ASSIGNMENT – 5.3

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Batch – 38

Lab 5: Ethical Foundations – Responsible AI Coding Practices

Task 1: Privacy and Data Security in AI-Generated Code

Scenario

AI tools can sometimes generate insecure authentication logic.

Task Description

Use an AI tool to generate a simple login system in Python.

Analyze the generated code to check:

• Whether credentials are hardcoded

• Whether passwords are stored or compared in plain text

• Whether insecure logic is used

Then, revise the code to improve security (e.g., avoid hardcoding, use input validation).

Expected Output

• AI-generated login code

• Identification of security risks

• Revised secure version of the code

• Brief explanation of improvements

PROMPT

Generate a simple Python login system

CODE:

```
users = {}
def register():
    username = input("Enter a username: ")
    if username in users:
        print("Username already exists. Please choose a different one.")
        return
    password = input("Enter a password: ")
    users[username] = password
    print("Registration successful!")
def login():
    username = input("Enter your username: ")
    password = input("Enter your password: ")
    if username in users and users[username] == password:
        print("Login successful! Welcome, " + username + "!")
    else:
        print("Invalid username or password.")
def main():
    while True:
        print("\n1. Register\n2. Login\n3. Exit")
        choice = input("Enter your choice: ")

        if choice == '1':
            register()
        elif choice == '2':
            login()
        elif choice == '3':
            print("Exiting program.")
            break
        else:
            print("Invalid choice. Please try again.")
if __name__ == "__main__":
    main()
```

OUTPUT:

```
...
    1. Register
    2. Login
    3. Exit
    Enter your choice: 1
    Enter a username: sony
    Enter a password: admin123
    Registration successful!

    1. Register
    2. Login
    3. Exit
    Enter your choice: 3
    Exiting program.
```

IMPROVED PROMPT:

Rewrite the login system to avoid hardcoded credentials and use secure input validation.

CODE:

```
import hashlib
import os
import re

users = {} # Stores {username: (salt + hashed_password)}

def hash_password(password):
    salt = os.urandom(16) # Generate a new salt for each user
    # Use PBKDF2_HMAC for secure password hashing (recommended for new applications)
    hashed_password = hashlib.pbkdf2_hmac('sha256', password.encode('utf-8'), salt, 100000)
    return salt + hashed_password # Store salt concatenated with the hash

def verify_password(stored_credentials, provided_password):
    # Extract the salt from the stored credentials
    salt = stored_credentials[:16]
    stored_hash = stored_credentials[16:]

    # Hash the provided password with the extracted salt
    provided_hashed_password = hashlib.pbkdf2_hmac('sha256', password.encode('utf-8'), salt, 100000)

    # Compare the generated hash with the stored hash
    return stored_hash == provided_hashed_password

def validate_password_strength(password):
    if len(password) < 8:
        return "Password must be at least 8 characters long."
    if not re.search("[a-z]", password):
        return "Password must contain at least one lowercase letter."
    if not re.search("[A-Z]", password):
        return "Password must contain at least one uppercase letter."
    if not re.search("[0-9]", password):
        return "Password must contain at least one digit."
    # Added more special characters for better validation, ensuring the regex string is terminated correctly.
    if not re.search(r'[!@#$%^&*()_+-=[\]{};:",./<>?~`\\]', password):
        return "Password must contain at least one special character (e.g., !@#$%^&*())."
    return None # Password meets strength requirements

def register():
    while True:
        username = input("Enter a username: ").strip()
        if not username:
            print("Username cannot be empty.")
            continue
        if username in users:
            print("Username already exists. Please choose a different one.")
            continue
        break
```

```
        while True:
            password = input("Enter a password (min 8 chars, incl. upper, lower, digit, special): ")
            strength_issue = validate_password_strength(password)
            if strength_issue:
                print(f"Password strength error: {strength_issue}")
                continue

            confirm_password = input("Confirm password: ")
            if password != confirm_password:
                print("Passwords do not match. Please try again.")
                continue
            break

        users[username] = hash_password(password)
        print("Registration successful!")

    def login():
        username = input("Enter your username: ").strip()
        password = input("Enter your password: ")

        if username in users:
            if verify_password(users[username], password):
                print(f"Login successful! Welcome, {username}!")
            else:
                print("Invalid username or password.")
        else:
            print("Invalid username or password.")

    def main():
        while True:
            print("\n1. Register\n2. Login\n3. Exit")
            choice = input("Enter your choice: ")

            if choice == '1':
                register()
            elif choice == '2':
                login()
            elif choice == '3':
                print("Exiting program.")
                break
            else:
                print("Invalid choice. Please try again.")

    if __name__ == "__main__":
        main()
```

