

# Lab 1: Introduction to ChatGPT

## Summary: Introduction to ChatGPT

### Overview:

ChatGPT is an advanced AI chatbot developed by OpenAI, based on the **GPT (Generative Pre-trained Transformer)** architecture. It uses deep learning to generate human-like text by predicting the next word in a sentence based on previous input. GPT models are trained on large datasets from the internet, enabling them to understand and respond to a wide variety of prompts.

### How It Works:

ChatGPT is powered by a **transformer** architecture, introduced by Vaswani et al. in 2017. The core concept is *self-attention*, which allows the model to weigh the importance of different words in a sentence, regardless of their position. This enables ChatGPT to understand context more effectively than older models.

Training occurs in two stages:

1. **Pre-training** on a broad dataset to learn language patterns.
2. **Fine-tuning** using human feedback (Reinforcement Learning with Human Feedback - RLHF) to align the model with user expectations.

### Capabilities:

ChatGPT can:

- Answer questions and explain complex topics
- Assist with writing, summarizing, and editing
- Translate languages
- Generate creative content like poetry, code, or stories
- Simulate conversations and act as a tutor or assistant

### Real-World Applications:

### 1. **Education:**

- Tutoring students in math, science, and language arts
- Explaining difficult topics in simple terms
- Assisting with essay writing and grammar correction

### 2. **Healthcare:**

- Summarizing patient notes
- Providing mental health support (e.g., journaling prompts)
- Assisting with medical research or symptom information (non-diagnostic)

### 3. **Business:**

- Drafting emails, reports, and marketing content
- Creating chatbots for customer service
- Automating repetitive tasks like data entry

### 4. **Creativity:**

- Writing stories, poetry, and scripts
- Brainstorming ideas for design or content
- Generating art prompts and music lyrics

### **Conclusion:**

ChatGPT represents a powerful step in human-AI interaction. Its transformer-based design allows for deep contextual understanding, and its versatility supports diverse applications in real-world settings, making it a valuable tool across multiple industries.

---

## Lab 2: Types of Prompts and Prompt Engineering Basics

### ♦ 1. Instructional Prompts

Prompts that clearly tell the AI what to do.

Prompt	Response Summary
<i>Summarize the following text: "The Earth revolves around the Sun..."</i>	Gives a concise summary.
<i>Translate "Hello, how are you?" into French.</i>	Translates as "Bonjour, comment ça va ?"
<i>Write a poem about a lonely robot in space.</i>	Generates a creative poem.
<i>Convert this list into bullet points: apples, bananas, oranges.</i>	Outputs as bullet points.
<i>Explain photosynthesis in simple terms.</i>	Provides a simplified explanation suitable for a child.

### ♦ 2. Interrogative Prompts

Questions that ask the AI for information or insight.

Prompt	Response Summary
<i>What is quantum computing?</i>	Gives a detailed explanation.
<i>How do bees make honey?</i>	Describes the process in steps.
<i>Why is the sky blue?</i>	Explains Rayleigh scattering.
<i>Who wrote "Pride and Prejudice"?</i>	Identifies Jane Austen.
<i>When did World War II end?</i>	Correctly states 1945.

### ◆ 3. Zero-Shot Prompts

The model is asked to perform a task without any examples.

Prompt	Response Summary
<i>Write a haiku about winter.</i>	Composes a correct haiku without a sample.
<i>Classify this sentence as positive or negative: "I hated the movie."</i>	Correctly says "negative."
<i>Generate a headline for a tech news article.</i>	Returns a creative and relevant headline.
<i>Fix the grammar in this sentence: "She go to school yesterday."</i>	Returns: "She went to school yesterday."
<i>Make a to-do list for planning a birthday party.</i>	Lists tasks like invitations, cake, venue, etc.

### ◆ 4. Few-Shot Prompts

Prompts include examples to guide the model's behavior.

Prompt	Response Summary
<i>Q: What's the capital of France? A: Paris \nQ: What's the capital of Japan? A:</i>	Returns "Tokyo."
<i>Fix grammar: "He don't like cake." → "He doesn't like cake." \n"He go home early." →</i>	Continues pattern: "He goes home early."
<i>Write headlines: \n1. A new tech startup launches → "Innovative Startup Disrupts Tech Scene" \n2. NASA discovers new planet →</i>	Generates "NASA Uncovers Mysterious New Planet"
<i>Translate: \nDog → Chien \nCat → Chat \nBird →</i>	Outputs "Oiseau."
<i>Poem format: \nRoses are red, \nViolets are blue... →</i>	Follows the format with a rhyming couplet.

