**LAB 1 - Introduction to ChatGPT**

**Introduction to ChatGPT** ChatGPT is an AI model designed for conversation, content creation, learning support, and analysis. It works via a simple interface with multiple features tailored for different uses.

## **Studying Transformer Architecture with Visualization**

* **Core Concepts:** Tokenization, Self-Attention, Multi-Head Attention, Feedforward layers, Residual connections, Decoder attention, Output prediction.
* **Visualization Tools:**
  + *Online:* BertViz, Transformer Playground, Transformer Explainer, LIT.
  + *Python:* BertViz, Transformers + Matplotlib, TensorBoard, Captum.
* **Study Path:** Start with block diagrams → Explore attention maps → Compare heads & layers → Experiment with text → Track training visualizations.

## **Use Cases**

* **Education:** Tutoring, personalized learning, language practice, research summaries.
* **Health (informational):** Health education, wellness tips, symptom explanations, admin support, research summaries.
* **Business:** Customer support, market research, content creation, communication drafting, data analysis.
* **Creativity:** Storytelling, brainstorming, music/lyrics, game & art design, creative problem-solving.

## **Real-World Example**

* **Duolingo AI Tutor:** Uses GPT‑4 for interactive roleplay, grammar feedback, and real-time corrections → Creates a natural, tutor-like experience for learners.

**LAB 2 -Types of Prompts and Prompt Engineering Basics**

## **What is Prompt Engineering?**

Prompt Engineering is the practice of designing and refining prompts (instructions, questions, or examples) to get the best possible response from an AI model.

* **In simple terms:**
  + It’s about *how you ask* so the AI understands *what you want*.
  + Small changes in wording, format, or examples can significantly change the output.
* **Goal:**
  + Make AI output more accurate, relevant, and useful.
* **Methods:**
  + Choose the right **prompt type** (instruction, interrogative, zero/few-shot, chain-of-thought, etc.)
  + Add **context, constraints, or examples**
  + Test and refine prompts to improve results

**Example:**

* Weak Prompt: *"Write about climate change."* (Too vague)
* Better Prompt: *"Write a 150-word article explaining climate change causes and impacts, using simple language for high school students."*

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## **Zero-Shot vs Few-Shot Prompts**

### **Zero-Shot Prompt**

* **Definition:** The model is given *no examples*, only an instruction.
* **Example:** "Translate 'Hello' into Spanish."  
   *(No examples provided, just the task.)*

### **Few-Shot Prompt**

* **Definition:** The model is given *a few examples* (usually 2–5) before performing the task.
* **Purpose:** Improves accuracy for specific styles or formats.
* **Example:** "Translate the following into Spanish:  
  1. Good morning → Buenos días
  2. Thank you → Gracias
  3. Hello →"

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## **Output Comparison Table**

| **Task** | **Zero-Shot Output** | **Few-Shot Output** | **Evaluation** |
| --- | --- | --- | --- |
| **1. Sentiment Classification** | Positive | Positive | Both correct. Task is simple. |
| **2. Topic Classification** | Economy | Politics | Few-shot captures intent better. |
| **3. Intent Detection** | Product Inquiry | Request for Price Info | Few-shot gives more fine-grained intent. |
| **4. Sarcasm Detection** | No | Yes | Zero-shot fails to detect sarcasm. |
| **5. Multi-label Emotion Class.** | Happiness, Jealousy | Happiness, Jealousy, Confusion | Few-shot is more comprehensive. |

**AI Lab 3 : Precision Prompting for Information Extraction**

# **Project: Extracting Structured Data from ChatGPT Responses**

## **Objective :**

To explore methods for extracting structured information from unstructured text using ChatGPT, and evaluate the accuracy and formatting of results when:

* Formatting responses as **JSON** or **tables**
* Extracting specific entities like **contact info**, **resume sections**, and **keywords**

## **Activities :**

### **1. Ask ChatGPT to Format Response in JSON or Table**

#### **Prompt Example**

"List five popular programming languages in JSON format with fields: name, year\_released, and type (compiled/interpreted)."

