ASSIGNMENT-5.5

Name: K.Sathvik Reddy

Roll Number: 2303A51202

Batch - 04

AI Assisted Coding

30-01-2026

Task Description #1 (Transparency in Algorithm Optimization)

Task: Use AI to generate two solutions for checking prime numbers:

• Naive approach(basic)

• Optimized approach Prompt:

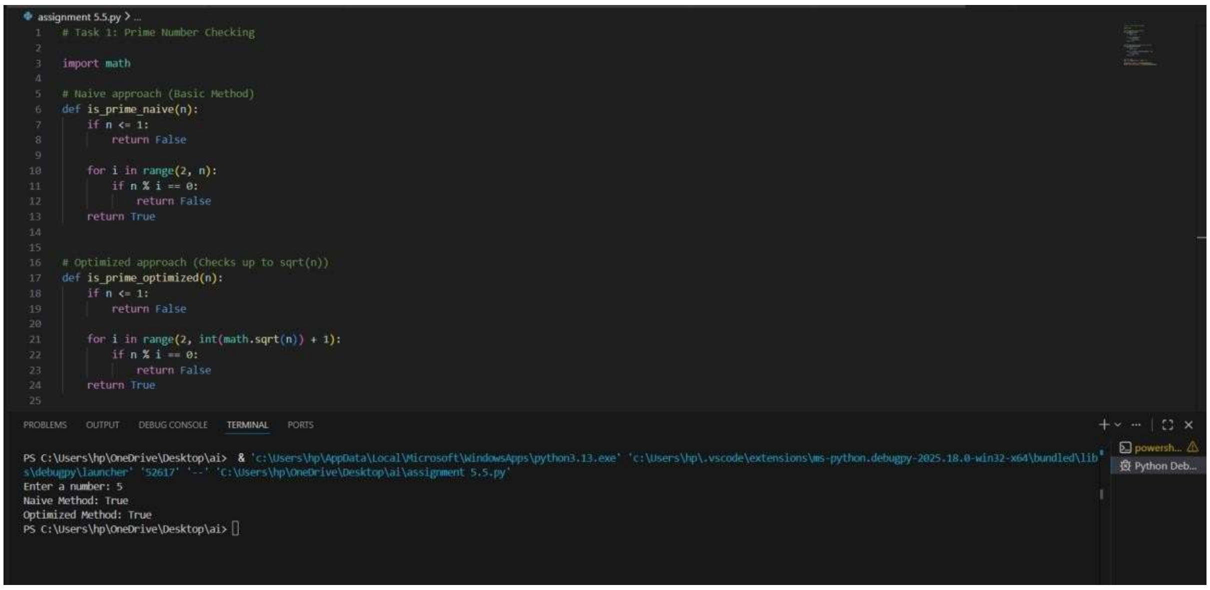
“Generate Python code for two prime-checking methods and explain how the optimized version improves performance.”

Expected Output:

• Code for both methods.

• Transparent explanation of time complexity.

• Comparison highlighting efficiency improvements.



```python
# Task 1: Prime Number Checking

import math

# Naive approach (Basic Method)
def is_prime_naive(n):
    if n <= 1:
        return False

    for i in range(2, n):
        if n % i == 0:
            return False
    return True


# Optimized approach (Checks up to sqrt(n))
def is_prime_optimized(n):
    if n <= 1:
        return False

    for i in range(2, int(math.sqrt(n)) + 1):
        if n % i == 0:
            return False
    return True

```

```
PS C:\Users\hp\OneDrive\Desktop\ai>  & 'c:\Users\hp\AppData\Local\Microsoft\WindowsApps\python3.13.exe' 'c:\Users\hp\.vscode\extensions\ms-python.debugpy-2025.18.0-win32-x64\bundled\lib
s\debugpy\launcher' '52617' '--' 'C:\Users\hp\OneDrive\Desktop\ai\assignment 5.5.py'
Enter a number: 5
Naive Method: True
Optimized Method: True
PS C:\Users\hp\OneDrive\Desktop\ai> 
```

Explanation:

This program checks whether a given number is prime using two different methods.

