



TT06

Red Pill or Blue Pill?

Assessing the Impact of Generative AI on Pharmaceutical
Programming

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Agenda

- 01** Introduction to Generative AI
- 02** Demonstration
- 03** Stakeholder Views
- 04** Conclusions

Introduction to Generative AI

Introduction to Generative AI

How did we get to a world with Generative AI?

1900s

Earliest origins of artificial intelligence can be traced to mid 20th century.

Term “Artificial Intelligence” first coined in 1956.

2000s

Machine Learning and Deep Learning models emerged in mid 2000s.

2010s

Natural Language Processing matures (Siri, Alexa, etc.)
Large Foundation Models follow.

2020s

Large Language Models enables Generative AI becomes mainstream with ChatGPT, Google’s Bard etc.

Introduction to Generative AI

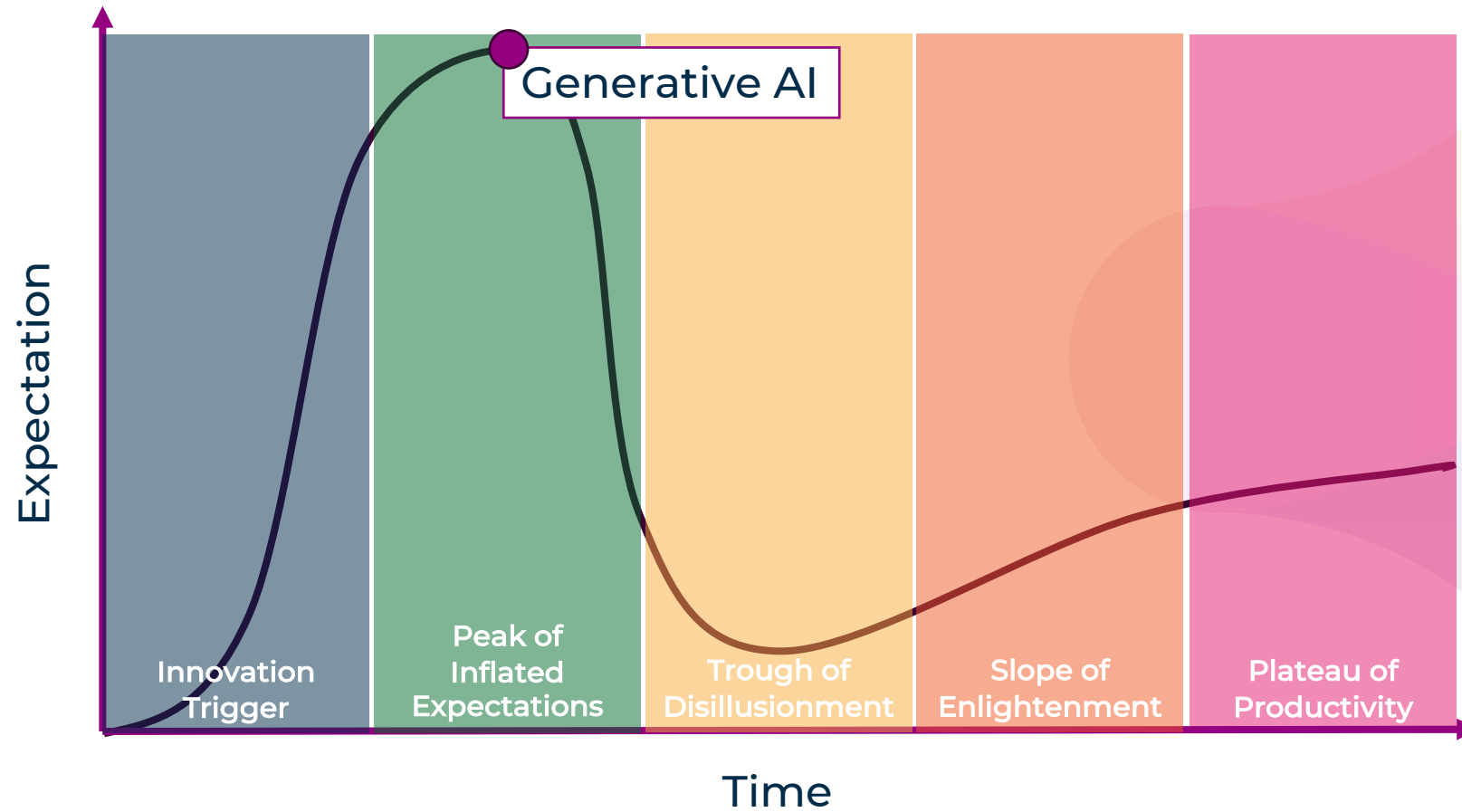
- How would you describe generative AI to a non-technical person?

“Generative AI is like a digital artist or storyteller that can create things all on its own, without any human intervention. It's a computer program that has learned from lots of examples and data, and it uses that knowledge to make new things, such as text, images, music, and more.”

