

ASSIGNMENT 3

Lab 1:- Introduction to ChatGpt

Introduction to ChatGPT

ChatGPT is a language model developed by OpenAI, based on the **Generative Pretrained Transformer (GPT)** architecture. It uses deep learning to process and generate human-like text by understanding the context of input and generating coherent, contextually relevant responses. The model has been trained on vast datasets sourced from the internet, making it proficient in a wide range of tasks including writing, problem-solving, answering questions, coding, and creative endeavors.

How ChatGPT Works

At its core, ChatGPT is powered by **transformer architecture**, which leverages a mechanism called **self-attention**. This allows the model to weigh the importance of each word in a sentence relative to the others, enabling it to capture the context effectively. Unlike earlier models that processed words sequentially, transformers can process all words in a sentence simultaneously, improving efficiency. Additionally, **positional encodings** are used to retain the order of words in the sequence.

GPT models are typically **decoder-only** architectures, meaning they generate text from a given input. For example, when asked to explain a concept or generate a story, the model predicts the most likely next word based on what it has seen before, forming a coherent response.

Real-World Applications of ChatGPT

1. Education

- **Personalized Tutoring:** ChatGPT can function as a virtual tutor, helping students with homework, explaining complex concepts, and providing additional practice. For instance, a student struggling with algebra can ask for step-by-step guidance, which ChatGPT can provide tailored to their understanding level.

- **Automated Grading:** Teachers can use ChatGPT to automate the grading process for assignments, particularly for tasks like multiple-choice questions or even essays, with feedback on structure, grammar, and content.

2. Healthcare

- **Symptom Checkers:** In healthcare, ChatGPT can act as a virtual assistant, answering general questions about symptoms or conditions. For instance, if a user is feeling unwell and is unsure about their symptoms, ChatGPT can provide suggestions, though it always directs users to consult a doctor for diagnosis.
- **Mental Health Support:** AI-based bots powered by models like ChatGPT can offer basic mental health support by providing coping strategies, mood tracking, or even directing individuals to mental health professionals when needed.

3. Business

- **Customer Support:** ChatGPT is widely used in customer service as a first point of contact, answering frequently asked questions (FAQs), assisting with troubleshooting, and guiding users through basic steps. For example, in an e-commerce setting, a customer could inquire about shipping policies or return procedures, and ChatGPT would provide an instant, accurate response.
- **Market Research:** Businesses can use ChatGPT to process large volumes of customer feedback or analyze market trends by summarizing customer reviews and identifying common concerns. This helps companies adapt to customer needs quickly.

4. Creativity

- **Content Generation:** ChatGPT aids writers, content creators, and marketers by brainstorming ideas, drafting articles, creating social media posts, and even writing stories or scripts. For example, an

author could use ChatGPT to develop plot ideas for a novel or to create character dialogues.

- **Idea Brainstorming:** ChatGPT also excels in creative brainstorming, whether for business solutions, product names, or new marketing strategies. It can generate multiple ideas in seconds, offering diverse perspectives.

Conclusion

ChatGPT is a versatile AI tool that can assist in various sectors, from education and healthcare to business and creativity. Its ability to understand and generate text based on context makes it a powerful assistant, enhancing productivity, efficiency, and creativity across multiple domains. Whether it's personalizing learning, streamlining customer service, or generating creative content, ChatGPT is reshaping the way humans interact with technology, offering an array of practical and innovative applications.

Lab 2:-Types of Prompts and Prompt Engineering Basics

1. Question-Based Prompts

Examples:

1. Basic Question: "What is the capital of France?"
2. Clarifying Question: "Can you explain how the Eiffel Tower was constructed?"
3. Contextual Question: "What was the political significance of the Eiffel Tower during its construction in 1887?"
4. Comparative Question: "How does the Eiffel Tower compare to the Statue of Liberty in terms of historical significance?"

5. Fact-Finding Question: "What materials were used in the construction of the Eiffel Tower?"

Results Comparison:

- Example 1: Provides a simple factual answer, "The capital of France is Paris."
- Example 2: Provides an informative and detailed construction timeline or engineering methods.
- Example 3: Adds historical context, highlighting political elements of the Eiffel Tower's creation.
- Example 4: Generates a comparative analysis between the Eiffel Tower and the Statue of Liberty, focusing on cultural and historical differences.
- Example 5: Lists materials like wrought iron, focusing on technical details about construction.