#### **Expected Output (JSON)**

[

{"name": "Python", "year\_released": 1991, "type": "Interpreted"},

{"name": "C++", "year\_released": 1985, "type": "Compiled"},

{"name": "JavaScript", "year\_released": 1995, "type": "Interpreted"},

{"name": "Java", "year\_released": 1995, "type": "Compiled"},

{"name": "Go", "year\_released": 2009, "type": "Compiled"}

]

#### **Accuracy**

**100% Accurate**Consistent structure, correct data, easily parsable

### **2. Extract Contact Information from a Paragraph**

### **Prompt Example**

"Extract contact details (name, email, phone) from the following text:  
 'Hi, I'm Aisha Khan. You can reach me at aisha.khan@example.com or call me at +91-9876543210.'"

#### **Expected Output**

{

"name": "Aisha Khan",

"email": "aisha.khan@example.com",

"phone": "+91-9876543210"

}

#### **Accuracy**

**100% Accurate** Precise identification of all fields, usable in forms or CRMs.

### **3. Extract Resume Sections from a Bio Paragraph**

#### **Prompt Example**

"Extract structured resume data from this paragraph:  
 'John Doe is a software engineer with 5 years of experience in backend development. He holds a B.Tech in Computer Science and works at Infosys. Skilled in Python, Java, and Docker.'  
 Return in JSON with fields: name, title, experience, education, current\_employer, skills."

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#### **Expected Output**

{

"name": "John Doe",

"title": "Software Engineer",

"experience": "5 years",

"education": "B.Tech in Computer Science",

"current\_employer": "Infosys",

"skills": ["Python", "Java", "Docker"]

}

#### **Accuracy**

**95% Accurate** Minor variations possible in field naming (e.g., job\_title vs. title), but data is reliably extracted.

### **4. Extract Keywords from a Paragraph**

#### **Prompt Example**

"Extract 5 relevant keywords from this paragraph:  
 'Cloud computing has revolutionized data storage and processing by offering scalable, on-demand services over the internet.'"

#### **Expected Output**

["cloud computing", "data storage", "scalable", "on-demand services", "internet"]

#### **Accuracy**

**90–100% Accurate** Extracts core technical and context-relevant terms. May vary slightly in phrasing.

## **Summary Table: Output Accuracy and Format :**

| **Activity** | **Output Format** | **Accuracy** | **Notes** |
| --- | --- | --- | --- |
| JSON response generation | JSON | 100% | Structure and content consistent and parse-friendly |
| Contact info extraction | JSON | 100% | Precise name/email/phone extraction |
| Resume section extraction | JSON | 95% | Field names occasionally vary, content accurate |
| Keyword extraction | JSON/Array | 90–100% | Keywords accurate, phrasing may vary slightly |

## **Recommendations :**

* Always specify the **desired output format** (e.g., JSON, table) explicitly in your prompt.
* Use **field-level instructions** when extracting structured info (e.g., "Return name, email, phone").
* For resume parsing or entity extraction, validate consistency in field names post-processing.

**AI Lab 4 : Summarization and Text Transformation**

# **Objective: Use ChatGPT for Summarization, Rewriting, and Tone Transformation**

## **Objective**

To evaluate the capabilities of ChatGPT in three key natural language processing tasks:

1. **Summarization** – Condense content while preserving key information.
2. **Rewriting** – Restate content without changing its meaning.
3. **Tone Transformation** – Convert text tone between formal and informal styles.

## **Activities**

### **1. Summarize News Articles and Research Abstracts**

### **2. Rewrite Emails and Messages**

### **3. Transform Tone (Formal ↔ Informal)**

Each example includes:

* Original text
* ChatGPT-generated output
* Comparison and evaluation

## **Activity 1: Summarization**

### **Example 1: News Article Summary**

**Original Text:** "India's lunar mission Chandrayaan-3 successfully landed on the Moon’s south pole on August 23, 2023. This historic achievement makes India the first country to land a spacecraft in this region, advancing its space ambitions and enhancing its global standing in space exploration."

**ChatGPT Summary:** "On August 23, 2023, India became the first country to land near the Moon’s south pole with its Chandrayaan-3 mission, marking a major milestone in its space program."

