

INTRO TO CHATGPT/GENERATIVE AI

Yogesh Haribhau Kulkarni



Outline

① BACKGROUND

② INTRODUCTION

③ APPLICATIONS

④ DEMO

⑤ CONCLUSION

About Me

YHK

Yogesh Haribhau Kulkarni

Bio:

- ▶ 20+ years in CAD/Engineering software development
- ▶ Got Bachelors, Masters and Doctoral degrees in Mechanical Engineering (specialization: Geometric Modeling Algorithms).
- ▶ Currently doing Coaching in fields such as Data Science, Artificial Intelligence Machine-Deep Learning (ML/DL) and Natural Language Processing (NLP).
- ▶ Feel free to follow me at:
 - ▶ Github (github.com/yogeshhk)
 - ▶ LinkedIn (www.linkedin.com/in/yogeshkulkarni/)
 - ▶ Medium (yogeshharibhaukulkarni.medium.com)
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Office Hours:
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From Zero to GPT!!

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Chess: next move?

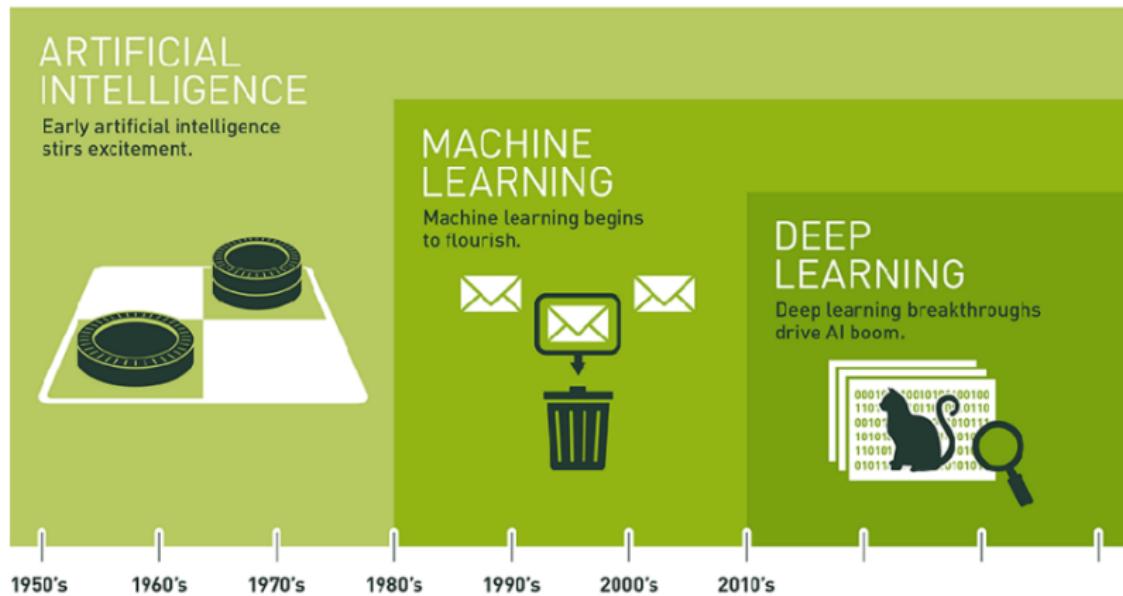
- ▶ Needs extreme expertise
- ▶ Needs “intelligence”
- ▶ How do you get that?
 - ▶ Built by lots of training.
 - ▶ By studying lots of past games.
- ▶ This is how Humans build intelligence

Intelligence

- ▶ Can machine (software/program) also do the same?
- ▶ Can it play chess?
- ▶ Can it build intelligence?
- ▶ By looking at past experiences (data),
- ▶ Training Data: games played, moves used, etc.

Yes, it can!! Thats Artificial Intelligence.

Relationship between AI, ML, DL



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

What is AI-ML-DL?

- ▶ Artificial Intelligence: mimicking human intelligence
- ▶ Machine Learning: Automating Learning with features.
- ▶ ML: human-designed representations and input features. So, its just optimizing weights to best make a final prediction
- ▶ There could be programmed (hand coded) AI, that's not Machine Learning
- ▶ Machine Learning could be for non AI activities, like automation
- ▶ Deep Learning: Neural network with no input features

Introduction to Machine Learning

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How do we learn?

