Assginment 3

# Lab 1 : One-Page Summary: ChatGPT’s Working and Real-World Applications

## Introduction

ChatGPT is an advanced language model developed by OpenAI, based on the **Transformer**

**architecture**. It uses **deep learning** techniques, especially *attention mechanisms*, to understand and generate human-like text. ChatGPT is trained on massive datasets containing books, articles,

websites, and conversations, which enables it to recognize patterns in language, predict the next word in a sequence, and provide meaningful responses.

## How ChatGPT Works

1. **Input (Prompt):** The user provides a question, instruction, or request.
2. **Processing:** The model breaks down the input into tokens, analyzes context, and applies the transformer mechanism (self-attention layers).
3. **Output (Response):** ChatGPT generates coherent, context-aware text, often formatted as explanations, summaries, or even structured outputs like tables or code.
4. **Fine-tuning:** Reinforcement learning with human feedback (RLHF) improves response quality, safety, and alignment with user needs.

## Real-World Applications

* + **Education:**
    - Virtual tutor for subjects like math, science, and programming.
    - Summarizing textbooks or generating practice quizzes.

## Healthcare:

* + - Assisting patients with symptom checks and appointment reminders.
    - Providing mental health support via conversational agents.

## Business:

* + - Automating customer support with chatbots.
    - Drafting professional emails, contracts, and reports.

## Creativity & Content Creation:

* + - Generating stories, blogs, social media posts, and marketing ideas.
    - Assisting in brainstorming and rewriting text in different tones.

## Conclusion

ChatGPT demonstrates how artificial intelligence can simulate human conversation and provide assistance in multiple fields. Its adaptability makes it a valuable tool for **education, healthcare, business automation, and creative industries**, showing the power of AI in solving real-world problems.

# Lab 2: Types of Prompts and Prompt Engineering Basics

## Instructional Prompts

**Prompt Output (Summary)**

1. *"Write a paragraph about climate change in* Gave a clear, child-friendly explanation of climate

*simple words."*

1. *"Translate ‘Good Morning’ into French, Spanish, and Hindi."*

change.

Returned translations: *Bonjour, Buenos Días,* शुभ प्रभात.

1. *"Generate a list of 5 healthy breakfast ideas."*

Output: Oatmeal, fruit salad, eggs, smoothies, yogurt.

1. *"Summarize the story of Cinderella in 3 sentences."*
2. *"Write Python code to calculate factorial of a number."*

Provided a concise summary with beginning, problem, and resolution.

Generated correct Python function using recursion.

⬛ **Comparison:** Instructional prompts give **direct and accurate** outputs, but quality depends on clarity of instructions.

## Interrogative Prompts

**Prompt Output (Summary)**

1. *"What is Artificial Intelligence?"* Explained AI as machines simulating human intelligence.
2. *"Why is the sky blue?"* Explained scattering of sunlight and wavelengths.
3. *"How does the internet work?"* Gave layered explanation (servers, protocols, data packets).
4. *"Who invented the telephone?"* Correct answer: Alexander Graham Bell.
5. *"Which is healthier: rice or bread?"* Compared calories, digestion, and nutrition.

⬛ **Comparison:** Interrogative prompts yield **informative, explanatory answers**, often more detailed than instructional.

## Zero-Shot Prompts

**Prompt Output (Summary)**

1. *"Classify this movie review as positive or negative: ‘The film was boring and too long.’"*

Output: *Negative*.

## Prompt Output (Summary)

1. *"Translate ‘How are you?’ into German."* Output: *Wie geht es dir?*
2. *"Summarize this text: ‘AI is growing rapidly and changing industries.’"*

Output: *AI is advancing and transforming industries.*

1. *"Solve: 12 × 15."* Output: *180*.
2. *"Identify the capital of Japan."* Output: *Tokyo*.

⬛ **Comparison:** Zero-shot prompts show ChatGPT’s **general knowledge**, but accuracy may drop for complex/ambiguous tasks.

## Few-Shot Prompts

**Prompt Output (Summary)**

1. *"Translate the following into Spanish: Hello → Hola, Cat → Gato, Dog*

*→ ?"*

Output: *Perro*.

1. *"Classify sentiment: Happy → Positive, Angry → Negative, Excited → ?"* Output: *Positive*.
2. *"Summarize like this: Long text → One short sentence. Example: ‘The company increased sales’ → ‘Sales up.’ Now: ‘AI is changing industries globally.’"*

Output: *AI transforms industries worldwide.*

1. *"Convert temperature: 0°C → 32°F, 100°C → 212°F, 50°C → ?"* Output: *122°F*.
2. *"Make analogies: Cat → Kitten, Dog → Puppy, Cow → ?"* Output: *Calf*.

⬛ **Comparison:** Few-shot prompts improve **accuracy and consistency**, especially in structured tasks like translation, classification, and analogies.

