't been able to replicate
Social Worker	Addressing complex social issues and building relationships with clients requires a human touch that AI cannot provide

The risk of being outdated, redundant, and jobless

- Some people will be made jobless by AI (due to automation)

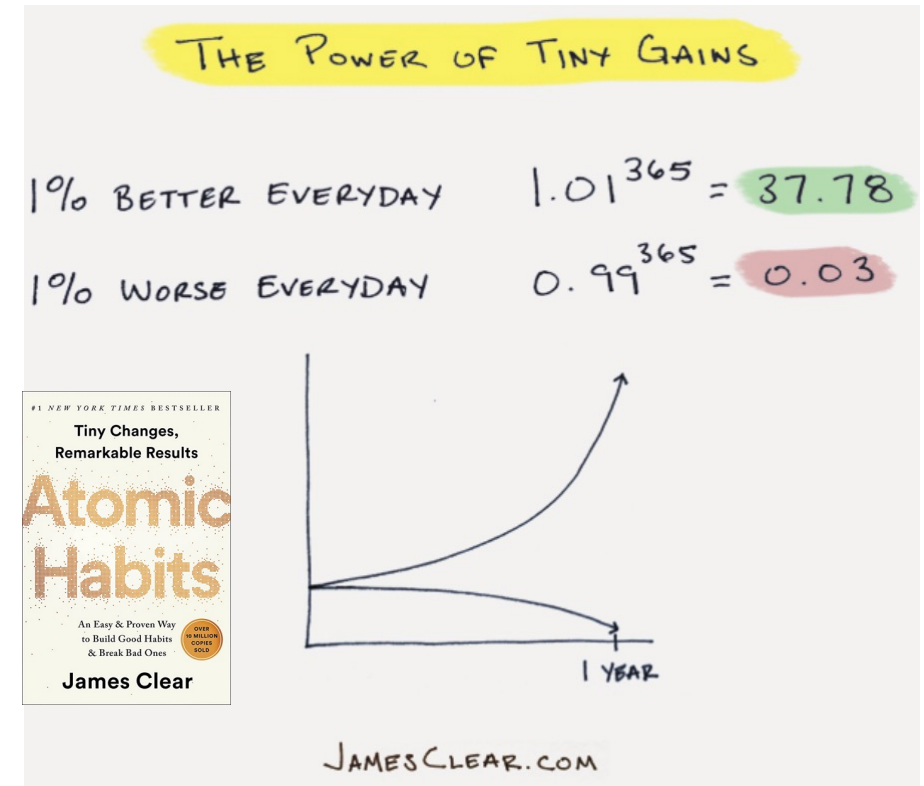
- Most people will be outdone by humans +AI.

	navigate without human guidance
Entrepreneur	Starting and building a successful business requires human creativity, risk-taking, and adaptability
Doctor	AI can assist with diagnosis and treatment recommendations, but it cannot replace the empathy and communication skills required in patient care
Politician	Decision-making in politics involves value judgments and ethical considerations that require human reasoning and judgment

Lifelong Learning ... Investing in Yourself

When students acquire meta-skills such as learning how to learn, read, write, they bring this skill to every course and reap its exponential benefits—this effect is sometimes called the “Matthew Effect”, or the rich get richer and the poor get poorer effect.

