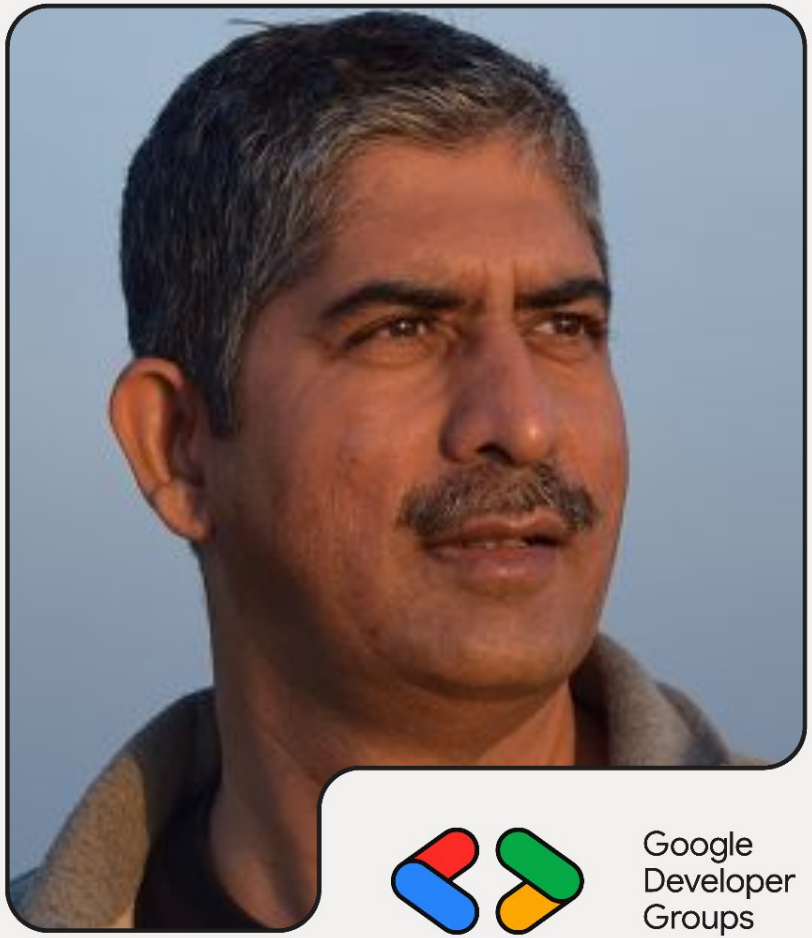
DevFest

Pune

Introduction to Generative AI

Yogesh Haribhau Kulkarni



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Agenda

1. Overview
2. Demo
3. Conclusions
4. Preparation
5. References

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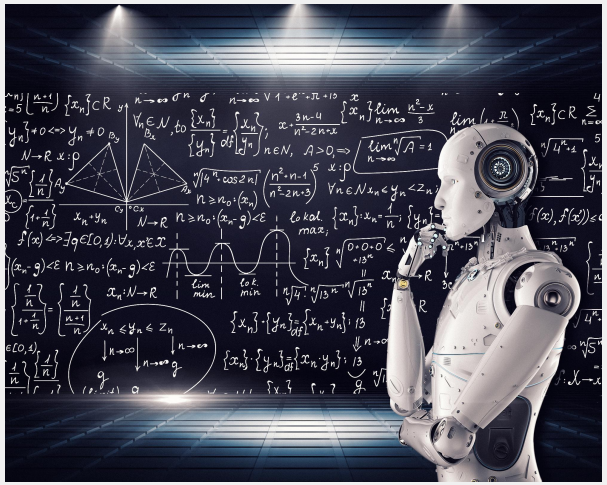
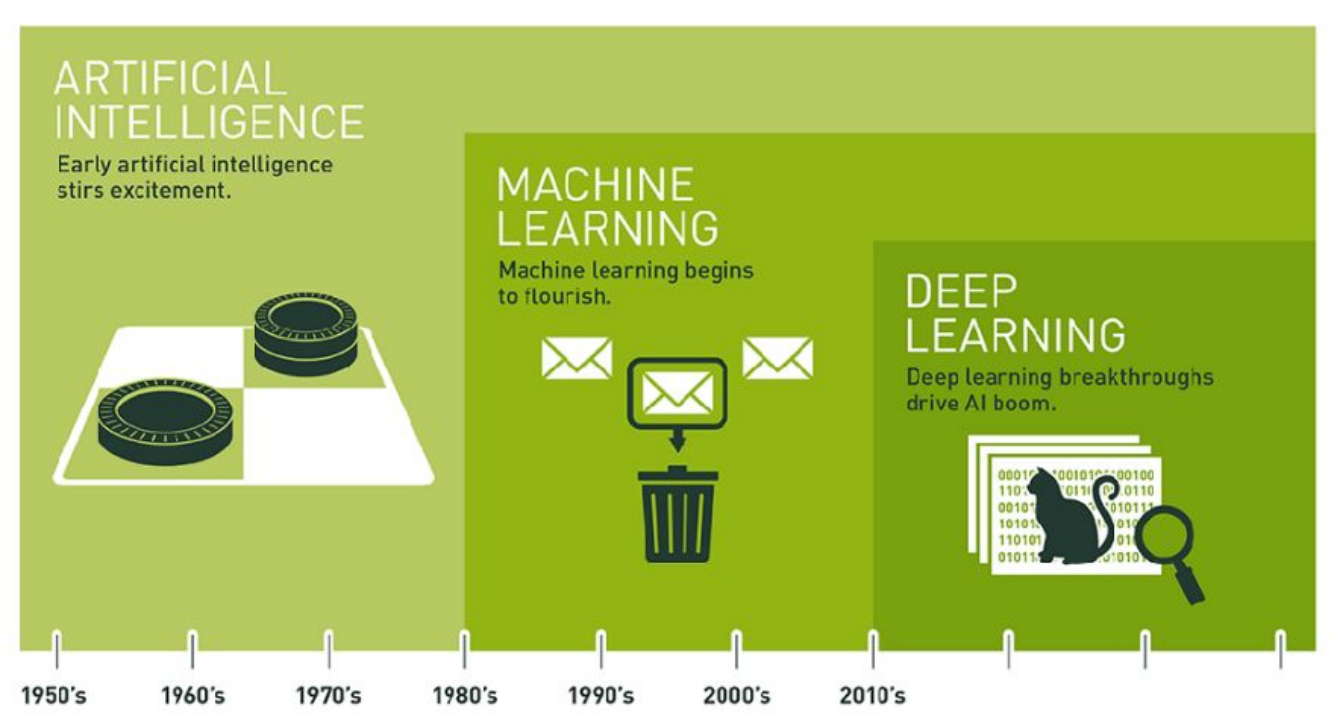
Overview