2. Instruction-Based Prompts

Examples:

1. Basic Instruction: "Summarize the history of the Eiffel Tower."
2. Detailed Instruction: "Write a 3-paragraph summary of the Eiffel Tower, including its history, architectural features, and cultural significance."
3. Task-Oriented Instruction: "Create an outline for an essay on the Eiffel Tower's architectural impact."
4. Style-Based Instruction: "Write a paragraph on the Eiffel Tower in a formal tone."

5. Action-Oriented Instruction: "List 5 interesting facts about the Eiffel Tower."

Results Comparison:

- Example 1: A concise summary of the history of the Eiffel Tower, mentioning the year of completion and its importance.
- Example 2: A more structured and thorough response, with clear divisions between historical facts, architectural details, and cultural significance.
- Example 3: Provides an organized essay outline with sections like Introduction, History, Design, and Conclusion.
- Example 4: Adopts a formal language style with technical vocabulary and a focus on precision.
- Example 5: Lists 5 unique, often surprising facts (e.g., its original height, famous visitors, or engineering innovations).

3. Contextual Prompts

Examples:

1. Basic Context: "Explain the Eiffel Tower as if I know nothing about it."
2. Specific Context: "Explain the Eiffel Tower to a group of high school students studying architecture."
3. Complex Context: "Describe how the Eiffel Tower's design impacted the modern understanding of structural engineering."
4. Personal Context: "As a tourist in Paris, what should I know about the Eiffel Tower?"

5. Scenario-Based Context: "If you were designing the Eiffel Tower today, how might you use modern technology in its construction?"

Results Comparison:

- Example 1: Simple, introductory explanation for someone new to the subject.
- Example 2: Tailored to students, using architectural terms and presenting design principles.
- Example 3: Offers an advanced perspective, discussing the scientific and engineering advances introduced by the Eiffel Tower.
- Example 4: Focuses on practical advice for tourists, including what to see and do, as well as historical context.
- Example 5: Focuses on hypothetical, modern technology such as advanced materials, structural simulations, and sustainability.

4. Open-Ended Prompts

Examples:

1. Story Generation: "Tell me a story about the Eiffel Tower."
2. Creative Exploration: "Write a poem about the Eiffel Tower at sunset."
3. Fictional Scenario: "Imagine if the Eiffel Tower could talk, what would it say about its history?"
4. Exploratory Prompt: "Describe what it would be like to live inside the Eiffel Tower."
5. Imaginative Scenario: "Write a futuristic story where the Eiffel Tower becomes the center of a new city."

Results Comparison:

- Example 1: Generates a narrative, focusing on fictional elements, events, or emotions related to the Eiffel Tower.
- Example 2: Produces a creative poem, likely to evoke imagery and feelings of beauty and awe.
- Example 3: Personifies the Eiffel Tower, giving it a voice and perspective on its history and significance.
- Example 4: Describes a highly imaginative experience, exploring what living inside a monumental structure might entail.
- Example 5: Sets the Eiffel Tower as a central element in a futuristic scenario, using speculative or science-fiction language.

5. Role-Playing Prompts

Examples:

1. Historical Expert Role: "Pretend you are a historian and explain why the Eiffel Tower was controversial when it was first built."
2. Teacher Role: "Imagine you're an art teacher. How would you explain the architectural significance of the Eiffel Tower to students?"
3. Tour Guide Role: "Pretend you're a tour guide at the Eiffel Tower. What would you say to visitors?"
4. Architect Role: "If you were the architect Gustave Eiffel, how would you describe your vision for the tower?"
5. Engineer Role: "Assume you are an engineer from the 19th century. How would you explain the challenges of building the Eiffel Tower?"

Results Comparison:

- Example 1: Offers a historian's perspective, detailing the public backlash, including opposition from artists and intellectuals.
 - Example 2: Presents educational content with simplified language and focuses on the architectural design aspects.
 - Example 3: Provides a friendly, welcoming tone aimed at tourists, focusing on fun facts and key highlights.
 - Example 4: Uses first-person perspective, providing insight into Gustave Eiffel's design philosophy and the tower's purpose.
 - Example 5: Offers a technical perspective, focusing on the engineering challenges faced and how they were overcome.
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Lab 3:- Precision Prompting for Information Extraction

Activity 1: Ask ChatGPT to Format its Response in JSON or Tabular Format

Document Prompt (JSON Format):

Prompt:

_"Can you provide the following details about the Eiffel Tower in a JSON format?"

