



The Opportunity and Challenges of ChatGPT and Beyond

Francis Kendall



Overview

- Opportunities and challenges of ChatGPT & Generative AI
- Impact on Statistical Programming in the pharmaceutical industry
- Discuss the potential evolution of roles and skillsets
- Analyze the impact on processes and deliverables
- Evaluate the potential of in-house ChatGPT implementation

ChatGPT headlines... In case you missed it

ChatGPT's answer goes wrong: Gives away journalist's number to join Signal

A Conversation With Bing's Chatbot Left Me Deeply Unsettled

ChatGPT creator Sam Altman says the world may not be 'that far away from potentially scary' AI and feels 'regulation will be critical'

Can We Trust ChatGPT and Artificial Intelligence to Do Humans' Work?

THE DAILY AI NEWS

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FOR THE LATEST FICTIONAL AI WORLD NEWS

Dec 2022

Is this the Death of Google Search and the rise of ChatGPT?



An image produced by Stable Diffusion 2.0 with the authors prompt to represent the metaphorical destruction of Google search as it stands today.

How would you describe the front page of a newspaper that reads "Google search is dead, long live ChatGPT"?

The front page of the newspaper features a headline that declares the death of Google search and the rise of ChatGPT as the new dominant search platform. The article likely discusses the shift in the technology industry towards more advanced artificial intelligence and conversational interfaces. It may also highlight the features and advantages of ChatGPT over traditional search engines. Overall, the tone of the article is likely to be celebratory and enthusiastic about the potential of this new technology.

"Why is ChatGPT going to replace google search?"

It is not specified why ChatGPT is going to replace Google search. It is possible that ChatGPT offers more advanced artificial intelligence and conversational capabilities, making it a more effective and user-friendly search platform. It may also have more comprehensive and up-to-date information, or better integrate with other technologies and platforms. Ultimately, the reason for the replacement will depend on the specific features and advantages of ChatGPT compared to Google search.

An interview with ChatGPT & Author David Bartram-Shaw

HOW LONG IT TOOK TOP APPS TO HIT 100M MONTHLY USERS

ChatGPT is estimated to have hit 100M users in January, 2 months after it's launch. Here's how long it took other top apps to reach that:

APP	MONTHS TO REACH 100M GLOBAL MAUS
CHATGPT	2
TIKTOK	9
INSTAGRAM	30
PINTEREST	41
SPOTIFY	55
TELEGRAM	61
UBER	70
GOOGLE TRANSLATE	78

SOURCE: UBS

yahoo!
finance

Microsoft Bing SEARCH CHAT

Attempting to reconnect...

