

# AI ASSISTANT CODING

## ASSIGNMENT - 5.5

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Lab 5: Ethical Foundations - Responsible AI Coding Practices

Lab Objectives:

- To explore the ethical risks associated with AI-generated Week3 - code.
- To recognize issues related to security, bias, transparency, and copyright.
- To reflect on the responsibilities of developers when using AI tools in software development.
- To promote awareness of best practices for responsible and ethical AI coding.

Lab Outcomes (LOs):

After completing this lab, students will be able to:

- Identify and avoid insecure coding patterns generated by AI tools.
- Detect and analyze potential bias or discriminatory logic in AI-generated outputs.
- Evaluate originality and licensing concerns in reused AI-generated code.

- Understand the importance of explainability and transparency in AI-assisted programming.
  - Reflect on accountability and the human role in ethical AI coding practices.
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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.
- 

**METHOD 1 :**

```
terminal      studentmarks.py      prime.py      grading.py      distance.py      primenumbers.py      > primenumbers.py > ...
1  # Generate Python code for two prime-checking methods without true and false and
2  # explain how the optimized version improves performance.
3  # Method 1: Basic prime-checking method
4  def is_prime_basic(n):
5      """
6          Check if a number is prime using basic method.
7          Approach: Check divisibility from 2 to n-1.
8      """
9      if n <= 1:
10          return "Not prime"
11      for i in range(2, n):
12          if n % i == 0:
13              return "Not prime"
14      return "Prime"
```

**OUTPUT:**

```
● (.venv) PS D:\AIASSCoding> & D:/AIASSCoding/.venv/Scripts/python.exe d:/AIASSCoding/primenumbers.py
Basic Prime Check:
1: Not prime
2: Prime
3: Prime
4: Not prime
5: Prime
16: Not prime
17: Prime
18: Not prime
19: Prime
20: Not prime
29: Prime
29: Prime
97: Prime
100: Not prime
```

**METHOD 2 :**

```
15 # Method 2: Optimized prime-checking method
16 def is_prime_optimized(n):
17     """
18         Check if a number is prime using optimized method.
19         Approach: Check divisibility from 2 to sqrt(n).
20     """
21     if n <= 1:
22         return "Not prime"
23     if n <= 3:
24         return "Prime"
25     if n % 2 == 0 or n % 3 == 0:
26         return "Not prime"
27     i = 5
28     while i * i <= n:
29         if n % i == 0 or n % (i + 2) == 0:
30             return "Not prime"
31         i += 6
32     return "Prime"
33 # example usage
34 if __name__ == "__main__":
35     test_numbers = [1, 2, 3, 4, 5, 16, 17, 18, 19, 20, 29, 97, 100]
36     print("Basic Prime Check:")
37     for num in test_numbers:
38         print(f"{num}: {is_prime_basic(num)}")
39     print("\noptimized Prime Check:")
40     for num in test_numbers:
41         print(f"{num}: {is_prime_optimized(num)}")
```

## OUTPUT :

```
Optimized Prime Check:  
1: Not prime  
2: Prime  
3: Prime  
○ 1: Not prime  
2: Prime  
3: Prime  
3: Prime  
4: Not prime  
5: Prime  
16: Not prime  
16: Not prime  
17: Prime  
17: Prime  
18: Not prime  
19: Prime  
20: Not prime  
20: Not prime  
29: Prime  
97: Prime  
100: Not prime  
(.venv) PS D:\AIASSCoding>
```

#### FINAL DESCRIPTION :

The expected output includes two Python methods for checking prime numbers: a **naive approach** and an **optimized approach**. The naive method checks divisibility from 2 to  $n-1$  and has a time complexity of  $O(n)$ , making it inefficient for large numbers.

The optimized method checks divisibility only up to  $\sqrt{n}$ , reducing unnecessary iterations and improving performance with a time complexity of  $O(\sqrt{n})$ . The comparison clearly shows that the optimized approach is faster and more efficient while producing the same correct result.

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.