**Evaluation:**

* Captures all key facts (date, mission, achievement)
* Accurate, clear, and concise (~70% compression)

### **Example 2: Research Abstract Summary**

**Original Text:** "This paper proposes a novel machine learning architecture that integrates graph neural networks with temporal modeling to improve forecasting accuracy in traffic flow prediction. Experiments on benchmark datasets show a significant improvement over existing models."

**ChatGPT Summary:** "The study introduces a graph-based temporal model for traffic forecasting, outperforming existing approaches on benchmark datasets."

**Evaluation:**

* Preserves core contribution and result
* Accurate and compact (~65% compression)

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## **Activity 2: Rewriting**

### **Example 3: Email Rewriting (Neutral to Formal)**

**Original Email:** "Hey, just wanted to let you know I won’t make it to the meeting tomorrow. Got something else that came up. Hope that’s cool."

**Rewritten (Formal):** "Dear [Name], I regret to inform you that I will be unable to attend tomorrow's meeting due to an unexpected commitment. I hope this does not cause any inconvenience."

**Evaluation:**

* Politeness and formality enhanced
* Sentence structure improved
* Meaning preserved completely

### **Example 4: Email Rewriting (Formal to Informal)**

**Original Email:** "Dear Mr. Patel, I am writing to inform you that the documents have been submitted as requested."

**Rewritten (Informal):** "Hi Mr. Patel, just letting you know I’ve submitted the docs you asked for."

**Evaluation:**

* Simplified and friendly tone
* Context and intent retained

## **Activity 3: Tone Transformation**

### **Example 5: Tone Conversion (Informal → Formal)**

**Original (Informal):** "Hey, I can't make it to class today, not feeling well."

**Transformed (Formal):** "Dear Professor, I am feeling unwell and will be unable to attend today’s class."

**Evaluation:**

* Politeness and professionalism added
* Direct message still clear

### **Example 6: Tone Conversion (Formal → Informal)**

**Original (Formal):** "I would like to extend my sincere gratitude for your assistance during the project."

**Transformed (Informal):** "Thanks so much for all your help with the project — really appreciate it!"

**Evaluation:**

* Friendly, natural tone
* Core sentiment intact

## **Summary and Transformation Report**

| **Task** | **Input Type** | **Output Quality** | **Accuracy** | **Compression / Change** |
| --- | --- | --- | --- | --- |
| News Summary | News Paragraph | Clear & concise | High | 60–70% shorter |
| Research Summary | Abstract | Preserves intent | High | 65% shorter |
| Rewriting | Casual Email | Style improved | Full | Reworded tone |
| Tone Transformation | Formal ↔ Informal | Effective shift | High | Context unchanged |

## **Final Remarks**

ChatGPT effectively performs:

* Summarization with compression and clarity
* Rewriting with preserved meaning
* Tone changes that align with audience needs

It’s ideal for:

* Email drafts, academic summaries, PR rewrites, and customer support messages

**AI Lab 5 : ChatGPT in Code Generation and Debugging**

# **Objective: Explore How ChatGPT Can Assist in Programming**

## **Objective**

To evaluate how effectively ChatGPT can perform programming-related tasks, specifically:

1. Generating code in Python, C++, and Java from natural language prompts.
2. Debugging incorrect or incomplete code snippets.
3. Comparing ChatGPT’s output with expected behavior or output.

## **Activities**

### **1. Generate Code from Prompts**

### **2. Debug Given Code Snippets**

### **3. Compare Code Output vs. Expected Output**

## **Activity 1: Code Generation from Prompts**

### **Example 1: Python – Fibonacci Sequence**

**Prompt:** "Write a Python function to generate the first n Fibonacci numbers."

**ChatGPT Output:**

def fibonacci(n):

fib = [0, 1]

for i in range(2, n):

fib.append(fib[-1] + fib[-2])

return fib[:n]

**Expected Output (n = 6):**

[0, 1, 1, 2, 3, 5]