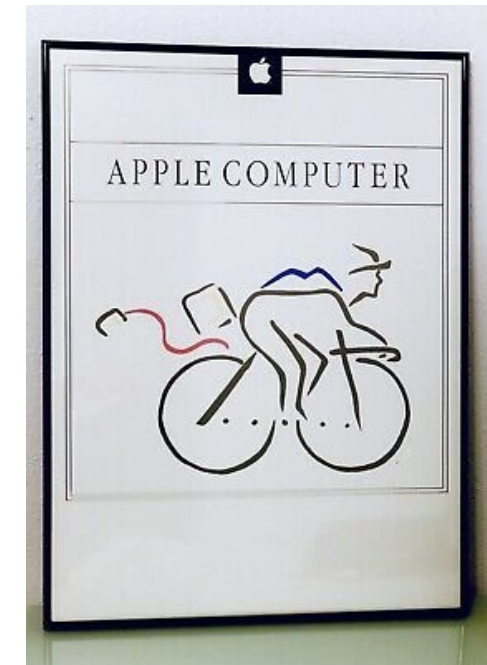
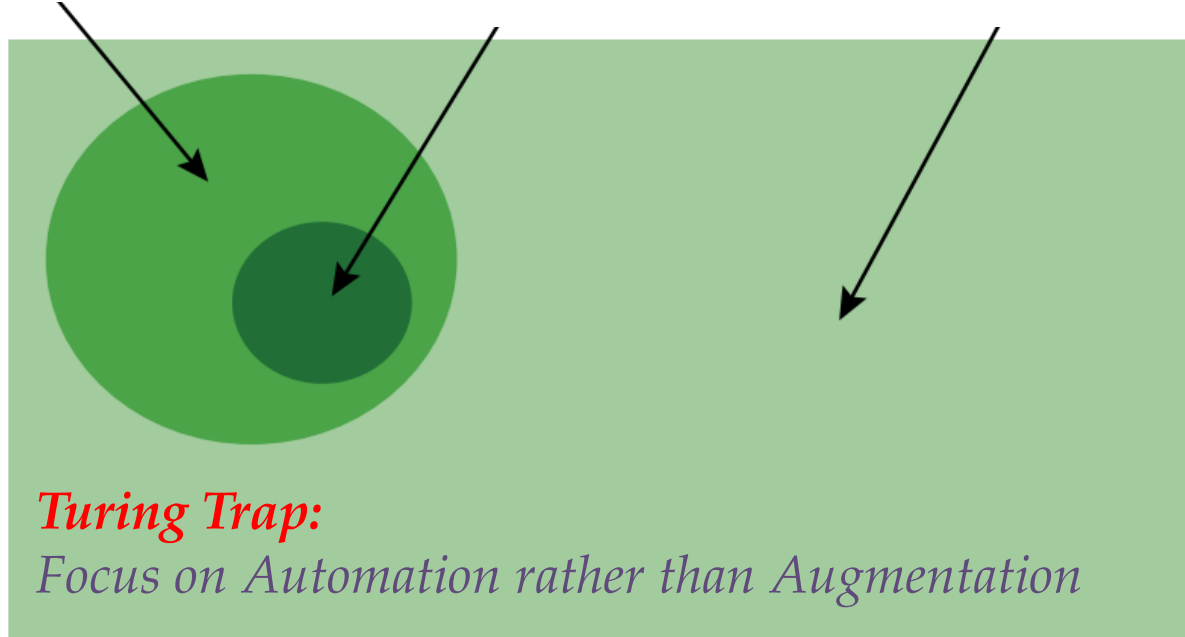
Thus investing in the basics provides compound interest over time



TASKS THAT HUMANS
CAN DO ON THEIR OWN

THE HUMAN TASKS THAT
AI CAN AUTOMATE

NEW TASKS THAT
HUMANS CAN DO WITH
AI AUGMENTATION



AI for Education, especially, should be:
(1) Human-Centered; and
(2) based on Intelligence Augmentation

“Laws” of Human Intelligence Augmentation

[Aimed at Learners]

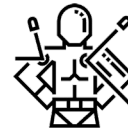
First Law



When the AI is readily accessible, your work should be no worse than that produced by the AI alone.
(Embrace change and leverage AI)

Second Law

(Corollary of Law 1)



When AI is there, and you don't want to be made irrelevant, maintain your competitive advantage
(Become AI Proof)

Third Law



After becoming users of AI, don't let your inherent unaided capabilities drop
(Don't outsource your thinking muscle allowing it to atrophy; i.e., do no harm [*a la* Asimov; Hippocrates])

Towards Human Intelligence Augmentation

(What Educators Can Do)

Principle 1

The learning process should be centered around the student, rather than on the teacher, curriculum, or AI
(Be learner-centric and make your education human-centered)

Principle 2

AI should be utilized in a way that facilitates scalable iterative rapid formative feedback
(Scale formative feedback using AI)

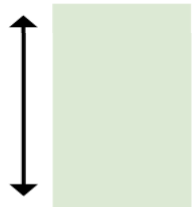
Principle 3

Teach the students the critical thinking skills necessary for judging and correcting the output of AI models
(Equip students with critical thinking to judge AI's output.)