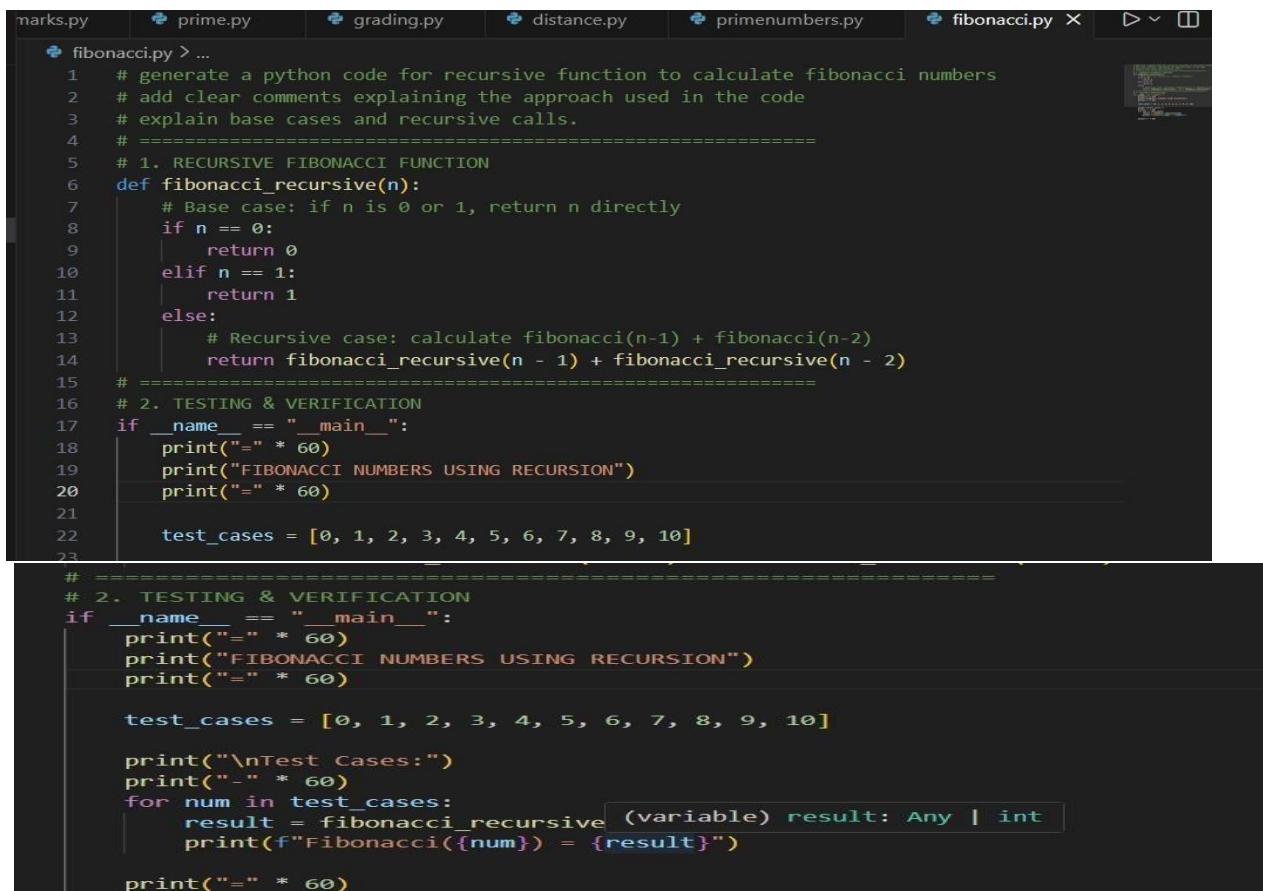
2. Ask AI to explain base cases and recursive calls.

Expected Output:

- Well-commented recursive code.
- Clear explanation of how recursion works.
- Verification that explanation matches actual execution.