- ▶ What do we do when we have to prepare for an examination?
- ▶ Study. Learn. Imbibe. Take notes. Practice mock papers.
- ▶ Thus, prepare for the unseen test.
- ▶ Machine Learning does the same.

What is Machine Learning?

Machine learning is a type of artificial intelligence (AI) which:

- ▶ Learns function without being explicitly programmed.
- ▶ Can grow and change when exposed to new data.



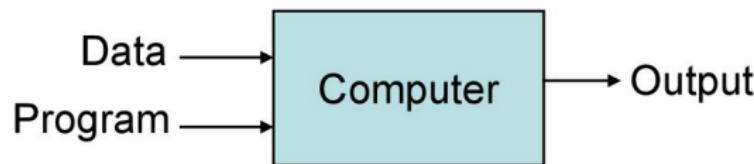
Model entities

For $income = c + \beta_0 \times education + \beta_1 \times experience$

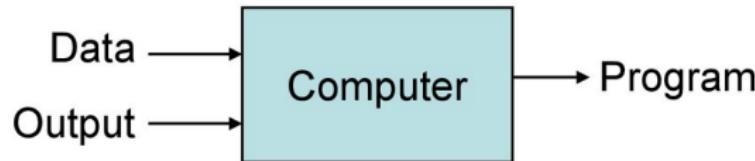
- ▶ Inputs: Education and experience, also called as features or attributes or dimensions or variables.
- ▶ Mathematical entities added to input data, are Parameters.. β_0 and β_1 are parameters
- ▶ Income is target, also called as outcome or class.

Traditional vs. Machine Learning?

Traditional Programming



Machine Learning



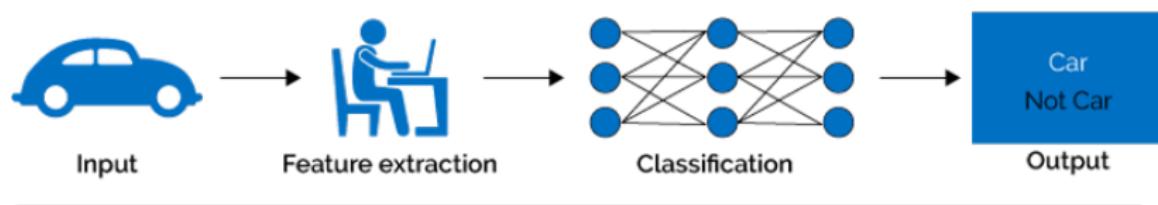
Why Machine Learning?

- ▶ Problems with High Dimensionality
- ▶ Hard/Expensive to program manually
- ▶ Techniques to model 'ANY' function given 'ENOUGH' data.
- ▶ Job \$\$\$

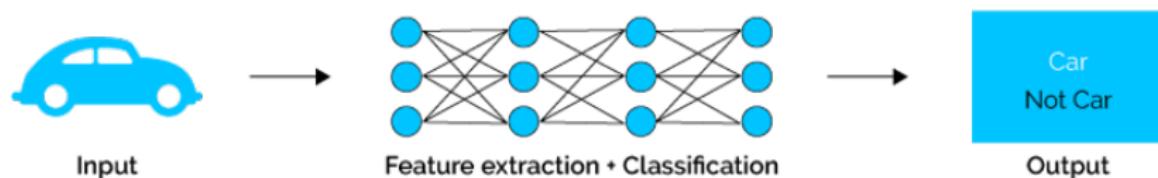
ML vs DL: What's the difference?

Deep learning algorithms attempt to learn (multiple levels of) representation by using a hierarchy of multiple layers

Machine Learning



Deep Learning



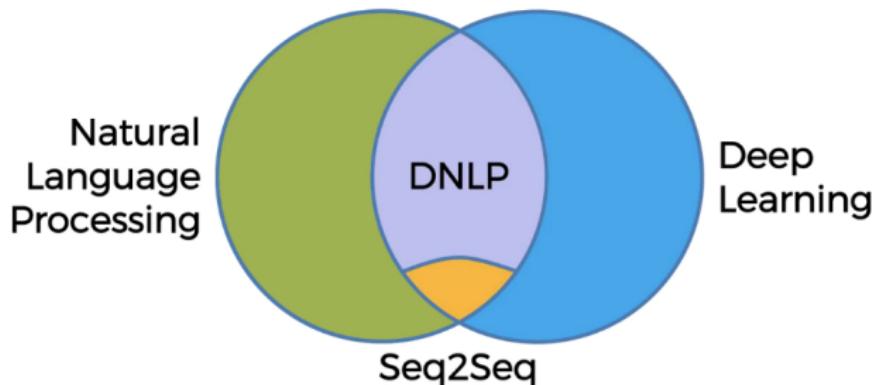
(Reference: <https://www.xenonstack.com/blog/static/public/uploads/media/machine-learning-vs-deep-learning.png>)

Use Deep Learning When ...

