AI in Public Health Today: The Basics

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hot topics in practice

Northwest Center
FOR PUBLIC HEALTH PRACTICE

Question for the Viewers

How would you describe your level of experience using artificial intelligence (AI) tools?

A. Beginner

B. Novice

C. Intermediate

D. Proficient

E. Expert

F. Other (please type in chat)
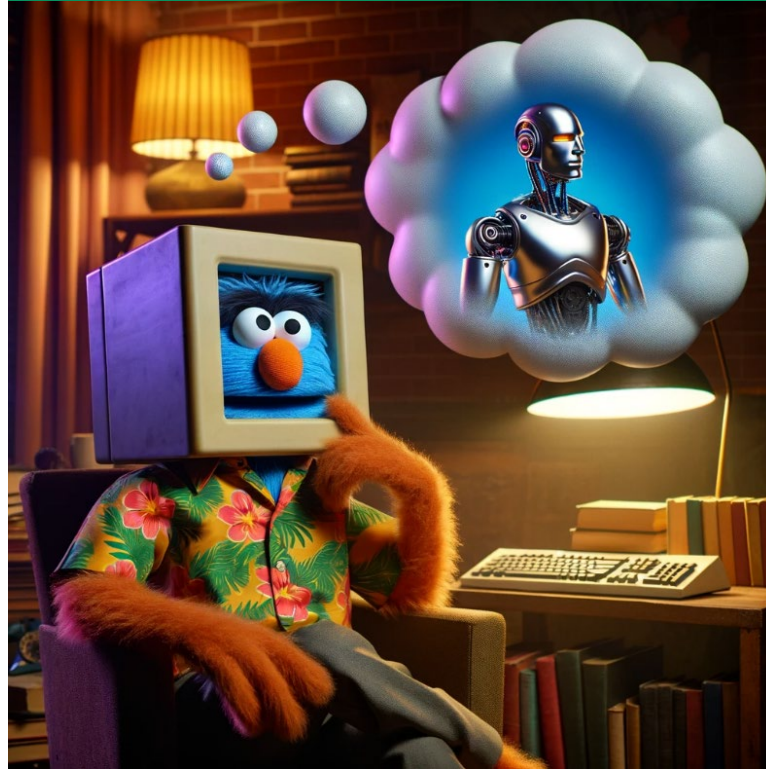
What is Generative AI?

How to Think About ChatBots

AI Applications for Public Health

What is Generative AI?

Origin of the Term "Artificial Intelligence"

A PROPOSAL FOR THE DARTMOUTH SUMMER RESEARCH PROJECT ON ARTIFICIAL INTELLIGENCE

August 31, 1955

We propose that a 2 month, 10 man study of artificial intelligence be carried out during the summer of 1956 at Dartmouth College in Hanover, New Hampshire. The study is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it. An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves. We think that a significant advance can be made in one or more of these problems if a carefully selected group of scientists work on it together for a summer.

Generative AI:

Refers to the use of artificial intelligence techniques to create or generate new content, such as images, videos, text, music, or any other form of media.

Examples: Llama 2, ChatGPT, Stable Diffusion, StyleGAN, Sora

" If a typical person can do a mental task with less than one second of thought, we can probably automate it using AI either now or in the near future

— Andrew Ng, 2018

" If a friend who read the Wikipedia article could answer my question, I'm confident feeding it in directly

— Simon Willison, 2023

AI can automate public health work that people:
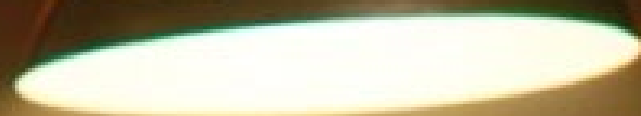
1. do not like doing;

2. cannot do fast enough;

3. cannot afford to do.

How to Think About ChatBots

Lifting the curtain, a little — chatbots are not magic. What are they?

$$p(w_{n+1}|w_1, w_2, \ldots, w_n)$$

where w_i is basically a word

Examples:

$$p(\text{"of"}|\text{"WA"}, \text{"Department"})$$

$$p(\text{"Health"}|\text{"WA"}, \text{"Department"}, \text{"of"})$$

Statistical Language Models are not necessarily complex

Results of a "Small Language Model" that I used recently to generate random business names:

- Pikes Creek Campground

- Red's Dairy Queen

- BP

- Nashville City Properties

- Ecr Whipple Oliver Finley Shoe Sensation

- Greenway Med Spa Services

- Northwell Health Center Inc

- La Conasupo Market North Branch Office Depot

- Waffle House of Big Daddys Burgers Shakes and Casualty

- Vincent's Hospital

A Language Model plus this one weird trick

- User: What is the capital of France?
- Assistant: Paris
- User: What language do they speak there?
- Assistant:

- `<s>`[INST] `<<SYS>>` You are a helpful, respectful and honest assistant. Always answer as helpfully as possible, while being safe. Your answers should not include any harmful, unethical, racist, sexist, toxic, dangerous, or illegal content. Please ensure that your responses are socially unbiased and positive in nature.

