

School of Computer Science and Artificial Intelligence

Lab Assignment # 5.5

Program : B. Tech (CSE)

Specialization : AIML

Course Title : AI Assisted

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Lab 5: Ethical Foundations – Responsible AI Coding Practices

Lab Objectives:

- To explore the ethical risks associated with AI-generated code.
- Week3 -
- 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.
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Task Description – 1: (Transparency in Algorithm Optimization)

Problem: Use AI to generate two solutions for checking prime numbers.

1. Naive approach
2. Optimized approach

Prompt Used (Zero-shot)

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

Python Code:

The screenshot shows a code editor interface with two code snippets. The first snippet, labeled [1] and preceded by a green checkmark, contains a naive prime-checking function named `is_prime_naive`. It iterates from 2 to n-1, checking if n is divisible by any number in the range. The second snippet, labeled [2] and preceded by a blue play icon, contains an optimized prime-checking function named `is_prime_optimized`. This function uses the `math.sqrt` function to find the square root of n, then iterates from 2 to the square root of n, checking for divisibility. Both snippets return `True` if no divisors are found, and `False` otherwise.

```
[1] ✓ 0s def is_prime_naive(n):
    if n <= 1:
        return False
    for i in range(2, n):
        if n % i == 0:
            return False
    return True

[2] ⏪ import math

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
```

Explanation & Time Complexity

- **Naive Method**
 - Checks divisibility from 2 to n-1
 - Time Complexity: $O(n)$
 - Inefficient for large numbers
- **Optimized Method**
 - Checks divisibility only up to \sqrt{n}
 - Time Complexity: $O(\sqrt{n})$
 - Faster because factors repeat after square root

Task – 2: Transparency in Recursive Algorithms Objective

Problem: Generate a recursive Fibonacci function with clear explanations.

Prompt Used (One-shot)

1. Ask AI to add clear comments explaining recursion.
2. Ask AI to explain base cases and recursive calls

Python Code:

▼ Task 2: Transparency in Recursive Algorithms

recursive Fibonacci function

```
[3] ✓ 0s ➔ def fibonacci(n):
    # Base case: Fibonacci of 0 is 0
    if n == 0:
        return 0

    # Base case: Fibonacci of 1 is 1
    if n == 1:
        return 1

    # Recursive case:
    # Fibonacci of n is the sum of Fibonacci of (n-1) and (n-2)
    return fibonacci(n - 1) + fibonacci(n - 2)
```

Explanation

- **Base Cases**
 - `fibonacci(0)` returns 0
 - `fibonacci(1)` returns 1
- **Recursive Call**
 - Function keeps calling itself with smaller values
 - Stops when base cases are reached
- **Execution Match**
 - Each recursive call mirrors the explanation exactly
 - Ensures transparency and correctness

Task Description – 3: Transparency in Error Handling.

Problem: Use AI to generate a Python program that reads a file and processes data.

Prompt Used (Few-shot)

“Generate code with proper error handling and clear explanations for each exception.”

Python Code:

Task 3: Transparency in Error Handling

Python program that reads a file with proper error handling.

```
❶ def read_file(filename):
    try:
        file = open(filename, "r")
        data = file.read()
        file.close()
        return data

    except FileNotFoundError:
        print("Error: File not found.")

    except PermissionError:
        print("Error: Permission denied.")

    except Exception as e:
        print("Unexpected error:", e)
```

Explanation of Exceptions:

- **FileNotFoundException**
 - Occurs when the file does not exist
- **PermissionError**
 - Occurs when access rights are insufficient
- **Generic Exception**
 - Catches unexpected runtime errors

Each explanation directly corresponds to actual Python runtime behavior, ensuring transparency.

Task Description – 4: Security in User Authentication

Problem: Use AI to generate a Python program that reads a file and processes data.

Prompt :

Check whether the AI uses secure password handling practices.

Initial AI-Generated Issue (Security Flaws)

- Passwords stored in **plain text**
- No hashing
- Weak input validation

Security Risks

- Data breaches
- Password reuse attacks
- Unauthorized access

Task 4: Security in User Authentication

Secure Revised Version

```
▶ import hashlib

def hash_password(password):
    return hashlib.sha256(password.encode()).hexdigest()

def login(stored_hash, entered_password):
    return stored_hash == hash_password(entered_password)
```

Best Practices for Secure Authentication

- Always hash passwords (never store plain text)
- Use strong hashing algorithms (bcrypt, SHA-256, etc.)
- Validate user inputs
- Implement rate limiting and authentication checks

Task Description – 5: Privacy in Data Logging

Problem: Determine the minimum of three numbers without using min().

Prompt Used : Examine whether sensitive data is logged unnecessarily or insecurely.

Original AI Logging Risks

- Logs **username, IP address, timestamp**
- IP addresses are sensitive personal data
- Logs stored without masking or protection

Python Code:

Task 5: Privacy in Data Logging

```
import datetime

def log_activity(username):
    masked_user = username[0] + "****"
    timestamp = datetime.datetime.now()
    print(f"User: {masked_user}, Time: {timestamp}")
```

Privacy-Aware Logging Principles

- Log only necessary information
- Mask or anonymize personal data
- Avoid storing IP addresses unless required
- Protect log files from unauthorized access

Conclusion

This lab highlights that **AI-generated code is not automatically ethical or secure.**

Developers are responsible for:

- Reviewing AI outputs
- Ensuring transparency and correctness
- Preventing security and privacy violations
- Maintaining accountability for deployed code

Ethical AI coding requires **human judgment**, not blind trust in AI tools.