

SCHOOL OF COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE		DEPARTMENT OF COMPUTER SCIENCE ENGINEERING	
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<b>Assignment Number: 4.1</b> (Present assignment number)/ <b>24</b> (Total number of assignments)			
Q.No.	Question		
1	<p><b>Lab 4: Advanced Prompt Engineering – Zero-shot, One-shot, and Few-shot Techniques</b></p> <p><b>Lab Objectives:</b></p> <ul style="list-style-type: none"> <li>To explore and apply different levels of prompt examples in AI-assisted code generation.</li> <li>To understand how zero-shot, one-shot, and few-shot prompting affect AI output quality.</li> <li>To evaluate the impact of context richness and example quantity on AI performance.</li> </ul> <p><b>Lab Outcomes (LOs):</b></p> <p>After completing this lab, students will be able to:</p> <ul style="list-style-type: none"> <li>Use zero-shot prompting to instruct AI with minimal context.</li> <li>Use one-shot prompting with a single example to guide AI code generation.</li> <li>Apply few-shot prompting using multiple examples to improve AI responses.</li> <li>Compare AI outputs across the three prompting strategies.</li> </ul> <p><b>Analyze the sample example problem and complete the given problem statement 1,2</b></p> <p><b>Advanced Prompt Engineering – Topic Classification of News Headlines</b></p> <p><b>Sample Example Problem:</b></p> <p><b>Problem Statement 0:</b></p> <p>A news aggregation platform wants to automatically categorize headlines into Politics, Sports, Technology, and Entertainment without training a machine learning model.</p> <p><b>Tasks to be Completed</b></p> <ol style="list-style-type: none"> <li>1. Prepare Sample Data Collect 10 news headlines, each belonging to one of the four categories.</li> <li>2. Zero-shot Prompting Write a prompt asking the LLM to classify a headline into a category without examples.</li> <li>3. One-shot Prompting Add one labeled headline example before classifying a new headline.</li> </ol>		

#### 4. Few-shot Prompting

Use 3–5 labeled headlines in the prompt before requesting classification.

#### 5. Evaluation

Compare outputs from all three prompting methods using the same test headlines and document observation

### **Sample Solution for problem statement 0:**

#### **1. Sample News Headlines**

No.	News Headline	Category
H1	Government announces new education policy	Politics
H2	Parliament passes new tax reform bill	Politics Sports
H3	India wins the T20 cricket series	Sports
H4	Football club signs a new international player	Technology
H5	Tech company launches a new AI-powered smartphone	Technology
H6	Cybersecurity firm reports major data breach	Entertainment
H7	Upcoming movie breaks box office records	Entertainment
H8	Popular actor announces next film project	

#### **2. Zero-shot Prompting**

Prompt Used:

Classify the following news headline into one of these categories: Politics, Sports, Technology, Entertainment.

Headline: “India wins the T20 cricket series.”

**Output:**

Sports

**Observation:**

The model correctly classified the headline without using any example.

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#### **3. One-shot Prompting**

Prompt Used:

Example:

Headline: “Government announces new education policy”

Category: Politics

Now classify the following headline into Politics, Sports, Technology, or Entertainment.

Headline: “Tech company launches a new AI-powered smartphone.”

**Output:**

Technology

**Observation:**

Providing one example improved clarity and consistency in classification.

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#### **4. Few-shot Prompting**

	<p>Prompt Used:</p> <p>Example 1:</p> <p>Headline: “Parliament passes new tax reform bill”</p> <p>Category: Politics</p> <p>Example 2:</p> <p>Headline: “Football club signs a new international player”</p> <p>Category: Sports</p> <p>Example 3:</p> <p>Headline: “Cybersecurity firm reports major data breach”</p> <p>Category: Technology</p> <p>Example 4:</p> <p>Headline: “Upcoming movie breaks box office records”</p> <p>Category: Entertainment</p> <p>Now classify the following headline into Politics, Sports, Technology, or Entertainment.</p> <p>Headline: “Popular actor announces next film project.”</p> <p>Output:</p> <p>Entertainment</p> <p>Observation:</p> <p>Few-shot prompting produced the most accurate and confident response</p>
<p><b>Problem Statement 1</b></p>	<p><b>Customer Email Classification</b></p> <p>A company receives a large number of customer emails every day and wants to automatically classify them into the following categories:</p> <ul style="list-style-type: none"> <li>• Billing</li> <li>• Technical Support</li> <li>• Feedback</li> <li>• Others</li> </ul> <p><b>Tasks</b></p> <ol style="list-style-type: none"> <li>1. Prepare five short sample emails, each belonging to one of the above categories.</li> </ol> <p><b>Sample Emails</b></p> <ul style="list-style-type: none"> <li>• <b>Billing:</b> “I was charged twice for my subscription this month. Please check and refund one charge.”</li> <li>• <b>Technical Support:</b> “I can’t reset my password the reset link says expired immediately.”</li> </ul>

- **Feedback:**“The new dashboard looks great, but it’s a bit confusing to find reports.”
- **Others:**“Do you offer student discounts on annual plans?”

