

Lab 1: Introduction to ChatGPT

ChatGPT: How It Works and Real-World Applications

1. What is ChatGPT?

ChatGPT is an **Artificial Intelligence (AI) model** developed by OpenAI that can understand and generate human-like text. It is based on **Generative Pre-trained Transformer (GPT)** architecture. It learns from large amounts of data (books, articles, websites, etc.) and then predicts the most suitable words to form meaningful sentences.

2. How Does It Work?

- **Training:** ChatGPT is trained on huge datasets containing text from various fields (science, technology, history, daily conversations).
- **Understanding:** When a user inputs a question or statement, ChatGPT breaks it into tokens (small pieces of text) and analyzes the meaning.
- **Generating Response:** It predicts the next word step by step using probabilities and creates a full, context-aware response.
- **Learning Style:** It does not “think” like humans but uses patterns and prior knowledge from training data to provide answers.

3. Key Features:

- Conversational and natural language interaction.
- Can summarize, explain, or simplify complex topics.

- Provides creative content like stories, essays, and business ideas.
- Can support multiple languages and subjects.

4. Real-World Examples:

- **Education:** Students use ChatGPT to understand difficult subjects (e.g., explaining physics equations or summarizing history chapters).
- **Business:** Entrepreneurs use it to generate marketing content, emails, or product descriptions.
- **Healthcare:** Doctors may use it to draft medical reports or explain health terms in simple language for patients.
- **Customer Support:** Companies integrate ChatGPT in chatbots to answer customer queries quickly.
- **Programming:** Developers use it to write or debug code.

5. Limitations:

- May sometimes give incorrect or outdated answers.
- Does not have personal experiences or emotions.
- Relies on training data and cannot provide real-time information unless connected to the internet.

Conclusion:

ChatGPT works by using AI and machine learning to generate human-like text based on patterns in data. It is a powerful tool that is already transforming **education, business, healthcare, and technology**. However, it should be used carefully, with human judgment, to ensure accuracy and reliability.

Lab 2: Types of Prompts and Prompt Engineering Basics

What is a Prompt?

A **prompt** is the input (question, instruction, or statement) given to an AI system like ChatGPT.

What is a Prompt Engineering?

The quality of the output depends heavily on how the prompt is written. Writing effective prompts is called **Prompt Engineering**.

1. Instructional Prompts (Command-based)

- **Prompt 1 (Simple):** *"Write a 2-line poem about friendship."*
 - **Output:** *Friendship is a shining light, guiding us through darkest night.*
- **Prompt 2:** *"Summarize World War I in 3 sentences."*
 - **Output:** *World War I (1914–1918) was fought between Allied and Central Powers. It caused massive destruction. The Treaty of Versailles ended the war.*
- **Prompt 3:** *"List 5 benefits of exercise."*
 - **Output:** Improves health, boosts energy, reduces stress, strengthens muscles, improves sleep.
- **Prompt 4:** *"Explain Newton's First Law in simple words."*
 - **Output:** *An object stays still or keeps moving unless a force changes its motion.*
- **Prompt 5 (Complex):** *"Write a 100-word essay on AI in education."*

- **Output:** AI is transforming education by offering personalized learning, virtual tutors, etc.

✓ *Instructional prompts give **direct, task-based answers**.*

2. Interrogative Prompts (Question-based)

- **Prompt 1:** *"What is photosynthesis?"*
- **Prompt 2:** *"Why is the sky blue?"*
- **Prompt 3:** *"How does email work?"*
- **Prompt 4:** *"What are the differences between RAM and ROM?"*
- **Prompt 5 (Complex):** *"Explain the working of the Internet in 4 points."*

✓ *Interrogative prompts lead to **explanations and factual answers**.*

3. Zero-Shot Prompts

- **Prompt 1:** *"Translate 'Good morning' into French."* → *Output: Bonjour*
- **Prompt 2:** *"Summarize the importance of recycling in 2 lines."*
- **Prompt 3:** *"Write a slogan for a school campaign on cleanliness."*
- **Prompt 4:** *"Solve: $36 \div (3 \times 2)$."* → *Output: 6*
- **Prompt 5 (Complex):** *"Write a short speech on the role of youth in nation-building."*

✓ *Zero-shot = No examples, AI uses prior knowledge.*

4. Few-Shot Prompts

(Provide examples before asking the question)

- **Prompt 1:**
Example: English: Hello → French: Bonjour
Task: English: Good morning → French: ...
Output: Bonjour
- **Prompt 2:**
Example: Q: What is a cat? A: A cat is a small domestic animal.
Q: What is a dog?
Output: A dog is a loyal domestic animal.
- **Prompt 3:**
Example: Write a 1-line quote about teachers: "Teachers light the path of knowledge."
Task: Write a 1-line quote about students.
Output: "*Students are the builders of tomorrow.*"
- **Prompt 4:**
Example: Q: Solve $12 \div (3 \times 2) \rightarrow 2$
Q: Solve $36 \div (3 \times 2) \rightarrow ?$
Output: 6
- **Prompt 5 (Complex):**
Example: Summarize exercise in 3 lines: Exercise keeps the body fit, strengthens muscles, and improves health.
Task: Summarize recycling in 3 lines.
Output: Recycling reduces waste, saves resources, and protects nature.

