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LAB 1 : Introduction to ChatGPT

ChatGPT is a conversational AI model developed by **OpenAI**, based on the **Generative Pre-trained Transformer (GPT)** architecture. It uses deep learning techniques, particularly **transformers**, to understand and generate human-like text. The latest versions of ChatGPT are based on **GPT-4** and **GPT-4o**, which are among the most advanced AI language models to date.

Origin and Development

ChatGPT originated from the GPT family of models. GPT-1 introduced the concept, GPT-2 improved scalability, GPT-3 showcased remarkable language generation abilities, and GPT-4 brought enhancements in reasoning, coding, and multimodal capabilities (text, image, and audio). The "Chat" variant is specially fine-tuned for dialogue using **Reinforcement Learning from Human Feedback (RLHF)**.

Working Principle

ChatGPT uses a **Transformer-based neural network**, which processes input text as a series of tokens. It understands context by assigning weights (attention) to each word or phrase. The model is pre-trained on vast amounts of data from the internet and fine-tuned to respond conversationally. It predicts the next word in a sentence, allowing it to generate coherent and relevant responses.

Exploring the Interface

Users can interact with ChatGPT via a simple text interface. You input questions or prompts, and the AI responds in natural language. The interface supports multimodal input (text, images) in newer versions like GPT-4o.

Use Cases and Applications

- **Education:** Assists students in learning concepts, generating essays, solving math problems, and explaining code.
- **Healthcare:** Provides preliminary health information, helps in summarizing medical records (not for diagnosis).
- **Business:** Automates customer support, generates reports, summarizes emails, and helps with marketing content.
- **Creativity:** Aids in writing poems, stories, generating design ideas, and composing music lyrics.

Real-World Examples

1. **Education:** A teacher uses ChatGPT to create quiz questions and lesson summaries.

2. **Healthcare:** A doctor uses ChatGPT to transcribe and summarize patient consultation notes.
3. **Business:** A company uses it to generate personalized replies to customer emails.
4. **Creative Writing:** Writers use ChatGPT to brainstorm character names and story plots.

LAB 2 : Prompt Engineering Basics: Types of Prompts

Prompt engineering is the process of crafting effective inputs to guide large language models like ChatGPT to produce desired outputs. The main types of prompts include:

1. **Instructional Prompts** – Give direct instructions.
 2. **Interrogative Prompts** – Ask questions.
 3. **Zero-shot Prompts** – Provide no examples, just the task.
 4. **Few-shot Prompts** – Provide a few examples before the task.
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1. Instructional Prompts

Instructional prompts are direct commands or tasks given to the model. These are useful for getting specific formats or actions done.

1. "Summarize this paragraph in one sentence."
2. "Write a haiku about summer."
3. "Generate a table of 5 animals and their habitats."
4. "Create a slogan for a coffee shop."
5. "Convert the sentence to passive voice: 'The cat chased the mouse.'"

These prompts yield direct and to-the-point responses. The outputs are usually well-formatted and follow the instructions closely. They work best when the instructions are clear and unambiguous.

2. Interrogative Prompts

These are question-based prompts that ask the model to explain or provide information.

1. "What are the benefits of solar energy?"
2. "How does a transformer model work?"
3. "Why is biodiversity important?"

4. "When did World War II end?"
5. "Who is considered the father of computing?"

Interrogative prompts help in extracting knowledge and explanations from the model. They resemble natural human queries and are especially useful in Q&A-style interactions. However, depending on how open-ended the question is, the answers may vary in detail

3. Zero-Shot Prompts

Zero-shot prompts ask the model to perform a task without showing any examples. It relies on the model's general understanding of the world and instructions.

1. "Translate 'Good morning' to Spanish."
2. "Write a poem about stars."
3. "Classify this text as positive, neutral, or negative: 'I'm disappointed.'"
4. "Give a summary of the Industrial Revolution."
5. "Generate a title for an essay about plastic pollution."

In zero-shot prompts, the model often does surprisingly well, but the accuracy depends on how common or familiar the task is. For more complex or context-specific tasks, performance may drop.

4. Few-shot Prompts

Few-shot prompts provide **a few examples** to show the AI how the task should be performed. This is especially useful for classification, translation, tone changes, or creative writing tasks where consistency and format matter.

* Examples:

1. Translate English to French:

- *Example 1:* Hello → Bonjour
- *Example 2:* Good night → Bonne nuit
- *Now translate:* Thank you
➤ Output: "Merci"

2. Classify sentiment:

- *Example 1:* "I love this phone!" → Positive
- *Example 2:* "This is terrible." → Negative
- *Now classify:* "It's okay, not great."
➤ Output: "Neutral"

3. **Rewrite to be more formal:**

- *Example 1:* “Can you send this?” → “Could you kindly send this?”
- *Text:* “I need that report fast.”
 - *Output:* “I would appreciate it if you could send that report promptly.”