- ▶ You have lots of data (about 10k+ examples)
- ▶ The problem is “complex” - speech, vision, natural language
- ▶ The data is unstructured
- ▶ You need the absolute “best” model

(Ref: Introduction to TensorFlow 2.0 - Brad Miro)

What is Deep NLP



(Ref: Deep Learning and NLP A-Z - Kirill Eremenko)
(Note: Size is not indicative of importance)

- ▶ Green part is NLP (rule based, linguistic)
- ▶ Blue part is Deep Learning not applied to NLP
- ▶ Purple is Deep NLP (DNLP), NN applied for NLP use cases
- ▶ Seq2Seq is heavily used technique of DNLP for sequence to sequence modeling, eg Translation, Q & A, etc.

Typical Machine Learning Classification

- ▶ Questions are converted to bag of words (a vocab long vector, having frequency of specific words at their places)
- ▶ Each question thus gets converted to fixed size vector, which acts as list of features.
- ▶ In training, weights are computed based on the given target.
- ▶ Once model is ready, it is able to answer Yes or No to the question.

Hello Kirill, Checking if you are back to Oz. Let me know if you are around ... Cheers, V



Training Data:

Hey mate, have you read about Hinton's capsule networks?

→ No

Did you like that recipe I sent you last week?

→ Yes

Hi Kirill, are you coming to dinner tonight?

→ Yes

Dear Kirill, would you like to service your car with us again?

→ No

Are you coming to Australia in December?

→ Yes

(Ref: Deep Learning and NLP A-Z - Kirill Eremenko)

Context

Representing words by their context



- Distributional semantics: A word's meaning is given by the words that frequently appear close-by
 - “*You shall know a word by the company it keeps*” (J. R. Firth 1957)
 - One of the most successful ideas of modern statistical NLP!
- When a word w appears in a text, its **context** is the set of words that appear nearby (within a fixed-size window).
- Use the many contexts of w to build up a representation of w

...government debt problems turning into **banking** crises as happened in 2009...

...saying that Europe needs unified **banking** regulation to replace the hodgepodge...

...India has just given its **banking** system a shot in the arm...

These **context words** will represent **banking**

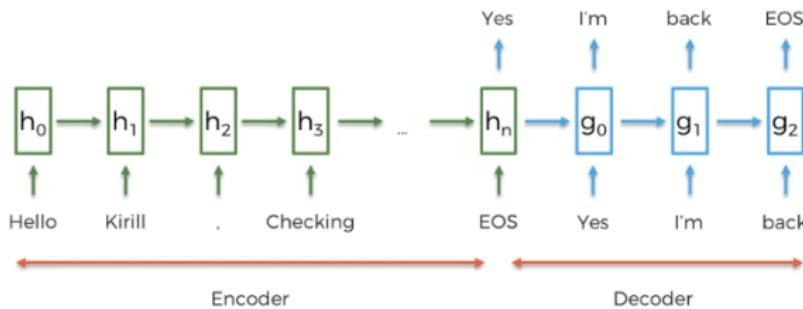
Word vectors

- ▶ Dense vector for each word
- ▶ Called distributed representation, word embeddings or word representations
- ▶ Test: similar to vectors of words that appear in similar contexts

$$\text{banking} = \begin{pmatrix} 0.286 \\ 0.792 \\ -0.177 \\ -0.107 \\ 0.109 \\ -0.542 \\ 0.349 \\ 0.271 \end{pmatrix}$$

Seq2Seq architecture

Hello Kirill, Checking if you are back to Oz.