- Name
- Location
- Year Completed
- Height

- Designer
- Purpose (e.g., event)"_

Expected Output (JSON Format):

```
{  
  "name": "Eiffel Tower",  
  "location": "Paris, France",  
  "year_completed": 1889,  
  "height": "324 meters",  
  "designer": "Gustave Eiffel",  
  "purpose": "Exposition Universelle (1889 World's Fair)"  
}
```

Document Prompt (Tabular Format):

Prompt:

_"Please present the following information about Marie Curie in a tabular format:

- Name
- Date of Birth
- Field
- First Nobel Prize (Year, Category)
- Second Nobel Prize (Year, Category)"_

Expected Output (Tabular Format):

Field	Information
Name	Marie Curie
Date of Birth	1867
Field	Physics, Chemistry
First Nobel Prize	1903, Physics
Second Nobel Prize	1911, Chemistry

Activity 2: Extract Contact Info, Resume Sections, and Keywords

Document Prompt (Contact Info Extraction):

Prompt:

_"Please extract the following contact information from the paragraph:

- Name
- Phone Number
- Email Address
- Address

From the paragraph:

'John Doe, 123 Elm St., Springfield, IL, 62701. You can contact me at john.doe@email.com or call me at 555-123-4567.'"_

Expected Output (Contact Info):

```
{  
  "name": "John Doe",  
  "phone_number": "555-123-4567",  
  "email": "john.doe@email.com",  
  "address": "123 Elm St., Springfield, IL, 62701"  
}
```

Document Prompt (Resume Section Extraction):

Prompt:

_"Extract the following resume sections from the given paragraph:

- Name
- Job Title
- Skills
- Experience

From the paragraph:

'Jane Smith, Software Engineer, proficient in Python, Java, and C++. Worked at XYZ Corp for 5 years as a Senior Developer, focusing on backend development and cloud

computing." _

Expected Output (Resume Sections):

```
{  
  "name": "Jane Smith",  
  "job_title": "Software Engineer",  
  "skills": ["Python", "Java", "C++", "Backend Development", "Cloud Computing"],  
  "experience": "5 years at XYZ Corp as Senior Developer"  
}
```

Document Prompt (Keyword Extraction):

Prompt:

*"Please extract the main keywords from the following paragraph:
'Artificial Intelligence and Machine Learning are transforming industries, particularly healthcare and finance. AI is enabling faster diagnostics, personalized treatments, and smarter financial algorithms.'"*

Expected Output (Keywords):

```
{  
  "keywords": ["Artificial Intelligence", "Machine Learning", "Healthcare", "Finance", "Faster  
Diagnostics", "Personalized Treatments", "Smarter Financial Algorithms"]  
}
```

Output Accuracy and Format

- **JSON Format:** The model should output data in a structured JSON format, where each extracted piece of information is paired with a key. JSON allows easy data manipulation and integration into software systems.
- **Tabular Format:** When requested, the output should present information in a clear tabular structure, which is easy to read and compare.
- **Contact Info, Resume Sections, and Keywords:** The extraction of information such as contact details, resume sections, and keywords should be accurate and presented in a clean, structured format (e.g., JSON or key-value pairs).

Summary of Results:

- Accuracy: Precision in prompts leads to structured, accurate outputs. Providing clear instructions helps the model focus on the right details.
 - Format: JSON is ideal for structured data (like contact info or resume sections), while tabular format is suitable for organizing and comparing data.
 - Extraction: By crafting precise prompts, you can easily extract specific types of information like contact info, skills, or key terms.
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Lab 4: Summarization and Text Transformation

Activity 1: Summarize News Articles or Research Abstracts

Example 1: Summarize a News Article

Original News Article:

"The rise of artificial intelligence (AI) has been one of the most debated topics of the 21st century. AI technologies have evolved rapidly, impacting industries ranging from healthcare to finance. Experts believe AI has the potential to significantly improve efficiency, but there are concerns about job displacement and the ethical implications of autonomous machines. Several countries are rushing to adopt AI in various sectors, but regulations to govern AI use are still in their infancy."

Prompt:

"Summarize this news article in 3-4 sentences."

Expected Output (Summary):

The rise of artificial intelligence (AI) is revolutionizing industries such as healthcare and finance. While AI has the potential to improve efficiency, concerns

about job displacement and ethical issues remain. Many countries are pushing for AI adoption, though regulatory frameworks are still developing.

