Course Title	AI Assisted Coding

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

Lab Objectives

• To explore and apply different levels of prompt examples in AI-assisted code generation

• To understand how zero-shot, one-shot, and few-shot prompting affect AI output quality

• To evaluate the impact of context richness and example quantity on AI performance

• To build awareness of prompt strategy effectiveness for different problem types

Week2 -

Wednesday

Lab Outcomes (LOs)

After completing this lab, students will be able to:

• Use zero-shot prompting to instruct AI with minimal context

• Use one-shot prompting with a single example to guide AI code generation

• Apply few-shot prompting using multiple examples to improve AI responses

• Compare AI outputs across different prompting strategies

Task 1: Zero-Shot Prompting – Leap Year Check

Scenario

Zero-shot prompting involves giving instructions without providing examples.

Task Description

Use zero-shot prompting to instruct an AI tool to generate a Python function that:

• Accepts a year as input

• Checks whether the given year is a leap year

• Returns an appropriate result

Note: No input-output examples should be provided in the prompt.

Expected Output

• AI-generated leap year checking function

• Correct logical conditions

• Sample input and output

• Screenshot of AI-generated response (if required)

Prompt: Generate a Python Code that accepts a year as input and checks whether the given year is a leap year.

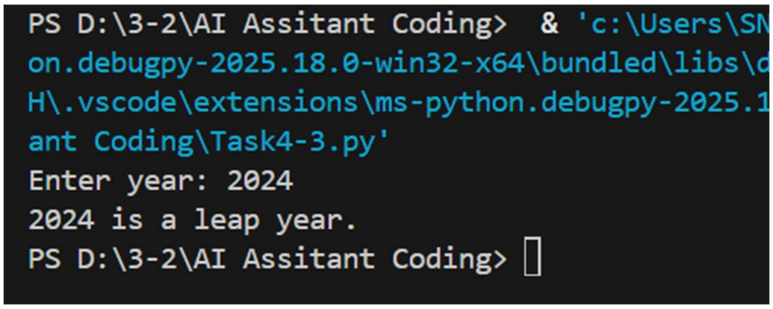
The function should return an appropriate result indicating whether the year is a leap year or not.

Also include a sample input and its corresponding output.

Code:

```
def is_leap_year(year: int) -> bool:
    Leap year rules:
      - divisible by 4
      - except years divisible by 100, unless also divisible by 400
    """
    return (year % 4 == 0) and (year % 100 != 0 or year % 400 == 0)


def check_leap_from_input() -> None:
    """Read a year from stdin and print whether it's a leap year."""
    try:
        year = int(input("Enter year: ").strip())
    except ValueError:
        print("Invalid input. Please enter an integer year.")
        return

    if is_leap_year(year):
        print(f"{year} is a leap year.")
    else:
        print(f"{year} is not a leap year.")


if __name__ == "__main__":
    # Example usage
    # Sample Input: 2000
    # Sample Output: 2000 is a leap year.
    check_leap_from_input()
```

Output:



Task 2: One-Shot Prompting – Centimeters to Inches Conversion

Scenario

One-shot prompting guides AI using a single example.

Task Description

Use one-shot prompting by providing one input-output example to generate a Python function that:

• Converts centimeters to inches

• Uses the correct mathematical formula

Example provided in prompt:

Input: 10 cm → Output: 3.94 inches

Expected Output

• Python function with correct conversion logic

• Accurate calculation

• Sample test cases and outputs

Prompt: Convert centimeters to inches using Python.

Example:

Input: 10 cm

Output: 3.94 inches

Now generate a Python code that:

- Accepts a value in centimeters as input

- Converts it to inches using the correct formula

- Returns the converted value

- Includes a few sample test cases with outputs

Code:

```python
def cm_to_inches(cm: float, ndigits: int = 2) -> float:
    """
    Convert centimeters to inches. Returns the value rounded to ndigits.
    1 inch = 2.54 cm
    """
    return round(cm / 2.54, ndigits)


def parse_cm_input(s: str) -> float:
    """Parse input like '10', '10 cm', or '  10.5 CM ' into a float centimeters value."""
    s = s.strip().lower().replace("cm", "").strip()
    return float(s)


if __name__ == "__main__":
    # Interactive example
    try:
        user = input("Enter length in centimeters (e.g. '10 cm'): ")
        cm_value = parse_cm_input(user)
        inches = cm_to_inches(cm_value)
        print(f"{cm_value} cm = {inches:.2f} inches")
    except Exception as e:
        print("Invalid input. Please enter a numeric value, optionally followed by 'cm'.")

    # Sample test cases with outputs
    print("\nSample conversions:")
    samples = [10, 0, 2.54, 30.48]
    for s in samples:
        print(f"{s} cm -> {cm_to_inches(s):.2f} inches")
```