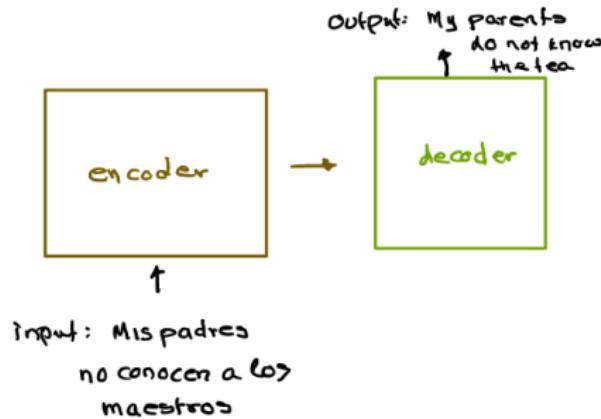


(Ref: Deep Learning and NLP A-Z - Kirill Eremenko)

During training, Encoder is fed with Questions and decoder with Answers. Weights in gates, hidden states get settled. During testing for each sequence of input, encoder results in to a combo vector. Decoder takes this and starts spitting out words one by one, probabilistically.

Transformers

- ▶ The Transformer is a model that uses attention to boost the speed with which seq2seq with attention models can be trained. The biggest benefit, however, comes from how The Transformer lends itself to parallelization.
- ▶ In its heart it contains an encoding component, a decoding component, and connections between them.



Transformers

- ▶ Offer a better structure to train a language model, which gave raise to the large language models (LLMs) like GPT and Bart. Its characteristics are:
 - ▶ Positional encoding: each word is labeled with the number of its position in a sentence.
 - ▶ Self-attention: each word is examined in the context of the whole sentence to generate a representation of the word. This helps the model to understand the linguistic meaning and nuances of a word. As the scale of a language model grows, the model builds mastery of our human language, and it does not only know how to perform basic text-based tasks but also gives a structured and logical answer to any user prompt.

(Ref: Techy Stuff 1: Notes on Transformers, LLMs, and OpenAI - Bill)

GPT

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Generative Pretrained Transformer (GPT)

2018's GPT was a big success in pretraining a decoder!

- ▶ Transformer decoder with 12 layers.
- ▶ 768-dimensional hidden states, 3072-dimensional feed-forward hidden layers.
- ▶ Trained on BooksCorpus: over 7000 unique books.
- ▶ Contains long spans of contiguous text, for learning long-distance dependencies.
- ▶ The acronym "GPT" never showed up in the original paper; it could stand for
- ▶ "Generative PreTraining" or "Generative Pretrained Transformer"

(Ref: John Hewitt, Radford et al., 2018)

GPT-3, in-context learning, very large models

- ▶ Very large language models seem to perform some kind of learning without gradient steps simply from examples you provide within their contexts.
- ▶ GPT-3 is the canonical example of this. The largest T5 model had 11 billion parameters.
- ▶ GPT-3 has 175 billion parameters.

(Ref: John Hewitt)

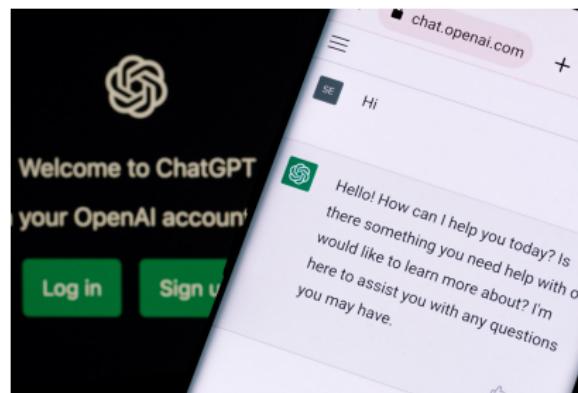


Overview of ChatGPT

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What is ChatGPT?

- ▶ A Chatbot
- ▶ A language model, that takes 'prompt' from user and generates a response.
- ▶ Built by OpenAI and released in Nov 2022
- ▶ Got 1m users in 5 days (Insta 2.5 months, Spotify 5m, Facebook 10m, Netflix 3.5yrs)
- ▶ Link: <https://chat.openai.com/chat>
- ▶ Details: <https://openai.com/blog/chatgpt/>

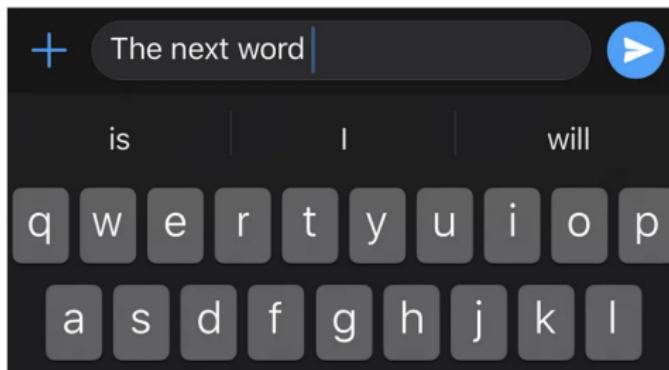


(Ref: OpenAI, creator of ChatGPT, casts spell on Microsoft - The Jakarta Post

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What is a Language Models?