Example 2: Summarize a Research Abstract

Original Research Abstract:

"The study explores the effectiveness of deep learning algorithms in predicting cardiovascular diseases. By analyzing patient data from various hospitals, the research shows that deep learning models can achieve an accuracy of 90% in diagnosing heart conditions. The study concludes that deep learning models hold promise for improving **diagnostic accuracy and could significantly reduce human error in medical settings.**"

Prompt:

"Summarize this research abstract in 3-4 sentences."

Expected Output (Summary):

This research investigates the use of deep learning algorithms in predicting cardiovascular diseases, finding that the models can achieve 90% accuracy. The study suggests that deep learning could improve diagnostic accuracy and reduce human error in medical diagnoses.

Activity 2: Rewriting Emails in Formal/Informal Tone

Example 1: Rewriting an Email in a Formal Tone

Original Informal Email:

"Hey Mark,
I wanted to let you know that I won't be able to make it to the meeting tomorrow. Something came up at work. I'll keep you posted and let you know if I can join later.
Cheers,
John"

Prompt:

"Rewrite this email in a formal tone."

Expected Output (Formal):

Dear Mark,

I regret to inform you that I will not be able to attend the meeting scheduled for tomorrow due to an unexpected work commitment. I will keep you updated and inform you if I am able to join at a later time.

Best regards,
John

Example 2: Rewriting an Email in an Informal Tone

Original Formal Email:

*"Dear Sarah,
I hope this message finds you well. I am writing to inform you that the reports you requested have been completed and are attached to this email. Should you have any questions, please do not hesitate to reach out.
Best regards,
Michael"*

Prompt:

"Rewrite this email in an informal tone."

Expected Output (Informal):

Hey Sarah,
Hope you're doing well! Just wanted to let you know that I've finished the reports you asked for, and I've attached them here. Let me know if you need anything else!
Cheers,
Michael

Activity 3: Tone Transformation of Sentences/Paragraphs

Example 1: Transforming Formal Tone to Casual Tone

Original (Formal Tone):

"The meeting is scheduled for 3 PM tomorrow in the conference room. Please

ensure that you arrive on time, as we will be discussing important matters related to the upcoming project."

Prompt:

"Transform this into a casual tone."

Expected Output (Casual):

The meeting's at 3 PM tomorrow in the conference room. Make sure to be on time since we'll be talking about some important stuff for the upcoming project.

Example 2: Transforming Casual Tone to Formal Tone

Original (Casual Tone):

"Hey, just wanted to remind you about the meeting at 3 PM tomorrow in the conference room. Don't be late because we've got a lot to go over!"

Prompt:

"Transform this into a formal tone."

Expected Output (Formal):

This is a reminder of the meeting scheduled for 3 PM tomorrow in the conference room. Kindly ensure punctuality as we will be covering several important topics.

Summary and Transformation Report

Activity	Original	Transformed Output
Summarize News Article	The rise of artificial intelligence (AI) has been one of the most debated topics of the 21st century...	AI is revolutionizing industries, but concerns about job displacement and ethics remain. Many countries are adopting AI.
Summarize Research	The study explores the effectiveness of deep learning algorithms in predicting cardiovascular diseases...	Deep learning algorithms can achieve 90% accuracy in predicting cardiovascular diseases, offering promise for healthcare.

Rewrite Formal Email	Hey Mark, I wanted to let you know that I won't be able to make it to the meeting tomorrow...	Dear Mark, I regret to inform you that I will not be able to attend the meeting scheduled for tomorrow...
Rewrite Informal Email	Dear Sarah, I hope this message finds you well. I am writing to inform you that the reports...	Hey Sarah, Hope you're doing well! Just wanted to let you know that I've finished the reports you asked for...
Tone Transformation	The meeting is scheduled for 3 PM tomorrow in the conference room...	The meeting's at 3 PM tomorrow in the conference room. Make sure to be on time...
Tone Transformation	Hey, just wanted to remind you about the meeting at 3 PM tomorrow...	This is a reminder of the meeting scheduled for 3 PM tomorrow in the conference room. Kindly ensure punctuality...

Lab 5:- ChatGPT in Code Generation and Debugging

Activity 1: Generate Code from Prompts

Task:

Generate code for a simple problem in Python, C++, and Java.

Problem Prompt:

Write a program to check if a number is prime.