## Final Comparison

**Type Strength Limitation**

Instructional Direct, task-oriented, clear outputs Needs precise instructions Interrogative Explains, teaches, gives reasoning Sometimes lengthy answers

Zero-shot Quick, general-purpose May misinterpret ambiguous tasks Few-shot Higher accuracy, follows patterns Needs well-chosen examples

# Lab 3: Precision Prompting for Information Extraction

## Objective:

To practice extracting structured data from ChatGPT by designing precise prompts and checking accuracy of the results.

## Extract Contact Information Prompt:

*"Extract the contact details from the following paragraph and present them in JSON format: ‘My name is Rahul Sharma. You can reach me at* [*rahul.sharma@gmail.com*](mailto:rahul.sharma@gmail.com) *or call me on 9876543210. I live in Pune, Maharashtra.’"*

## Output (JSON):

{

"Name": "Rahul Sharma",

"Email": "[rahul.sharma@gmail.com](mailto:rahul.sharma@gmail.com)", "Phone": "9876543210",

"Location": "Pune, Maharashtra"

}

**Accuracy:** ⬛ 100% (Correct extraction of all fields)

**Format:** JSON

## Extract Resume Sections Prompt:

*"Extract resume sections from the following text in a tabular format:*

*‘Anjali Verma, a software engineer with 3 years of experience. Skills include Python, Java, and SQL. Worked at Infosys (2019–2022). Graduated from IIT Delhi, B.Tech CSE.’"*

## Output (Table):

**Section Details**

Name Anjali Verma Profession Software Engineer Experience 3 years

Skills Python, Java, SQL

## Section Details

Work History Infosys (2019–2022) Education IIT Delhi, B.Tech CSE

**Accuracy:** ⬛ 95% (Correctly extracted but could add *“Years of Work Experience”* separately)

**Format:** Tabular

## Extract Keywords Prompt:

*"Extract 5 keywords from this paragraph:*

*‘Artificial Intelligence is transforming industries such as healthcare, finance, and education by automating tasks and improving decision-making.’"*

## Output:

* + Artificial Intelligence
  + Healthcare
  + Finance
  + Education
  + Automation

**Accuracy:** ⬛ 90% (Keywords accurate, but could also include *decision-making*)

**Format:** Bullet List

## JSON Formatting with Constraints Prompt:

*"From the text below, extract student details (Name, Roll No, Grade) and return strictly in JSON format only:*

*‘Student: Priya Singh, Roll No: 45, Grade: A.’"*

## Output (JSON):

{

"Name": "Priya Singh", "Roll No": "45",

"Grade": "A"

}

**Accuracy:** ⬛ 100%

**Format:** JSON

## Extract Entities from a News Headline Prompt:

*"Extract the entities (Person, Organization, Location) from this sentence and give output in a table: ‘Elon Musk announced a new SpaceX mission from California.’"*

## Output (Table):

**Entity Type Value**

Person Elon Musk Organization SpaceX Location California

**Accuracy:** ⬛ 100%

**Format:** Table

## Conclusion

* **JSON** format is highly structured and best for machine readability.
* **Tables** are effective for resumes and structured text.
* **Bullet lists** work well for keyword extraction.
* Accuracy was **90–100%** depending on the clarity of the prompt.
* Precision prompting ensures the model extracts **only required data** instead of long explanations.

# Lab 4: Summarization and Text Transformation

## Objective:

To explore ChatGPT’s ability to summarize long texts and rewrite content in different tones (formal/informal).

## Summarization of News Article Original Text:

*"The Indian government has announced a new policy to boost electric vehicle (EV) adoption. The policy includes subsidies for EV buyers, tax benefits for manufacturers, and investment in charging infrastructure. Officials believe this move will reduce pollution and dependence on fossil fuels."*

## Output (Summary):

*"India launched a new EV policy with subsidies, tax benefits, and charging infrastructure to cut pollution and reduce fossil fuel use."*

⬛ Concise and accurate (reduced from 50 words → 22 words).

## Summarization of Research Abstract Original Text:

*"Machine learning is widely used in predictive healthcare. By analyzing patient data, ML algorithms can predict diseases, improve diagnostics, and recommend treatments. This study reviews 50 papers and shows that ML enhances accuracy in early disease detection."*

## Output (Summary):

*"ML improves predictive healthcare by enhancing diagnostics and early disease detection, as shown in 50 reviewed studies."*

⬛ Retained key points, compressed into one sentence.

## Email Rewriting – Formal Tone Original Email (Informal):

*"Hey, I can’t make it to tomorrow’s meeting. Can we shift it to Friday instead?"*

## Rewritten (Formal):

*"Dear Team,*

*I regret to inform you that I will be unable to attend tomorrow’s meeting. Could we kindly reschedule it to Friday?*

*Regards, [Name]"*

⬛ More professional and polite.

## Email Rewriting – Informal Tone Original Email (Formal):

*"Dear Sir, I am writing to request an extension for the project deadline due to unforeseen personal reasons."*

## Rewritten (Informal):

*"Hi, I’m running into some personal stuff and won’t be able to finish the project on time. Can I get a little extension?"*

⬛ Casual and friendly, suitable for informal communication.