Output:

```
Enter length in centimeters (e.g. '10 cm'): 25
25.0 cm = 9.84 inches

Sample conversions:
10 cm -> 3.94 inches

Sample conversions:
10 cm -> 3.94 inches
Sample conversions:
10 cm -> 3.94 inches
0 cm -> 0.00 inches
2.54 cm -> 1.00 inches
10 cm -> 3.94 inches
0 cm -> 0.00 inches
2.54 cm -> 1.00 inches
0 cm -> 0.00 inches
2.54 cm -> 1.00 inches
2.54 cm -> 1.00 inches
30.48 cm -> 12.00 inches
PS D:\3-2\AI Assitant Coding>
```

Task 3: Few-Shot Prompting – Name Formatting

Scenario

Few-shot prompting improves accuracy by providing multiple examples.

Task Description

Use few-shot prompting with 2–3 examples to generate a Python function that:

• Accepts a full name as input

• Formats it as “Last, First”

Example formats:

• "John Smith" → "Smith, John"

• "Anita Rao" → "Rao, Anita"

Expected Output

• Well-structured Python function

• Output strictly following example patterns

• Correct handling of names

• Sample inputs and outputs

Prompt: Format a person's full name into the format "Last, First" using Python.

Examples:

Input: John Smith

Output: Smith, John

Input: Anita Rao

Output: Rao, Anita

Input: Rahul Verma

Output: Verma, Rahul

Now generate a Python Code that:

- Accepts a full name as input

- Formats the name as "Last, First"

- Returns the formatted name

- Includes sample inputs and outputs

Code:

```python
def format_name(full_name: str) -> str:
    """
    Format a full name into "Last, First".
    - Uses the first token as First and the last token as Last.
    - Returns empty string for empty input, single name returned as-is.
    """
    parts = full_name.strip().split()
    if not parts:
        return ""
    if len(parts) == 1:
        return parts[0]
    return f"{parts[-1]}, {parts[0]}"
if __name__ == "__main__":
    # Interactive usage
    name = input("Enter full name: ")
    print(format_name(name))

    # Sample inputs and outputs
    samples = ["John Smith", "Anita Rao", "Rahul Verma", "Madonna", "  Alice   Bob   Carol  "]
    print("\nSamples:")
    for s in samples:
        print(f"Input: {s!r} -> Output: {format_name(s)}")
```

Output:

```
Enter full name: Gunda Snehith
Snehith, Gunda

Samples:
Input: 'John Smith' -> Output: Smith, John
Input: 'Anita Rao' -> Output: Rao, Anita
Input: 'Rahul Verma' -> Output: Verma, Rahul
Input: 'Madonna' -> Output: Madonna
Samples:
Input: 'John Smith' -> Output: Smith, John
Input: 'Anita Rao' -> Output: Rao, Anita
Input: 'Rahul Verma' -> Output: Verma, Rahul
Input: 'Madonna' -> Output: Madonna
Input: 'Rahul Verma' -> Output: Verma, Rahul
Input: 'Madonna' -> Output: Madonna
Input: '  Alice   Bob   Carol  ' -> Output: Carol, Alice
PS D:\3-2\AI Assitant Coding>
```

Task 4: Comparative Analysis – Zero-Shot vs Few-Shot

Scenario

Different prompt strategies may produce different code quality.

Task Description

• Use zero-shot prompting to generate a function that counts vowels in a string

• Use few-shot prompting for the same problem

• Compare both outputs based on:

o Accuracy

o Readability

o Logical clarity

Expected Output

• Two vowel-counting functions

• Comparison table or short reflection paragraph

• Conclusion on prompt effectiveness

Prompt:

1.Zero Shot: Generate a Python Code that accepts a string as input and counts the number of vowels in the string.

The function should return the total vowel count.

Also include a sample input and output.

Code:

```python
def count_vowels(s: str) -> int:
    """Return the number of vowels (a, e, i, o, u) in the given string (case-insensitive)."""
    vowels = set("aeiouAEIOU")
    return sum(1 for ch in s if ch in vowels)


if __name__ == "__main__":
    # Interactive usage
    user_input = input("Enter a string: ")
    total = count_vowels(user_input)
    print(f"Vowel count: {total}")

    # Sample input/output
    # Sample Input: Hello World
    # Sample Output: Vowel count: 3

    # Additional sample runs
    samples = ["Hello World", "AEIOU", "bcdfg", "The quick brown fox"]
    for s in samples:
        print(f"Input: {s!r} -> Vowel count: {count_vowels(s)}")
```

