**Practicle3**

**Lab1:Introduction to ChatGPT**

ChatGPT is a state-of-the-art conversational agent developed by **OpenAI**, based on the **GPT (Generative Pretrained Transformer)** family of language models. It is capable of understanding natural language and generating human-like responses. The latest versions, such as GPT-4 and GPT-4o, represent the culmination of years of research in natural language processing (NLP), machine learning, and deep learning.

### **How ChatGPT Works**

At its core, ChatGPT is built upon the **Transformer architecture**, a model introduced by researchers at Google in 2017 through their groundbreaking paper titled *“Attention is All You Need.”* The Transformer revolutionized how machines understand language by introducing a mechanism called **self-attention**.

#### **Key Concepts Behind ChatGPT:**

1. **Transformer Model**: It consists of an encoder and a decoder. GPT uses only the decoder part to generate text, predicting the next word based on the previous words.
2. **Self-Attention**: This mechanism allows the model to weigh the importance of each word in a sentence relative to the others. For example, in the sentence *"The cat sat on the mat,"* the word "mat" is closely related to "sat," and the model captures such relationships effectively.
3. **Pretraining and Fine-tuning**:  
   * **Pretraining**: GPT is first trained on massive amounts of publicly available text data. It learns grammar, facts about the world, reasoning abilities, and some biases from this data.
   * **Fine-tuning**: After pretraining, the model is further refined using **Reinforcement Learning from Human Feedback (RLHF)**, where human reviewers guide the model to produce more helpful, honest, and harmless outputs.

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### **ChatGPT Interface Exploration**

The ChatGPT interface provides an easy-to-use chat window where users can type prompts in natural language. The interface is designed to simulate a real conversation — the AI understands input, processes it using its deep neural network, and responds almost instantly. Users can ask questions, generate code, create stories, summarize documents, translate text, and much more.

### **Visualization Tools for Transformers**

Several tools and platforms help users understand how Transformer-based models like GPT work internally:

* **Attention heatmaps** show how the model "pays attention" to various words while generating a response.
* **Model tracing tools** allow researchers to follow the flow of data across layers in the neural network.
* **Language interpretability tools** help analyze why the model chose certain words or phrases.

### **Real-World Applications of ChatGPT**

#### **1. Education**

ChatGPT acts as a tutor or study companion:

* Explains concepts in subjects like math, science, history, and programming.
* Generates quizzes and practice questions.
* Helps with writing, grammar correction, and language learning.

#### **2. Healthcare**

* ChatGPT can simulate a basic **medical assistant**, answering common health queries (though not a replacement for doctors).
* Assists healthcare professionals by summarizing **electronic medical records (EMRs)** or research papers.
* Can explain complex medical terms in simple language for patients.

#### **3. Business**

* Used in **customer service** as chatbots to automate responses.
* Drafts **emails, meeting summaries**, and marketing content.
* Assists in **data analysis**, business report writing, and financial forecasting.

#### **4. Creativity and Content Creation**

* Generates stories, poems, essays, and screenplays.
* Assists artists and writers with **brainstorming** and **plot development**.
* Used in gaming for **interactive storytelling** and dialogue generation.

**Lab2:Types of Prompts and Prompt Engineering Basics**

Prompt engineering is the process of designing inputs (called prompts) that guide an AI model like ChatGPT to generate desired outputs. The effectiveness of a prompt depends on how well it's structured. The three common types explored here are:

1. **Instructional Prompts**
2. **Interrogative Prompts**
3. **Zero-shot Prompts vs Few-shot Prompts**

### **1. Instructional Prompts**

These directly tell the model *what to do*.

#### **Examples:**

1. **Summarize** this paragraph: "Artificial intelligence is changing the way industries operate..."
2. **Write a poem** about the moon in four lines.
3. **Translate** the sentence “I love learning” into Spanish.
4. **Explain** the concept of photosynthesis to a 5-year-old.
5. **List** three benefits of using renewable energy sources.

### **2. Interrogative Prompts**

These are **question-based**, asking the model for information.

#### **Examples:**

1. What are the main causes of climate change?
2. How does a black hole form?
3. Why is biodiversity important to ecosystems?
4. What is the difference between RAM and ROM?
5. Who invented the internet?

### **3. Zero-shot vs Few-shot Prompts**

#### **Zero-Shot Prompts**

These ask the model to perform a task **without any example**.

#### **Examples:**

1. Write a haiku about rain.
2. Translate “Good morning” to Japanese.
3. Explain how a car engine works.
4. Generate a dialogue between a doctor and patient about a cold.
5. Convert the sentence to passive voice: “The cat chased the mouse.”

#### **Few-Shot Prompts**

These include **examples** to help guide the model’s response.