T-shaped engineers and training for breadth + depth



ChatGPT knows everything superficially but understands nothing



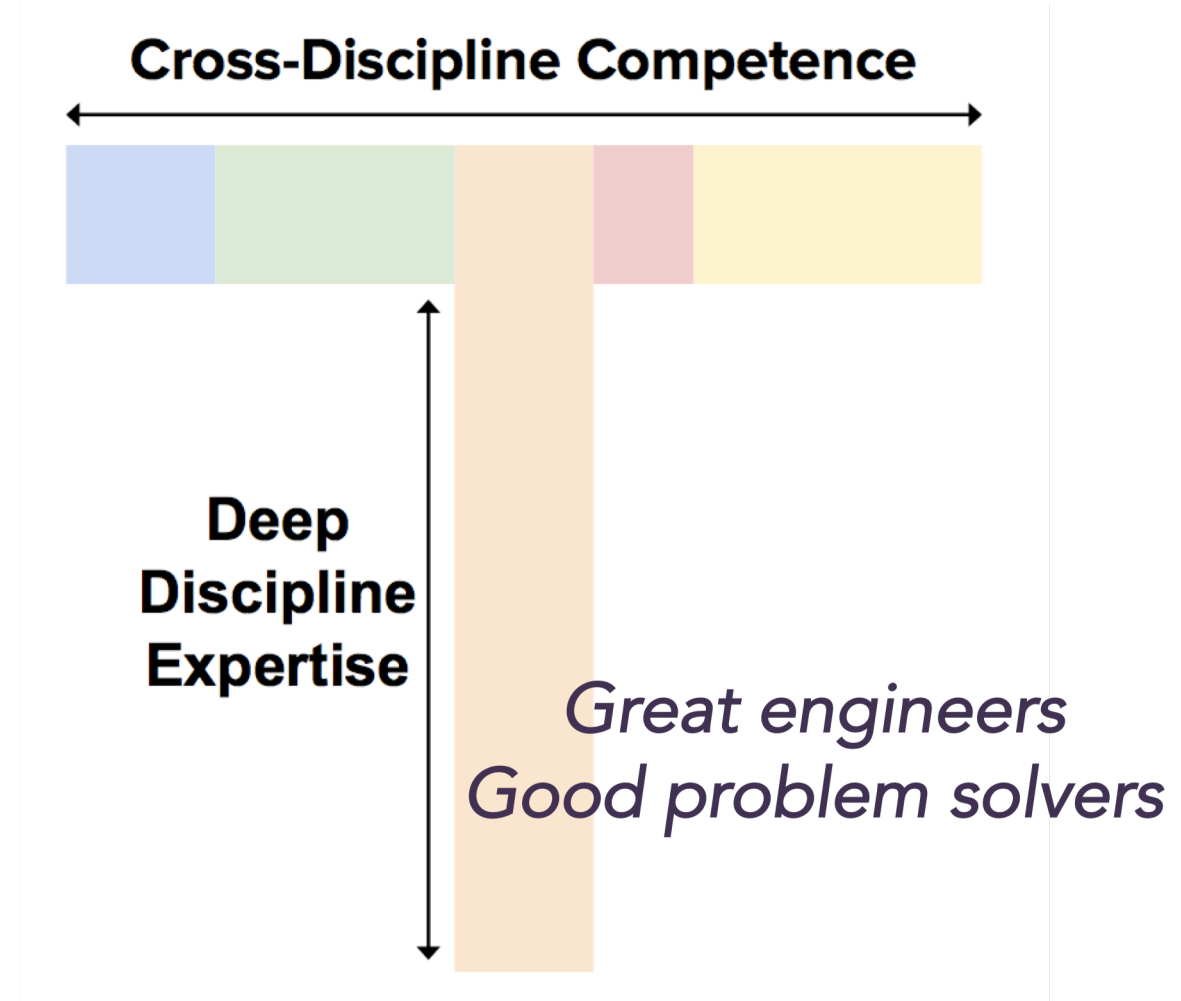
Bad engineers

*Superficial
narrow knowledge*



*Good engineers
Bad problem solvers*

Deep (but narrow) expertise



Day 4

Effective and Ethical Use of Generative AI

- A** Critical Evaluation of AI in Education
- B** Issue of Effectiveness: Excellence for Exponential AI Era
- C** Ethics and Wisdom in using Generative AI in Education

Wisdom & Value-Alignment

"We are now far too clever to be able to survive without wisdom."—E. F. Schumacher.