- **Naive Method:**
  It checks divisibility of the number from `2` to `n-1`.
  If any number divides `n`, it is not prime.
- **Optimized Method:**
  It checks divisibility only up to `√n` because if `n` has a factor greater than `√n`, it must also have a corresponding factor smaller than `√n`.

Time Complexity:

- Naive approach: **O(n)**
- Optimized approach: **O(√n)**

Ethical Transparency:

The optimized method improves performance while clearly explaining why fewer iterations are sufficient, ensuring algorithmic transparency.

Task Description #2 (Transparency in Recursive Algorithms)

Objective: Use AI to generate a recursive function to calculate

Fibonacci numbers.

Instructions:

1. Ask AI to add clear comments explaining recursion.

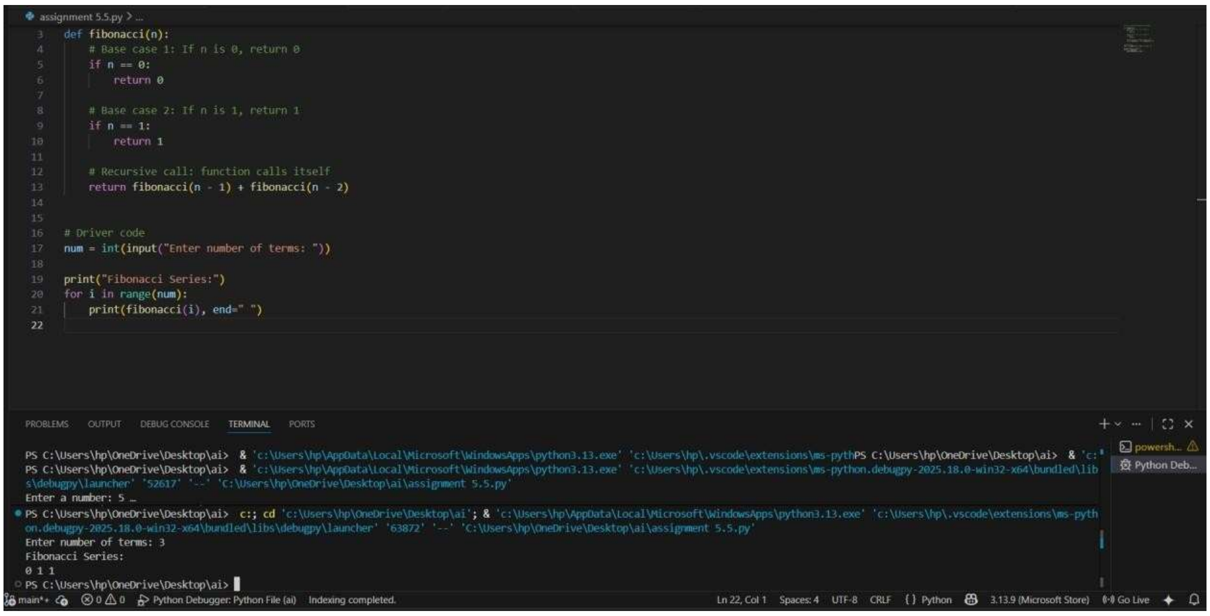
2. Ask AI to explain base cases and recursive calls.

Expected Output:

• Well-commented recursive code.

• Clear explanation of how recursion works.