Introduction

1. What is Generative AI?
2. What is not Generative AI?
3. How is it related to AI-ML-DL?



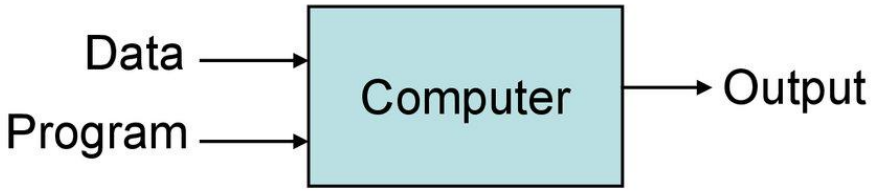
Relationship between AI, ML, DL



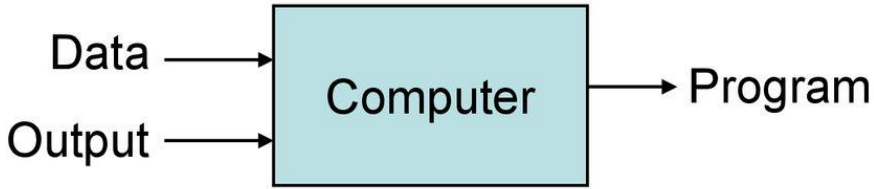
https://blogs.nvidia.com/blog/2016/07/29/whats-difference-artificial-intelligence-machine-learning-deep-learning-ai

Traditional vs. Machine Learning?

Traditional Programming



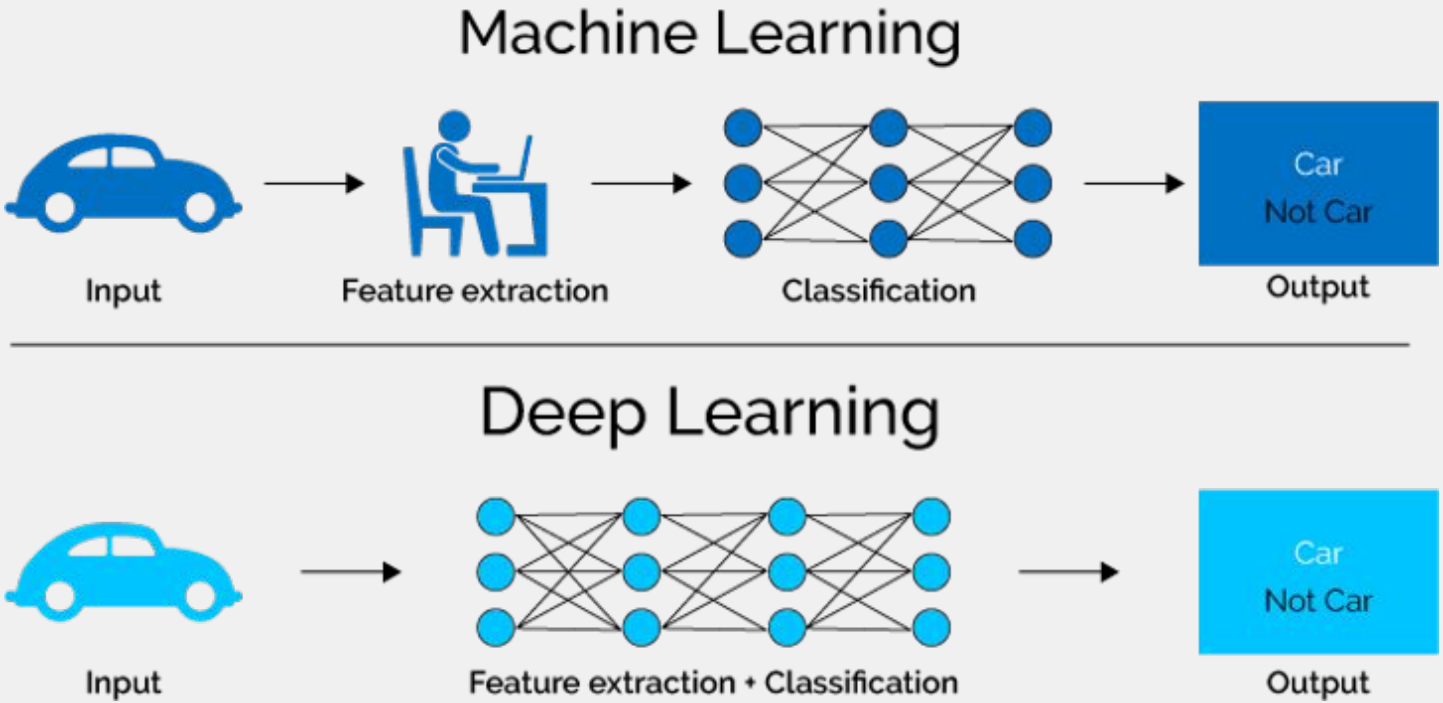
Machine Learning



Why Machine Learning?

1. Problems with High Dimensionality
2. Hard/Expensive to program manually
3. Job $$$

ML vs DL: What's the difference?