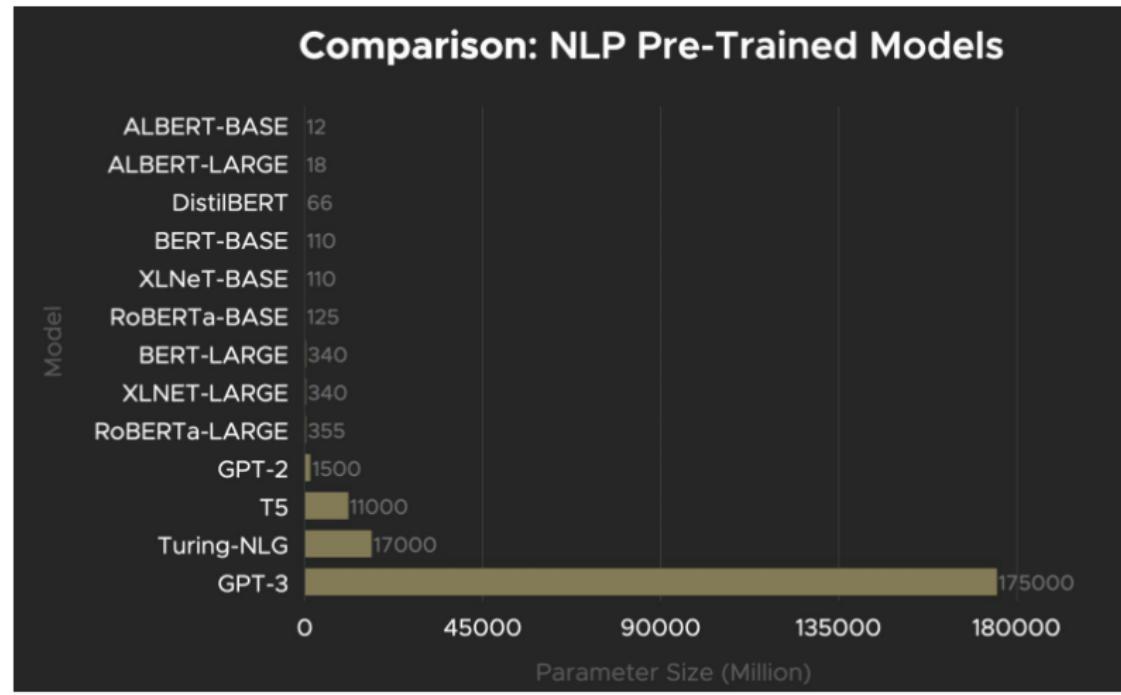
- ▶ While typing SMS, have you seen it suggests next word?
- ▶ While typing email, have you seen next few words are suggested?
- ▶ How does it suggest? (suggestions are not random, right?)
- ▶ In the past, for "Lets go for a ... ", if you have typed 'coffee' 15 times, 'movie' say 4 times, then it learns that. Machine/Statistical Learning.
- ▶ Next time, when you type "Lets 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)

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Large Language Models - Comparison



(Ref: Deus.ai <https://www.deus.ai/post/gpt-3-what-is-all-the-excitement-about>)

Open AI: Who are these guys?

- ▶ San Francisco-based artificial intelligence company
- ▶ Famous for its well-known DALL-E, generates images from prompts.
- ▶ Initially supported by Elon Musk
- ▶ The CEO is Sam Altman, who previously was president of Y Combinator.
- ▶ Microsoft is a partner and investor.
- ▶ Mission: To ensure that artificial general intelligence benefits all of humanity. Prevent misuse of AI

OpenAI Founded

The company was founded with the goal of developing and promoting friendly AI in a responsible way, with a focus on transparency and open research.



(Ref: <https://www.slideegg.com/open-ai-chat-gpt>)

GPTs Training

GPT: Generative Pre-trained Transformers

- ▶ GPT-1 is pre-trained on the BooksCorpus 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

GPTs Training compared to human reading

- ▶ GPT-3 was trained on 499B tokens; GPT-4, on 1.4T tokens.
- ▶ In comparison, if you spent 12 hours a day reading for an entire lifetime (80 years) at average speed (250 words / minute), we would absorb 5.26B words (tokens).
- ▶ That's a ratio of 100:1 between the training data used for GPT-3 and the amount of data that can ever be read by a human, and 260:1 for GPT-4.

