

**Course Title : AI Assisted Coding**

**Name : Amma Anjali**

**Batch : 33**

**Hall No : 2303a52385**

## **Lab 4: Advanced Prompt Engineering – Zero-shot, One-shot, and Few-shot Techniques**

### **Task Description-1**

- Zero-shot: Prompt AI with only the instruction. Write a Python function to determine**

**whether a given number is prime**

### **Expected Output-1**

- A basic Python function to check if a number is prime, demonstrating correct logical**

**conditions without relying on examples or additional context**

The screenshot shows a Jupyter Notebook interface with the following details:

- File Name:** Untitled36.ipynb
- Cells:** [2] (cell 1 is collapsed, cell 2 is expanded)
- Code Cell Content:**

```
def is_prime(number):
    """
    Checks if a given number is a prime number.

    Args:
        number (int): The number to check.

    Returns:
        bool: True if the number is prime, False otherwise.
    """
    if number <= 1:
        return False
    # Check for divisibility from 2 up to the square root of the number
    # Any factor larger than the square root would have a corresponding
    # factor smaller than the square root, which we would have already found.
    for i in range(2, int(number**0.5) + 1):
        if number % i == 0:
            return False
    return True

# Example usage:
print("Is 7 prime? ", is_prime(7))
print("Is 10 prime? ", is_prime(10))
print("Is 2 prime? ", is_prime(2))
print("Is 1 prime? ", is_prime(1))
print("Is 0 prime? ", is_prime(0))
print("Is 17 prime? ", is_prime(17))
```
- Output Cell Content:**

```
... Is 7 prime? True
Is 10 prime? False
Is 2 prime? True
Is 1 prime? False
Is 0 prime? False
Is 17 prime? True
```

## Task Description-2

- **One-shot:** Provide one example: Input: [1, 2, 3, 4], Output: 10 to help AI generate a function that calculates the sum of elements in a list.

## Expected Output-2

- A correct conversion function guided by the single example.

The screenshot shows a code editor interface with a toolbar at the top. The main area displays a Python script named `sum_list_elements.py`. The script defines a function `sum_list_elements` that takes a list of numbers and returns their sum. It includes docstrings for both the function and its parameters. Example usage is shown at the bottom, demonstrating the function with two lists: [1, 2, 3, 4] and [10, 20, 3.5, -5]. The output shows the expected results: 10 and 28.5 respectively.

```
File Edit View Insert Runtime Tools Help
Commands + Code + Text | Run all

Task Description – 2: One-shot Prompting Prompt Used (One-shot)
Example: Input: [1, 2, 3, 4] Output: 10
Write a Python function that calculates the sum of elements in a list.

[5] ✓ 0s
def sum_list_elements(input_list):
    """
    Calculates the sum of all numeric elements in a given list.

    Args:
        input_list (list): The list of numbers to sum.

    Returns:
        int or float: The sum of the elements in the list.
    """
    total = 0
    for item in input_list:
        total += item
    return total

# Example usage:
my_list = [1, 2, 3, 4]
print(f"Input: {my_list}")
print(f"Output: {sum_list_elements(my_list)}")

another_list = [10, 20, 3.5, -5]
print(f"Input: {another_list}")
print(f"Output: {sum_list_elements(another_list)}")
...
Input: [1, 2, 3, 4]
Output: 10
Input: [10, 20, 3.5, -5]
Output: 28.5
```

## Task Description-3

- **Few-shot:** Give 2–3 examples to create a function that extracts digits from an alphanumeric string.

## Expected Output-3

- Accurate function that returns only the digits from alphanumeric string.

The screenshot shows a code editor interface with a toolbar at the top. Below the toolbar, there's a search bar labeled 'Commands' and a dropdown menu 'Code'. A sidebar on the left contains icons for file operations like copy, paste, and refresh, along with a tree view of files and a status bar showing '[11] 0s'.

**Task Description – 3: Few-shot Prompting**

**Prompt Used (Few-shot)**

Examples: Input: "a1b2c3" → Output: "123" Input: "x9y8" → Output: "98" Input: "abc123" → Output: "123"