Output:

```
Enter a string: SnehithGunda
Vowel count: 4
Input: 'Hello World' -> Vowel count: 3
Input: 'AEIOU' -> Vowel count: 5
Input: 'bcdfg' -> Vowel count: 0
y'
Enter a string: SnehithGunda
Vowel count: 4
Input: 'Hello World' -> Vowel count: 3
Input: 'AEIOU' -> Vowel count: 5
Input: 'bcdfg' -> Vowel count: 0
Input: 'Hello World' -> Vowel count: 3
Input: 'AEIOU' -> Vowel count: 5
Input: 'bcdfg' -> Vowel count: 0
Input: 'bcdfg' -> Vowel count: 0
Input: 'The quick brown fox' -> Vowel count: 5
PS D:\3-2\AI Assitant Coding>
```

2. Few Shot: Count the number of vowels in a string using Python.

Examples:

Input: "hello"

Output: 2

Input: "Education"

Output: 5

Input: "sky"

Output: 0

Now generate a Python Code that:

- Accepts a string as input

- Counts the number of vowels in the string

- Returns the total count

- Includes sample inputs and outputs

Code:

```python
import re
def count_vowels(text: str) -> int:
    """Return the number of vowels (a, e, i, o, u) in text (case-insensitive)."""
    return len(re.findall(r"[aeiouAEIOU]", text))

if __name__ == "__main__":
    # Read a string from stdin and print the vowel count
    s = input("Input: ")
    print("Output:", count_vowels(s))

    # Sample inputs and outputs
    samples = ["hello", "Education", "sky"]
    print("\nSamples:")
    for sample in samples:
        print(f"Input: {sample!r} -> Output: {count_vowels(sample)}")
```

Output:

```
Input: Snehithgunda
Output: 4

Samples:
Input: 'hello' -> Output: 2
Input: 'Education' -> Output: 5
Input: 'sky' -> Output: 0
PS D:\3-2\AI Assitant Coding>
```

Comparative Analysis: Compare the zero-shot and few-shot vowel counting functions based on accuracy, readability, and logical clarity.

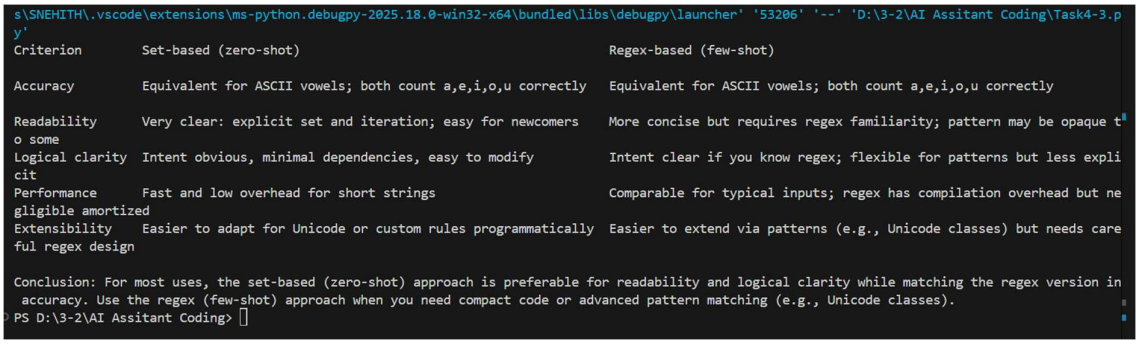
Present the comparison in a table or a short reflection paragraph.

Conclude which prompting technique is more effective and why.

Code:

```python
# Comparison of two vowel-counting implementations (set-based vs regex-based)
rows = [
    ("Criterion", "Set-based (zero-shot)", "Regex-based (few-shot)"),
    ("Accuracy", "Equivalent for ASCII vowels; both count a,e,i,o,u correctly", "Equivalent for ASCII vowels; both count a,e,i,o,u correctl
    ("Readability", "Very clear: explicit set and iteration; easy for newcomers", "More concise but requires regex familiarity; pattern may
    ("Logical clarity", "Intent obvious, minimal dependencies, easy to modify", "Intent clear if you know regex; flexible for patterns but
    ("Performance", "Fast and low overhead for short strings", "Comparable for typical inputs; regex has compilation overhead but negligibl
    ("Extensibility", "Easier to adapt for Unicode or custom rules programmatically", "Easier to extend via patterns (e.g., Unicode classes
]

# Print table
col_widths = [max(len(str(r[i])) for r in rows) + 2 for i in range(3)]
for r in rows:
    print(r[0].ljust(col_widths[0]) + r[1].ljust(col_widths[1]) + r[2].ljust(col_widths[2]))

# Conclusion
print("\nConclusion: For most uses, the set-based (zero-shot) approach is preferable for readability and logical clarity while matching the
```

Output:



Task 5: Few-Shot Prompting – File Handling

Scenario

File processing requires clear logical understanding.

