Lab 1: Introduction to ChatGPT

ChatGPT: Working and Real-World Applications

Q1. What is ChatGPT?

ChatGPT is an advanced **AI language model** developed by **OpenAI**. It is built using the **GPT (Generative Pre-trained Transformer)** architecture, which allows it to understand and generate human-like text responses. The model has been trained on a large dataset of books, articles, and web content to develop a deep understanding of natural language.

Q2. How ChatGpt works?

ChatGPT is an AI language model developed by **OpenAI** based on the **Generative Pre-trained Transformer (GPT)** architecture. It uses deep learning and **transformer neural networks**, which process language through a mechanism called **self-attention**—allowing the model to understand context and generate coherent responses.

ChatGPT is trained in two main phases:

1. **Pre-training**:- The model is exposed to vast text data (books, websites, articles) and learns grammar, facts, reasoning, and language patterns by predicting the next word in a sentence.

2. **Fine-tuning**:- The model is improved using **Reinforcement Learning with Human Feedback (RLHF)**. This makes responses safer, more helpful, and aligned with human intent.

Q2. *Real-World Applications of ChatGPT?*

1. *Education:-*
- Assists students in solving problems, writing essays, and summarizing topics.
- Helps teachers create quizzes, lesson plans, and learning materials.

2. *Healthcare:-*
- Acts as a conversational assistant for symptom explanation (non-diagnostic).
- Summarizes medical records and scientific papers.

3. 💼 *Business:-*
- Automates customer service via chatbots.
- Drafts emails, business letters, reports, and social media content.

4. 🎨 *Creativity:-*
- Generates poems, stories, and lyrics.
- Aids in idea generation for art, design, advertising, and content writing.

Conclusion:

ChatGPT represents a significant advancement in artificial intelligence and natural language processing. Its ability to understand and generate human-like text makes it a powerful tool across various domains such as education, healthcare, business, and creative industries. As AI continues to evolve, ChatGPT demonstrates how language models can assist humans by enhancing productivity, learning, and communication in real-world applications.

Lab 2: Types of Prompts and Prompt Engineering Basics

Objective: Learn and compare instructional, interrogative, zero-shot, and few-shot prompting techniques.

1. Instructional Prompts (5 Examples)

1. ***Prompt***: *"List and explain the five steps required to perform exploratory data analysis in Python using pandas." ChatGPT Output (excerpt): A numbered, step-by-step guide with brief code snippets for each step.*
2. ***Prompt***: *"Write a detailed tutorial for deploying a Flask app to Heroku." Output: A multi-section walkthrough covering setup, Procfile, requirements, and deployment commands.*
3. ***Prompt***: *"Provide a recipe for a vegetarian lasagna with ingredient quantities and cooking times." Output: A structured recipe format with ingredients list and ordered cooking steps.*
4. ***Prompt***: *"Generate a step-by-step guide on how to secure an AWS S3 bucket." Output: Best practices checklist: public access settings, bucket policies, IAM roles, encryption.*
5. *Prompt: "Outline the process of training a convolutional neural network for image classification." Output: Sequential description from data loading and augmentation to model evaluation.*

2. Interrogative Prompts (5 Examples)

1. ***Prompt***: *"What are the advantages of using transformers over RNNs for NLP?" Output: A bulleted list contrasting parallelism, context windows, and training efficiency.*

2. **Prompt**: "How does regularization prevent overfitting in machine learning?" Output: Explanation of L1/L2 norms, dropout, early stopping with illustrative formulas.
3. **Prompt**: "Why is data normalization important before clustering?" Output: Discussion on feature scale impact, distance metrics, and clustering stability.
4. **Prompt**: "When should one use precision vs recall as a performance metric?" Output: Scenarios and trade-offs in classification tasks, with examples in fraud detection.
5. **Prompt**: "Where are the primary ethical concerns in deploying AI in healthcare?" Output: List of bias, privacy, informed consent, and transparency issues.

Lab 3: Precision Prompting for Information Extraction

Objective:

Extract structured data from ChatGPT responses using precision prompting techniques.

Activities:

1. **Prompt:**

   Extract the following details in JSON format from this paragraph: full name, email, phone number, skills, education, and experience.
   "John Doe is a software engineer with 5 years of experience in Python and Java. He graduated with a B.Tech in Computer Science from MIT in 2015. Contact him at john.doe@example.com or +1-234-567-8901."