Welcome to the new Bing
Your AI-powered answer engine

Ask complex questions Get better answers Get creative inspiration

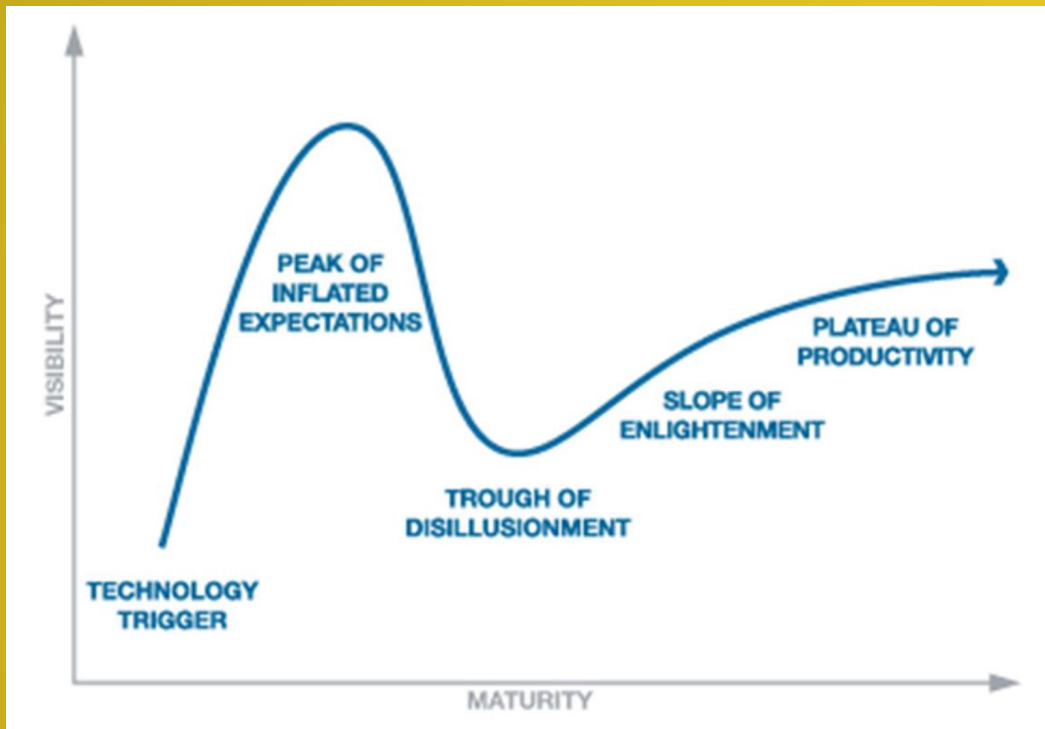
"What are some meals I can make for my picky toddler who only eats orange-colored food?"

"What are the pros and cons of the top 3 selling pet vacuums?"

"Write a haiku about crocodiles in outer space in the voice of a pirate"

Let's learn together. Bing is powered by AI, so surprises and mistakes are possible. Make sure to check the facts, and share feedback so we can learn and improve!

Ask me anything...



Revolution or Hype?

- Is this the internet of the 90's
- Is it just a glorified internet search engine?

What is Chat GPT & Generative AI

- ChatGPT
 - Advanced language model that uses deep learning techniques to understand and generate human-like text based on input it receives
- Generative AI
 - Is a field of AI focused on creating models that generate new content, such as text, images, or even music

```
mirror_mod = modifier_ob.  
set mirror object to mirror.  
mirror_mod.mirror_object =  
operation == "MIRROR_X":  
mirror_mod.use_x = True  
mirror_mod.use_y = False  
mirror_mod.use_z = False  
operation == "MIRROR_Y":  
mirror_mod.use_x = False  
mirror_mod.use_y = True  
mirror_mod.use_z = False  
operation == "MIRROR_Z":  
mirror_mod.use_x = False  
mirror_mod.use_y = False  
mirror_mod.use_z = True  
  
selection at the end -add  
mirror_ob.select= 1  
modifier_ob.select=1  
context.scene.objects.active  
("Selected" + str(modifier_ob.  
mirror_ob.select = 0  
= bpy.context.selected_object  
data.objects[one.name].select  
print("please select exactly  
  
--- OPERATOR CLASSES ---  
  
types.Operator):  
on X mirror to the selected  
object.mirror_mirror_x"  
mirror X"  
  
context):  
context.active_object is not
```

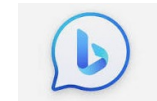
Example – What time is it ?



If it is 02.11 now, what time will it be in 48 hours?



- if it is 02.11 now, what time will it be in 48 hours
- If it is currently 02:11 and we add 48 hours to the current time, we get a total of 50 hours.
- To convert this to a valid 24-hour format, we need to divide the total hours by 24 and take the remainder. In this case, 50 divided by 24 equals 2, with a remainder of 2.
- Since the remainder is 2, the time will be 2 hours ahead of the current time. Adding the remainder to the current hour gives us $2 + 2 = 4$.
- Therefore, if it is currently 02:11, it will be 04:11 in 48 hours.



- [If it is 02.11 now and you add 48 hours to it, it will be 02.11 on June 7th¹.](#)



- if it is 02.11 now, what time will it be in 48 hours
- If it is 02:11 now, then in 48 hours it will be $02:11 + 48 \text{ hours} = 02:11 + 2 \text{ days} = 02:11 + 48 \text{ hours} = 06:11$.
- 48 hours is equal to two days.