(ChatGPT, 2023)

- “Generative AI is like a digital programmer that can write code all on its own, without any human intervention”.

Is It All Hype?



[What's New in Artificial Intelligence From the 2023 Gartner Hype Cycle™](#)

Demonstration

ChatGPT Writes SAS Code

Demonstration: ChatGPT Writes SAS Code

“Create a SAS Macro program to calculate summary statistics”

- Created a macro program
- Title case name
- Logically named input parameters
- Clear, consistent indentation
- Comments throughout

```
%macro SummaryStats(data, var);  
  /* Calculate summary statistics for a numeric variable */  
  data &data;  
    /* Ensure the variable exists and is numeric */  
    if 0 then set &data;  
  
    if vartype("&var") = 'N' then do;  
      call symputx('var_found', 1);  
    end;  
    else do;  
      call symputx('var_found', 0);  
    end;  
  run;  
  
  /* Check if the variable exists and is numeric */  
  %if &var_found = 0 %then %do;  
    %put ERROR: Variable &var not found or is not numeric in dataset &data.;  
  %end;  
  %else %do;  
    /* Calculate summary statistics */  
    proc means data=&data n mean std min max;  
      var &var;  
    run;  
  %end;  
%mend;
```

Demonstration: ChatGPT Writes SAS Code

A few red flags

```
%macro SummaryStats(data, var);  
  /* Calculate summary statistics for a numeric variable */  
  1 data &data;  
    /* Ensure the variable exists and is numeric */  
    2 if 0 then set &data;  
    3 if vartype("&var") = 'N' then do;  
      call symputx('var_found', 1);  
    end;  
    else do;  
      call symputx('var_found', 0);  
    end;  
run;
```

1. Datasheet overrides source data
2. If 0 then is never processed
3. Syntax error with vartype function

Demonstration: ChatGPT Writes SAS Code

These issues are however, easily fixed

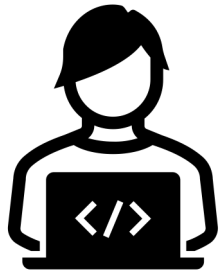
“Replace the first datastep with this code: `data _null_; ... ; run;`”

“Add a Program Header to the previous macro”

“Add data step to this macro that checks if the input dataset exists”.

Stakeholder Views

Stakeholder Views



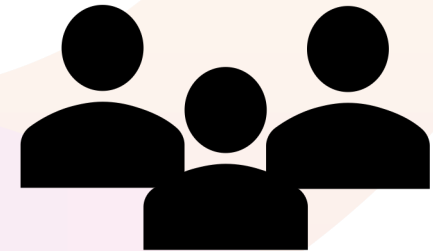
Programmers



QA Department

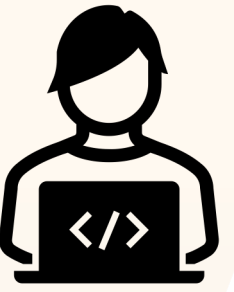


Regulators



Customers

Stakeholder Views – Programmer



Opportunities

- Accelerated programming.
- Complete in less time.
- Maintain high coding standards.

Responsibilities

- Code is correct and bug free
- Executes to at least the same standard

Stakeholder Views – QA Managers



Responsibility

- Cast a critical eye over changes in methods
- Implement standards and processes within your company
- Independent Parallel Programming is the gold standard

Accountability

- Adoption of AI must not lead to reduction in quality of output
- Best practice policy is universally adopted

Stakeholder Views – Regulators



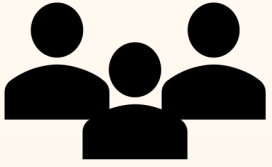
FDA:

Ensure the safety, efficacy, quality and purity of health products by fostering integrity, transparency and **excellence**; developing and maintaining evidence-based standards and policies, in a healthy and safe work environment.

EMA:

The mission of the European Medicines Agency (EMA) is to foster scientific **excellence** in the evaluation and supervision of medicines, for the benefit of public and animal health in the European Union (EU).

Stakeholder Views - Customers



Opportunity

- Increased speed of delivery
- Every day saved in drug development can be measured in \$100,000s

Accountability

- Manufacturers held to account for error
- Potential impact on revenue
- Regulatory penalties

Conclusions

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Human Oversight

Generative AI is still a long way from writing flawless code consistently.

Evidence Based Industry

Human responsibility will remain until studies can demonstrate superiority in AI. This is a long way away.

Maturing Technology

Generative AI is relatively new technology and will only improve over time.

Press the Accelerator

Co-pilot features are already using AI to serve as an accelerator for programmers to increase productivity

Conclusions – Red Pill or Blue Pill?

Red Pill.

Generative AI cannot be un-invented and is here to stay.