#### **Examples:**

1. Write a haiku:  
    Example: "Soft rain whispers low / Leaves trembling in the quiet / Earth drinks silently."  
    Now write one about winter.
2. Translate:  
    Example: "Hello" → "Hola"  
    "Goodbye" → "Adiós"  
    Now translate: "Thank you"
3. Explain with example:  
    Example: "A simile is a comparison using 'like' or 'as'. E.g., Her smile is like sunshine."  
    Now explain a metaphor.
4. Dialogue example:  
    Doctor: What seems to be the problem?  
    Patient: I’ve had a sore throat for two days.  
    Now generate a dialogue about a headache.
5. Convert to passive:  
    Example: "John baked a cake." → "A cake was baked by John."  
    Now convert: "She completed the assignment."

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# **Lab 3: Precision Prompting for Information Extraction**

### **Objective**

## In this lab, the goal was to learn how to use ChatGPT to **extract specific pieces of information** from regular text things like names, emails, skills, education, and more and then present that information in a **structured format** like JSON or a table. This kind of task is common in real-world applications such as **resume screening**, **contact info collection**, or **keyword identification** from documents or web pages.

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## **Why This Matters**

## Normally, pulling out structured data from unstructured text (like resumes or paragraphs) requires complex programming or specialized tools. But with ChatGPT, we can achieve surprisingly accurate results just by using **carefully crafted prompts** — this process is called **precision prompting**.

## In this lab, we experimented with different types of prompts to:

## Ask ChatGPT to return data in **JSON** (a format used in programming),

## Show results in a **table** (which humans can read easily),

## And accurately **pull key information** from a variety of sample texts.

## **What We Did?**

**Activity 1: Pulling Contact Details in JSON**

#### **Input Paragraph:**

*My name is Maria Wandhare. You can reach me at maria.wandhare@gmail.com or call me at +91-98765\*\*\*\*\*. I have experience in Python, Data Analysis, and Machine Learning.*

#### **Prompt Given:**

Extract Name, Email, Phone, and Skills. Return the result in **JSON format**.

#### **Output Received:**

| {  "Name": "Maria Wandhare",  "Email": "maria.wandhare@gmail.com",  "Phone": "+91-9876543210",  "Skills": ["Python", "Data Analysis", "Machine Learning"]  } |
| --- |

#### **What We Observed:**

* The result was **spot on** — accurate, clean, and structured.
* JSON format was perfect for use in a database or application.
* This worked because the prompt was **clear and specific**.

### **Activity 2: Structuring Resume Info in a Table**

#### **Input Paragraph:**

*Jane Doe completed her M.Tech in Computer Science from IIT Delhi. She worked as a software engineer for 3 years at Infosys. Her skills include Java, Spring Boot, and SQL.*

#### **Prompt Given:**

Extract **Education**, **Work Experience**, and **Skills**. Present the answer in a table.

#### **Output Received:**

| **Section** | **Details** |
| --- | --- |
| Education | M.Tech in Computer Science, IIT Delhi |
| Work Experience | 3 years as Software Engineer at Infosys |
| Skills | Java, Spring Boot, SQL |

### **Activity 3: Extracting Keywords for Quick Analysis**

#### **Input Paragraph:**

*Cloud computing enables scalable and flexible IT services through internet-based resources. It helps reduce infrastructure costs and supports on-demand access to computing power.*

#### **Prompt Given:**

Pull out the **top 5 important keywords** and give the result in JSON.

**Output:**

| {  "Keywords": [  "Cloud computing",  "Scalable",  "Flexible",  "Infrastructure",  "On-demand access"  ]  } |
| --- |

#### What We Observed:

#### The keywords were mostly on-point and technical.

#### A more refined prompt (e.g., "only technical nouns") could make it even better.

#### This would be useful for summarizing articles or doing SEO keyword research.

#### 

| **Task** | **Format Used** | **Accuracy** | **Notes** |
| --- | --- | --- | --- |

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| Contact Info Extraction | JSON | 100% | Clear structure and full match of fields. |
| --- | --- | --- | --- |

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| Resume Sections (Tabular) | Table | 95–100% | Sometimes section titles vary, but info is still correct. |
| --- | --- | --- | --- |

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| Keyword Extraction | JSON | 90–95% | Can vary based on prompt specificity. |
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## **Lab 4: Summarization and Text Transformation**

### **Objective:**

## To understand how ChatGPT can summarize content, rewrite text, and change the tone (formal to informal or vice versa).