- If a question does not make any sense, or is not factually coherent, explain why instead of answering something not correct. If you don't know the answer to a question, please don't share false information.`<</SYS>>`

- **Fit a linear regression model for a numeric response variable based on one predictor variable in a data frame.**[/INST]

From *On Bullshit* by Harry G. Frankfurt, Princeton University, 2005:

"One of the most salient features of our culture is that there is so much bullshit. Everyone knows this."

"[a BS] statement is grounded neither in belief that it is true nor, as a lie must be, in a belief that it is not true. It is just this lack of connection to a concern with truth – this indifference to how things really are – that I regard as of the essence of bullshit."

"[A] fundamental aspect of the essential nature of bullshit: although it is produced without concern with the truth it need not be false."

BS Does Not Mean Useless

Most Common ChatGPT User Tasks
Analysis of 4,089 unique users' sessions, Spring 2023

Task	Percentage
Programming Assistance	29.1%
Professional Education	11.9%
Professional Content Creation	7.4%
Personal Content Creation	7.3%
Marketing	7.3%
Higher Education	5.6%
Creative Ideation	4.9%
Personal Task Assistance	3.4%
Primary Education	3.3%
Other	3.3%
Analytics	3.2%
Sales	3.0%
Homework	2.4%
Politics	1.6%
Nonprofit	1.5%
Writing Assistance	1.2%
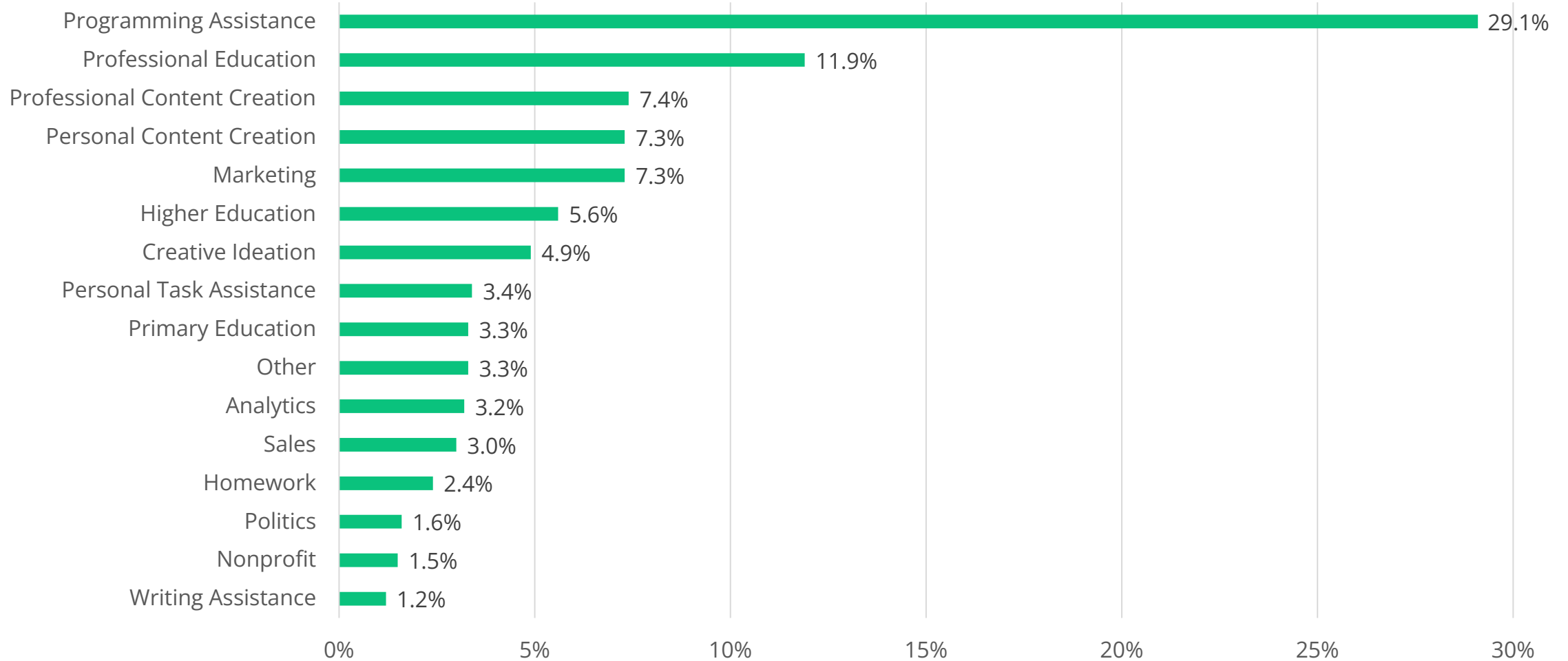
Prompt: Describe this picture

✓ Analyzing the image: Privacy blur hides faces from Bing chat

This is a picture of a young child who is having a medical check-up. The child is sitting on a green stool and wearing an orange shirt and green pants. The child's face is not visible, but they seem to be calm and cooperative. The room is clean and well-equipped with medical devices and a white cabinet. The photographer is probably a parent or a guardian of the child, who is...