Task Description

Use few-shot prompting to generate a Python function that:

• Reads a .txt file

• Counts the number of lines in the file

• Returns the line count

Expected Output

• Working Python file-processing function

• Correct line count

• Sample .txt input and output

• AI-assisted logic explanation

Prompt: Read a text file and count the number of lines using Python.

Examples:

Example 1:

File content:

Hello

Welcome to Python

File handling is easy

Output:

Number of lines: 3

Example 2:

File content:

AI

Prompt Engineering

Few-shot Learning

Output:

Number of lines: 3

Now generate a Python Code that:

- Reads a .txt file given its filename

- Counts the total number of lines in the file

- Returns the line count

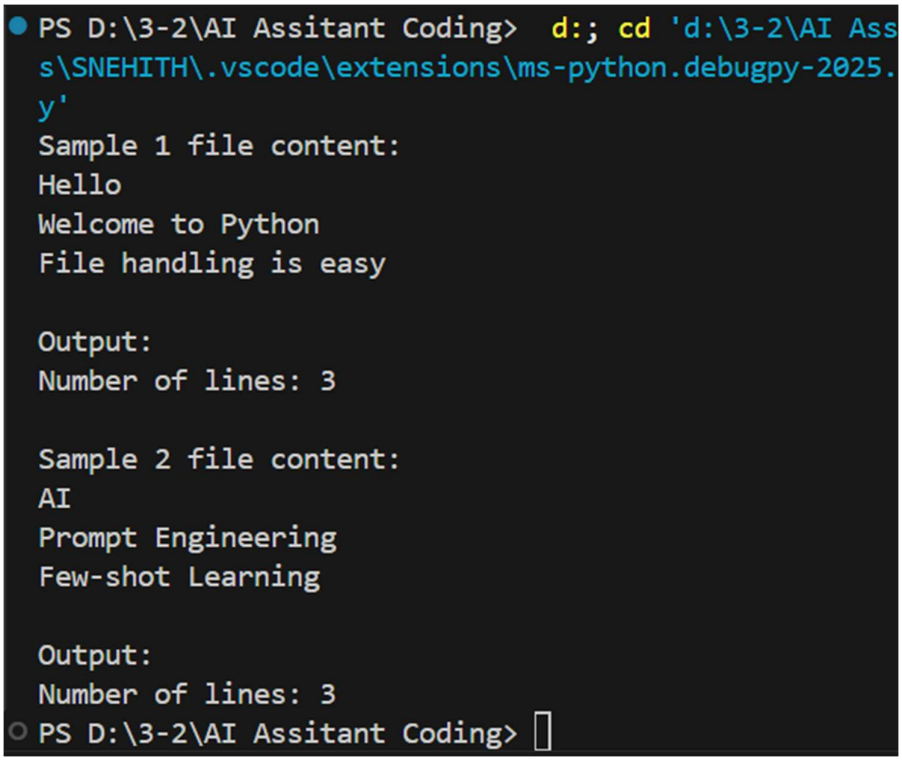
- Includes a sample .txt file input and its output

- Explains the logic used in the function

Code:

```python
def count_lines(filename: str) -> int:
    """
    Return the number of lines in the given text file.

    Logic: open the file and iterate over the file object (which yields one line at a time)
    and sum 1 for each yielded line. This avoids loading the whole file into memory.
    """
    with open(filename, "r", encoding="utf-8") as f:
        return sum(1 for _ in f)
if __name__ == "__main__":
    # Sample file 1 (Example 1)
    sample1 = "sample1.txt"
    with open(sample1, "w", encoding="utf-8") as f:
        f.write("Hello\nWelcome to Python\nFile handling is easy\n")

    # Sample file 2 (Example 2)
    sample2 = "sample2.txt"
    with open(sample2, "w", encoding="utf-8") as f:
        f.write("AI\nPrompt Engineering\nFew-shot Learning\n")

    # Run and print outputs
    print("Sample 1 file content:")
    print("Hello\nWelcome to Python\nFile handling is easy\n")
    print("Output:")
    print(f"Number of lines: {count_lines(sample1)}\n")

    print("Sample 2 file content:")
    print("AI\nPrompt Engineering\nFew-shot Learning\n")
    print("Output:")
    print(f"Number of lines: {count_lines(sample2)}")
```

Output:


PS D:\3-2\AI Assitant Coding> d:; cd 'd:\3-2\AI Ass
s\SNEHITH\.vscode\extensions\ms-python.debugpy-2025.
y'
Sample 1 file content:
Hello
Welcome to Python
File handling is easy
Output:
Number of lines: 3
Sample 2 file content:
AI
Prompt Engineering
Few-shot Learning
Output:
Number of lines: 3
PS D:\3-2\AI Assitant Coding>