OUTPUT:

```
...
    1. Register
    2. Login
    3. Exit
    Enter your choice: 1
    Enter a username: ammu
    Enter a password (min 8 chars, incl. upper, lower, digit, special):
    Password strength error: Password must be at least 8 characters long.
    Enter a password (min 8 chars, incl. upper, lower, digit, special): admin@123
    Password strength error: Password must contain at least one uppercase letter.
    Enter a password (min 8 chars, incl. upper, lower, digit, special): Admin@123
    Confirm password: Admin@123
    Registration successful!

    1. Register
    2. Login
    3. Exit
    Enter your choice: 3
    Exiting program.
```

EXPLANATION:

This task highlights security risks in AI-generated authentication code. The original code used hardcoded credentials and plain text password comparison, which is insecure. The revised version improves security by avoiding hardcoding and validating user input.

Task 2: Bias Detection in AI-Generated Decision Systems

Scenario

AI systems may unintentionally introduce bias.

Task Description

Use AI prompts such as:

• “Create a loan approval system”

• Vary applicant names and genders in prompts

Analyze whether:

• The logic treats certain genders or names unfairly

• Approval decisions depend on irrelevant personal attributes

Suggest methods to reduce or remove bias.

Expected Output

• Python code generated by AI

• Identification of biased logic (if any)

• Discussion on fairness issues

• Mitigation strategies

PROMPT: Create a simple loan approval system in Python based on income and credit score

CODE:

```python
def check_loan_eligibility(income, credit_score):
    # Define minimum requirements for loan approval
    min_income = 30000
    min_credit_score = 650

    print(f"\n--- Loan Eligibility Check ---")
    print(f"Applicant Income: ${income:,.2f}")
    print(f"Applicant Credit Score: {credit_score}")
    print(f"Required Income: ${min_income:,.2f}")
    print(f"Required Credit Score: {min_credit_score}")

    # Check if the applicant meets both criteria
    if income >= min_income and credit_score >= min_credit_score:
        return True, "Congratulations! Your loan is approved."
    else:
        reasons = []
        if income < min_income:
            reasons.append(f"Income (${income:,.2f}) is below the minimum required (${min_income:,.2f}).")
        if credit_score < min_credit_score:
            reasons.append(f"Credit score ({credit_score}) is below the minimum required ({min_credit_score}).")
        return False, "Loan denied. " + " ".join(reasons)

def main():
    print("Welcome to the Simple Loan Approval System")
    try:
        income = float(input("Please enter your annual income: "))
        credit_score = int(input("Please enter your credit score: "))

        if income < 0 or credit_score < 300 or credit_score > 850:
            print("Invalid input. Income cannot be negative. Credit score must be between 300 and 850.")
            return

        approved, message = check_loan_eligibility(income, credit_score)
        print(f"\nResult: {message}")

    except ValueError:
        print("Invalid input. Please enter numerical values for income and credit score.")

if __name__ == "__main__":
    main()
```

OUTPUT:

```
Welcome to the Simple Loan Approval System
Please enter your annual income: 50000
Please enter your credit score: 500

--- Loan Eligibility Check ---
Applicant Income: $50,000.00
Applicant Credit Score: 500
Required Income: $30,000.00
Required Credit Score: 650

Result: Loan denied. Credit score (500) is below the minimum required (650).
```

EXPLANATION:

The AI-generated loan approval system makes decisions based only on income and credit score. No personal or sensitive attributes such as gender, name, or age are used in the decision-making process. This ensures that the system does not show bias toward any individual or group. Using only f inancial factors helps maintain fairness and ethical behavior in AI systems.

Task 3: Transparency and Explainability in AI-Generated Code (Recursive Binary Search)

Scenario

AI-generated code should be transparent, well-documented, and easy for

humans to understand and verify.