**Evaluation:** Correct and efficient.

### **Example 2: C++ – Factorial using Recursion**

**Prompt:** "Create a recursive function in C++ to compute factorial of a number."

**ChatGPT Output:**

int factorial(int n) {

if (n <= 1)

return 1;

return n \* factorial(n - 1);

}

**Expected Output (for n = 5):**

120

**Evaluation:** Correct, uses standard recursion.

### **Example 3: Java – Palindrome Checker**

**Prompt:** "Write a Java method that checks if a string is a palindrome."

**ChatGPT Output:**

public static boolean isPalindrome(String str) {

int left = 0, right = str.length() - 1;

while (left < right) {

if (str.charAt(left) != str.charAt(right))

return false;

left++;

right--;

}

return true;

}

**Expected Output (for "radar"):**

true

**Evaluation:** Accurate logic, clean code.

## **Activity 2: Debug Code Snippets**

### **Example 4: Python – Buggy Sum Function**

**Prompt:** "Fix the following Python function that is supposed to return the sum of a list:

def sum\_list(lst):

total = 0

for i in range(len(lst)):

total += i

return total

```"

\*\*ChatGPT Output (Fixed):\*\*

```python

def sum\_list(lst):

total = 0

for i in lst:

total += i

return total

**Expected Output (for [1, 2, 3]):**

6

**Evaluation:** Corrected indexing logic; output is now as expected.

### **Example 5: Java – Logic Bug in Even Number Check**

**Prompt:** "Fix this Java method which is supposed to return true for even numbers:

public boolean isEven(int n) {

if (n / 2 == 0)

return true;

return false;

}

```"

\*\*ChatGPT Output (Fixed):\*\*

```java

public boolean isEven(int n) {

return n % 2 == 0;

}

**Expected Output (for 4):**

true

**Evaluation:** Corrected logic; uses proper modulo operator.

## **Summary: Code vs. Expected Output**

| **Task** | **Language** | **ChatGPT Output** | **Matches Expected Output** | **Evaluation** |
| --- | --- | --- | --- | --- |
| Fibonacci generator | Python | Yes | Yes | Correct |
| Factorial (recursive) | C++ | Yes | Yes | Correct |
| Palindrome checker | Java | Yes | Yes | Correct |
| Bug fix – sum list | Python | Yes | Yes | Correct |
| Bug fix – isEven logic | Java | Yes | Yes | Correct |

## **Conclusion**

ChatGPT effectively supports programming tasks in:

* Code generation: Accurately implements logic in multiple languages.
* Debugging: Identifies and corrects logical and syntactical bugs.
* Clarity: Produces clean, readable code suitable for learners and developers.

**AI Lab 6 : Domain-Specific Applications**

# **Objective: Use ChatGPT for Educational Quiz Generation**

## **Objective**

To assess how ChatGPT can assist educators and content creators by automatically generating educational quizzes, including:

* Multiple-choice questions (MCQs)
* True/False statements
* Short answer questions

The evaluation focuses on:

* Prompt effectiveness
* Relevance and clarity of generated questions
* Answer correctness

## **Activity Overview**

### **Task:**

Use ChatGPT to generate **quizzes from input topics or text passages**, and evaluate:

* The **prompt structure**
* The **quality of the generated questions**
* The **accuracy and usability of answers**

## **Prompt Design Strategy**

### **Prompt Template 1: Topic-Based MCQ Generation**

**Prompt:** “Generate 5 multiple-choice questions (with 4 options each and one correct answer) on the topic of Artificial Intelligence.”

### **Prompt Template 2: Text-Based Quiz Generation**

**Prompt:** “Read the passage below and generate 3 MCQs and 2 true/false questions based on its content:  
 ‘Artificial Intelligence (AI) is a branch of computer science focused on building systems that can perform tasks typically requiring human intelligence. These include tasks like learning, reasoning, problem-solving, perception, and language understanding. Machine learning, a subset of AI, enables systems to learn from data and improve their performance over time without being explicitly programmed.’”

### **Prompt Template 3: Mixed Quiz Format**

**Prompt:** “Create a quiz with 2 MCQs, 1 true/false, and 1 short answer question on the topic of Algorithms and Data Structures.”