## Text Transformation – Changing Style Original Text:

*"Climate change poses a serious threat to human health and the environment, requiring urgent action worldwide."*

## Rewritten (Motivational Tone):

*"Together, we have the power to fight climate change and protect our planet for future generations. Let’s act now!"*

⬛ Same idea but emotionally inspiring.

## Conclusion:

* + ChatGPT can effectively **summarize** long texts into short, meaningful statements.
  + **Tone transformation** (formal ↔ informal, motivational, casual) works well with clear instructions.
  + The **original vs output comparison** shows that meaning is preserved but style and length can be customized.

# Lab 5: ChatGPT in Code Generation and Debugging

## Objective:

To explore how ChatGPT can help in generating and debugging code across languages like Python, C++, and Java.

## Python Example – Factorial Calculation Prompt Given:

*"Write a Python program to calculate the factorial of a number."*

## ChatGPT’s Code:

def factorial(n):

if n == 0 or n == 1:

return 1 else:

return n \* factorial(n-1)

num = 5

print("Factorial of", num, "is", factorial(num))

## Expected Output:

Factorial of 5 is 120

**Comparison:** ⬛ Correct. Matches expected output.

## C++ Example – Sum of Array Elements

**Prompt Given:**

*"Write a C++ program to find the sum of elements in an array."*

## ChatGPT’s Code:

#include <iostream> using namespace std;

int main() {

int arr[] = {1, 2, 3, 4, 5};

int sum = 0;

for(int i = 0; i < 5; i++) { sum += arr[i];

}

cout << "Sum of array elements = " << sum; return 0;

}

## Expected Output:

Sum of array elements = 15

**Comparison:** ⬛ Correct. Code works as expected.

## Java Example – Palindrome Check Prompt Given:

*"Write a Java program to check if a string is a palindrome."*

## ChatGPT’s Code:

class Palindrome {

public static void main(String[] args) { String str = "madam";

String rev = "";

for(int i = str.length()-1; i >= 0; i--) { rev += str.charAt(i);

}

if(str.equals(rev)) {

System.out.println(str + " is a palindrome");

} else {

System.out.println(str + " is not a palindrome");

}

}

}

## Expected Output:

madam is a palindrome

**Comparison:** ⬛ Works correctly.

## Debugging Example – Python Error Fixing Prompt Given:

*"Debug the following code snippet to fix errors:"*

def add\_numbers(a, b) return a + b

print(add\_numbers(2 3))

## ChatGPT Debugged Code:

def add\_numbers(a, b): return a + b

print(add\_numbers(2, 3))

## Expected Output:

5

**Comparison:** ⬛ Errors fixed successfully (missing colon and comma).

## Conclusion:

* ChatGPT can **generate correct code** in multiple languages (Python, C++, Java).
* It can also **debug errors** by identifying syntax issues and correcting them.
* Outputs matched the expected results, showing ChatGPT’s usefulness as a coding assistant.

# Lab 6: Domain-Specific Applications

## Objective

To explore how ChatGPT can simulate a **medical chatbot** that assists patients by answering basic health queries while ensuring safe and ethical use.

## Activity: Medical Chatbot Simulation Prompt Design:

*"You are a medical chatbot. Ask the user about their symptoms, provide possible non-diagnostic suggestions, and advise them to consult a doctor if the issue is serious. Example symptoms: headache, fever, cough."*

## ChatGPT’s Output (Simulated Conversation):

**User:** I have had a headache and mild fever for two days.

## Chatbot:

I’m sorry you’re not feeling well. Let me ask a few questions:

* Do you also have symptoms such as cough, sore throat, or body aches?
* Have you taken any medication so far?
* Do you have any pre-existing conditions like diabetes, hypertension, or asthma?

**User:** Yes, I also have a sore throat.

## Chatbot:

Based on your symptoms (headache, fever, sore throat), this could be a common viral infection, like the flu or a throat infection.

⬛ Suggested care:

* Stay hydrated and rest well
* Take paracetamol for fever if needed
* Warm salt-water gargles may help with throat pain

ı . **Important:** If your fever gets worse, you have breathing difficulties, or the symptoms persist beyond 3–4 days, please consult a doctor immediately.

## Evaluation of Output:

* ⬛ **Accuracy:** The chatbot gives **safe, general advice** (hydration, rest, mild medication) without making a direct medical diagnosis.
* ⬛ **Ethical Safety:** Clearly includes a disclaimer to **consult a doctor** for serious or prolonged symptoms.
* ⬛ **Format:** Simulates a natural **chat-based conversation**, making it easy for patients to follow.
* ⬛ **Usefulness:** Can be deployed in **health apps, telemedicine, or hospital websites** to assist patients with preliminary queries.

## Conclusion:

The **Medical Chatbot Simulation** shows how ChatGPT can support healthcare by **triaging symptoms, giving general wellness tips, and encouraging professional consultation**. It is **not a replacement for doctors** but acts as a **first-line assistant** to guide patients responsibly.