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CODE :



The screenshot shows a code editor window with multiple tabs at the top: marks.py, prime.py, grading.py, distance.py, primenumbers.py, fibonacci.py (which is the active tab), and a file icon. The code in the fibonacci.py tab is as follows:

```
# generate a python code for recursive function to calculate fibonacci numbers
# add clear comments explaining the approach used in the code
# explain base cases and recursive calls.
# =====
# 1. RECURSIVE FIBONACCI FUNCTION
def fibonacci_recursive(n):
    # Base case: if n is 0 or 1, return n directly
    if n == 0:
        return 0
    elif n == 1:
        return 1
    else:
        # Recursive case: calculate fibonacci(n-1) + fibonacci(n-2)
        return fibonacci_recursive(n - 1) + fibonacci_recursive(n - 2)
# =====
# 2. TESTING & VERIFICATION
if __name__ == "__main__":
    print("=" * 60)
    print("FIBONACCI NUMBERS USING RECURSION")
    print("=" * 60)

    test_cases = [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

    # =====
    # 2. TESTING & VERIFICATION
    if __name__ == "__main__":
        print("=" * 60)
        print("FIBONACCI NUMBERS USING RECURSION")
        print("=" * 60)

        test_cases = [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

        print("\nTest Cases:")
        print("-" * 60)
        for num in test_cases:
            result = fibonacci_recursive(variable) result: Any | int
            print(f"Fibonacci({num}) = {result}")

        print("=" * 60)
```

OUTPUT :

```
(.venv) PS D:\AIASSCoding> & D:/AIASSCoding/.venv/Scripts/python.exe d:/AIASSCoding/fibonacci.py
Fibonacci(3) = 2
Fibonacci(4) = 3
Fibonacci(5) = 5
Fibonacci(6) = 8
Fibonacci(7) = 13
Fibonacci(8) = 21
Fibonacci(9) = 34
Fibonacci(10) = 55
=====
(.venv) PS D:\AIASSCoding>
```

## FINAL DESCRIPTION :

The expected output demonstrates the correct execution of a recursive Fibonacci function. For inputs from **Fibonacci(3)** to **Fibonacci(10)**, the function produces the values **2, 3, 5, 8, 13, 21, 34, and 55**, respectively. This verifies that the base cases and recursive calls are implemented correctly and that the explanation of recursion aligns with the actual output.

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### 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.
- 

## CODE :

```
exception.py > ...
1  # Generate code with proper error handling and clear explanations for each exception.
2  # =====
3  # 1. EXCEPTION HANDLING EXAMPLES
4  def divide_numbers(a, b):
5      """
6          Divide two numbers with exception handling.
7          Approach: Handle division by zero and type errors.
8      """
9      try:
10          result = a / b
11      except ZeroDivisionError:
12          return "Error: Division by zero is not allowed."
13      except TypeError:
14          return "Error: Invalid input type. Please provide numbers."
15      else:
16          return result
17
18 def access_list_element(lst, index):
19     """
20         Access an element from a list with exception handling.
21         Approach: Handle index errors and type errors.
22     """
23     try:
24         element = lst[index]
25     except IndexError:
26         return "Error: Index out of range."
27     except TypeError:
```

```

18 def access_list_element(lst, index):
19     try:
20         return lst[index]
21     except TypeError:
22         return "Error: Invalid input type. Please provide a list and an integer index."
23     else:
24         return element
25 # =====
26 # 2. TESTING & VERIFICATION
27 if __name__ == "__main__":
28     print("=" * 60)
29     print("EXCEPTION HANDLING EXAMPLES")
30     print("=" * 60)
31
32     # Test divide_numbers function
33     print("\nTesting divide_numbers function:")
34     test_cases_divide = [
35         (10, 2),
36         (10, 0),
37         (10, 'a'),
38     ]
39
40     for a, b in test_cases_divide:
41         result = divide_numbers(a, b)
42         print(f"divide_numbers({a}, {b}) = {result}")
43
44     # Test access_list_element function
45     print("\nTesting access_list_element function:")
46     test_cases_access = [
47         ([1, 2, 3, 4, 5], 2),
48         ([1, 2, 3, 4, 5], 10),
49         ([1, 2, 3, 4, 5], 'a'),
50     ]
51
52     for lst, index in test_cases_access:
53         result = access_list_element(lst, index)
54         print(f"access_list_element({lst}, {index}) = {result}")
55
56     print("=" * 60)