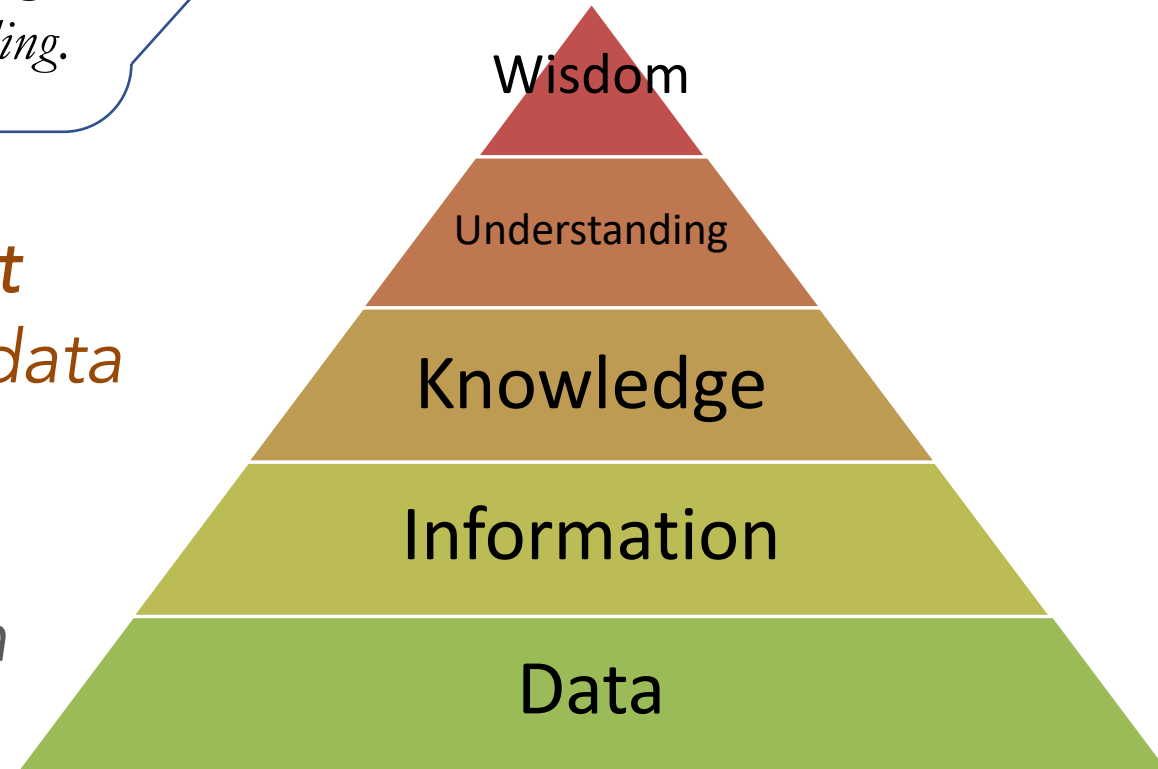


*An ounce of information is worth a pound of data.
An ounce of knowledge is worth a pound of information.
An ounce of understanding is worth a pound of knowledge.
An ounce of wisdom is worth a pound of understanding.*



**Wisdom is qualitatively different
from knowledge, information, and data**

*A little bit of wisdom is worth a
whole lot of data and information*



“Knowledge hard fought for, and then used for good”—Peterson & Seligman

What would educating for wisdom look like?