(Ref: LinkedIn post by Dr Jennifer Prendki)

GPT3 vs ChatGPT

	GPT-3	ChatGPT
Training Parameters	175 billion	175 Billion RLHF Technique Human conversational text
Designed For	NLP Tasks	Chatbot apps
Content Retention Ability	No	Yes
Use Cases	Creative Writing, Business Writing, Ads, Translation, Summarization, Data Analysis	Customer Service, Data Analysis, Blogging, Copywriting, Coding, Debugging, etc.

(Ref: ChatGPT Explained: Complete A-Z Guide - Kripesh Adwani)

Applications

Explain Complex Subjects



What is neuroscience?



Neuroscience is the scientific study of the nervous system, which includes the brain, spinal cord, and peripheral nerves. It is a multidisciplinary field that combines knowledge from biology, chemistry, physics, psychology, and other fields to understand how the nervous system works and how it relates to behavior and cognition. Researchers in neuroscience use a variety of methods, including neuroanatomy, neurophysiology, and neuroimaging, to study the structure and function of the nervous system.



(Ref: Top 10 Chat GPT Use Cases - Simplilearn)

Write Code

Give me a machine learning sample program for stocks prediction

Here is a sample Python program that uses the scikit-learn library to train a linear regression model to predict stock prices based on historical data:

Copy code

```
import numpy as np
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split

# Load stock data
stock_prices = np.genfromtxt('
    ■
```

it was still writing but I stopped it, just to show this pic

(Ref: Top 10 Chat GPT Use Cases - Simplilearn)

Debug Code

```
arr[j + 1] = tempp;
```

It should be:

 Copy code

```
arr[j + 1] = temp;
```

You have an extra "p" in the variable name, ~~temp~~ which is causing a compile error. This is because "temp" is the variable that you declared earlier to store the value of the current element, whereas "tempp" is not a variable that has been declared.

This error is causing the code not to run. Once you fix this issue, the code should work correctly and sort the array in ascending

(Ref: Top 10 Chat GPT Use Cases - Simplilearn)

Get Custom Marketing Strategy



How should i promote my youtube videos on social media?



Promoting your YouTube videos on social media can be a great way to increase views and engagement. Here are a few strategies you can use:

1. Share your videos on your personal social media accounts. This includes your Facebook, Twitter, Instagram, and other accounts where you have a following. Encourage your friends, family and followers to share the video with their own networks.
2. Join relevant communities and groups on social media. For example, if you're making cooking videos, join Facebook groups and Reddit communities dedicated to cooking. Share your videos with the group and engage with the community.
3. Use social media ads. Platforms like Facebook, Instagram, and Twitter allow you to create targeted ads that promote your videos



Write Articles



Write an article on machine learning in 500 words



Machine learning is a rapidly growing field that is transforming the way we live and work. It is a branch of artificial intelligence that allows computers to learn from data, without being explicitly programmed. Machine learning is changing the way we interact with technology and has the potential to revolutionize many industries, including healthcare, finance, transportation, and more.

The basic idea behind machine learning is that computers can learn from data, without being explicitly programmed. This is done by feeding a computer large amounts of data and allowing it to find patterns and make predictions. There are three main types of machine learning: supervised learning, unsupervised learning, and reinforcement learning.

Supervised learning is the most common type of machine learning. It involves training a computer on a labeled dataset, where the desired output is ■

Summarize Book



summarize the book Gullivers travels



Gulliver's Travels is a satirical novel written by Jonathan Swift in 1726. The book tells the story of Lemuel Gulliver, a ship's surgeon who becomes shipwrecked and ends up on a series of strange and fantastical islands. The novel is divided into four parts, each of which tells the story of Gulliver's travels to a different island.

In Part 1, Gulliver washes up on the island of Lilliput, where he encounters a race of tiny people who are locked in a bitter war with their neighboring island of Blefuscus. Gulliver becomes embroiled in the politics of the island and ultimately helps the Lilliputians defeat the Blefuscudians.

