AI Assisted Coding (III Year) Assignment

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Lab 10 – Code Review and Quality: Using AI to Improve Code Quality and Readability

Lab Objectives

- Use AI for automated code review and quality enhancement
- Identify and fix syntax, logical, performance, and security issues in Python code
- Improve readability and maintainability through structured refactoring and comments
- Apply prompt engineering for targeted improvements
- Evaluate AI-generated suggestions against **PEP 8 standards** and software engineering best practices

Lab Outcomes

1. Ability to use AI tools to review code
2. Ability to improve code quality and readability
3. Ability to identify and fix common coding issues

Task Description #1 – Variable Naming Issues

Given Code

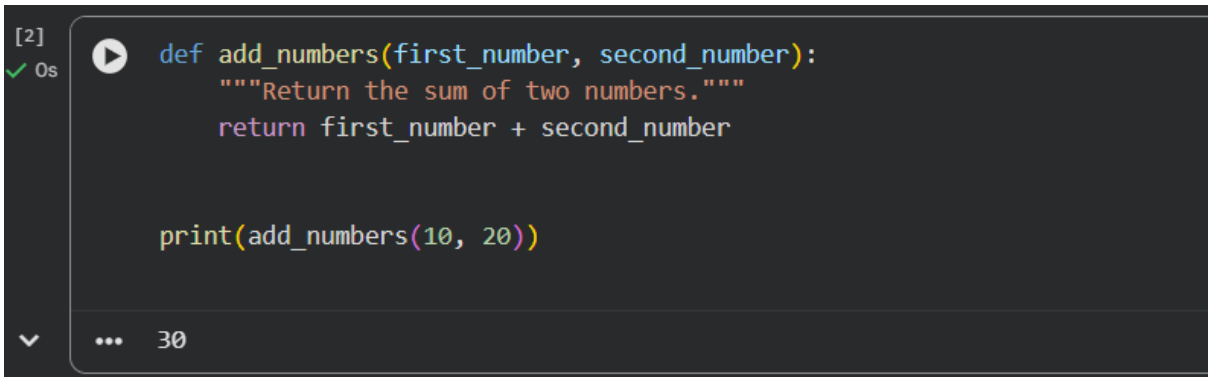
```
def f(a, b):
    return a + b

print(f(10, 20))
```

```
30
```

Issues Identified

- Function name f is unclear
- Variable names a and b lack meaning
- Poor readability

Improved Code:



Improvements

- Meaningful function and variable names
- Added docstring for clarity
- Improved readability and maintainability

Task Description #2 – Missing Error Handling

Given Code

```python
def divide(a, b):
    if b == 0:
        raise ValueError("Cannot divide by zero!")
    return a / b

print(divide(10, 0))
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
/tmp/ipython-input-4071441399.py in <cell line: 0>()
      4     return a / b
      5
----> 6 print(divide(10, 0))

/tmp/ipython-input-4071441399.py in divide(a, b)
      1 def divide(a, b):
      2     if b == 0:
----> 3         raise ValueError("Cannot divide by zero!")
      4     return a / b
      5

ValueError: Cannot divide by zero!
```

Next steps: Explain error

Issues Identified

- No error handling for division by zero
- Program crashes at runtime

Improved Code:

```python
def divide_numbers(numerator, denominator):
    """Divide two numbers safely with error handling."""
    try:
        return numerator / denominator
    except ZeroDivisionError:
        return "Error: Division by zero is not allowed."
    except TypeError:
        return "Error: Please provide numeric values."


print(divide_numbers(10, 0))
```

```
Error: Division by zero is not allowed.
```

Improvements

- Added exception handling
- Clear error messages
- Prevents runtime crashes

Task Description #3 – Student Marks Processing System

Given Code

```
marks=[78,85,90,66,88]
t=0
for i in marks:
    t=t+i
a=t/len(marks)
if a>=90:
    print("A")
elif a>=75:
    print("B")
elif a>=60:
    print("C")
else:
    print("F")
```

```
B
```

Issues Identified

- Poor variable names
- No functions
- No validation
- Not PEP 8 compliant

Refactored Code:

```python
def calculate_grade(marks):
    """
    Calculate total marks, average, and grade.
    Args:
        marks (list): List of student marks
    """
    if not marks:
        print("Error: Marks list cannot be empty.")
        return

    total_marks = sum(marks)
    average_marks = total_marks / len(marks)

    if average_marks >= 90:
        grade = "A"
    elif average_marks >= 75:
        grade = "B"
    elif average_marks >= 60:
        grade = "C"
    else:
        grade = "F"

    print(f"Total Marks: {total_marks}")
    print(f"Average Marks: {average_marks:.2f}")
    print(f"Grade: {grade}")


student_marks = [78, 85, 90, 66, 88]
calculate_grade(student_marks)
```

```
Total Marks: 407
Average Marks: 81.40
Grade: B
```

Improvements

- Follows PEP 8 standards
- Meaningful variable names
- Modular function-based design
- Added documentation and validation

Task Description #4 – Add Docstrings and Inline Comments

Improved Code

```python
def factorial(n):
    """
    Calculate the factorial of a given number.

    Args:
        n (int): A non-negative integer

    Returns:
        int: Factorial of the number
    """
    result = 1

    # Loop from 1 to n and multiply each value
    for i in range(1, n + 1):
        result *= i

    return result
```

Improvements

- Clear docstring explaining purpose, parameters, and return value
- Inline comments for better understanding

