

School of Computer Science and Artificial Intelligence

Lab Assignment # 5

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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:-

write a python program of a prime number checking in two methods navie and optimised approach. and add when in input letters it gives invalid input

Code:-

```
Assignments Codes > * Assignment5.py ...
1  # Task-1
2  #write a python program of a prime number checking in two methods navie and optimised approach.
3  # and add when in input letters it gives invalid input
4  def is_prime_naive(n):
5      if n <= 1:
6          return False
7      for i in range(2, n):
8          if n % i == 0:
9              return False
10     return True
11 def is_prime_optimized(n):
12     if n <= 1:
13         return False
14     if n <= 3:
15         return True
16     if n % 2 == 0 or n % 3 == 0:
17         return False
18     i = 5
19     while i * i <= n:
20         if n % i == 0 or n % (i + 2) == 0:
21             return False
22         i += 6
23     return True
24 try:
25     number = int(input("Enter a number to check if it is prime: "))
26     print("Naive approach:", is_prime_naive(number))
27     print("Optimized approach:", is_prime_optimized(number))
28 except ValueError:
29     print("Invalid input. Please enter a valid integer.")
```

Output:-

```
Enter a number to check if it is prime: 5
Naive approach: True
Optimized approach: True
PS C:\AIAC LAB> & C:/Users/shiva/AppData/Local
Enter a number to check if it is prime: -9
Naive approach: False
Optimized approach: False
PS C:\AIAC LAB> & C:/Users/shiva/AppData/Local
Enter a number to check if it is prime: p
Invalid input. Please enter a valid integer.
PS C:\AIAC LAB>
```

Justification:-

The program includes two methods for checking prime numbers: a naive approach that checks divisibility from 2 to n-1, and an optimized approach that reduces the number of checks by eliminating even numbers and using a $6k \pm 1$ rule. Additionally, it handles invalid input by catching Value Error exceptions when the user inputs non-integer values. This ensures robustness and user-friendliness.

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.

Prompt:-

write a python program to print to calculate fibonacci series using recursion function and clear explanation of recursion, base case and recursive calls.

Code:-

```
31      # Task-2
32  #write a python program to print to calculate fibonacci series using recursion
33  def fibonacci(n):
34      # Base case: the first two Fibonacci numbers are 0 and 1
35      if n <= 0:
36          return 0
37      elif n == 1:
38          return 1
39      else:
40          # Recursive call: sum of the two preceding Fibonacci numbers
41          return fibonacci(n - 1) + fibonacci(n - 2)
42  num_terms = int(input("Enter the number of terms in the Fibonacci series: "))
43  print("Fibonacci series:")
44  for i in range(num_terms):
45      print(fibonacci(i), end=" ")
46  print() # for a new line after the series
47
48
```

Output:-

```
Enter the number of terms in the Fibonacci series: 5
Fibonacci series:
0 1 1 2 3
PS C:\AIAC LAB>
```

Justification:-

Recursion is a programming technique where a function calls itself to solve a problem. In this case, the `fibonacci` function calculates the nth Fibonacci number by recursively calling itself with smaller values of n until it reaches the base cases (n=0 or n=1). The base cases are essential because they stop the recursion and provide a direct answer for the simplest subproblems. The recursive calls break down the problem into smaller subproblems, which are then solved by further recursive calls.

Task Description #3 (Transparency in Error Handling)

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

Prompt:-

write a python program to read file and processes data using error handling and clear explanations for each exception.

Code:-

```

50  #Task-3
51  # write a python program to read file and processes data using error handling and clear errors
52 try:
53     file_name = input("Enter the file name to read: ")
54     with open(file_name, 'r') as file:
55         data = file.read()
56         print("File content:")
57         print(data)
58 except FileNotFoundError:
59     print("Error: The file was not found. Please check the file name and try again.")
60 except IOError:
61     print("Error: An I/O error occurred while trying to read the file.")
62 except Exception as e:
63     print(f"An unexpected error occurred: {e}")
64

```

Output:-

```

Enter the file name to read: AIAC_Lab Assignment_1.docx
Error: The file was not found. Please check the file name and try again.

```

Justification:-

The code handles various exceptions that might occur during file reading:

FileNotFoundException: Raised when the specified file does not exist.

IOError: Raised when an I/O error occurs while trying to read the file.

Exception: Catches any other unexpected errors.

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.

Prompt:-

write a python program to build a login system and secure password handling practices.

Code:-

```

66  # Task-4
67  #write a python program to build a login system and secure password handling practices.
68  import hashlib
69  def hash_password(password):
70      # Hash the password using SHA-256
71      return hashlib.sha256(password.encode()).hexdigest()
72  def verify_password(stored_password_hash, provided_password):
73      # Verify the provided password against the stored hash
74      return stored_password_hash == hash_password(provided_password)
75  # Simulated user database
76  user_db = {
77      "PhaniKumar": hash_password("Phani@123"),
78      "Kirito": hash_password("SwordArtOnline"),
79  }
80  username = input("Enter your username: ")
81  password = input("Enter your password: ")
82  if username in user_db:
83      if verify_password(user_db[username], password):
84          print("Login successful!")
85      else:
86          print("Invalid password.")
87  else:
88      print("Username not found.")

```

Output:-

```
Enter your username: PhaniKumar
Enter your password: Phani@123
Login successful!
```

Justification:-

Secure password handling is crucial to protect user data. By hashing passwords, we ensure that even if the database is compromised, the actual passwords remain secure. Using a strong hashing algorithm like SHA-256 adds an additional layer of security. This approach prevents storing plain-text passwords, reducing the risk of unauthorized access.

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.

Prompt:-

write a python program to script the logs user activities Example: username, time stamp, IP address etc Examine sensitive data is logged unnecessarily or insecurely and Improved version with minimal, anonymized, or masked logging system.

Code:-

```
90  # Task-5
91  #write a python program to script the logs user activities Example: username,
92  import logging
93  from datetime import datetime
94  import socket
95  # Configure logging
96  logging.basicConfig(
97      filename='user_activities.log',
98      level=logging.INFO,
99      format='%(asctime)s - %(message)s',
100 )
101 def log_user_activity(username):
102     # Get the current timestamp
103     timestamp = datetime.now().strftime('%Y-%m-%d %H:%M:%S')
104     # Get the user's IP address
105     ip_address = socket.gethostname()
106     # Log the activity with anonymized data
107     logging.info(f'User: {username}, IP: {ip_address}, Time: {timestamp}')
108     # Example usage
109     username = input("Enter your username: ")
110     log_user_activity(username)
111     print("User activity logged successfully.")
112
113
```

Output:-

```
Enter your username: phanikumar
User activity logged successfully.
PS C:\AIAC LAB> █
```

Justification:-

The code handles various exceptions that might occur during file reading:

FileNotFoundException: Raised when the specified file does not exist.

IOError: Raised when an I/O error occurs while trying to read the file.

Exception: Catches any other unexpected errors.