• Verification that explanation matches actual execution.



```python
def fibonacci(n):
    # Base case 1: If n is 0, return 0
    if n == 0:
        return 0

    # Base case 2: If n is 1, return 1
    if n == 1:
        return 1

    # Recursive call: function calls itself
    return fibonacci(n - 1) + fibonacci(n - 2)


# Driver code
num = int(input("Enter number of terms: "))

print("Fibonacci Series:")
for i in range(num):
    print(fibonacci(i), end=" ")
```

```
PS C:\Users\hp\OneDrive\Desktop\ai>  & 'c:\Users\hp\AppData\Local\Microsoft\WindowsApps\python3.13.exe' 'c:\Users\hp\.vscode\extensions\ms-pythPS C:\Users\hp\OneDrive\Desktop\ai>  & 'c:'
PS C:\Users\hp\OneDrive\Desktop\ai>  & 'c:\Users\hp\AppData\Local\Microsoft\WindowsApps\python3.13.exe' 'c:\Users\hp\.vscode\extensions\ms-python.debugpy-2025.18.0-win32-x64\bundled\lib
s\debugpy\launcher' '52617' '--' 'C:\Users\hp\OneDrive\Desktop\ai\assignment 5.5.py'
Enter a number: 5 …
PS C:\Users\hp\OneDrive\Desktop\ai>  c:; cd 'c:\Users\hp\OneDrive\Desktop\ai'; & 'c:\Users\hp\AppData\Local\Microsoft\WindowsApps\python3.13.exe' 'c:\Users\hp\.vscode\extensions\ms-pyth
on.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '63872' '--' 'C:\Users\hp\OneDrive\Desktop\ai\assignment 5.5.py'
Enter number of terms: 3
Fibonacci Series:
0 1 1
PS C:\Users\hp\OneDrive\Desktop\ai> 
```

```
main*+   ⊗ 0 ⚠ 0   Python Debugger: Python File (ai)   Indexing completed.   Ln 22, Col 1   Spaces: 4   UTF-8   CRLF   {} Python   3.13.9 (Microsoft Store)   Go Live
```

Explanation:

This program calculates Fibonacci numbers using **recursion**, where a function calls itself.

- **Base Case 1:** When `n = 0`, the function returns `0`.
- **Base Case 2:** When `n = 1`, the function returns `1`.
- **Recursive Case:** For all other values, the function calls itself as `fibonacci(n-1) + fibonacci(n-2)`.

The base cases prevent infinite recursion and ensure correct termination.

Ethical Transparency:

Clear comments and explanations help developers understand recursive behavior and avoid logical or performance errors.

Task Description #3 (Transparency in Error Handling)

Task: Use AI to generate a Python program that reads a file and

processes data.

Prompt:

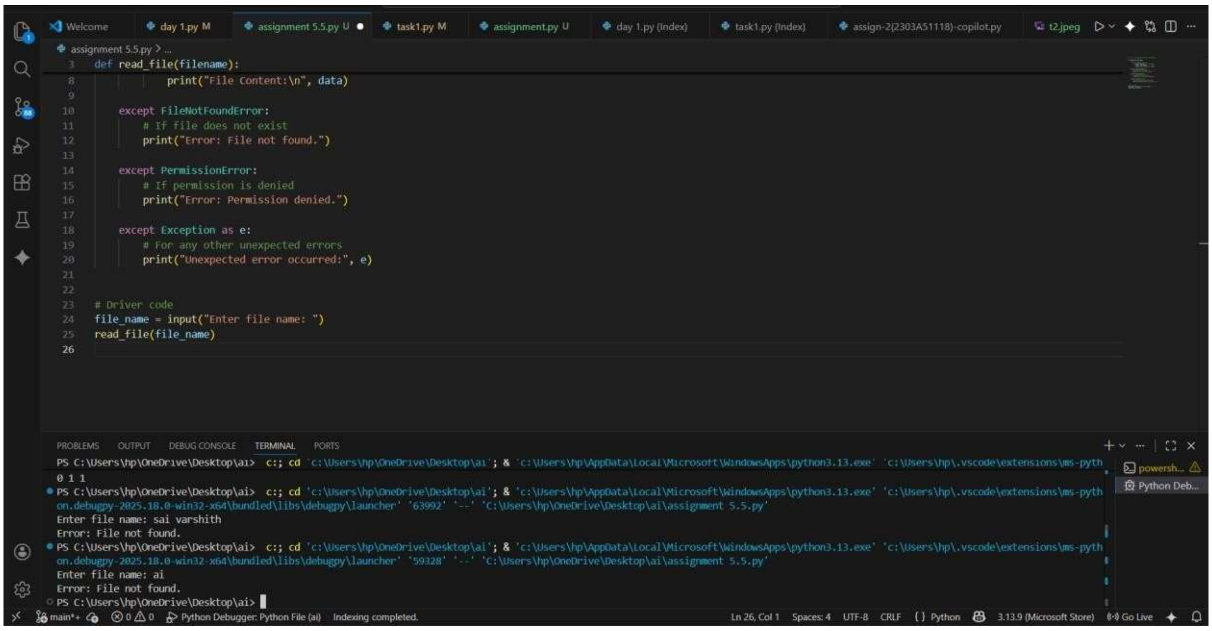
“Generate code with proper error handling and clear explanations