You

def farenheit_to_celcius(temp_f):
    """ return temperature in celcius"""

ChatGPT

The formula to convert a temperature from Fahrenheit to Celsius is:

$$C = \left(\frac{F-32}{9}\right) \times 5$$

You can implement this formula in the given function:

```python
def fahrenheit_to_celsius(temp_f):
    """Return temperature in Celsius."""
    temp_c = (temp_f - 32) * 5/9
    return temp_c
```

Usage:

```python
print(fahrenheit_to_celsius(32))  # Expected output: 0.0
print(fahrenheit_to_celsius(212)) # Expected output: 100.0
```

(Note: Fixed the spelling of "fahrenheit".)

Question for the Viewers

How might you use generative AI in your current role?

Type your response in the chat

AI Applications for Public Health

AI-Assisted Data Analysis

Potential for AI-assisted data analysis to broaden participation in technical analyses central to evidence-based public health

Example: counting rows with missing data when considering using complete case analysis or multiple imputation

AI-Assisted Data Analysis

- How can I get these 50 CSV files into R?

- Why can't I get the right answer when summarizing this grouped data?

- How can I tell R that my categorical measure is ordered?

- How can I clean up this textual data?

- How can I neatly calculate summary statistics for all the measures in my data?

- How can I arrange this table to print in a nice way?

- Why doesn't the answer I found on Stack Overflow work properly?

- Why does R keep telling me "Object of type 'closure' is not subsettable"?

Verbal Autopsy as a Case Study

- The Global Burden of Disease is a study that compares how much health is lost to each of over 200 different conditions, geographically and temporally

- To measure disease burden, we must know who is dying of what and where

- Death certificates exist for less than half of all deaths globally

Solution: Ask

SECTION 5
MODULE 1. GENERAL ILLNESS LEADING TO DEATH
SPECIFIC QUESTIONS TO ELICIT SYMPTOMS AND SIGNS OF THE LAST ILLNESS

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
501	Did _____(NAME) have fever during her last illness?	YES...1 NO ....2 DON'T KNOW...............................8	 502 502

501A	How many days/months before her death did the fever start and end?	START |____|____| |____|____|
		       mons days
		END |____|____| |____|____|
		     mons days
		DIED WITH FEVER 9995
		DON'T KNOW/UNSURE...........9998	

501B	How was the fever like?	HIGH ....1 MILD ....2 DON'T KNOW/UNSURE..............8	
501C	Was the fever continuous or on and off?	CONTINUOUS...............................1 AFTER EVERY 1 - 2 DAYS..........2 AT NIGHT ONLY ....3 OTHER..7	

Computer Certification of Verbal Autopsy

Prompt:

You are a medical expert assisting researchers in assigning a cause of death based on provided information. Your task is to determine the cause of death from a list of options, which includes Cirrhosis, Epilepsy, Pneumonia, COPD, Acute Myocardial Infarction, Fires, Renal Failure, AIDS, Lung Cancer, Maternal, Drowning, Other Cardiovascular Diseases, Other Non-communicable Diseases, Falls, Road Traffic, Bite...

Input:

The respondent explained that the deceased died on the 3 day after being injured himself with rod which caused his neck to become very stiff and died because of tetanus.

Output:

Cause of Death: Tetanus : Confidence 0.9

- Nurses Notes

- Triage for SMS-based advice during pregnancy

- Billing data and diagnosis codes

There are also AI *Threats*

Existential risk from superintelligence

Intentional harms
- Bioterrorism
- Misinformation
- Deepfake pornography

Unintended consequences
- Future of work
- Environmental impacts
- Intellectual property
- Erosion of privacy
- Bias in, bias out

Key Takeaways

- ✓ It has been almost 70 years since scientists set the goal of creating Artificial Intelligence (AI)

- ✓ In the last decade, year, month, and maybe even week (!), there have been many exciting breakthroughs

- ✓ But AI and ChatBots are not magic, and you can understand what they do

- ✓ What they do might be described by philosophers as BS

- ✓ But it might still be useful! There are many opportunities and threats ahead for AI in public health.

A Chat with Abraham Flaxman

Sue Grinnell

Abraham Flaxman

QUESTIONS?

To ask a question, please click the [icon] icon in the Zoom toolbar to open your Q&A Pod.

Might Artificial Intelligence be useful for you? Try and see.

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Resources

ChatGPT Maker's Prompt Writing Guide
OpenAI
https://platform.openai.com/docs/guides/prompt-engineering/

Andrew Ng's Free Online Courses for Using AI
DeepLearning.AI
https://learn.deeplearning.ai/

Ethan and Lilach Mollick's AI Resources
More Useful Things: AI Resources
https://www.moreusefulthings.com/

Emily Bender and Alex Hanna's AI Hype Podcast
Mystery AI Hype Theater 3000
https://www.buzzsprout.com/2126417