In Part 2, Gulliver travels to the island of Brobdingnag, where he encounters a race of giants. He is initially treated kindly by ■

Answer Interview Questions



How to answer the interviewer what is your weakness



When answering this question, it is best to be honest, but also to frame your answer in a positive way. For example, you could say something like: "I have a tendency to be a perfectionist and sometimes struggle with delegating tasks. However, I have been working on this by learning to trust my team members and giving them more responsibility." This shows that you are aware of your weakness and actively working to improve it.

(Ref: Top 10 Chat GPT Use Cases - Simplilearn)

Develop Apps



I want to write an android app that shows me 50 stock prices as a list from yahoo API. How can i do it?



To write an Android app that shows a list of 50 stock prices from the Yahoo API, you will need to do the following:

1. Create a new Android project using Android Studio or another development environment.
2. Register for a Yahoo API key, which will allow you to access financial data such as stock prices.
3. Use the Retrofit library to make API calls to the Yahoo API. You can use the Retrofit library to create an interface that defines the API endpoints, and then use this interface to make API calls.

4 ■

Create Health Plan



My weight is 95 kg and I want to loose it. create 7 days plan excercise and diet planfor it.



Here is a 7-day exercise and diet plan that can help you lose weight:

Day 1:

- Exercise: 30-minute brisk walk or jog
- Diet: Start your day with a healthy breakfast of oatmeal, berries, and a boiled egg. For lunch, have a salad with grilled chicken or fish. For dinner, have grilled vegetables and a small serving of lean protein.

Day 2:

- Exercise: 45-minute circuit training routine that includes bodyweight exercises such as push-ups, ■

Answer General Knowledge Questions



Who invented the first printer?



The first printer was invented by a German goldsmith named Johannes Gutenberg in the 15th century. He developed a printing press that used movable type, which made it possible to print books and other documents quickly and cheaply. The Gutenberg press used metal movable type, which was set into a wooden form and inked, then pressed onto paper. This invention revolutionized the way information was disseminated and made the mass production of books possible.

Gutenberg's invention of the printing press is widely regarded as one of the most important events in the second millennium, it is considered the most important invention of the second millennium, after the invention of the wheel.

(Ref: Top 10 Chat GPT Use Cases - Simplilearn)

Making of a Sandwich

YHK

Basic

Explain how to make a peanut butter and jelly sandwich

Adding Roles

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



Adding Constraints

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



Adding Examples

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

Triple Berry Blast: . . .



Adding Contextual Information

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



Incorporating Feedback

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

Time Constraints and Prioritization

Prepare an alternative fruit version for testing within a tight deadline

Incorporating Multidisciplinary Knowledge

Use food presentation and garnishing techniques for a visually appealing sandwich



Addressing Dietary Preferences

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

Reflection and Iteration

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

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.



Chain-of-Thought

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

Self-Consistency

Here are recipes of multiple sandwiches. Sandwich 1: recipe 1. Sandwich 2: recipe 2. Explain how to make a peanut butter jelly sandwich.



Conclusions

Advantages

- ▶ Conversational Abilities
- ▶ Solving Complex Problems
- ▶ Retaining Previous Information
- ▶ Will replace mundane language tasks, How to articles, homework, etc

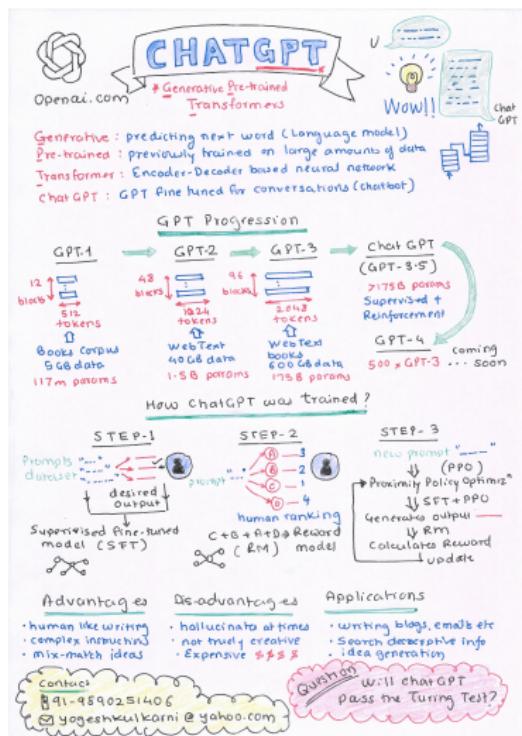
Dis-advantages

- ▶ Sensitive to Input Phrasing
- ▶ Cannot replace humans for innovation, for which data does not exist already
- ▶ Keeps “hallucinating”: Tends to write plausible but incorrect content with confidence
- ▶ May not get language structure right all the time, e.g try getting ghazal written

Compared to humans?