4. **Solve math with logic:**

- *Example 1:* If $x + 2 = 5$, then $x = 3$
- *Now solve:* If $2x = 8$, then $x = ?$
 - *Output:* “ $x = 4$ ”

Final Comparison and Observations

After testing and comparing all four types of prompts, here are the key observations:

- **Instructional prompts** give clear, direct responses when the task is well defined.
- **Interrogative prompts** are best for factual and informative queries.
- **Zero-shot prompts** rely solely on the wording of the prompt, and while they can perform well on simple tasks, they sometimes lack consistency or precision.
- **Few-shot prompts** provide context and format guidance, producing the most reliable and well-structured responses, especially for nuanced or creative tasks.

Lab 3: Precision Prompting for Information Extraction

Objective:

To extract structured data (like contact info, resume sections, keywords) from unstructured text using ChatGPT by prompting it to return results in **JSON** or **table format**.

1: JSON Formatting:

Prompt

"Extract the following information from this paragraph and provide it in JSON format:

- Contact Info: name, email, phone number, address
 - Resume Sections: Education, Work Experience, Skills
- Paragraph: 'Ravi Kumar is a project manager based in Bangalore. You can contact him at ravi.kumar@example.in or call him at +91-98765-43210. His office is located at 45 MG Road, Bangalore, Karnataka, 560001. Ravi completed his MBA from IIM Bangalore. He worked at TCS as a project manager for 5 years. His skills include leadership, project management, and business strategy.'

Output

```
{
  "Contact Info": {
    "name": "Ravi Kumar",
    "email": "ravi.kumar@example.in",
    "phone": "+91-98765-43210",
    "address": "45 MG Road, Bangalore, Karnataka, 560001"
  },
  "Resume": {
    "Education": "IIM Bangalore, MBA",
    "Work Experience": "TCS, Project Manager, 5 years",
    "Skills": ["leadership", "project management", "business strategy"]
  }
}
```

Output Accuracy and Format

- Accuracy: All contact and resume fields correctly extracted.
- Format: Nested JSON structure is clean and well-organized, separating Contact Info and Resume sections.

Lab 4: Summarization and Text Transformation

Objective:

To explore how ChatGPT can be used for:

- Summarizing content (news articles, research abstracts)
- Rewriting text
- Transforming tone (formal ↔ informal)

ACTIVITY 1.

- **Summarizing a News Article**

Original:

"India launched its latest lunar mission, Chandrayaan-3, aiming to land near the Moon's south pole. Scientists hope this will provide crucial data about the lunar surface."

Prompt:

"Summarize this news in one sentence."

Output:

"India's Chandrayaan-3 mission aims to explore the Moon's south pole for scientific research."

 **Effective and concise summary.**

- **Summarizing a Research Abstract**

Original:

"This study investigates the impact of remote work on employee productivity during the pandemic. Results show a 15% increase in efficiency, especially in tech industries."

Prompt:

"Summarize this abstract."

Output:

"Remote work during the pandemic boosted productivity by 15%, particularly in tech sectors."

ACTIVITY 2 .

Rewriting Email – Formal Tone

Original:

"Hey, just letting you know I won't make it to the meeting. Something came up."

Prompt:

"Rewrite this in a formal tone."

Output:

"I regret to inform you that I will be unable to attend the meeting due to unforeseen circumstances."

Lab 5 : ChatGPT in Code Generation and Debugging

Objective:

To explore how ChatGPT can assist in:

- Generating correct and working code from natural language prompts
- Identifying and fixing bugs in faulty code snippets

1. Generate Python Code from Prompt

Prompt:

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

ChatGPT Output:

```
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  
  
# Example usage  
  
num = 17  
  
print(f"{num} is prime:", is_prime(num))
```

Expected Output:

Correct output:

17 is prime: True

ChatGPT's code was accurate and matched expected output.

2. Debug a Faulty Code Snippet

Given Code:

```
def add_numbers(a, b):  
    return a - b # Bug: should be a + b
```

```
print(add_numbers(5, 3)) # Expected: 8
```

Prompt:

"Find the bug and fix the code."

ChatGPT Fix:

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

```
print(add_numbers(5, 3)) # Output: 8
```

ChatGPT Code vs Expected Output Comparison

Task	ChatGPT Output	Expected Output
Prime check code	✓ Accurate	✓ Accurate
Bug fix (add func)	✓ Corrected	✓ Correct

Lab 6: Domain-Specific Applications

Objective:

To explore how ChatGPT can assist in domain-specific tasks, specifically in legal document summarization — simplifying complex legal text into clear, concise summaries.

Activity: Legal Document Summarization

Prompt Design:

Prompt Used:

“Summarize the following legal clause in plain English, highlighting the key responsibilities and rights of the tenant and landlord.”




Input Text (Example Legal Clause):

“The tenant shall maintain the premises in good repair and shall not make any alterations without the landlord’s prior written consent. The landlord is responsible for major structural repairs and maintaining compliance with safety codes.”

ChatGPT Output:

“The tenant must keep the property in good condition and cannot make changes without the landlord’s written permission. The landlord must handle big repairs and ensure the property meets safety rules.”

Evaluation:

- Accuracy:  Key responsibilities and rights were clearly captured.
- Clarity:  Legal terms were simplified into easy-to-understand language.
- Usefulness:  Suitable for non-experts or clients needing clarity on lease terms.