Write a function to extract digits from an alphanumeric string.

```
[11] 0s
def extract_digits(input_string):
    """
    Extracts all digits from an alphanumeric string.

    Args:
        input_string (str): The alphanumeric string to process.

    Returns:
        str: A string containing only the digits found in the input string.
    """
    digits = ""
    for char in input_string:
        if char.isdigit():
            digits += char
    return digits

# Example usage:
print(f'Input: "a1b2c3" → Output: "{extract_digits("a1b2c3")}"')
print(f'Input: "x9y8" → Output: "{extract_digits("x9y8")}"')
print(f'Input: "abc123" → Output: "{extract_digits("abc123")}"')
print(f'Input: "NoDigitsHere" → Output: "{extract_digits("NoDigitsHere")}"')
print(f'Input: "12345" → Output: "{extract_digits("12345")}"')
print(f'Input: "" → Output: "{extract_digits("")}"')

... Input: "a1b2c3" → Output: "123"
Input: "x9y8" → Output: "98"
Input: "abc123" → Output: "123"
Input: "NoDigitsHere" → Output: ""
Input: "12345" → Output: "12345"
Input: "" → Output: ""
```

## Task Description-4

- Compare zero-shot vs few-shot prompting for generating a function that counts the number of vowels in a string.

## Expected Output-4

- Output comparison + student explanation on how examples helped the model.

Zero-shot Prompting for Vowel Counting

When given only the instruction "Write a Python function to count the number of vowels in a string" (a zero-shot prompt, meaning no examples were provided), the model generated the following function (as seen in cell [33a537c9]):

```
def count_vowels(input_string):
    vowels = "aeiouAEIOU"
    count = 0
    for char in input_string:
        if char in vowels:
            count += 1
    return count
```

Output from Zero-shot Prompting (from cell [33a537c9]):

```
'Hello World' has 3 vowels.
'Python Programming' has 4 vowels.
'AEIOUaeiou' has 10 vowels.
'rhythm' has 0 vowels.
```

### Few-shot Prompting for Vowel Counting

When presented with the instruction along with specific examples like:

- "hello" → 2
- "AI Model" → 4

(which implicitly led to the generation or reinforcement of the function in cell `ykMiVK79vT09`), the model produced a functionally identical `count_vowels` function. This demonstrates that for a clear and straightforward task like counting vowels, even a zero-shot prompt can yield a correct and robust solution.

```
def count_vowels(s):
    vowels = "aeiouAEIOU"
    count = 0
    for char in s:
        if char in vowels:
            count += 1
    return count
```

Output from Few-shot Prompting (from cell `ykMiVK79vT09`):

```
'Hello World' has 3 vowels.
'Python Programming' has 4 vowels.
'AEIOUaeiou' has 10 vowels.
'rhythm' has 0 vowels.
'aAbBcCdDeE' has 4 vowels.
```

- Comparison and Explanation: How Examples Help (Student-style Explanation)

In this particular case of counting vowels, both the zero-shot and few-shot approaches yielded a correct and very similar Python function. This shows that for simple and unambiguous tasks, a Large Language Model (LLM) can often infer the correct logic from the instruction alone.

## Task Description-5

- **Use few-shot prompting with 3 sample inputs to generate a function that determines**

**the minimum of three numbers without using the built-in min() function.**

## Expected Output-5

- **A function that handles all cases with correct logic based on example patterns.**

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Task Description – 5: Few-shot Prompting (Minimum of Three Numbers)

Prompt Used (Few-shot)

Examples:  $(3, 5, 1) \rightarrow 1$   $(10, 2, 7) \rightarrow 2$   $(4, 4, 9) \rightarrow 4$

Write a function to find the minimum of three numbers without using `min()`.

```
[12] ✓ Os
def find_minimum_of_three(a, b, c):
    """
    Finds the minimum of three numbers without using the built-in min() function.

    Args:
        a (int or float): The first number.
        b (int or float): The second number.
        c (int or float): The third number.

    Returns:
        int or float: The minimum of the three numbers.
    """
    minimum = a
    if b < minimum:
        minimum = b
    if c < minimum:
        minimum = c
    return minimum

# Example usage based on the prompt:
print(f'({3}, {5}, {1}) + {find_minimum_of_three(3, 5, 1)}')
print(f'({10}, {2}, {7}) + {find_minimum_of_three(10, 2, 7)}')
print(f'({4}, {4}, {9}) + {find_minimum_of_three(4, 4, 9)}')

# Additional examples:
print(f'({-1}, {0}, {1}) + {find_minimum_of_three(-1, 0, 1)}')
print(f'({5.5}, {2.1}, {8.0}) + {find_minimum_of_three(5.5, 2.1, 8.0)}')
print(f'({7}, {7}, {7}) + {find_minimum_of_three(7, 7, 7)}')

...
... (3, 5, 1) + 1
(10, 2, 7) + 2
(4, 4, 9) + 4
(-1, 0, 1) + -1
(5.5, 2.1, 8.0) + 2.1
(7, 7, 7) + 7
```