✓ *Few-shot = AI follows the **pattern and style** shown in example.*

Comparison (Zero-Shot vs Few-Shot)

Aspect	Zero-Shot Prompt	Few-Shot Prompt
Examples provided	None	1–2 examples given
Style of answer	Generic	Matches example style
Accuracy	Good	More structured

Best use case

Simple tasks

*Complex tasks or format-specific
answers*

Conclusion:

- **Instructional prompts** work best for commands.
- **Interrogative prompts** give clear explanations.
- **Zero-shot prompts** are fast but generic.
- **Few-shot prompts** give more accurate, formatted answers.
- **Prompt engineering** improves AI outputs by making inputs specific, structured, and clear.

Lab 3: Precision Prompting for Information Extraction

Objective

The objective of this lab is to understand how ChatGPT can be prompted to extract **structured data** from unstructured text. By using precision prompting, the responses can be obtained in **JSON** or **tabular format**, ensuring clarity, accuracy, and machine-readability.

Activities

Activity 1: Ask ChatGPT to format its response in JSON

Prompt:

Extract the following details in JSON format:

Name, Email, Phone, Address

From this text:

"Hello, my name is Rohan Sharma. You can reach me at rohan.sharma@example.com or call me at +91-9876543210. I live in Pune, Maharashtra."

Output (JSON):

```
{  
  "Name": "Rohan Sharma",  
  "Email": "rohan.sharma@example.com",  
  "Phone": "+91-9876543210",  
  "Address": "Pune, Maharashtra"  
}
```

Activity 2: Extract contact info, resume sections, and keywords in tabular format

Prompt:

From the paragraph below, extract:

- Contact Information
- Education
- Skills
- Work Experience
- Keywords

Paragraph:

"Priya Verma, Email: priya.verma@gmail.com, Phone: 9876541230. She completed her B.Tech in Computer Science from IIT Delhi. She has 2 years of experience as a Software Engineer at Infosys. Her skills include Python, Machine Learning, and Data Structures."

Output (Table):

Section	Extracted Data
Contact Info	Email: priya.verma@gmail.com, Phone: 9876541230
Education	B.Tech in Computer Science, IIT Delhi
Work Experience	Software Engineer, Infosys (2 years)
Skills	Python, Machine Learning, Data Structures

Keywords

Priya Verma, B.Tech, IIT Delhi, Infosys, Software Engineer,
Python, ML, DS

Output: Accuracy and Format

- **Accuracy:** Extracted information was correct and matched the input paragraph.
- **Format:**
 - JSON → Machine-readable, ideal for automation.
 - Table → Human-readable, useful for reports.

Conclusion:

Precision prompting helps in extracting structured information effectively. ChatGPT can return outputs in multiple structured formats such as **JSON** and **tables**, which makes it useful for tasks like **data extraction, resume screening, and information organization**.

Lab 4: Summarization and Text Transformation

Objective

To practice using ChatGPT for **summarization, rewriting, and tone transformation**. The goal is to understand how the same content can be shortened, rephrased, or rewritten in different tones (formal/informal).

Activities

Activity 1: Summarize a News Article

Original Text:

"The government announced a new digital education policy aimed at improving online learning infrastructure across the country. The policy includes free internet access to rural schools, training programs for teachers, and development of e-learning platforms. Experts believe this step will help bridge the digital divide and provide equal opportunities to students."

Output (Summary):

"The government introduced a digital education policy to enhance online learning, offering free internet in rural schools, teacher training, and e-learning platforms to reduce the digital divide."

Activity 2: Summarize a Research Abstract

Original Text:

"This study explores the impact of machine learning algorithms in predicting weather patterns. Using large datasets and deep learning models, researchers achieved 90% accuracy in short-term forecasts. The findings suggest that AI can significantly enhance climate prediction and disaster preparedness."

Output (Summary):

"Machine learning improves weather forecasting with 90% accuracy, aiding climate prediction and disaster preparedness."

Activity 3: Rewrite Email in Formal Tone

Original Email (Informal):

"Hey boss, I can't make it to work tomorrow. Got some personal stuff to handle. Will be back the next day."

Output (Formal Tone):

"Dear Sir, I would like to inform you that I will not be able to attend work tomorrow due to personal reasons. I will resume duties the following day. Regards."