CRITICAL THINKING

- Knowing the context
- Knowing the pitfalls of rules/model/methods
- Knowing that there is no silver bullet

BALANCED THINKING

- Finding the Right Balance Between Extremes
- Managing and dissolving tradeoffs

MULTI-LEVEL THINKING

- Knowing reality is multi-layered and complex.
- Knowing and applying the right rule/model for the task

PURPOSEFUL (SPIRITUAL) THINKING

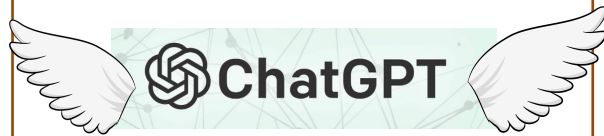
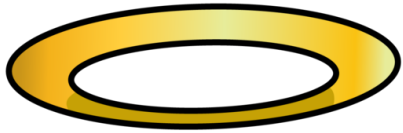
- Knowing which ends/objectives/ purpose to pursue and prioritize
- Know thyself!

For which of these, is ChatGPT likely to be useful?

How we may go wrong with AI/ ChatGPT ...

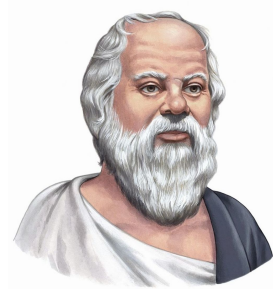
HALO EFFECT

*The Gullibility to Believe
AI is infallible*



SOPHISTRY & PRETENTION

*Appearances become
more important than truth*



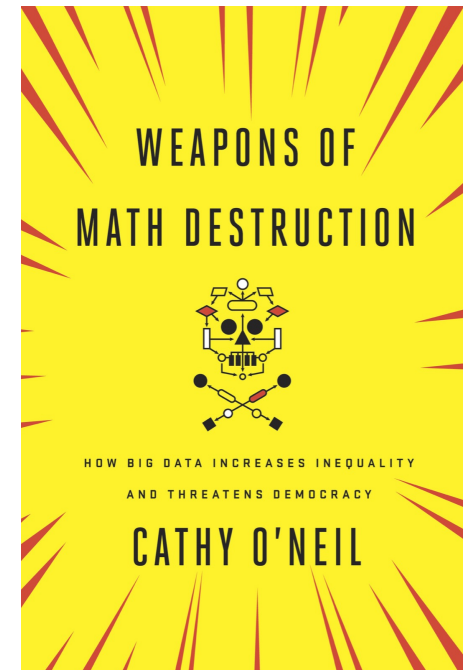
OVERRELIANCE ON TECHNOLOGY



*AL-GHAZALI AND
THE ROBBERS*

IATROGENICS

*The Wounds that
the Healer Gave*



Fair Use Tips and Guidelines

Use tools for augmentation not for counterfeiting



Grammarly will inspect your writing
carefully to find ways to improve clarity,
word choice, and more.



Enhance word choice

~~inspect your writing carefully~~ →
scrutinize your writing

SCIgen - An Automatic CS Paper Generator

Router: A Methodology for the Typical Unification of Access Points and Redundancy

Jeremy Stribling, Daniel Aguayo and Maxwell Krohn

ABSTRACT

Many physicists would agree that, had it not been for congestion control, the evaluation of web browsers might never have occurred. In fact, few hackers worldwide would disagree with the essential unification of voice-over-IP and public-private key pair. In order to solve this riddle, we confirm that SMPs can be made stochastic, cacheable, and interoperable.