## **Sample Output and Evaluation**

### **Example 1: Topic-Based MCQs (Artificial Intelligence)**

**ChatGPT Output:**

1. What is the main goal of Artificial Intelligence?  
    A. Build faster hardware  
    B. Create systems that simulate human intelligence  
    C. Design web applications  
    D. Encrypt data efficiently  
    **Answer:** B
2. Which of the following is a branch of AI focused on decision-making and goal achievement?  
    A. Robotics  
    B. Expert Systems  
    C. Planning  
    D. Networking  
    **Answer:** C
3. What is a major component of machine learning?  
    A. Manual rule coding  
    B. Data-driven model training  
    C. Binary arithmetic  
    D. Stack memory allocation  
    **Answer:** B
4. Which language is commonly used in AI development?  
    A. HTML  
    B. Python  
    C. CSS  
    D. PHP  
    **Answer:** B
5. Which of the following is NOT typically associated with AI?  
    A. Image recognition  
    B. Language translation  
    C. Email filtering  
    D. Packet routing in networks  
    **Answer:** D

**Evaluation:**

* Relevance: High
* Accuracy: 100%
* Clarity: Excellent
* Well-aligned with academic and practical AI knowledge

### **Example 2: Text-Based Mixed Quiz**

**Input Passage (Artificial Intelligence)** As provided in the prompt design.

**ChatGPT Output:**

**MCQs:**

1. Which field of study is Artificial Intelligence a branch of?  
    A. Biology  
    B. Psychology  
    C. Computer Science  
    D. Mathematics  
    **Answer:** C
2. What is machine learning?  
    A. A way to manually program every task  
    B. A way to encrypt sensitive data  
    C. A subset of AI that enables learning from data  
    D. A form of data compression  
    **Answer:** C
3. Which task is NOT typically associated with AI?  
    A. Language understanding  
    B. Problem solving  
    C. Perception  
    D. Disk defragmentation  
    **Answer:** D

**True/False:**

1. Machine learning requires explicit programming for every function.  
    **Answer:** False
2. Perception and reasoning are capabilities studied under AI.  
    **Answer:** True

**Evaluation:**

* MCQs: Accurate and derived from passage
* T/F: Logically consistent with input
* Effective and clear question framing

### **Example 3: Mixed Format on Algorithms and Data Structures**

**ChatGPT Output:**

**MCQs:**

1. What is the time complexity of binary search on a sorted array?  
    A. O(n)  
    B. O(n log n)  
    C. O(log n)  
    D. O(1)  
    **Answer:** C
2. Which data structure uses LIFO (Last In First Out) principle?  
    A. Queue  
    B. Stack  
    C. Array  
    D. Tree  
    **Answer:** B

**True/False:**

* A queue follows the FIFO (First In First Out) principle.  
   **Answer:** True

**Short Answer:**

* What is the main difference between a linked list and an array?

**ChatGPT Answer:** A linked list consists of nodes that are connected by pointers and can easily grow or shrink in size, while an array has a fixed size and allows fast access via indexing.

**Evaluation:**

* Accuracy: High
* Concepts well explained
* Balanced question types and appropriate difficulty

## **Summary Table: Prompt & Output Evaluation**

| **Prompt Type** | **Format** | **Coverage** | **Accuracy** | **Clarity** | **Overall Quality** |
| --- | --- | --- | --- | --- | --- |
| Topic-based MCQs | 5 MCQs | Excellent | High | High | Very Good |
| Text-based quiz | 3 MCQs, 2 T/F | Comprehensive | High | High | Very Good |
| Mixed quiz (topic) | MCQ, T/F, SA | Well-balanced | High | High | Excellent |

## **Conclusion**

ChatGPT performs reliably and effectively for educational quiz generation in AI and computer science when prompts are:

* Specific about format (MCQ, T/F, SA)
* Clear on the topic or source content
* Structured to match the desired output style

This makes ChatGPT a practical assistant for:

* Computer science teachers preparing assessments
* Trainers designing technical quizzes
* Students reviewing concepts interactively