2. Output

```json
{
  "full_name": "John Doe",
  "email": "john.doe@example.com",
  "phone": "+1-234-567-8901",
  "skills": ["Python", "Java"],
  "education": {
      "degree": "B.Tech in Computer Science",
      "institution": "MIT",
      "year": 2015
  },
  "experience": "5 years"
}
```

3. Accuracy and Format Report:

- *Accuracy: 100% – All key details were correctly extracted.*

- *Format: Clean and well-structured JSON format.*

- *Observation: Proper entity recognition was achieved with minimal prompting.*

Lab 4: Summarization and Text Transformation

Objective:

Use ChatGPT to summarize and transform tone of text.

Activities:

A. Summarization

1. **Prompt:**

Summarize the following research abstract in 2-3 sentences: "This study evaluates the effects of climate change on agricultural productivity in South Asia. Using satellite data and machine learning models, it finds a 12% decline in crop yield over the past decade, especially in rice and wheat. It recommends policy-level interventions for adaptive farming practices."

2. **Summary Output:**

Climate change has led to a 12% decline in rice and wheat yields in South Asia over the past decade, according to satellite and machine learning data. The study urges adaptive farming policies in response.

B. Tone Transformation

1. Prompt:

Rewrite the following informal email in a formal tone: "Hey, I can't make it to the meeting tomorrow. Got some stuff to deal with. Let's reschedule?"

2. Formal Output

Dear sir,
I regret to inform you that I will be unable to attend tomorrow's meeting due to unforeseen personal matters. Kindly let me know a convenient time for rescheduling.
Best regards,
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Output Summary Report:

- **Summarization:** Condensed key information without losing meaning.
- **Tone Transformation:** Successfully adapted informal to formal tone.
- **Accuracy:** High
- **Clarity:** Maintained throughout.

Lab 5: ChatGPT in Code Generation and Debugging

Objective:

Evaluate how ChatGPT can assist in generating and debugging code.

Activities:

A. Code Generation Prompt:

Generate a Python program that calculates the factorial of a number using recursion.

ChatGPT Output:

```
def factorial(n):

    if n == 0 or n == 1:

    return 1

    else:

    return n * factorial(n - 1)



num = int(input("Enter a number: "))

print("Factorial:", factorial(num))
```

Expected Output:

Correctly returns the factorial of any non-negative integer.

B. Debugging Prompt:

Debug this Python code:

```
def add_numbers(a, b)

    result = a + b

    return result

print(add_numbers(5, 10)
```

ChatGPT Debugged Output:

```
def add_numbers(a, b):

        result = a + b

        return result

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

Corrections Made:

- Added missing colon ： after function definition.
- Closed the parenthesis in the print statement.

Output Report:

- **Code Generation:** Functional, logical, and optimized.
- **Debugging Accuracy:** Corrected syntax errors and provided valid output.
- **Assessment:** Efficient coding assistance and error resolution.

Lab 6: Domain-Specific Applications

Objective:

Use ChatGPT for domain-specific use case.

Activity Chosen: Educational Quiz Generation

1. **Prompt:**

    Generate a 5-question multiple-choice quiz on the topic "Photosynthesis" for grade 7 students.

2. ChatGPT Output:

Quiz: Photosynthesis (Grade 7)

1. What is the main purpose of photosynthesis?

   a) To consume oxygen

   b) To produce food for the plant

   c) To absorb minerals

   d) To grow taller

   Answer: b

2. What gas do plants take in during photosynthesis?

   a) Oxygen

   b) Hydrogen

   c) Carbon dioxide

   d) Nitrogen

   Answer: c

3. Which part of the plant carries out photosynthesis?

   a) Roots

   b) Stems

   c) Leaves

   d) Flowers

Answer: c

4. What is the green pigment in plants called?

*   *a) Hemoglobin*

*   *b) Melanin*

*   *c) Chlorophyll*

*   *d) Keratin*

*   ***Answer:** c*

5. What do plants produce as a result of photosynthesis?

*   *a) Carbon dioxide*

*   *b) Oxygen and glucose*

*   *c) Water and salt*

*   *d) Nitrogen and starch*

*   ***Answer:** b*

Output Evaluation:

*   ● *Relevance: All questions aligned with grade 7 curriculum.*

*   ● *Clarity: Clear, age-appropriate wording.*

*   ● *Structure: Proper multiple-choice format.*

*   ● *Overall Accuracy: 100%*

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