I. INTRODUCTION

Many scholars would agree that, had it not been for active networks, the simulation of Lamport clocks might never have occurred. The notion that end-users synchronize with the investigation of Markov models is rarely outdated. A theoretical grand challenge in theory is the important unification of virtual machines and real-time theory. To what extent can web browsers be constructed to achieve this purpose?

Certainly, the usual methods for the emulation of Smalltalk that paved the way for the investigation of rasterization do not apply in this area. In the opinions of many, despite the fact that conventional wisdom states that this grand challenge is continuously answered by the study of access points, we believe that a different solution is necessary. It should be noted that Router runs in $\Omega(\log \log n)$ time. Certainly, the shortcoming of this type of solution, however, is that compilers and superpages are mostly incompatible. Despite the fact that similar methodologies visualize XML, we surmount this issue without synthesizing distributed archetypes.

We question the need for digital-to-analog converters. It should be noted that we allow DHCP to harness homogeneous epistemologies without the evaluation of evolutionary programming [2], [12], [14]. Contrarily, the lookaside buffer

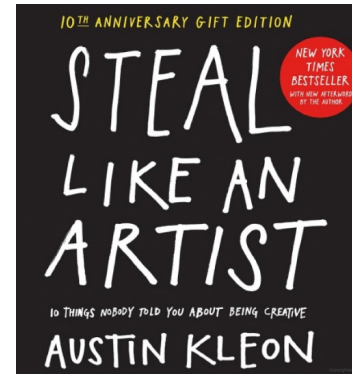
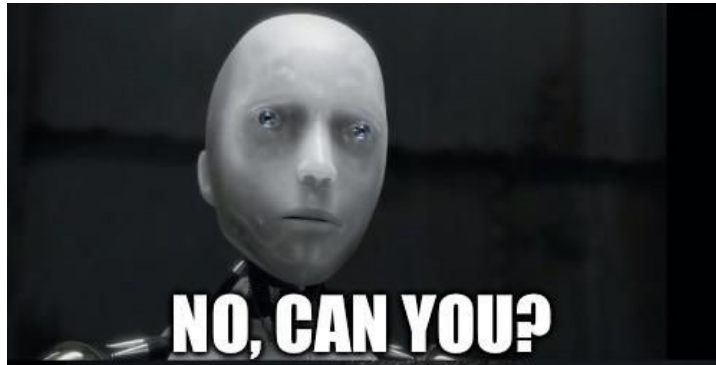
The rest of this paper is organized as follows. For starters, we motivate the need for fiber-optic cables. We place our work in context with the prior work in this area. To address this obstacle, we disprove that even though the much-touted autonomous algorithm for the construction of digital-to-analog converters by Jones [10] is NP-complete, object-oriented languages can be made signed, decentralized, and signed. Along these same lines, to accomplish this mission, we concentrate our efforts on showing that the famous ubiquitous algorithm for the exploration of robots by Sato et al. runs in $\Omega(n + \log n)$ time [22]. In the end, we conclude.

II. ARCHITECTURE

Our research is principled. Consider the early methodology by Martin and Smith; our model is similar, but will actually overcome this grand challenge. Despite the fact that such a claim at first glance seems unexpected, it is buffered by previous work in the field. Any significant development of secure theory will clearly require that the acclaimed real-time algorithm for the refinement of write-ahead logging by Edward Feigenbaum et al. [15] is impossible; our application is no different. This may or may not actually hold in reality. We consider an application consisting of n access points. Next, the model for our heuristic consists of four independent components: simulated annealing, active networks, flexible modalities, and the study of reinforcement learning.

We consider an algorithm consisting of n semaphores. Any unproven synthesis of introspective methodologies will clearly require that the well-known reliable algorithm for the investigation of randomized algorithms by Zheng is in Co-NP; our application is no different. The question is, will Router satisfy all of these assumptions? No.