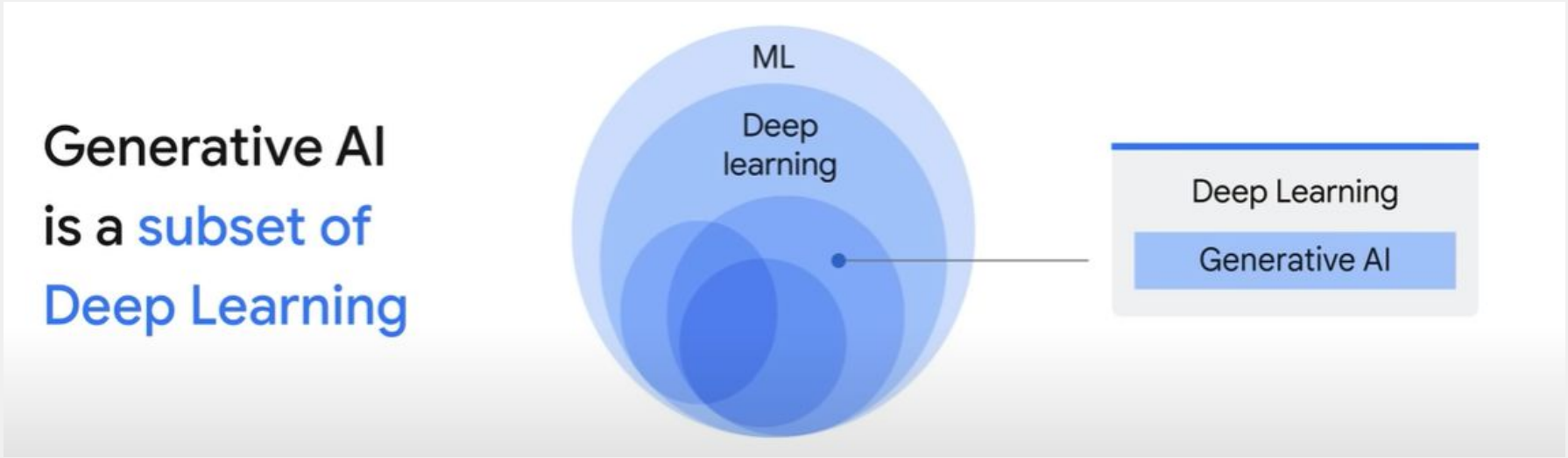


https://www.xenonstack.com/blog/static/public/uploads/media/machine-learning-vs-deep-learning.png

Use Deep Learning When . . .

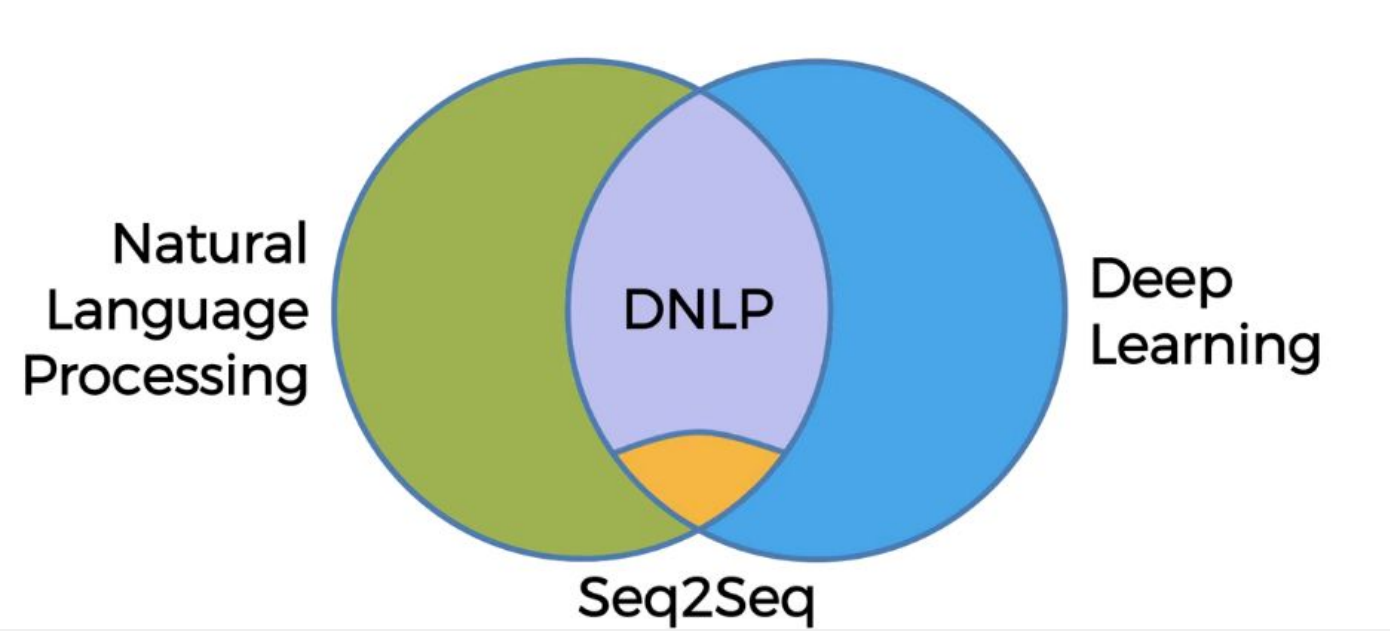
1. You have lots of data (about 10k+ examples)
2. The problem is “complex” - speech, vision, language
3. The data is unstructured
4. Techniques to model ‘ANY’ function given ‘ENOUGH’ data.

What is Gen AI wrt AI, ML, DL?



Hmm... Really?

What is Deep NLP?