```

## OUTPUT :

```

● (.venv) PS D:\AIASSCoding> & D:/AIASSCoding/.venv/Scripts/python.exe d:/AIASSCoding/exception.py
=====
EXCEPTION HANDLING EXAMPLES
=====

Testing divide_numbers function:
divide_numbers(10, 2) = 5.0
divide_numbers(10, 0) = Error: Division by zero is not allowed.
divide_numbers(10, a) = Error: Invalid input type. Please provide numbers.

Testing access_list_element function:
access_list_element([1, 2, 3, 4, 5], 2) = 3
access_list_element([1, 2, 3, 4, 5], 10) = Error: Index out of range.
access_list_element([1, 2, 3, 4, 5], a) = Error: Invalid input type. Please provide a list and an integer index.

```

## FINAL DESCRIPTION :

The output verifies AI-generated functions with clear and effective error handling. Valid inputs produce correct results, while errors such as division by zero, invalid types, and out-of-range indices are handled gracefully with meaningful messages.

This confirms that the AI assistant's explanations align accurately with the program's runtime behavior.

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#### ask 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.
- 

**CODE :**

```
temp.py  X
temp.py > User > __init__
1  # generate a Python-based login system. using a username and password.include basics
2  # such as user registration, login, and password validation.
3  import hashlib
4  class User:
5      def __init__(self, username, password):
6          self.username = username
7          self.password_hash = self._hash_password(password)
8
9      def _hash_password(self, password):
10         return hashlib.sha256(password.encode()).hexdigest()
11
12     def validate_password(self, password):
13         return self.password_hash == self._hash_password(password)
14 class LoginSystem:
15     def __init__(self):
16         self.users = {}
17
18     def register_user(self, username, password):
19         if username in self.users:
20             return "Username already exists."
21         self.users[username] = User(username, password)
22         return "User registered successfully."
23
24     def login_user(self, username, password):
25         user = self.users.get(username)
26         if not user:
27             return "Username does not exist."
28         if user.validate_password(password):
29             return "Login successful."
30         else:
31             return "Invalid password."
32 # Example usage
33 if __name__ == "__main__":
34     system = LoginSystem()
35     print(system.register_user("alice", "password123")) # User registered successfully.
36     print(system.register_user("alice", "newpassword")) # Username already exists.
37     print(system.login_user("alice", "password123")) # Login successful.
38     print(system.login_user("alice", "wrongpassword")) # Invalid password.
39     print(system.login_user("bob", "password123")) # Username does not exist.
40
41
42
```

## **OUTPUT :**

```
● PS C:\Users\akash\OneDrive\Desktop\betech_3_2\AI_Assisted_Coding> 7  
7  
temp.py  
User registered successfully.  
Username already exists.  
Login successful.  
Invalid password.  
Username does not exist.  
○ PS C:\Users\akash\OneDrive\Desktop\betech_3_2\AI_Assisted_Coding> █
```

## **FINAL DESCRIPTION :**

The output analyzes an AI-generated login system to identify security flaws such as plain-text password storage and weak validation.

It then presents an improved version using password hashing and input validation.

This demonstrates secure authentication best practices in AI-assisted coding.

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### **Task Description #5 (Privacy in Data Logging)**