Activity 4: Rewrite Email in Informal Tone

Original Email (Formal):

"Dear Professor, I am writing to request an extension for submitting my assignment. Due to unforeseen circumstances, I could not complete it on time. I kindly request an additional two days to finish it."

Output (Informal Tone):

"Hi Professor, I couldn't finish the assignment on time because of some issues. Can you please give me two more days to submit it? Thanks!"

Output: Summary and Transformation Report

Task	Original (Input)	Output (Transformed)
News Article Summary	Government announced digital education policy with internet, training, e-learning	Policy enhances online learning with internet, training, and platforms
Research Abstract Summary	ML algorithms used for weather prediction with 90% accuracy	AI improves weather forecasting with 90% accuracy
Email (Informal → Formal)	"Hey boss, I can't make it..."	"Dear Sir, I would like to inform you..."

Email (Formal
→ Informal)

"Dear Professor, I am writing to
request..."

"Hi Professor, I couldn't finish..."

Conclusion

This lab demonstrated how ChatGPT can **summarize long texts** into concise versions and **transform tone** between formal and informal styles. Such capabilities are useful for **academic, professional, and communication tasks**.

Lab 5: ChatGPT in Code Generation and Debugging

Objective

To explore how ChatGPT can assist programmers by **generating code** from natural language prompts and **debugging faulty code snippets**.

Activities

Activity 1: Generate Code from Prompt

Prompt:

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

ChatGPT Output (Generated Code):

```
def is_prime(num):  
    if num <= 1:  
        return False  
    for i in range(2, int(num**0.5) + 1):  
        if num % i == 0:  
            return False  
    return True  
  
number = int(input("Enter a number: "))  
  
if is_prime(number):
```

```
        print(number, "is a prime number")
else:
    print(number, "is not a prime number")
```

Expected Output (Example Run):

```
Enter a number: 7
7 is a prime number
```

 *The generated code works correctly and matches expected output.*

Activity 2: Debug Code Snippet

Given Faulty Code (Python):

```
def add_numbers(a, b)
    return a + b

print(add_numbers(5 10))
```

Errors in Code:

- Missing colon (:) after function definition.
- Missing comma between 5 and 10.

ChatGPT Debugged Code:

```
def add_numbers(a, b):
    return a + b
```

```
print(add_numbers(5, 10))
```

Expected Output:

15

✅ *ChatGPT successfully identified syntax errors and provided a corrected version.*

Output: Comparison of Generated vs Expected Results

Task	ChatGPT Output (Generated/Debugged)	Expected Output	Match
Prime Number Program	Python function using loop and sqrt for efficiency	Correct prime check program	Yes
Debug Addition Program	Fixed syntax errors (colon + comma)	15	Yes

Conclusion

ChatGPT can effectively:

- Generate working code in multiple programming languages (Python, C++, Java).
- Debug faulty code snippets by identifying syntax and logic errors.

This makes ChatGPT a valuable assistant for programmers in learning, development, and troubleshooting.

Lab 6: Domain-Specific Applications

Objective

To explore how ChatGPT can be applied in domain-specific tasks such as medical chatbots, legal summarization, or educational quiz generation. The aim is to design effective prompts and evaluate the quality of the generated outputs.

Activity Chosen: Educational Quiz Generation

Prompt Design

Generate 5 multiple-choice questions (MCQs) on the topic of Data Structures.

Each question should have 4 options and indicate the correct answer.

ChatGPT Output

Quiz: Data Structures

1. Which data structure follows the LIFO principle?
 - a) Queue
 - b) Stack ☒
 - c) Linked List
 - d) Graph
2. What is the time complexity of searching an element in a balanced binary search tree (BST)?
 - a) $O(n)$
 - b) $O(\log n)$ ☒
 - c) $O(n \log n)$
 - d) $O(1)$
3. Which data structure is best suited for implementing recursion?
 - a) Stack ☒
 - b) Queue

- c) Array
- d) Linked List

4. In which data structure do we use FIFO (First In, First Out)?

- a) Stack
- b) Queue ✓
- c) Tree
- d) Graph

5. Which sorting algorithm has the best average time complexity?

- a) Bubble Sort
- b) Selection Sort
- c) Quick Sort ✓
- d) Insertion Sort

Output Evaluation

- **Accuracy:** Questions and answers are correct and aligned with the Data Structures syllabus.
- **Clarity:** Questions are concise and options are clearly stated.
- **Usefulness:** Suitable for academic quizzes, practice tests, or self-learning.

Conclusion

This lab demonstrated that ChatGPT can be effectively used for domain-specific educational applications, such as quiz generation. By designing precise prompts, ChatGPT outputs accurate and structured educational content, making it a valuable tool for teachers, trainers, and students.