for each exception.” Expected Output:

• Code with meaningful exception handling.

• Clear comments explaining each error scenario.

• Validation that explanations align with runtime behavior.



```python
def read_file(filename):
            print("File Content:\n", data)

    except FileNotFoundError:
        # If file does not exist
        print("Error: File not found.")

    except PermissionError:
        # If permission is denied
        print("Error: Permission denied.")

    except Exception as e:
        # For any other unexpected errors
        print("Unexpected error occurred:", e)


# Driver code
file_name = input("Enter file name: ")
read_file(file_name)
```

```
PS C:\Users\hp\OneDrive\Desktop\ai>  c:; cd 'c:\Users\hp\OneDrive\Desktop\ai'; & 'c:\Users\hp\AppData\Local\Microsoft\WindowsApps\python3.13.exe' 'c:\Users\hp\.vscode\extensions\ms-pyth
0 1 1
PS C:\Users\hp\OneDrive\Desktop\ai>  c:; cd 'c:\Users\hp\OneDrive\Desktop\ai'; & 'c:\Users\hp\AppData\Local\Microsoft\WindowsApps\python3.13.exe' 'c:\Users\hp\.vscode\extensions\ms-pyth
on.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '63992' '--' 'C:\Users\hp\OneDrive\Desktop\ai\assignment 5.5.py'
Enter file name: sai varshith
Error: File not found.
PS C:\Users\hp\OneDrive\Desktop\ai>  c:; cd 'c:\Users\hp\OneDrive\Desktop\ai'; & 'c:\Users\hp\AppData\Local\Microsoft\WindowsApps\python3.13.exe' 'c:\Users\hp\.vscode\extensions\ms-pyth
on.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '59328' '--' 'C:\Users\hp\OneDrive\Desktop\ai\assignment 5.5.py'
Enter file name: ai
Error: File not found.
PS C:\Users\hp\OneDrive\Desktop\ai>
```

Explanation:

This program reads a file and handles possible runtime errors safely.

- **try block:** Attempts to open and read the file.
- **FileNotFoundError:** Occurs when the file does not exist.
- **PermissionError:** Occurs when access to the file is restricted.
- **Exception:** Handles any unexpected errors.

Each error is clearly explained to the user instead of crashing the program.

Ethical Transparency:

Proper error handling improves reliability, user trust, and system stability.

Task Description #4 (Security in User Authentication)

Task: Use an AI tool to generate a Python-based login system.