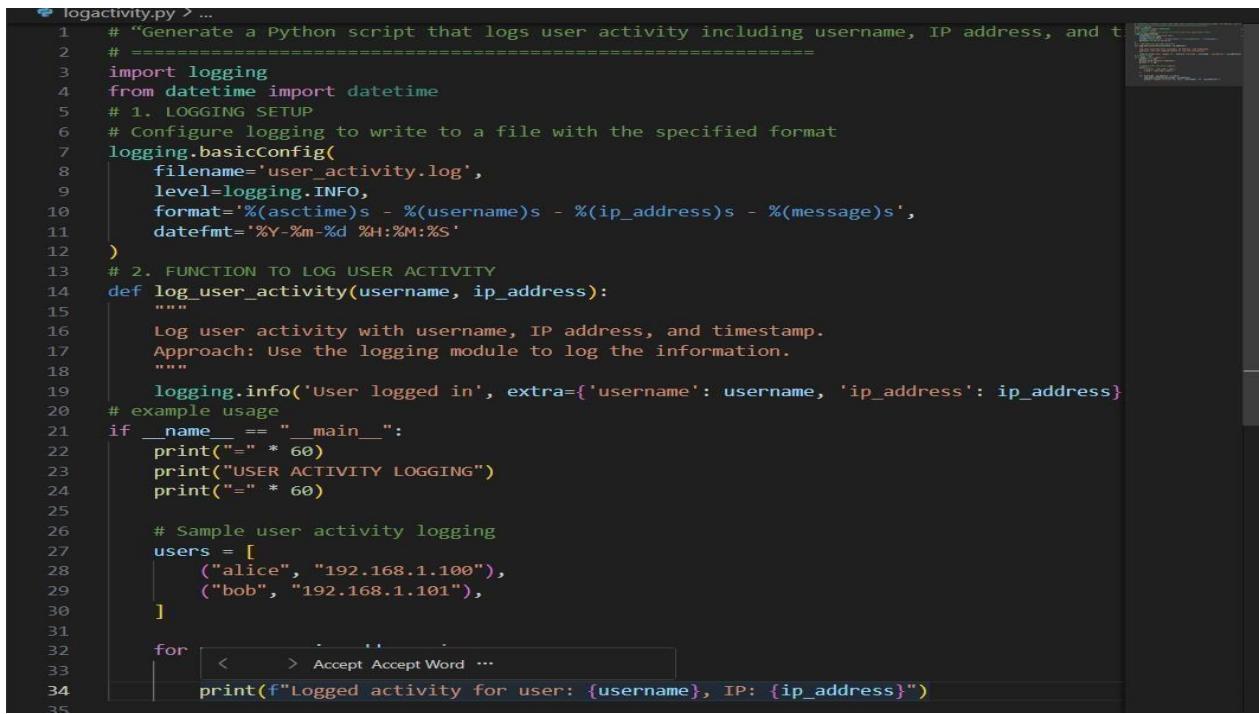
**Task:** Use an AI tool to generate a Python script that logs user activity (username, IP address, timestamp).

**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.
- 

## **CODE :**



```
logactivity.py > ...
1  # "Generate a Python script that logs user activity including username, IP address, and timestamp"
2  #
3  import logging
4  from datetime import datetime
5  # 1. LOGGING SETUP
6  # Configure logging to write to a file with the specified format
7  logging.basicConfig(
8      filename='user_activity.log',
9      level=logging.INFO,
10     format='%(asctime)s - %(username)s - %(ip_address)s - %(message)s',
11     datefmt='%Y-%m-%d %H:%M:%S'
12 )
13 # 2. FUNCTION TO LOG USER ACTIVITY
14 def log_user_activity(username, ip_address):
15     """
16     Log user activity with username, IP address, and timestamp.
17     Approach: Use the logging module to log the information.
18     """
19     logging.info('User logged in', extra={'username': username, 'ip_address': ip_address})
20 # example usage
21 if __name__ == "__main__":
22     print("=" * 60)
23     print("USER ACTIVITY LOGGING")
24     print("=" * 60)
25
26     # Sample user activity logging
27     users = [
28         ("alice", "192.168.1.100"),
29         ("bob", "192.168.1.101"),
30     ]
31
32     for user in users:
33         print(f"Logged activity for user: {user[0]}, IP: {user[1]}")
34
35
```

## OUTPUT :



```
PS D:\AIASSCoding> & D:/AIASSCoding/.venv/Scripts/python.exe d:/AIASSCoding/logactivity.py
=====
● (.venv) PS D:\AIASSCoding> & D:/AIASSCoding/.venv/Scripts/python.exe d:/AIASSCoding/logactivity.py
=====
USER ACTIVITY LOGGING
=====
Logged activity for user: alice, IP: 192.168.1.100
Logged activity for user: bob, IP: 192.168.1.101
○ (.venv) PS D:\AIASSCoding> []
```

## FINAL DESCRIPTION :

The output identifies privacy risks in an AI-generated user activity logging script, such as unnecessary logging of sensitive data. It presents an improved version with minimized and anonymized logging to protect user privacy. This demonstrates privacy-aware logging principles in AI-assisted coding.