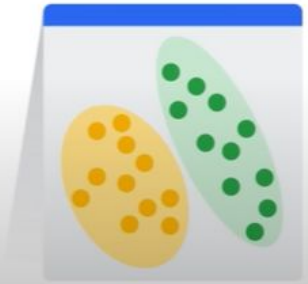


Types of Approaches

Deep Learning Model Types

Discriminative

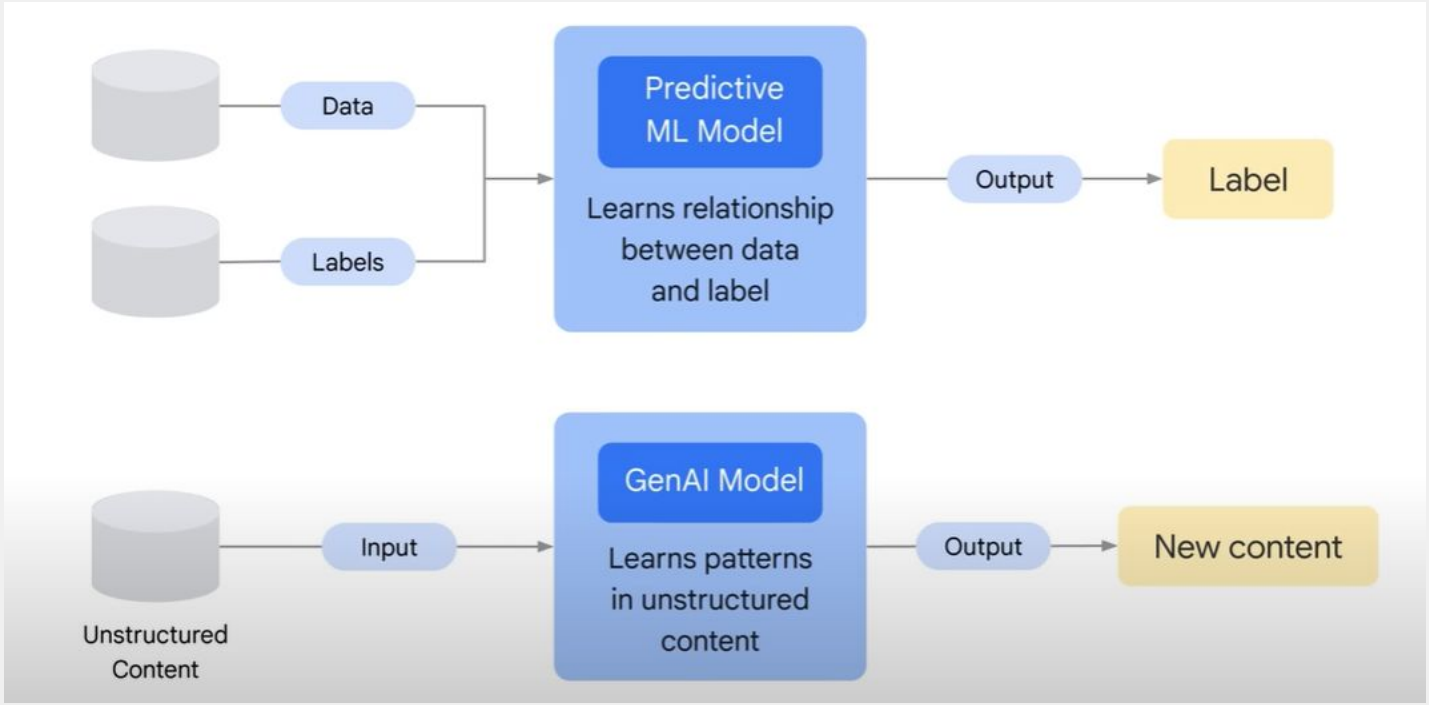
- Used to classify or predict
- Typically trained on a dataset of labeled data
- Learns the relationship between the features of the data points and the labels