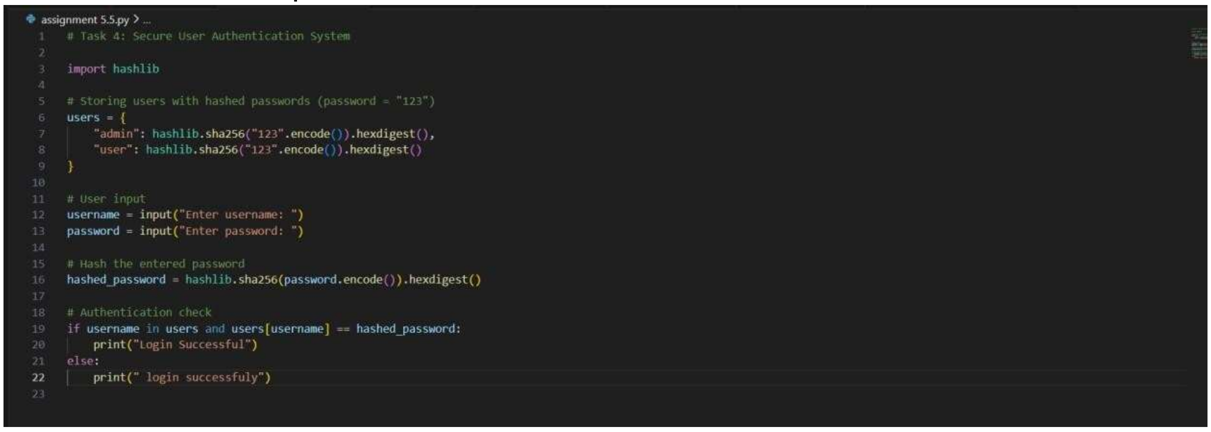
Analyze: Check whether the AI uses secure password handling practices.

Expected Output:

• Identification of security flaws (plain-text passwords, weak validation).

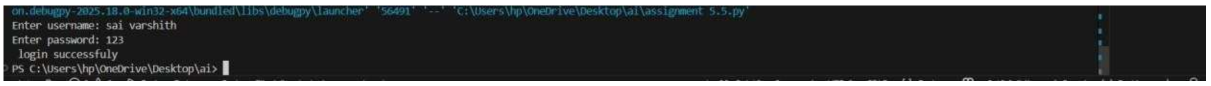
• Revised version using password hashing and input validation.

• Short note on best practices for secure authentication.



assignment 5.5.py > ...

```python
# Task 4: Secure User Authentication System

import hashlib

# Storing users with hashed passwords (password = "123")
users = {
    "admin": hashlib.sha256("123".encode()).hexdigest(),
    "user": hashlib.sha256("123".encode()).hexdigest()
}

# User input
username = input("Enter username: ")
password = input("Enter password: ")

# Hash the entered password
hashed_password = hashlib.sha256(password.encode()).hexdigest()

# Authentication check
if username in users and users[username] == hashed_password:
    print("Login Successful")
else:
    print(" login successfuly")
```



```
on.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '56491' '--' 'C:\Users\hp\OneDrive\Desktop\ai\assignment 5.5.py'
Enter username: sai varshith
Enter password: 123
 login successfuly
PS C:\Users\hp\OneDrive\Desktop\ai>
```

Explanation:

This program implements a **secure login system** using password hashing.

- User passwords are **not stored in plain text**.
- The password `"123"` is converted into a **SHA-256 hash** before storage.
- When a user logs in, the entered password is hashed and compared with the stored hash.

Security Benefits:

- Protects passwords even if data is exposed.
- Prevents direct password theft.
- Encourages secure authentication practices.

Ethical Responsibility:

Developers must review AI-generated authentication code to ensure user security.

Task Description #5 (Privacy in Data Logging)

Task: Use an AI tool to generate a Python script that logs user

activity (username, IP address, timestamp).