ChatGPT



Find the bug with this code:

```
...  
for (var i = 0; i < 5; i++) {  
  setTimeout(() => console.log(i), 1000)  
}  
...
```



The code contains a bug that will cause it to always print the number 5 to the console, rather than the expected sequence of numbers from 0 to 4. This is because the `setTimeout` function creates a closure that captures the value of the `i` variable, but the `i` variable is changed before the callback function is executed.

To fix this bug, the code can be modified to create a new variable in the loop that is passed to the `setTimeout` callback function, rather than using the loop variable directly. This will ensure that each callback function captures the correct value of the loop variable, and the expected output will be produced. Here is an example of how the code could be fixed:

```
for (var i = 0; i < 5; i++) {  
  // Create a new variable and pass its value to setTimeout  
  const value = i;  
  setTimeout(() => console.log(value), 1000)  
}
```

This code will print the numbers 0 to 4 to the console, as expected. Alternatively, the `let` keyword can be used in place of `var` to declare the loop variable, which will automatically create a new variable for each iteration of the loop and avoid the need to create a new variable manually. This is a common pattern for avoiding closure-related bugs in JavaScript.

FD

Write an example protocol patient deviation summary



Sure, here's an example of a protocol patient deviation summary:



Protocol: Standardized protocol for administering insulin to hospitalized patients with diabetes.

Patient deviation summary: Patient ABC, who was admitted to the hospital with poorly controlled diabetes, experienced a hypoglycemic event despite following the prescribed insulin protocol. The patient was found to have skipped a meal due to nausea and vomiting, which was not documented in the medical record. As a result, the patient's insulin dose was not adjusted accordingly, leading to a drop in blood glucose levels. The patient was treated promptly with glucose gel and closely monitored to prevent further hypoglycemia. The healthcare team revised the insulin protocol to include specific instructions for adjusting insulin doses in patients who miss meals or experience vomiting. The deviation was documented in the patient's medical record and discussed with the healthcare team to prevent similar incidents in the future. The patient's condition stabilized and they were discharged home in a stable condition with a modified insulin protocol.

So what are the possibilities - Example of the scope of ChatGPT

- 1. Generate ideas and brainstorm.** E.g. Ask for ideas on themes
- 2. Get personalized recommendations.** E.g, Which is the best Stats test to use or population
- 3. Understand complicated topics.** If you want to understand machine learning, or find out how quantum computing is being used, ChatGPT can give you succinct, clear overviews in layman's terms E.g. help communicate to non Biometrics folk
- 4. Bring in a writing assistant.** Tell ChatGPT what you're writing about — whether an email, or a presentation, and you'll get customized content that you can use in a wide variety of situations.
- 5. Summarize the latest research.** ChatGPT can summarize research for you, including entire reports, web pages, or studies? You can provide some content and it will summarize that content for you. Maybe write scientific papers
- 6. Get assistance with coding and debugging.** ChatGPT can provide code examples, look up syntax and parameters, or help you troubleshoot by providing solutions to common coding issues or errors.
- 8. Get assistance with your travel plans.** If you're planning a trip, ChatGPT can help you with everything from finding flights and accommodations – Do we need as much admin support
- 9. Analyze sentiment and tone.** If you want to understand the emotional tone of a piece of text e.g. Can this help with PULSE feedback
- 10. Find data sets.** If you tell ChatGPT you're looking for a dataset on a disease area of, it can search through various online databases, repositories, and resources to find relevant data sets for you.
- 11. Train ChatGPT on your own data.** You can collect your own data, feed that data into the model, and fine-tune the parameters of the model with algorithms.
- 12. Advance in your career.** ChatGPT can help you with job searching and interview preparation — and it can even provide career advice. We need to be mindful of this for candidate selection

An abstract graphic featuring a large circular area filled with diagonal streaks of blue and green, resembling a stylized galaxy or a close-up of a planet's surface. To the right of this circle is a solid orange circle. Below the main circular area, there are three yellow curved lines. At the bottom of the image, a curved banner displays logos for 'OpenAI', 'Jasper', and 'Simplifile', with the word 'RESEARCH' visible above the OpenAI logo.