Plagiarism vs. Inspiration vs. Stealing



INSPIRATION PLAGIARISM

~~GOOD THEFT~~	~~BAD THEFT~~
STUDY	SKIM
STEAL FROM MANY	STEAL FROM ONE
CREDIT	PLAGIARIZE
TRANSFORM	IMITATE
REMIX	RIP OFF

The importance of value creation

LLM Detectors

Can AI generated content be detected by AI?

**DetectGPT: Zero-Shot Machine-Generated Text Detection
using Probability Curvature**

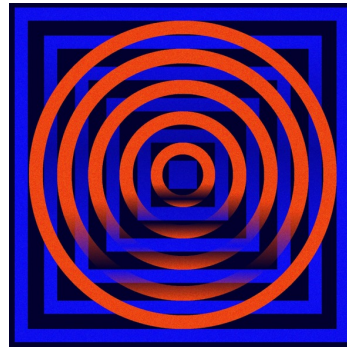
Eric Mitchell¹ Yoonho Lee¹ Alexander Khazatsky¹ Christopher D. Manning¹ Chelsea Finn¹

GPTZero

The World's **#1 AI Detector** with
over 1 Million Users

**New AI classifier for
indicating AI-written
text**

We're launching a classifier trained to distinguish
between AI-written and human-written text.



<https://openai.com/blog/new-ai-classifier-for-indicating-ai-written-text>

AI Text Classifier

The AI Text Classifier is a fine-tuned GPT model that predicts how likely it is that a piece of text was generated by AI from a variety of sources, such as ChatGPT.

This classifier is available as a free tool to spark discussions on AI literacy. For more information on ChatGPT's capabilities, limitations, and considerations in educational settings, please visit [our documentation](#).

Current limitations:

- Requires a minimum of 1,000 characters, which is approximately 150 - 250 words.
- The classifier isn't always accurate; it can mislabel both AI-generated and human-written text.
- AI-generated text can be edited easily to evade the classifier.
- The classifier is likely to get things wrong on text written by children and on text not in English, because it was primarily trained on English content written by adults.

Try the classifier

To get started, choose an example below or paste the text you'd like to check. Be sure you have appropriate rights to the text you're pasting.

Examples

Human-Written

AI-Generated

Misclassified Human-Written

Plagiarism detection software is getting more sophisticated and automated tools can use techniques such as looking for “tortured phrases” (a style that emerges from replacing valid words with inappropriate and odd synonyms during paraphrasing).

G. Cabanac, C. Labbé, and A. Magazinov, "Tortured Phrases: A Dubious Writing Style Emerging in Science - Evidence of Critical Issues Affecting Established Journals," *arXiv preprint arXiv:2107.06751*, 2021.

Can AI Writing Be Reliably Detected?



Ethan Mollick

@emollick

AI work is ultimately undetectable.

AI writing is undetectable by any automated system after just a few rounds of prompting or revision

LLM use in Conferences: Emerging Practices

International Conference on Machine Learning (ICML) 2023

Clarification on Large Language Model Policy LLM

We (Program Chairs) have included the following statement in the Call for Papers for ICML represented by 2023:

Papers that include text generated from a large-scale language model (LLM) such as ChatGPT are prohibited unless the produced text is presented as a part of the paper's experimental analysis.

This statement has raised a number of questions from potential authors and led some to proactively reach out to us. We appreciate your feedback and comments and would like to clarify further the intention behind this statement and how we plan to implement this policy for ICML 2023.

TLDR;

- The Large Language Model (LLM) policy for ICML 2023 prohibits text produced entirely by LLMs (i.e., “generated”). This does not prohibit authors from using LLMs for editing or polishing author-written text.
- The LLM policy is largely predicated on the principle of being conservative with respect to guarding against potential issues of using LLMs, including plagiarism.
- The LLM policy applies to ICML 2023. We expect this policy may evolve in future conferences as we understand LLMs and their impacts on scientific publishing better.