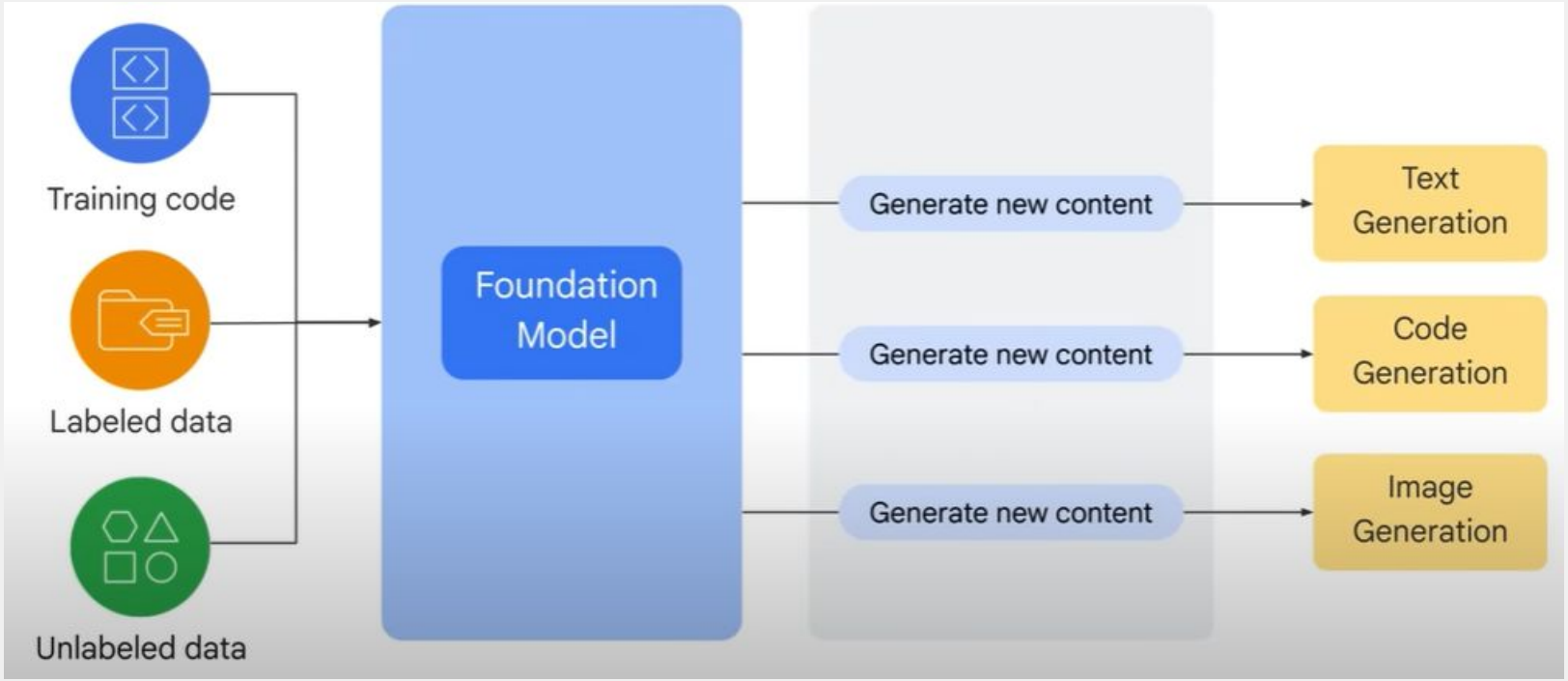
Generative

- Generates new data that is similar to data it was trained on
- Understands distribution of data and how likely a given example is
- Predict next word in a sequence

Types of Approaches



What is Foundation Model?



Same Problem, using different Technologies

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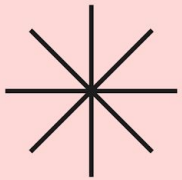

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Lets see how the solutions to the problem of Sentiment Analysis using traditional programming, deep learning, and generative AI, respectively.

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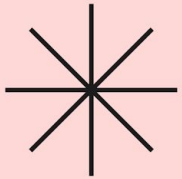

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Traditional Programming

- Writing explicit rules to detect sentiment in texts.
- Features like positive, negative words can be used to define these rules.
- However, designing accurate rules for complex word patterns like can be challenging.
- It requires extensive domain knowledge and might not generalize well to different phrases.

Deep Learning

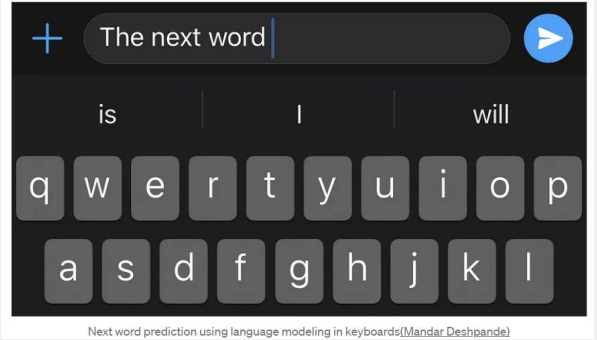
- Utilizes neural networks to automatically learn features for sentiment analysis.
- Word Embeddings are particularly effective, along with neural networks
- Large labeled datasets of tagged sentiments are used to train the network.
- Offers better accuracy and can handle complex patterns without explicit rule definition.

Generative AI

- Generative AI gets trained on huge pile of data, including mentions of sentiments
- ‘Learns’ the language, its patterns, from large set of examples, self-supervised manner
- Inferencing can be done using zero-few shots prompting or fine-tuned models.
- Quality depends on the Large Language Model (LLM) used.

What is a Language Model?

- While typing SMS, have you seen it suggests next word?
- While typing email, have you seen next few words are suggested?
- How does it suggest? (suggestions are not random, right?)
- In the past, for “Let's go for a . . . ’, if you have typed ’coffee’ 15 times, ’movie’ say 4 times, then it learns that.
  Machine/Statistical Learning.
- Next time, when you type “Let's go for a ”, what will be suggested? Why?
- This is called Language Model. Predicting the next word. When done continuously, one after other, it spits sentence, called Generative Model.