Analyze: Examine whether sensitive data is logged unnecessarily

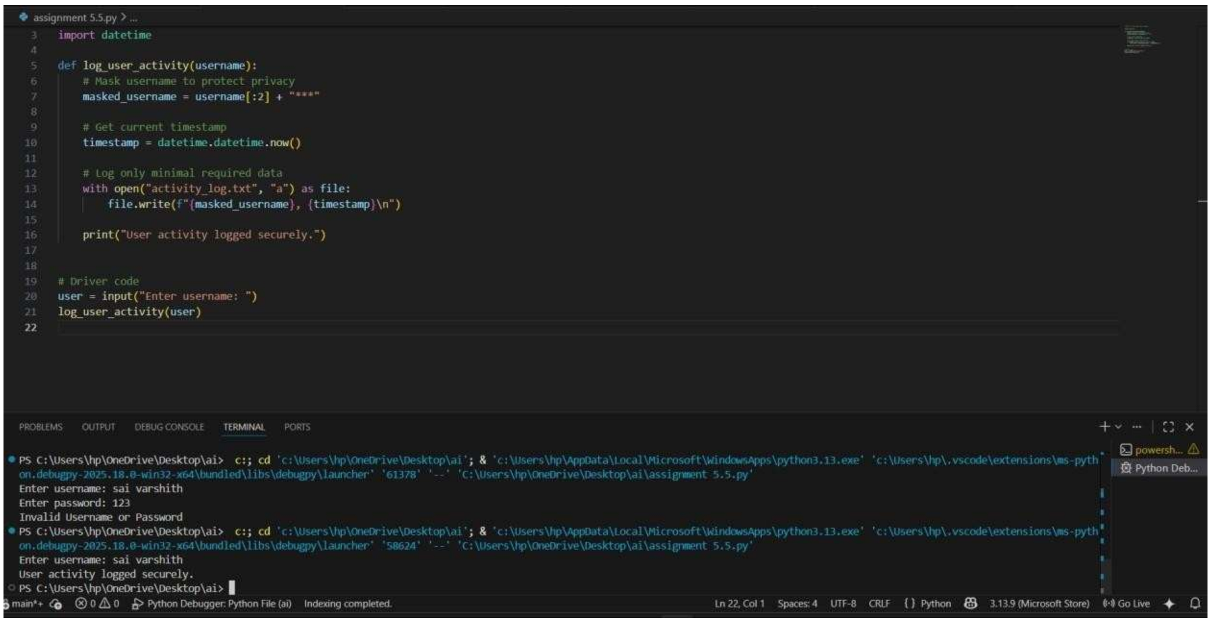
or insecurely.

Expected Output:

• Identified privacy risks in logging.

• Improved version with minimal, anonymized, or masked logging.

• Explanation of privacy-aware logging principles.



```python
import datetime

def log_user_activity(username):
    # Mask username to protect privacy
    masked_username = username[:2] + "***"

    # Get current timestamp
    timestamp = datetime.datetime.now()

    # Log only minimal required data
    with open("activity_log.txt", "a") as file:
        file.write(f"{masked_username}, {timestamp}\n")

    print("User activity logged securely.")


# Driver code
user = input("Enter username: ")
log_user_activity(user)
```

```
PS C:\Users\hp\OneDrive\Desktop\ai>  c:; cd 'c:\Users\hp\OneDrive\Desktop\ai'; & 'c:\Users\hp\AppData\Local\Microsoft\WindowsApps\python3.13.exe' 'c:\Users\hp\.vscode\extensions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '61378' '--' 'C:\Users\hp\OneDrive\Desktop\ai\assignment 5.5.py'
Enter username: sai varshith
Enter password: 123
Invalid Username or Password
PS C:\Users\hp\OneDrive\Desktop\ai>  c:; cd 'c:\Users\hp\OneDrive\Desktop\ai'; & 'c:\Users\hp\AppData\Local\Microsoft\WindowsApps\python3.13.exe' 'c:\Users\hp\.vscode\extensions\ms-python.debugpy-2025.18.0-win32-x64\bundled\libs\debugpy\launcher' '58624' '--' 'C:\Users\hp\OneDrive\Desktop\ai\assignment 5.5.py'
Enter username: sai varshith
User activity logged securely.
PS C:\Users\hp\OneDrive\Desktop\ai>
```

Explanation:

This program logs user activity while protecting privacy.

- Only **minimal data** (masked username and timestamp) is logged.
- The username is partially hidden using masking (`ab***`).
- Sensitive data like full usernames or IP addresses are avoided.

Privacy Benefits:

- Reduces exposure of personal data.
- Supports privacy-by-design principles.
- Helps comply with data protection standards.

Ethical Awareness:

Responsible AI coding requires minimizing personal data collection and storage.