Writing/Debugging code

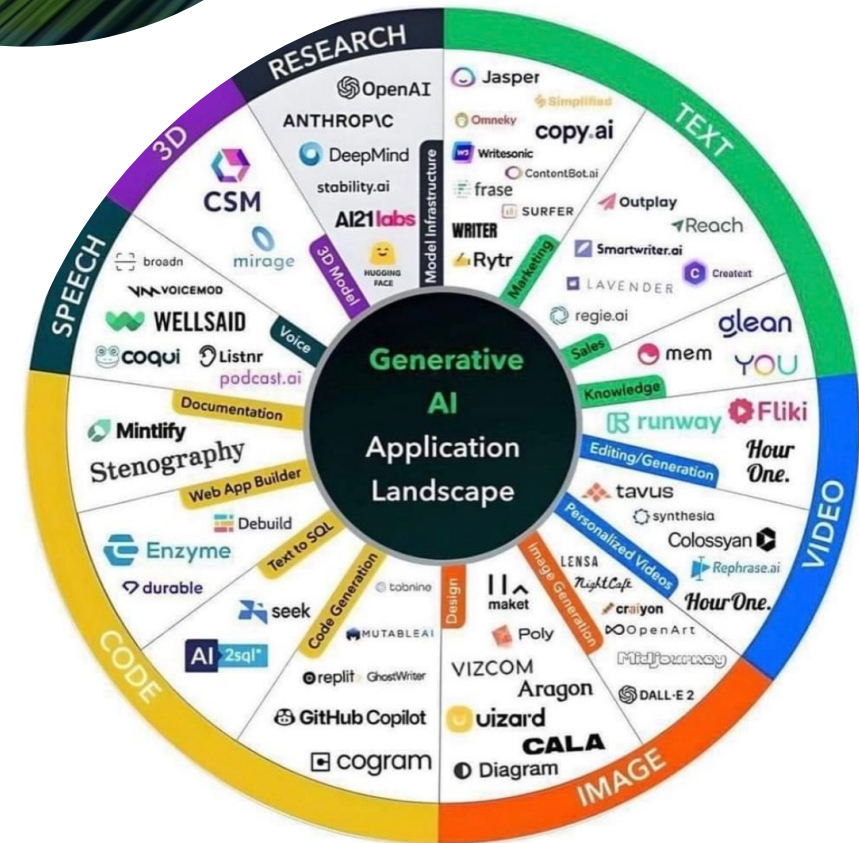
Copywriting/content creation

Customer support - Chatbots

Creating summaries of meetings or documents

Product Design

Training aids



Challenges of Generative AI

Data privacy and
security

Legal and Regulatory
Compliance

Data Quality and
Availability

Ethical Considerations

Bias

Intellectual property

Technical complexity,
Model Interpretability
and Transparency,
Overfitting and
Generalization

Computational
Resources and
Infrastructure

User Acceptance and
Trust

Workforce restructuring

Are our Data Standards
mature enough

Revolution in the business



Automation of Operational Tasks

Administration
Project Management
Finance/Budget



Identification of new Molecules

Throughout of screenings
Address more complex modes of operation



Clinical Trials

Companion AI tools for Molecule
Prospective Patient identification for trials
Synthetic controls



Working with Regulators

Higher Bar for Safety/Efficacy
Need for RWE evidence
Companion AI tools for Molecules



Opportunities of Generative AI in Clinical Development Workplace

- Automation of Routine Tasks
 - Timesheets, Absences...
- Chatbots
 - Help to locate relevant information -document resources , SOPs
- Knowledge Guidance
 - Training aids, Training pathways
- Knowledge mining
 - Extraction of relevant data sources



Opportunities of Generative AI in Evidence Generation for Clinical Trials

- Design
 - Sample Size Estimation
 - Adaptive Trial Design
- Data
 - Simulating Patient Populations
 - Missing Data Imputation
 - Generating Synthetic Control Arm
- Coding
 - Code Generation
 - Debugging
 - Statistical Advisor
- Documentation

Impact on Statistical Programming



Tools

Ability to use right tool for right activity

- E.g. SAS for data wrangling and R for Graphics, Python etc...
- Auditing and control



Skillsets

New Tools (SAS, R, Python...)