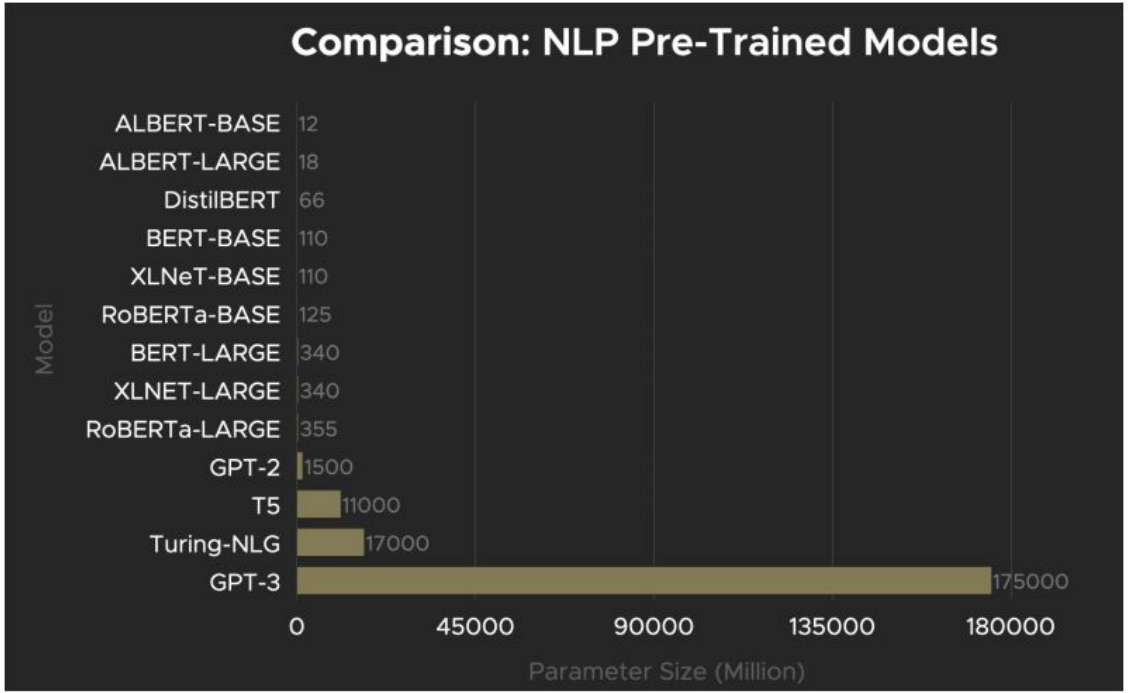


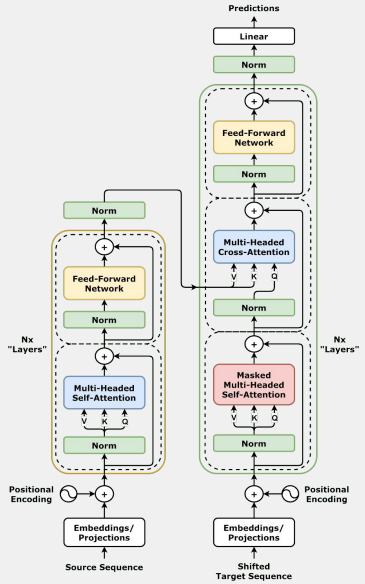
Next word prediction using language modeling in keyboards(Mandar Deshpande)

Why they are called Large? Corpus

- GPT-1 is pre-trained on the Books Corpus dataset, containing 7000 books amounting to 5GB of data
- GPT-2 is pre-trained using the WebText dataset which is a more diverse set of internet data containing 8M documents for about 40 GB of data
- GPT-3 uses an expanded version of the WebText dataset, two internet-based books corpora that are not disclosed and the English-language Wikipedia which constituted 600 GB of data

Why they are called Large? Parameters

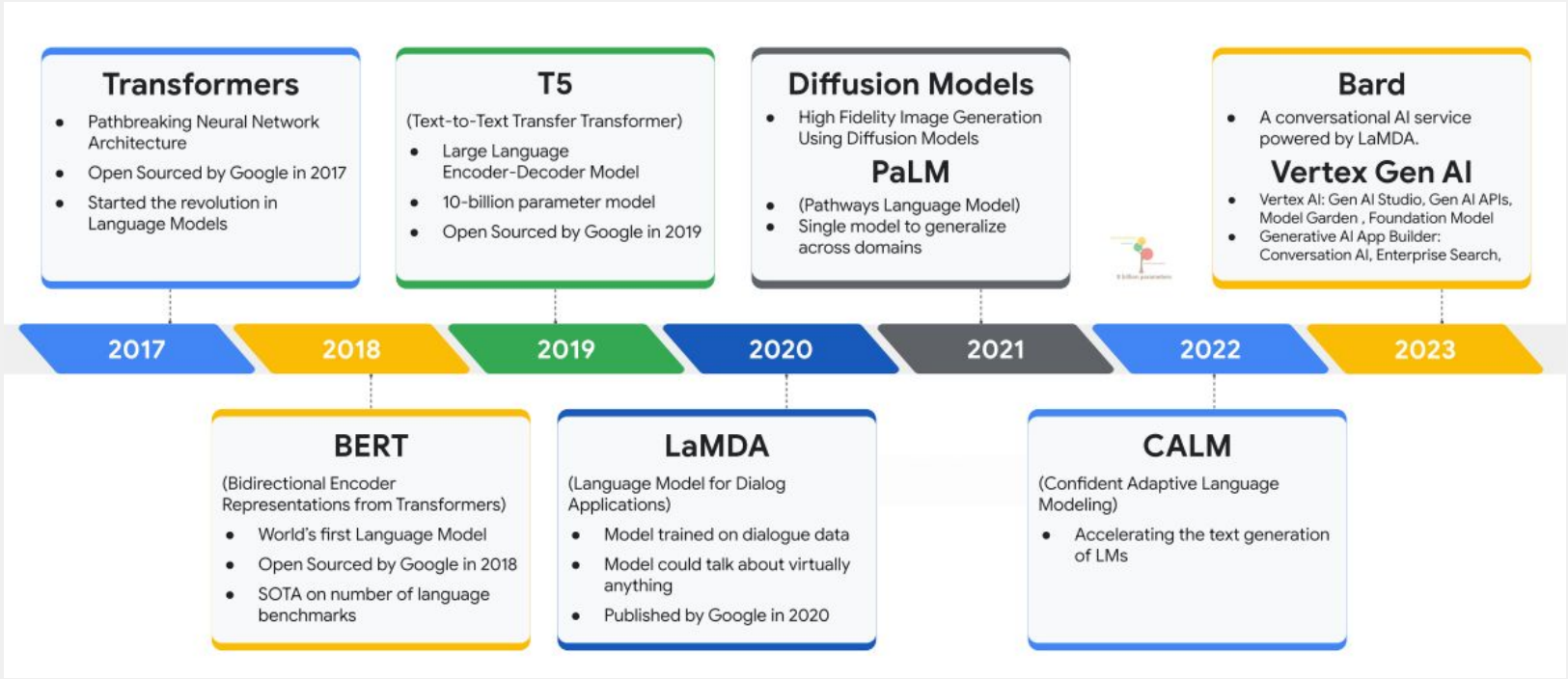




GPT-4?

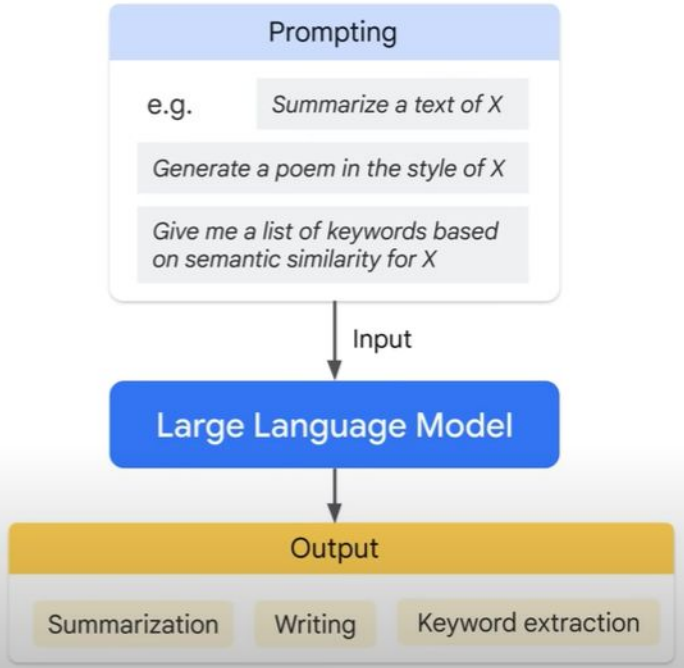
Deus.ai https://www.deus.ai/post/gpt-3-what-is-all-the-excitement-about

The Progress of Models . . .