### **Activities Performed:**

#### **1. News Article Summarization**

## **Original Input (News Snippet): *"****India successfully launched its new weather satellite INSAT-3DS, aiming to improve weather forecasting and disaster management. The satellite was launched from Sriharikota on February 17, 2024, aboard a GSLV rocket."*

## **Prompt Given:**

## **Summarize this news article in 2–3 lines.**

## **ChatGPT Output:** *India launched the INSAT-3DS weather satellite on February 17, 2024, using a GSLV rocket from Sriharikota. The satellite will enhance weather prediction and disaster response.*

## Result: The summary was accurate and concise, covering the key details clearly.

## **2. Tone Transformation – Email (Informal to Formal)**

## **Original Email:**

## "Hey sir, I just wanted to tell you that I can’t make it to class today. Feeling kinda sick. Sorry!"

## **Prompt Given:**

## Rewrite this email in a formal tone.

## **ChatGPT Output:**

## *Dear Sir, I regret to inform you that I will be unable to attend class today due to illness. I apologize for the inconvenience. Sincerely, [Your Name]*

## **Result:** Tone transformation was excellent. It maintained the message but made it suitable for formal communication.

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#### **3. Text Rewriting – Simplify a Research Abstract**

## Original Abstract: *"Convolutional Neural Networks (CNNs) have shown great promise in computer vision tasks. This study introduces an optimized CNN model that significantly reduces training time while improving accuracy across benchmark datasets."*

## Prompt Given:

## Rewrite this paragraph in simpler language for school students.

## ChatGPT Output: *CNNs are a type of AI used in recognizing images. This research created a better version of CNN that learns faster and gives more accurate results when tested on image data.*

## Result: The explanation was easy to understand, using simpler vocabulary while keeping the meaning intact.

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### **Conclusion:**

## **ChatGPT is highly effective in:**

## Summarizing long content into short, clear points.

## Changing the tone of messages (formal/informal).

## Rewriting complex text into simpler form for different audiences.

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## **Lab 5: ChatGPT in Code Generation and Debugging**

### **Objective:**

## To explore how ChatGPT can help generate code from prompts and fix bugs in existing code.

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### **Activities Performed:**

#### **1. Code Generation – Python Program**

## **Prompt Given:**

## Write a Python program to check if a number is prime.

## **ChatGPT Output:**

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| 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 Truenum = int(input("Enter a number: "))if is\_prime(num): print("It's a prime number.")else: print("It's not a prime number.") |
| --- |

## Tested with different inputs and it worked perfectly.

#### **2. Code Debugging**

#### **Given Buggy Code (C++):**

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| #include<iostream>  using namespace std;  int main() {  int a, b;  cin << a << b;  cout << "Sum is " << a + b;  return 0;  } |
| --- |

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**Prompt Given:**

Find and fix the errors in this code.

**ChatGPT Output (Corrected):**

| #include<iostream>  using namespace std;  int main() {  int a, b;  cin >> a >> b;  cout << "Sum is " << a + b;  return 0;  } |
| --- |

ChatGPT correctly identified the mistake (cin << should be cin >>) and fixed it.

### **Conclusion:**

ChatGPT is a powerful tool for:

* Writing simple programs in Python, C++, Java, etc.
* Identifying syntax and logic errors in code quickly.
* Helping beginners understand code structure and logic.

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## **Lab 6: Domain-Specific Applications**

### **Objective:**

To explore how ChatGPT can be used in **specific fields** like healthcare, law, or education.

**Activity Performed: Educational Quiz Generation**

#### **Prompt Given:**

Generate a 5-question multiple-choice quiz on the topic "Photosynthesis" for 8th-grade students.

**ChatGPT Output:**

1. **What is the main function of photosynthesis?** a) Break down food  
    b) Absorb nutrients  
    c) Make food using sunlight   
    d) Grow leave  
    **Answer: c**
2. **Which gas is taken in during photosynthesis?** a) Oxygen  
    b) Carbon Dioxide   
    c) Nitrogen  
    d) Hydrogen  
    **Answer: b**
3. **What part of the plant performs photosynthesis?** a) Roots  
    b) Flowers  
    c) Leaves   
    d) Stems  
    **Answer: c**
4. **What pigment helps plants absorb sunlight?** a) Melanin  
    b) Keratin  
    c) Chlorophyll   
    d) Hemoglobin  
    **Answer: c**
5. **What are the products of photosynthesis?** a) Sugar and oxygen  
    b) Water and heat  
    c) Carbon dioxide and water  
    d) Oxygen and carbon  
    **Answer: a**

**Result:**

* Questions were **age-appropriate** and well-designed.
* Clear formatting and correct answers.
* Could be directly used in classroom activities or quizzes.

**Conclusion (Lab 6):**

ChatGPT can:

* Create subject-specific content (like educational quizzes),
* Simulate professional tasks (e.g., medical or legal),
* Save time for teachers, lawyers, and healthcare providers by automating repetitive tasks.

## **Final Thoughts:**

These labs showed the **real-world power** of ChatGPT in:

* Transforming and summarizing content (Lab 4),
* Assisting with programming tasks (Lab 5),
* Supporting domain-specific applications (Lab 6).

With smart prompt design, ChatGPT becomes not just a chatbot but a **versatile digital assistant** across multiple industries.

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