New Knowledge around Artificial Intelligence

Algorithm development – Natural language instructions

Auditing capabilities – Model/Data robustness

Oversight of ML algorithm performance



Mindset

Openness to change and opportunity

Critical Thinking

Identifying bias



Automation and machine learning

Exploratory

Admin, Medical Writing
Document tasks

Coding& Rapid development

Non Statistical task e.g. creating SDTM Data sets

Ad Hoc requests activities

Dashboard for Clinicians,
Managers / Finance /
Recruitment



Collaboration and communication

Taking advantages of common knowledge e.g. Pharmaverse

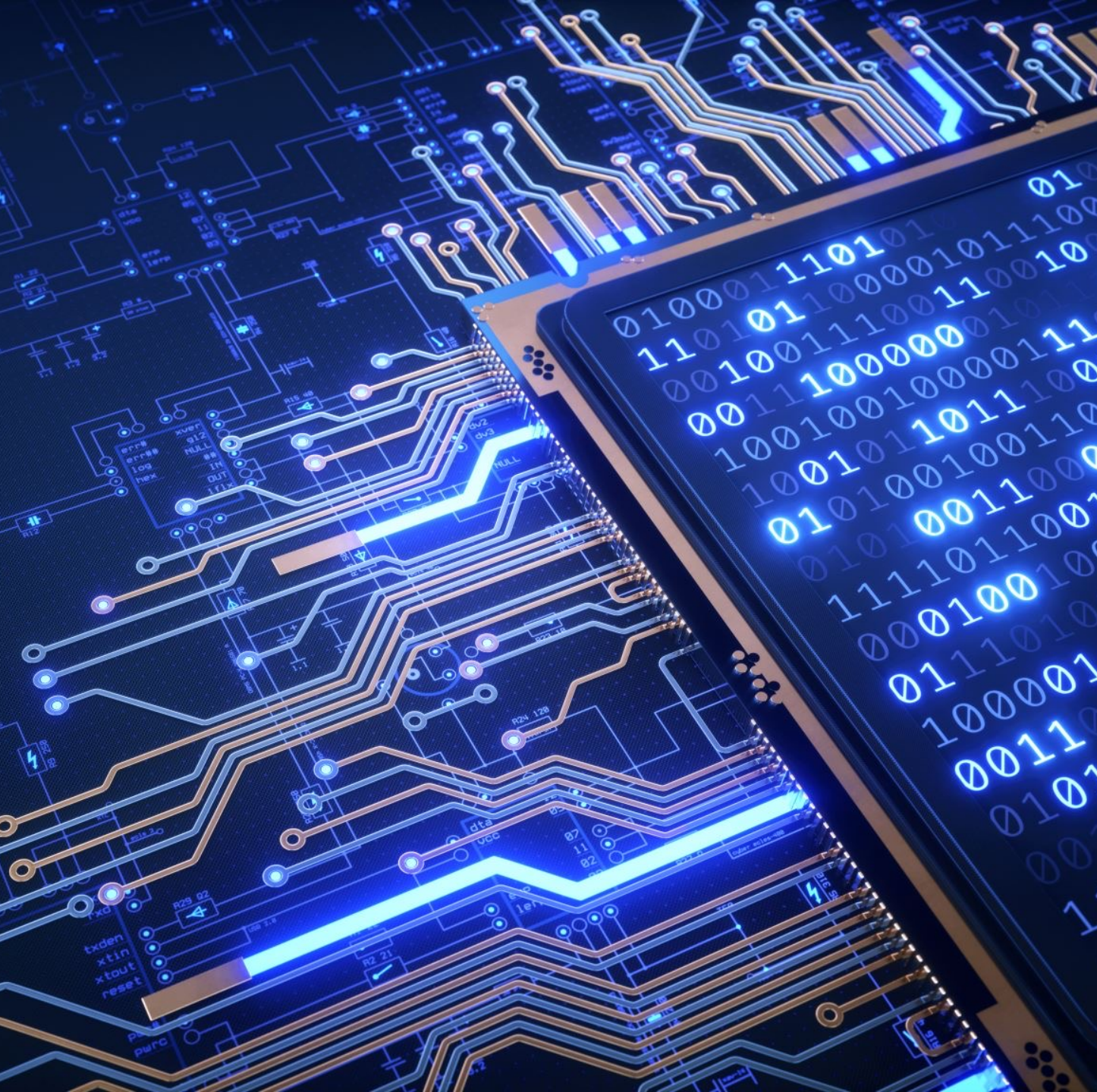
Code & Data sharing

Working with Commercial colleagues