Prompts driving Generative AI

Prompt Design:
the quality of the input determines the quality of the output.



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Demo:
Prompt Engineering:

Making of a Sandwich

Basic:

Explain how to make a peanut butter and jelly sandwich

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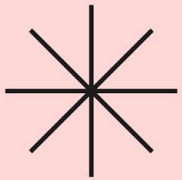

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Adding Roles:

As a chef, explain to your assistant how to make a peanut butter and jelly sandwich

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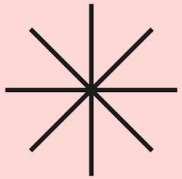

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Adding Constraints:

Make a nut-free version of the sandwich due to a customer's nut allergy

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Adding Examples:

Create two unique variations of the classic sandwich.
Banana Nut Crunch: . . . .
Triple Berry Blast: . . .

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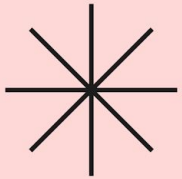

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Adding Contextual Information:

As the head chef at ’The Sandwich Haven,’ guide your new assistant to create specials for the menu

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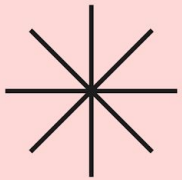

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Incorporating Feedback:

Improve the sandwich based on customer feedback for less sweetness and a creative twist

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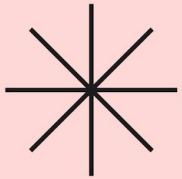

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Time Constraints and Prioritization:

Prepare an alternative fruit version for testing within a tight deadline

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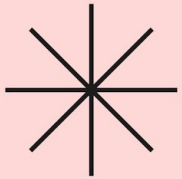

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Incorporating Multidisciplinary Knowledge:

Use food presentation and garnishing techniques for a visually appealing sandwich

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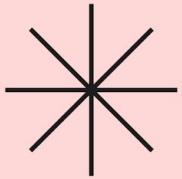

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Addressing Dietary Preferences:

Prepare a vegan version using plant-based alternatives for all ingredients

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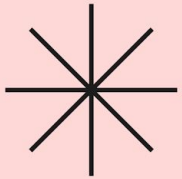

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Reflection and Iteration:

Reflect on feedback and iteratively refine the sandwich for better taste and appeal

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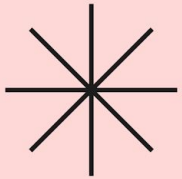

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Self-Criticism:

Explain how to make a peanut butter and jelly sandwich. Please re-read your above response. Any mistakes? If so, please identify and make the necessary edits.

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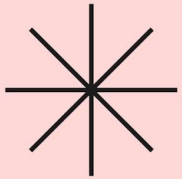

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Chain-of-Thought:

Explain how to make a peanut butter and jelly sandwich. Let's think step by step.

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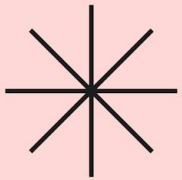

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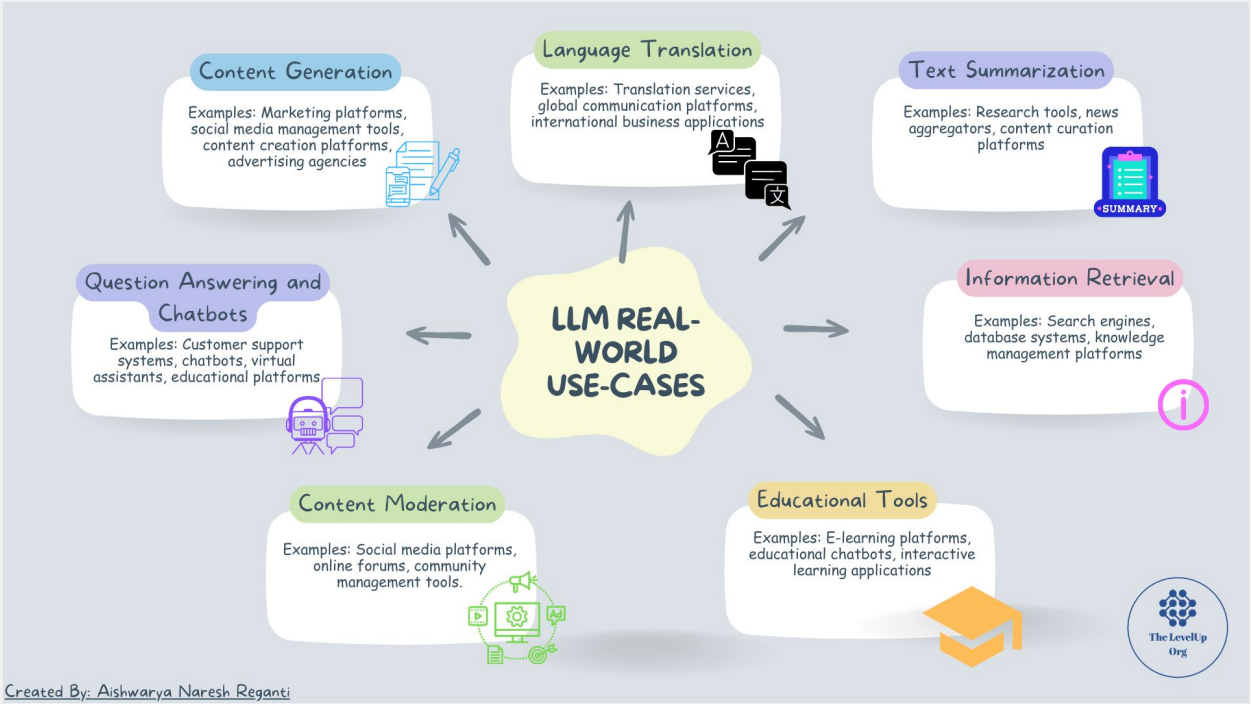
Conclusions