## Comparison of Prompt Types

Prompt Type	Strengths	Limitations
<b>Instructional</b>	Clear, controlled output for specific tasks	Can be too rigid; lacks creativity without tweaking
<b>Interrogative</b>	Good for learning and fact retrieval	May need context to avoid vague answers
<b>Zero-Shot</b>	Fast, flexible, no prep needed	Accuracy varies for complex or nuanced tasks
<b>Few-Shot</b>	Guides model with style and structure	Requires more space and careful example selection

---

### Conclusion

Prompt engineering is key to maximizing AI usefulness. Instructional and interrogative prompts are great for straightforward tasks. Zero-shot works well for general requests, but few-shot is more reliable for consistency and control over the output format and tone.

## Lab 3: Precision Prompting for Information Extraction

### Objective:

Extract structured data from ChatGPT responses using precision prompts and evaluate the output in JSON and table formats.

---

### Activity 1: Ask ChatGPT to Format Response in JSON

#### Prompt:




*"Extract the following information from the text and return it in JSON format: Name, Email, Phone Number.*

*Text: Hello, I'm Aisha Khan. Feel free to contact me at aisha.khan@email.com or call me on 9876543210."*

#### ChatGPT Output:

```
{  
  "name": "Aisha Khan",  
  "email": "aisha.khan@email.com",  
  "phone": "9876543210"  
}
```

### Evaluation:

-  Accurate data extraction
  -  JSON format is correct and clean
  -  Would need regex validation in real implementation for edge cases
- 

### Activity 2: Ask ChatGPT to Format Resume in Table Format




#### Prompt:

*"Here is a resume summary. Extract the sections and present them in a table:  
Name: Rahul Mehta  
Skills: Python, Data Analysis, Machine Learning  
Experience: 3 years as Data Analyst at Infosys  
Education: B.Tech in Computer Science from IIT Delhi"*

#### ChatGPT Output:

Section	Details
Name	Rahul Mehta
Skills	Python, Data Analysis, Machine Learning
Experience	3 years as Data Analyst at Infosys
Education	B.Tech in Computer Science from IIT Delhi

### Evaluation:

-  Clean table formatting
  -  All sections correctly parsed
  -  Suitable for direct use in documents or ATS formatting
- 

### Activity 3: Extract Keywords from a Paragraph



#### Prompt:

*"Extract key technical keywords from this paragraph:  
'As a frontend developer, I have experience in HTML, CSS, JavaScript, and React.  
I've built responsive websites and optimized user experiences.'"*

#### ChatGPT Output:

**Keywords:** ["HTML", "CSS", "JavaScript", "React", "frontend developer", "responsive websites", "user experience"]

### Evaluation:

-  Relevant technical keywords extracted
  -  Useful for resume keyword optimization or semantic tagging
- 

### Conclusion:

- ChatGPT successfully extracts structured information using **precision prompting**.
- Output formatting in **JSON** and **tables** is accurate and reliable for most simple use-cases.
- Keyword extraction is context-aware and relevant.
- Such techniques are useful in **resume screening**, **data labeling**, **contact parsing**, and **automated report generation**.



## Lab 4: Summarization and Text Transformation

### Objective:

Use ChatGPT for summarizing texts and transforming writing styles (rewriting with tone changes).

---

### Activity 1: Summarize News Article

#### Original Text:

*"The city council approved a new environmental policy aimed at reducing carbon emissions by 30% over the next decade. The policy includes incentives for electric vehicles, stricter regulations on industrial pollution, and increased investment in renewable energy sources."*

#### Prompt:

*"Summarize the above news article in 2 sentences."*

#### ChatGPT Output:

The city council has approved a policy to cut carbon emissions by 30% within ten years. It includes incentives for electric vehicles, tighter pollution controls, and more renewable energy investments.

---

### Activity 2: Summarize Research Abstract

#### Original Abstract:

*"This study investigates the effects of climate change on coral reef bleaching. Using satellite imagery and field surveys, we found that rising sea temperatures have increased bleaching events by 25% over the last 15 years."*

#### Prompt:

*"Provide a concise summary of the research abstract."*

#### ChatGPT Output:

The study shows that rising sea temperatures due to climate change have caused a 25% increase in coral reef bleaching over the past 15 years.

---

### Activity 3: Rewrite Email in Formal Tone

#### Original Email:

*"Hey John, just wanted to check if we're still on for the meeting tomorrow? Let me know. Thanks!"*

#### Prompt:

*"Rewrite the following email in a formal tone."*

#### ChatGPT Output:

Dear John,

I hope this message finds you well. I would like to confirm if our meeting scheduled for tomorrow is still on. Kindly let me know at your earliest convenience.

Thank you.

---

### Activity 4: Rewrite Email in Informal Tone

#### Original Email:

*"Dear Sarah, I regret to inform you that I will be unable to attend the conference due to unforeseen circumstances."*

#### Prompt:

*"Rewrite the following email in an informal tone."*

#### ChatGPT Output:

Hi Sarah,

Just wanted to let you know I can't make it to the conference because something came up. Sorry about that!