1. Python Code

```
def is_prime(n):
    if n <= 1:
        return False
    for i in range(2, int(n ** 0.5) + 1):
        if n % i == 0:
            return False
    return True

num = int(input("Enter a number: "))
if is_prime(num):
    print("Prime")
else:
    print("Not Prime")
```

2. C++ Code

```
#include <iostream>
using namespace std;

bool isPrime(int n) {
    if (n <= 1)
        return false;
    for (int i = 2; i * i <= n; i++) {
        if (n % i == 0)
            return false;
    }
    return true;
}

int main() {
    int num;
    cout << "Enter a number: ";
    cin >> num;
    if (isPrime(num))
        cout << "Prime";
}
```

```
    else
        cout << "Not Prime";
    return 0;
}
```

3. Java Code

```
import java.util.Scanner;

public class PrimeCheck {
    public static boolean isPrime(int n) {
        if (n <= 1)
            return false;
        for (int i = 2; i <= Math.sqrt(n); i++) {
            if (n % i == 0)
                return false;
        }
        return true;
    }

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int num = sc.nextInt();
        if (isPrime(num))
            System.out.println("Prime");
        else
            System.out.println("Not Prime");
    }
}
```

Activity 2: Debug a Given Code Snippet

Problematic C++ Code:

```
#include <iostream>
using namespace std;
```

```

int main() {
    int n, i;
    cout << "Enter a number: ";
    cin >> n;
    for (i = 2; i < n / 2; i++) {
        if (n % i == 0) {
            cout << "Not Prime";
            break;
        } else {
            cout << "Prime";
            break;
        }
    }
    return 0;
}

```

Fixed Code:

```

#include <iostream>
using namespace std;

```

```

int main() {
    int n, i;
    bool isPrime = true;

    cout << "Enter a number: ";
    cin >> n;

    if (n <= 1)
        isPrime = false;
    else {
        for (i = 2; i * i <= n; i++) {
            if (n % i == 0) {
                isPrime = false;
                break;
            }
        }
    }
}

```

```
if (isPrime)
    cout << "Prime";
else
    cout << "Not Prime";

return 0;
}
```

Comparison: ChatGPT Output vs. Expected Output

Input	Expected Output	ChatGPT Generated Output
7	Prime	Prime
12	Not Prime	Not Prime
1	Not Prime	Not Prime

Lab 6: Domain-Specific Applications

Activity: Educational Quiz Generation

Topic Chosen: Basic Electronics – Logic Gates

Prompt Design (Instruction given to ChatGPT):

Prompt Used:

"Create a multiple-choice quiz with 5 questions on the topic 'Logic Gates' for first-year engineering students. Each question should have 4 options and indicate the correct answer with a short explanation."

ChatGPT Output:

Quiz: Logic Gates

Q1. Which logic gate outputs HIGH only when all inputs are HIGH?

- A. OR gate
- B. AND gate
- C. XOR gate
- D. NOR gate

☒ **Answer: B. AND gate**

Explanation: AND gate outputs HIGH (1) only if all inputs are HIGH (1).

Q2. What is the output of a NAND gate when both inputs are HIGH?

- A. LOW
- B. HIGH
- C. Undefined
- D. Same as OR gate

☒ **Answer: A. LOW**

Explanation: NAND is the inverse of AND. $AND(1,1) = 1 \rightarrow NAND = 0$.

Q3. Which gate gives a HIGH output when both inputs are different?

- A. XNOR
- B. NOR
- C. XOR
- D. AND

☒ **Answer: C. XOR**

Explanation: XOR outputs HIGH when inputs are different (0,1 or 1,0).

Q4. Which of the following is a universal gate?

- A. OR
- B. XOR
- C. NAND
- D. XNOR

✓ Answer: C. NAND

Explanation: NAND and NOR gates can be used to construct all other logic gates.

Q5. What is the output of a NOR gate when both inputs are LOW?

- A. LOW
- B. HIGH
- C. Undefined
- D. Depends on gate type

✓ Answer: B. HIGH

Explanation: NOR gate gives HIGH output only when all inputs are LOW.

Output Evaluation:

Criteria	Evaluation
Relevance to Topic	All questions are directly related to logic gates.
Clarity of Questions	Clear, concise, and easy to understand.
Correct Options & Answers	Technically accurate with valid MCQs.
Explanations Provided	Helpful brief explanations enhance understanding.
Level of Difficulty	Suitable for first-year engineering level.