Impact on Processes and Deliverables

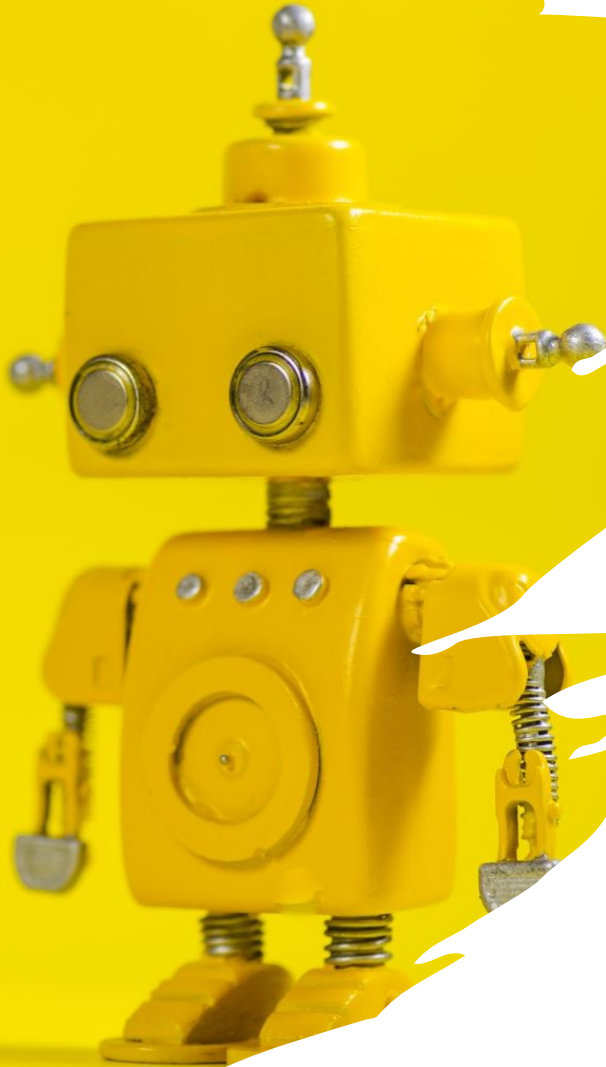
- Processes and deliverables in Statistical Programming
 - Automation of Data Deliverables (SDTM etc.)
 - Semi Automated Template Reporting
 - AI Driven Exploratory Data Review Tools
 - Evolution of deliverables to Regulators
 - From TFLs to Reporting Datasets (possibly Acumulus)
 - Process workflows





In-House Generative AI Implementation

- Early days in Pharma Clinical Research
- Approach
 - Behind the firewall
 - Using propriety data
 - Distinct use cases with transformational potential
- Challenge
 - Echo Chamber
 - Not reaching full potential of data usage
 - Maybe missing opportunities in incremental approaches