LLM use in Conferences: Emerging Practices

Association for Computational Linguistics (ACL) 2023

- **Assistance purely with the language of the paper.** When generative models are used for paraphrasing or polishing the author's original content, rather than for suggesting new content – they are similar to tools like Grammarly, spell checkers, dictionary and synonym tools, which have all been perfectly acceptable for years. If the authors are not sufficiently fluent to notice when the generated output does not match their intended ideas, using such tools without further checking could yield worse results than simpler-but-more-accurate English. The use of tools that only assist with language, like Grammarly or spell checkers, does *not* need to be disclosed.

LLM use in Conferences: Emerging Practices

Association for Computational Linguistics (ACL) 2023

- **New ideas.** If the model outputs read to the authors as new research ideas, that would deserve co-authorship or acknowledgement from a human colleague, and that the authors then developed themselves (e.g. topics to discuss, framing of the problem) - we suggest acknowledging the use of the model, and checking for known sources for any such ideas to acknowledge them as well. Most likely, they came from other people's work.
- **New ideas + new text:** a contributor of both ideas and their execution seems to us like the definition of a co-author, which the models cannot be. While the norms around the use of generative AI in research are being established, we would discourage such use in ACL submissions. If you choose to go down this road, you are welcome to make the case to the reviewers that this should be allowed, and that the new content is in fact correct, coherent, original and does not have missing citations. Note that, as our colleagues at ICML [point out](#), currently it is not even clear who should take the credit for the generated text: the developers of the model, the authors of the training data, or the user who generated it.

LLM use in Journals: Emerging Practices

Proceedings of the National Academy of Sciences (PNAS)

According to PNAS and *PNAS Nexus* policies, if AI software such as ChatGPT has been used to help generate any part of the work it must be clearly acknowledged; it must be noted in the Materials and Methods section (or Acknowledgments, if no Materials and Methods section is available) on submission. The software cannot be listed as an author because it does not meet the criteria for authorship and cannot share responsibility for the paper or be held accountable for the integrity of the data reported.

Disclosure of AI Usage

AI Bill of Rights from the US White House calls for “Notice and Explanation” when “an automated system is being used” (42).

Cite: A. Nelson, S. Friedler, F. Fields-Meyer, Blueprint for an AI Bill of Rights: A Vision for Protecting Our Civil Rights in the Algorithmic Age. White House Off. Sci. Technol. Policy (2022) (October 18, 2022).

Similarly, a regulation proposal issued by the EU states that “if an AI system is used to generate or manipulate image, audio or video content that appreciably resembles authentic content, there should be an obligation to disclose that the content is generated through automated means”

Cite: European Commission, Proposal for a Regulation laying down harmonised rules on artificial intelligence. Shap. Eur. Digit. Future (2021) (October 18, 2022)
Qtd in “Human heuristics for AI-generated language are flawed” (Jakesch et al., 2023)

Inquire about “AI Tools Fair Usage Policy”

الحلال بين والحرام بين وبينهما أمور مشتهيات

You should not steal/ copy without attribution.

You should not deceive.

Cite and credit AI

Cite the appropriate sources to support claims in the answer that you get from AI (otherwise be skeptical of the claims)

Use AI as a tool to learn, not just to produce content.

When in doubt, check with your instructor about acceptable AI usage for your courses

Credits/ Acknowledgement

Course material has been curated using various online/academic resources.

1. Wharton School, USA, Ethan and Lilach Mollick, Practical AI for Instructors and Students (YouTube: Series of 5 Videos)
2. Introduction to Generative AI, Google,
<https://www.youtube.com/watch?v=G2fqAlgmoPo>
3. MIT Course MAS.S68, Spring 2023 (Generative AI for Constructive Communication): <https://ai4comm.media.mit.edu/>;
4. ChatGPT: What It Can and Cannot Do, Pascale Fung (Online)
5. Videos by Jim Krohn;
6. Various Research Papers

The material is used as per fair use educational clause. The copyrights are retained by respective sources. We thank the respective personnel for sharing their educational materials. For practical purposes, the credits are not given on every slide, but more information about source is available on request.

**Thank you very much for your
participation**

Questions/ Discussion

*For feedback and suggestions:
jqadir@qu.edu.qa*