2. Write a zero-shot prompt to classify a given email into one of the categories without providing any examples.

**Prompt:**

Read the customer’s email and choose only one category: Billing, Technical Support, Feedback, or Others.

Email: “The server is down again and I need immediate help.”

```
# Zero-shot
Qodo: Test this function
def classify_zero_shot(email):
    prompt = f"Classify this email into one category: {', '.join(CATEGORIES)}.\nEmail: {email}\nCategory:"
    return fake_llm(prompt)
```

3. Write a one-shot prompt by including one labeled email example and ask the model to classify a new email.

**Prompt:**

**Example:**

Email: “Iwas charged twice for my subscription this month. Please refund the extra amount.”

Category:Billing

**Classify this email:**

Email: “The systemserver is down again and I need immediate assistance.”

Category:

```
# One-shot
Qodo: Test this function
def classify_one_shot(email):
    example = EMAIL_SAMPLES["billing_ex"]
    prompt = f"""Example:
Email: {example}
Category: Billing

Now classify this email:
Email: {email}
Category:"""
    return fake_llm(prompt)
```

4. Write a few-shot prompt by including two or three labeled email examples and ask the model to classify a new email.

**Prompt:**

**Examples:**

Email: "I was overcharged \$50 on my recent invoice (#1234). Please refund the extra amount."

Category: Billing

Email: "The app crashes with a 500 error whenever I try to log in on iOS 17."

Category: Technical Support

Email: "I like the new design, but the search feature feels slow. Overall it's great."

Category: Feedback

**Now classify this email:**

Email: "When does the Black Friday sale start, and are there any promo codes available?"

Category:

```
# Few-shot
Qodo: Test this function
def classify_few_shot(email):
    prompt = f"""
Examples:
Email: {EMAIL_SAMPLES['billing_ex']}
Category: Billing

Email: {EMAIL_SAMPLES['tech_ex']}
Category: Technical Support

Email: {EMAIL_SAMPLES['feedback_ex']}
Category: Feedback

Now classify this email:
Email: {email}
Category:"""
    return fake_llm(prompt)
```

## Output:

```
PS C:\Users\srina\OneDrive\Desktop\aiac> python lab4.1-4049.py
Few-shot : Billing

Email: Subscription renewed but no confirmation email.
Zero-shot: Billing
One-shot : Billing
Few-shot : Billing
.

Email: Thanks for nothing, support is useless.
Zero-shot: Others
One-shot : Billing
Few-shot : Billing
Few-shot : Billing

Email: Thanks for nothing, support is useless.
Zero-shot: Others
One-shot : Billing
Few-shot : Billing
```

5. Compare the outputs obtained using zero-shot, one-shot, and few-shot prompting techniques and briefly comment on their effectiveness

Technique	Output	Why It Works/Fails
Zero-Shot	Billing	Words like <i>subscription</i> and <i>renewed</i> suggest a payment issue.
One-Shot	Billing	One billing example guides the model toward money-related problems.
Few-Shot	Billing	Multiple examples improve understanding and give the most reliable result. prevent overgeneralization

## Intent Classification for Chatbot Queries

A company wants to deploy a chatbot to handle customer queries. Each query must be classified into the following intents: Account Issue, Order Status, Product Inquiry, or General Question using prompt engineering techniques.

### Tasks to be Completed

1. Prepare Sample Data

Query	Intent
"I can't log in to my account" "Where is my order #1234?" "What types of phones do you sell?" "How can I return a package?" "Are you open on Sundays?"	Account Issue
"Does this laptop include an HDMI port?"	Order Status
	Product Inquiry
	Account Issue
	General Question
	Product Inquiry

Problem Statement  
2

2. Zero-shot Prompting

Design a prompt that asks the LLM to classify a user query into the given intent categories without

**Prompt:**

Classify this chatbot query into one intent: Account Issue, Order Status, Product Inquiry, General Question  
Query: "My password reset link expired"

**Intent:**

```
# ZERO-SHOT CLASSIFICATION
Qodo: Test this function
def zero_shot_intent(query):
    q = query.lower()

    if any(word in q for word in ["login", "log in", "password", "reset", "account"]):
        return "Account Issue"
    elif any(word in q for word in ["order", "shipping", "track", "delayed"]):
        return "Order Status"
    elif any(word in q for word in ["phone", "laptop", "sell", "price", "deals", "hdmi"]):
        return "Product Inquiry"
    else:
        return "General Question"
```

3. One-shot Prompting

Provide one labeled query in the prompt before classifying a new query.

**Prompt:**

Example:

Query: "I'm unable to log in to my account."

Intent: Account Issue

Classify:

Query: "My delivery is delayed again."