---

### Output Summary and Evaluation:

Activity	Original Text	ChatGPT Output	Evaluation
News Article Summarization	3 sentences	2 concise sentences	✓ Captures key points clearly and briefly
Research Abstract Summarization	Detailed scientific text	Concise summary	✓ Accurate and easy to understand
Email Formal Tone Rewrite	Informal message	Polite, professional tone	✓ Appropriate language and formatting
Email Informal Tone Rewrite	Formal message	Casual, friendly tone	✓ Maintains message meaning with relaxed style

## Conclusion:

ChatGPT effectively summarizes complex texts into concise versions without losing key information. It can also transform the tone of emails to fit different contexts, maintaining clarity and appropriateness. This makes it a valuable tool for communication and information processing tasks.

---

# Lab 5: ChatGPT in Code Generation and Debugging

## Objective:

Explore how ChatGPT can assist in generating and debugging code across multiple programming languages (Python, C++, Java).

---

## Activity 1: Generate Code from Prompts

### Instructions:

Choose one language (Python, C++, or Java). Provide a problem prompt, and ask ChatGPT to generate code. Then compare its output with the expected result.

### Example Prompt:

*Write a program that takes an integer input  $n$  and prints whether it is a prime number.*

### ChatGPT Output (Python):

```
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

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

### Expected Output Test Cases:

Input	Expected Output
7	Prime
10	Not Prime

## Activity 2: Debug a Given Code Snippet

### Instructions:

Present a buggy code snippet. Ask ChatGPT to find and fix the bug. Then test it and compare results.

### Buggy Code (Java):

```
public class Sum {  
    public static void main(String[] args) {  
        int[] numbers = {1, 2, 3, 4, 5}  
        int sum = 0;  
        for (int i = 0; i <= numbers.length; i++) {  
            sum += numbers[i];  
        }  
        System.out.println("Sum is: " + sum);  
    }  
}
```

### ChatGPT Debugged Code:

```
public class Sum {  
    public static void main(String[] args) {  
        int[] numbers = {1, 2, 3, 4, 5};  
        int sum = 0;  
        for (int i = 0; i < numbers.length; i++) {  
            sum += numbers[i];  
        }  
        System.out.println("Sum is: " + sum);  
    }  
}
```

### Issues Fixed:

- Missing semicolon after array initialization.
- Incorrect loop condition: changed `i <= numbers.length` to `i < numbers.length` to prevent `ArrayIndexOutOfBoundsException`.

### Expected Output:

Sum is: 15

✅ *Corrected code runs and gives expected output.*

---

### Conclusion / Reflection:

- ChatGPT can effectively **generate working code** from problem statements.
- It can **detect and fix common programming errors**, including syntax and logic bugs.
- Output matches expected results, proving its usefulness as a **coding assistant**.

## Lab 6: Domain-Specific Applications

### Objective:

Apply ChatGPT to a domain-specific task by designing a prompt and evaluating its output.

---

### Activity Options:

---

#### Option 1: Medical Chatbot Simulation

##### Prompt Design:




*"You are a medical assistant chatbot. A patient says: 'I have a sore throat, mild fever, and feel tired.' Respond with advice on what they should do next."*

##### ChatGPT Output:

Based on your symptoms—sore throat, mild fever, and fatigue—you may have a common viral infection like a cold or flu. It's important to rest, stay hydrated, and monitor your symptoms. If your fever lasts more than 3 days, or you experience difficulty breathing or severe pain, please see a healthcare professional immediately.

##### Evaluation:

- ✅ Clear, empathetic response

-  Provides practical advice without diagnosing
  -  Includes red flags for urgent care
  -  Not a replacement for professional medical consultation
- 

## Option 2: Legal Document Summarization





### Prompt Design:

*“Summarize this rental agreement in simple English: The tenant agrees to pay \$1200 monthly rent, not sublet without permission, and the landlord handles maintenance.”*

### ChatGPT Output:

This rental agreement means you will pay \$1200 each month to rent the place. You cannot rent it to someone else without asking first. The landlord will take care of repairs and maintenance.

### Evaluation:

-  Uses plain language
  -  Captures key obligations and terms
  -  Useful for clients unfamiliar with legal jargon
  -  Summary should be reviewed by a legal professional
- 

## Option 3: Educational Quiz Generation

### Prompt Design:

*“Create a 5-question multiple-choice quiz about the water cycle for 6th-grade students, including correct answers.”*

### ChatGPT Output:

1. What is evaporation?
  - a) Water falling from clouds
  - b) Water turning into vapor ☒
  - c) Water freezing
  - d) Water flowing underground
2. What causes rain?
  - a) Evaporation
  - b) Condensation
  - c) Precipitation ☒
  - d) Collection
3. Where does water collect after precipitation?
  - a) Oceans and lakes ☒
  - b) Trees
  - c) Clouds
  - d) Sunlight

(...and 2 more questions)

**Evaluation:**

- ☒ Age-appropriate language and content
  - ☒ Correct answers clearly indicated
  - ☒ Covers key concepts of the water cycle
  - ☐ ⚠ Could be enhanced with images for better engagement
-