LLM Real World Use Cases

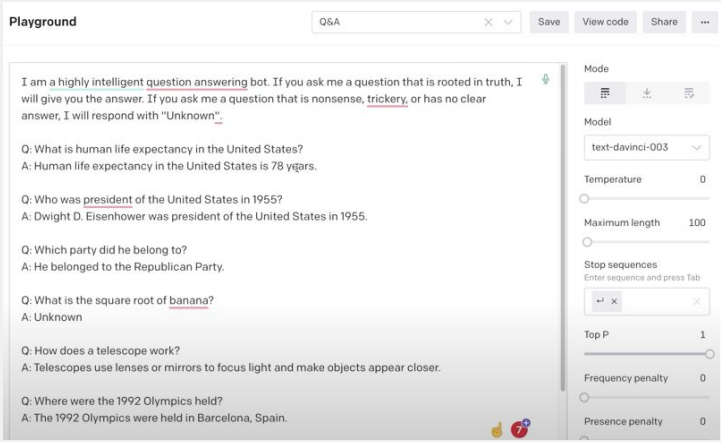


Will Gen AI Kill Jobs?

- Repetitive, boring and standard, language based jobs, for sure.
- Need to be more creative, experiential to stand against Gen AI.

New Job Roles?

Prompt Engineer: Preparing input to AI effectively to get the desired answer. Will need to AI works in the background plus domain knowledge. Give context, examples etc to prime the model to give short specific answers than the usual page-long ones (davinci GPT3 in this case)



Advanced ChatGPT Guide - How to build your own Chat GPT Site - Drian Twarog

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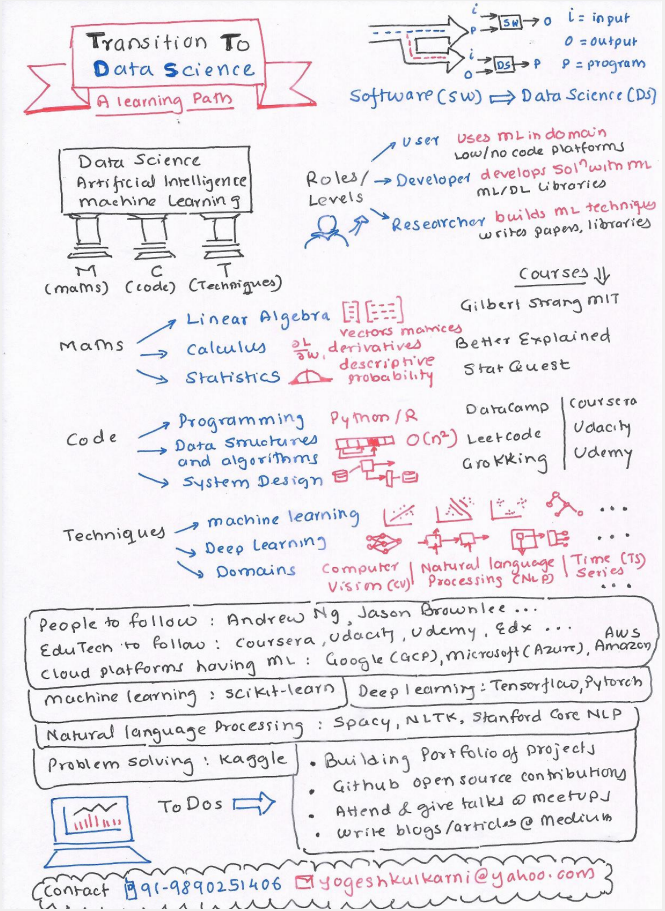
Preparation

Learning Path for Data Scientist

- Start Playing the Role in the current domain
- Build Foundation: mathematics, programming, ML, and DL
- Kaggle Competitions
- Specialize and Apply
- Build a GitHub Portfolio



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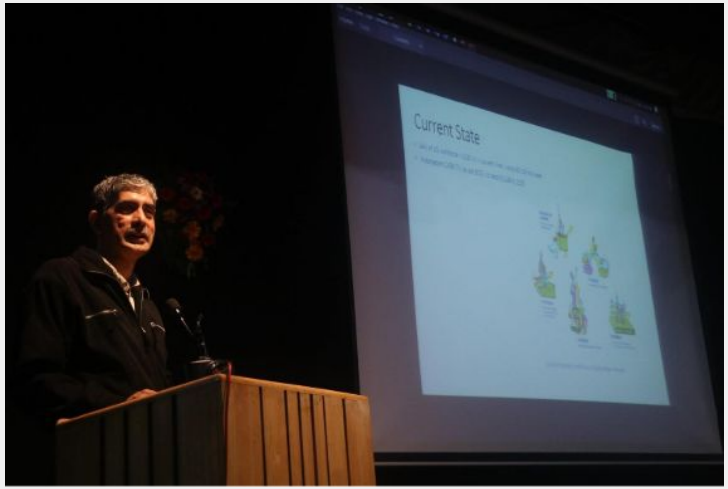
References

Resources

- Introduction to Generative AI - Google Cloud Tech
- Generative AI Presentation - Laura Worden
- Analytics Vidhya Learning Path 2017
- Let's build GPT: from scratch, in code, spelled out: Andrej Karpathy
- ChatGPT and Reinforcement Learning - CodeEmporium



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My TEDx talk:

Hit Refresh : A story of purposeful resets