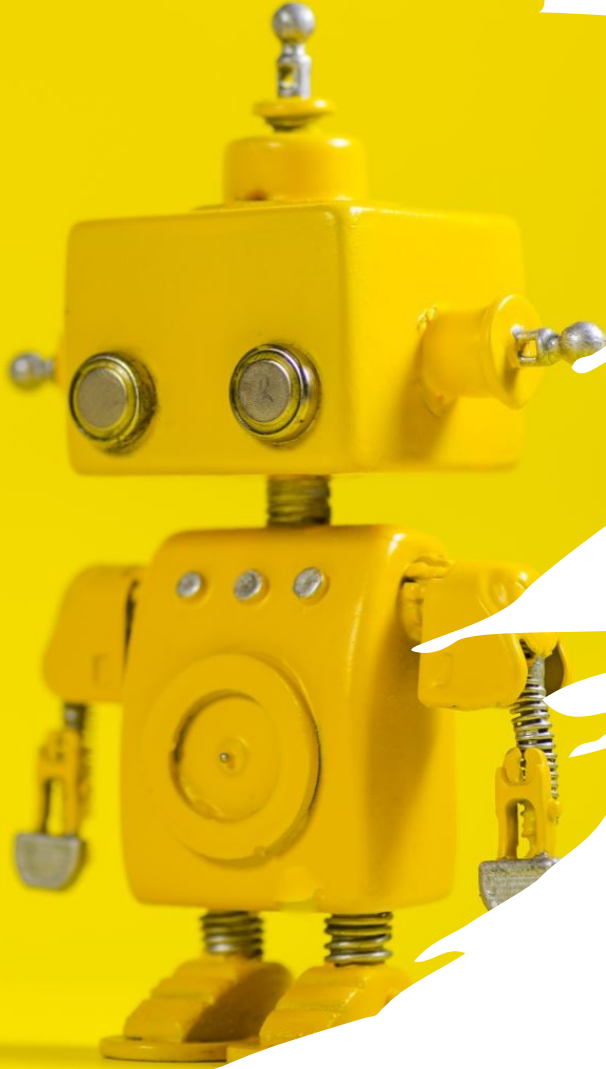


What's next....

1. **Reinforcement Learning:** Reinforcement learning focuses on training agents to make sequential decisions in dynamic environments
2. **Explainable AI:** Explainable AI aims to enhance the transparency and interpretability of AI models and algorithms. It focuses on developing methods and techniques that can explain the reasoning and decision-making process of AI systems.
3. **Quantum Computing:** Quantum computing holds the potential to revolutionize AI by leveraging quantum principles to perform computations at an exponential scale.
4. **Meta-Learning:** Meta-learning, also known as "learning to learn," focuses on training models to acquire new skills or adapt to new tasks quickly.
5. **Continual Learning:** Continual learning addresses the challenge of lifelong learning in AI systems. It aims to enable models to acquire new knowledge while retaining previously learned information, without catastrophic forgetting.
6. **Augmented Intelligence:** Augmented intelligence refers to the collaboration between humans and AI systems to enhance human capabilities and decision-making.
7. **Ethical AI and Responsible AI Development:** As AI technologies advance, there is an increasing focus on ethical considerations and responsible development practices.

Elon Musk's brain implant company Neuralink announces FDA approval of in-human clinical study

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What's next....

- **NeuraLink and Generative AI.....**
 1. **Brain-Machine Interfaces for Data Input:** Neuralink's technology could provide a new input method for generative AI systems. Users may be able to interact with AI models and generate outputs by directly transmitting their thoughts, intentions, or commands from their brain to the AI system.
 2. **Brain-Inspired Algorithms and Learning:** Neuralink's advancements in understanding the brain's neural networks and dynamics could inspire the development of new generative AI algorithms and learning approaches.
 3. **Enhancing Generative AI with Brain Feedback:** Neuralink's technology could provide real-time feedback from the brain, allowing generative AI models to adapt and respond to user's cognitive states, emotions, or preferences
 4. **Neuroprosthetics and Neural Rehabilitation:** Neuralink's brain-computer interface technology has the potential to revolutionize neuroprosthetics and neural rehabilitation.





Conclusion

- The future awaits and we have an opportunity to influence its direction within Evidence Generation



Q&A