Task Description #5 – Password Validation System (Enhanced)

Original Code:

```python
pwd = input("Enter password: ")
if len(pwd) >= 8:
    print("Strong")
else:
    print("Weak")
```

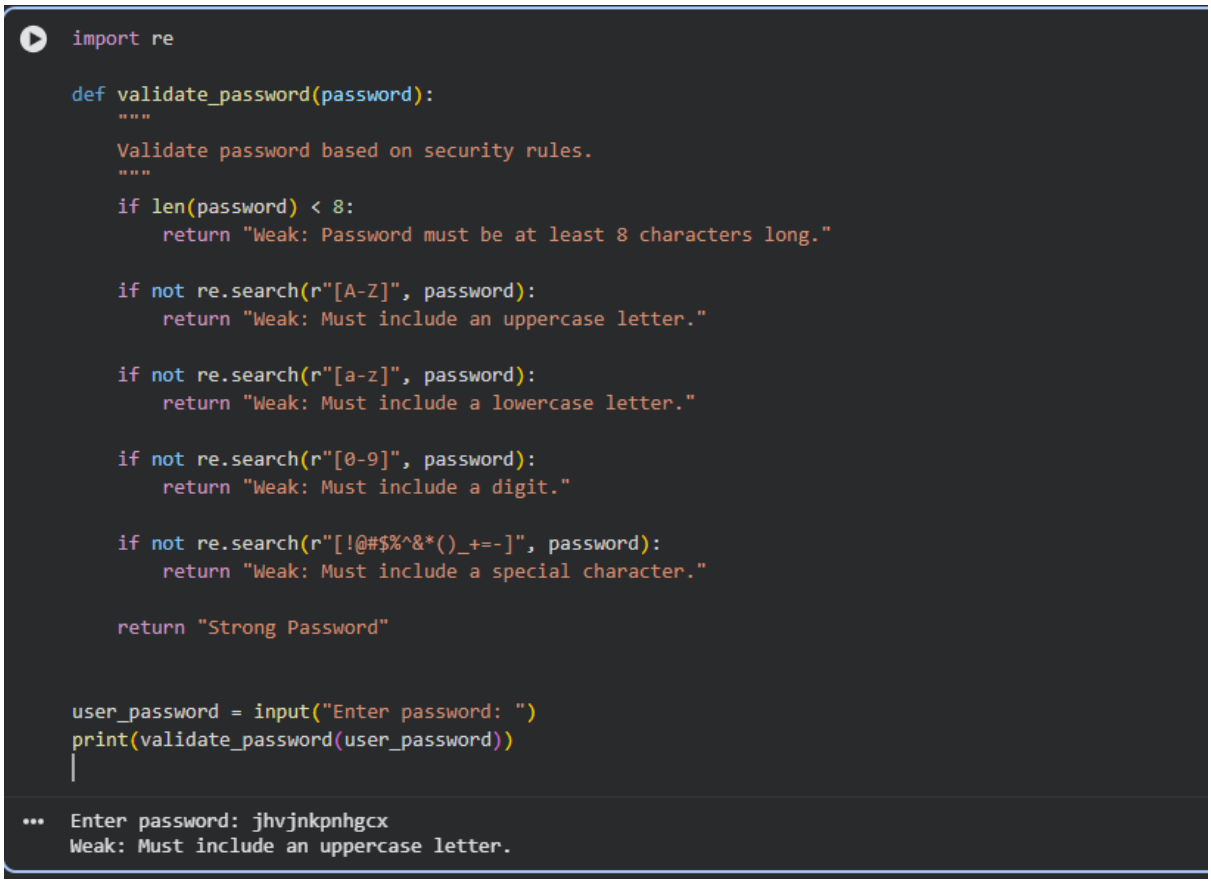
```
Enter password: kjvlknkhv
Strong
```

Limitations

- Checks only password length
- No real security
- Not reusable

- Poor readability

Enhanced Code:



```
import re

def validate_password(password):
    """
    Validate password based on security rules.
    """
    if len(password) < 8:
        return "Weak: Password must be at least 8 characters long."

    if not re.search(r"[A-Z]", password):
        return "Weak: Must include an uppercase letter."

    if not re.search(r"[a-z]", password):
        return "Weak: Must include a lowercase letter."

    if not re.search(r"[0-9]", password):
        return "Weak: Must include a digit."

    if not re.search(r"[!@#$%^&*()_+=-]", password):
        return "Weak: Must include a special character."

    return "Strong Password"


user_password = input("Enter password: ")
print(validate_password(user_password))

Enter password: jhvjnkpnhgcx
Weak: Must include an uppercase letter.
```

Comparison and Analysis

1. Code Readability and Structure

- Clear function-based design
- Meaningful variable names
- Clean and readable logic

2. Maintainability and Reusability

- Password validation logic is reusable
- Easy to modify or extend security rules

3. Security Strength and Robustness

- Enforces industry-standard password rules
- Reduces risk of weak passwords

Justification of AI-Generated Improvements

- Length check ensures baseline security
- Uppercase and lowercase checks prevent predictable passwords
- Digit requirement increases complexity
- Special characters reduce brute-force success
- Refactoring improves clarity, testability, and maintainability

Conclusion

This lab demonstrated how AI-assisted code review can significantly improve:

- Code readability
- Error handling
- Security
- Maintainability
- Compliance with PEP 8 standards

The refactored programs are safer, cleaner, and suitable for real-world applications.