

Assignment-5.5

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Batch - 03

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.

```
#Transparency in Algorithm Optimization Use AI to generate two solutions for checking prime numbers

def is_prime_basic(n):
    if n <= 1:
        return False
    for i in range(2, n):
        if n % i == 0:
            return False
    return True

def is_prime_optimized(n):
    if n <= 1:
        return False
    if n <= 3:
        return True
    if n % 2 == 0 or n % 3 == 0:
        return False
    i = 5
    while i * i <= n:
        if n % i == 0 or n % (i + 2) == 0:
            return False
        i += 6
    return True
print("Basic Method:")
print(f"Is 29 prime? {is_prime_basic(29)}")
print(f"Is 15 prime? {is_prime_basic(15)}")
print("\nOptimized Method:")
print(f"Is 29 prime? {is_prime_optimized(29)}")
print(f"Is 15 prime? {is_prime_optimized(15)}")
```

```
● Basic Method:
Is 29 prime? True
Is 15 prime? False

Optimized Method:
Is 29 prime? True
Is 15 prime? False
○ PS C:\Users\POOJA\OneDrive\Documents\ai_coding>
```

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 \sqrt{n} because if n has a factor greater than \sqrt{n} , it must also have a corresponding factor smaller than \sqrt{n} .

Time Complexity:

- Naive approach: $O(n)$
- Optimized approach: $O(\sqrt{n})$

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.

```

#(Transparency in Recursive Algorithms) Use AI to generate a recursive function to calculate Fibonacci numbers.

def fibonacci_recursive(n):
    if n <= 0:
        return 0
    elif n == 1:
        return 1
    else:
        return fibonacci_recursive(n - 1) + fibonacci_recursive(n - 2)

def fibonacci_iterative(n):
    a, b = 0, 1
    for _ in range(n):
        a, b = b, a + b
    return a

print("Recursive Fibonacci:")
print(f"Fibonacci(6) = {fibonacci_recursive(6)}")
print(f"Fibonacci(10) = {fibonacci_recursive(10)}")

print("\nIterative Fibonacci:")
print(f"Fibonacci(6) = {fibonacci_iterative(6)}")
print(f"Fibonacci(10) = {fibonacci_iterative(10)}")

```

ai_coding/ass5.py

Recursive Fibonacci:

Fibonacci(6) = 8

Fibonacci(10) = 55

Iterative Fibonacci:

Fibonacci(6) = 8

Fibonacci(10) = 55

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 $\text{fibonacci}(n-1) + \text{fibonacci}(n-2)$.

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.

```
#(Transparency in Error Handling) Use AI to generate a Python program that reads a file and processes data. Prompt:Generate code with proper error handling
def read_file(file_path):
    try:
        with open(file_path, 'r') as file:
            data = file.read()
            print("File content successfully read.")
            return data
    except FileNotFoundError:
        print(f"Error: The file at {file_path} was not found.")
    except IOError:
        print(f"Error: An I/O error occurred while reading the file at {file_path}.")
    except Exception as e:
        print(f"An unexpected error occurred: {e}")
# Example usage
file_path = "numbers.txt"
content = read_file(file_path)
if content:
    print(content)
def gcd(a, b):
    while b:
        a, b = b, a % b
    return a
def lcm_formula(a, b):
    return (a * b) // gcd(a, b)
def lcm_brute(a, b):
    max_val = max(a, b)
    multiple = max_val
    while True:
        if multiple % a == 0 and multiple % b == 0:
            return multiple
        multiple += max_val
print("Example 1: LCM(4, 6) = 12")
print(f"Formula-based: {lcm_formula(4, 6)}")
print(f"Brute force: {lcm_brute(4, 6)}")
print("\nExample 2: LCM(5, 10) = 10")
print(f"Formula-based: {lcm_formula(5, 10)}")
print(f"Brute force: {lcm_brute(5, 10)}")
```

Error: The file at numbers.txt was not found.

Example 1: LCM(4, 6) = 12

Formula-based: 12

Brute force: 12

Example 2: LCM(5, 10) = 10

Formula-based: 10

Example 1: LCM(4, 6) = 12

Formula-based: 12

Brute force: 12

Example 2: LCM(5, 10) = 10

Formula-based: 10

Example 2: LCM(5, 10) = 10

Formula-based: 10

Formula-based: 10

Brute force: 10

Explanation:

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

- **try block:** Attempts to open and read the file.
- **FileNotFoundException:** 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.

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 in User Authentication) Use an AI tool to generate a Python-based login system.
import hashlib
users_db = {
    "user1": hashlib.sha256("password123".encode()).hexdigest(),
    "user2": hashlib.sha256("mysecurepassword".encode()).hexdigest(),
}
def hash_password(password):
    return

    return hashlib.sha256(password.encode()).hexdigest()
    hashlib.sha256(password.encode()).hexdigest()
def verify_login(username, password):
    if username in users_db:
        hashed_input_password = hash_password(password)
        if users_db[username] == hashed_input_password:
            return True
        return False
    return hashlib.sha256(password.encode()).hexdigest()
# Example usage
username = "user1"
password = "password123"
if verify_login(username, password):
    print("Login successful!")
else:
    print("Login failed. Invalid username or password.")
```

Login failed. Invalid username or password.

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.

```
# Task 5: Privacy-Aware Data Logging
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)

# Task 5: Privacy-Aware Data Logging
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)

# Task 5: Privacy-Aware Data Logging
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)
```

```
User activity logged securely.  
Enter username: abc  
User activity logged securely.  
Enter username: abc  
Enter username: abc  
User activity logged securely.  
Enter username: □
```

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.