- ▶ Although GPT models are far more knowledgeable due to vast training (GPT-3 was trained on 499B tokens, GPT-4 on 1.4 T tokens whereas a human can read about 5.26B tokens in 80 years)
- ▶ It's not about the volume of data ...
- ▶ Children can talk long before they reach adulthood, and it's likely that < 1B tokens is enough for a human to master language. Need to figure out how nature has made her neural network so efficient.
- ▶ Imagine the pretraining done over billions of years at the time a baby comes ready with

My Sketchnote



(Ref: <https://medium.com/technology-hits/overview-of-chatgpt-95f4b43645c0>)

The After-shocks

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ChatGPT vs Google: Who is better?



Google: almost latest data, gives source, not trainable, looks more accurate
ChatGPT: a bit old data, no source, trainable, hallucinates

(Ref: ChatGPT Explained: Complete A-Z Guide - Kripesh Adwani)

Will ChatGPT Kill Jobs?



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

(Ref:ChatGPT Explained: Complete A-Z Guide - Kripesh Adwani)

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)

Playground Q&A Save View code Share ...

I am a highly intelligent question answering bot. If you ask me a question that is rooted in truth, I will give you the answer. If you ask me a question that is nonsense, trickery, or has no clear answer, I will respond with "Unknown".

Q: What is human life expectancy in the United States?
A: Human life expectancy in the United States is 78 years.

Q: Who was president of the United States in 1955?
A: Dwight D. Eisenhower was president of the United States in 1955.

Q: Which party did he belong to?
A: He belonged to the Republican Party.

Q: What is the square root of banana?
A: Unknown

Q: How does a telescope work?
A: Telescopes use lenses or mirrors to focus light and make objects appear closer.

Q: Where were the 1992 Olympics held?
A: The 1992 Olympics were held in Barcelona, Spain.

Mode: text-davinci-003
Temperature: 0
Maximum length: 100
Stop sequences: Enter sequence and press Tab
Top P: 1
Frequency penalty: 0
Presence penalty: 0

(Ref: Advanced ChatGPT Guide - How to build your own Chat GPT Site - Drian Twarog)

The Hype



Elon Musk ✅ @elonmusk · Dec 4

Replies to @sama

ChatGPT is scary good. We are not far from dangerously strong AI.

...



François Chollet ✅ @fchollet · 8h

With apps like Midjourney, Lensa, and ChatGPT, the age of consumer AI has finally arrived.

...



@jh@sigmoid.social (Mastodon) @jeremyphoward · 9h

...

I remember well when Google was first released. I felt confident that it would become a critical tool that we'd all rely on.

I haven't felt that way again, until now: ChatGPT.

In just a few days I've gotten so much out of it.

(Ref: ChatGPT - Intro & Potential Impact Sudalai Rajkumar, SRK)

Finally, from horses mouth!!



Sam Altman  @sama · 10 dic.

ChatGPT is incredibly limited, but good enough at some things to create a misleading impression of greatness.

it's a mistake to be relying on it for anything important right now. it's a preview of progress; we have lots of work to do on robustness and truthfulness.

877 3.856 27,5 mil

(Ref: ChatGPT: training process, advantages, and limitations - By Sergio Soage, Machine Learning Engineer at Aivo)

References

- ▶ Let's build GPT: from scratch, in code, spelled out: Andrej Karpathy
- ▶ ChatGPT and Reinforcement Learning - CodeEmporium

My TEDx Talk :

Hit Refresh : A story of purposeful resets

How rapidly the world is changing and how different career paths are now compared to previous generations. Yogesh shares his own journey of constant reinvention.

(<https://www.youtube.com/watch?v=-VbWRs7BsPY>, QR by

<https://www.the-qrcode-generator.com/>)



Thanks ...

- ▶ Search "**Yogesh Haribhau Kulkarni**" on Google and follow me on LinkedIn and Medium
- ▶ Office Hours: Saturdays, 2 to 5pm (IST); Free-Open to all; email for appointment.
- ▶ Email: yogeshkulkarni at yahoo dot com

(<https://www.linkedin.com/in/yogeshkulkarni/>, QR by Hugging Face

QR-code-AI-art-generator, with prompt as "Follow me")

