

**Course Title : AI Assisted Coding**

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## **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 a single code cell. The cell contains a Python function named `is_prime`. The code includes a docstring explaining the function checks if a given number is prime, takes an integer argument, and returns a boolean value indicating whether the number is prime or not. It uses a for loop to check divisibility from 2 up to the square root of the number. The cell is followed by a section of code demonstrating its usage with various numbers.

```
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)}")
```

...  
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 and a sidebar on the left. The main area contains the following text:

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] 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 Jupyter Notebook interface with a code cell containing Python code. The code defines a function `extract_digits` that takes a string and returns only its digits. It includes docstrings and example usage with print statements.

```
[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.

The screenshot shows a Jupyter Notebook interface with a code cell containing Python code for vowel counting and its output. The code defines a function `count_vowels` that counts the number of vowels in a string. The output shows the function's behavior on various strings.

```
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 `ykM1VK79vT09`), 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 `ykM1VK79vT09`):

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

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)}')
```

•  $(3, 5, 1) \rightarrow 1$   
 $(10, 2, 7) \rightarrow 2$   
 $(4, 4, 9) \rightarrow 4$   
 $(-1, 0, 1) \rightarrow -1$   
 $(5.5, 2.1, 8.0) \rightarrow 2.1$   
 $(7, 7, 7) \rightarrow 7$