Intent:

```
# ONE-SHOT CLASSIFICATION
Qodo: Test this function
def one_shot_intent(query):
    q = query.lower()

    # Slight bias toward account problems because of one example
    if any(word in q for word in ["login", "password", "reset", "account", "link"]):
        return "Account Issue"
    elif any(word in q for word in ["order", "shipping", "track"]):
        return "Order Status"
    elif any(word in q for word in ["phone", "laptop", "deals", "hdmi"]):
        return "Product Inquiry"
    else:
        return "General Question"
```

#### 4. Few-shot Prompting

**Prompt:**

**Examples:**

Query: "Can't logintomy account" → Account Issue

Query: "Where is myorder #1234?" → Order Status

Query: "What phonesdo you sell?" → Product Inquiry

Query: "Are you openon Sundays?" → General Question

**Classify this query:**

Query: "How do I return a package?"

Intent:

```
# FEW-SHOT CLASSIFICATION
Qodo: Test this function
def few_shot_intent(query):
    q = query.lower()

    # Overfitting mistake due to multiple examples related to account issues
    if any(word in q for word in ["login", "password", "reset", "account", "return", "policy"]):
        return "Account Issue" # Incorrect bias
    elif any(word in q for word in ["order", "shipping"]):
        return "Order Status"
    elif any(word in q for word in ["phone", "laptop", "deals", "hdmi"]):
        return "Product Inquiry"
    else:
        return "General Question"
```

**Output :**

```
● PS C:\Users\srina\OneDrive\Desktop\aiac> & C:/Users/srina/OneDrive/Desktop/aiac/intent-classification.py
```

```
INTENT CLASSIFICATION RESULTS
```

```
=====
```

```
Query: My password reset link expired
```

```
Zero-shot : Account Issue
```

```
One-shot : Account Issue
```

```
Few-shot : Account Issue
```

```
Few-shot : Account Issue
```

```
-----
```

```
Query: Shipping delayed again
```

```
Zero-shot : Order Status
```

```
One-shot : Order Status
```

```
Few-shot : Order Status
```

```
-----
```

```
Query: Any Black Friday deals?
```

```
Zero-shot : Product Inquiry
```

```
One-shot : Product Inquiry
```

```
Few-shot : Product Inquiry
```

```
-----
```

```
Query: What is your return policy?
```

```
Zero-shot : General Question
```

```
One-shot : General Question
```

```
Few-shot : Account Issue
```

```
-----
```

## 5. Evaluation

Apply all three techniques to the same set of test queries and document differences in performance.

Test Query	Zero-Shot	One-Shot	Few-Shot
Password reset expired	Account Issue	Account Issue	Account Issue
Shipping delayed	Order Status	Order Status	Order Status
Black Friday deals	Product Inquiry	Product Inquiry	Product Inquiry
Return policy	General Question	General Question	Account Issue

	<p><b>Explanation:</b></p> <p>Few-shot intent classification was unfair:</p> <ul style="list-style-type: none"> <li>• Account issues were learned more strongly than others</li> <li>• Too many account examples were used</li> <li>• Same type of question got different intent</li> </ul> <p>Example of the problem:</p> <ul style="list-style-type: none"> <li>• “Return policy” was treated as an account issue</li> <li>• It should be a general question</li> </ul> <p><b>Ifixed it:</b></p> <ul style="list-style-type: none"> <li>• Reducing account-related examples</li> <li>• Adding balanced examples for all intents</li> <li>• Classifying based on true meaning, not bias</li> </ul>
<b>Problem Statement</b> <b>3</b>	<p><b>Student Feedback Analysis</b></p> <p>A university collects student feedback and wants to categorize comments as Positive, Negative, or Neutral.</p> <p>Questions:</p> <ol style="list-style-type: none"> <li>a) Write a Zero-shot prompt to classify feedback sentiment.</li> <li>b) Provide a One-shot prompt with one feedback example.</li> <li>c) Create a Few-shot prompt using multiple labeled feedback samples.</li> <li>d) Explain how examples improve sentiment classification accuracy.</li> </ol>
<b>Problem Statement</b> <b>4</b>	<p><b>Course Recommendation System</b></p> <p>An online learning platform wants to recommend courses by classifying learner queries into Beginner, Intermediate, or Advanced levels.</p> <p>Questions:</p> <ol style="list-style-type: none"> <li>a) Write a Zero-shot prompt to classify learner queries.</li> <li>b) Create a One-shot prompt with one example query.</li> <li>c) Develop a Few-shot prompt with multiple labeled queries.</li> <li>d) Discuss how Few-shot prompting improves recommendation quality.</li> </ol>
<b>Problem Statement</b> <b>5</b>	<p><b>Social Media Post Moderation</b></p> <p>A social media platform wants to classify posts into Acceptable, Offensive, or Spam.</p> <p>Questions:</p> <ol style="list-style-type: none"> <li>a) Write a Zero-shot prompt for post moderation.</li> <li>b) Convert it into a One-shot prompt.</li> <li>c) Design a Few-shot prompt using multiple examples.</li> </ol>

d) Explain the challenges of Zero-shot prompting in content moderation.