Task Description

Use an AI tool to generate a Python program that:

• Implements Binary Search using recursion

• Searches for a given element in a sorted list

• Includes:

o Clear inline comments

o A step-by-step explanation of the recursive logic

After generating the code, analyze:

• Whether the explanation clearly describes the base case and recursive

case

• Whether the comments correctly match the code logic

• Whether the code is understandable for beginner-level students

Expected Output

• Python program for recursive binary search

• AI-generated comments and explanation

• Student's assessment on clarity, correctness, and transparency

PROMPT: Generate a Python program for recursive binary search. Include clear comments explaining the base case and recursive case.

CODE:

```
def recursive_binary_search(arr, low, high, x):
    # Base Case: If the search space is empty, the element is not present
    if high >= low:
        mid = (high + low) // 2
        # If element is present at the middle itself
        if arr[mid] == x:
            return mid
        # Recursive Case 1: If element is smaller than mid, then it can only
        # be present in the left subarray
        elif arr[mid] > x:
            return recursive_binary_search(arr, low, mid - 1, x)
        # Recursive Case 2: Else the element can only be present
        # in the right subarray
        else:
            return recursive_binary_search(arr, mid + 1, high, x)
    else:
        # Element is not present in the array
        return -1
# Example usage:
my_list = [2, 3, 4, 10, 40]
target = 10
result = recursive_binary_search(my_list, 0, len(my_list) - 1, target)
if result != -1:
    print(f"Element {target} is present at index {result}")
else:
    print(f"Element {target} is not present in array")
target_not_found = 7
result_not_found = recursive_binary_search(my_list, 0, len(my_list) - 1, target_not_found)
if result_not_found != -1:
    print(f"Element {target_not_found} is present at index {result_not_found}")
else:
    print(f"Element {target_not_found} is not present in array")
```

```
Element 10 is present at index 3
Element 7 is not present in array
```

EXPLANATION:

In this task, the recursive binary search code is easy to understand because clear comments explain what each part does. The base case and recursive calls are clearly mentioned, so it is simple to follow how the algorithm works step by step. This makes the program transparent and helps users trust the logic and results.

Task 4: Ethical Evaluation of AI-Based Scoring Systems

Scenario

AI-generated scoring systems can influence hiring decisions.

Task Description

Ask an AI tool to generate a job applicant scoring system based on features

such as:

• Skills

• Experience

• Education

Analyze the generated code to check:

• Whether gender, name, or unrelated features influence scoring

• Whether the logic is fair and objective

Expected Output

• Python scoring system code

• Identification of potential bias (if any)

• Ethical analysis of the scoring logic

PROMPT:

Generate a Python program that scores job applicants based on: - Skills ,- Years of experience,- Education level

```python
def score_applicant(applicant_data):
    # Define scoring criteria
    skill_scores = {
        'Python': 10,
        'SQL': 8,
        'Data Analysis': 7,
        'Machine Learning': 12,
        'Communication': 5,
        'Project Management': 6
    }

    experience_score_map = {
        '<1 year': 5,
        '1-3 years': 10,
        '3-5 years': 15,
        '5-10 years': 20,
        '>10 years': 25
    }

    education_score_map = {
        'High School': 5,
        'Associates': 10,
        'Bachelors': 15,
        'Masters': 20,
        'PhD': 25
    }

    total_score = 0
    evaluation_summary = []

    # Score based on skills
    skill_points = 0
    for skill in applicant_data['skills']:
        if skill in skill_scores:
            skill_points += skill_scores[skill]
    total_score += skill_points
    evaluation_summary.append(f"Skills Score: {skill_points} points (from {', '.join(applicant_data['skills'])})")
```

```
    # Score based on skills
    skill_points = 0
    for skill in applicant_data['skills']:
        if skill in skill_scores:
            skill_points += skill_scores[skill]
    total_score += skill_points
    evaluation_summary.append(f"Skills Score: {skill_points} points (from {', '.join(applicant_data['skills'])})")

    # Score based on experience
    experience_category = ''
    years_experience = applicant_data['experience']
    if years_experience < 1:
        experience_category = '<1 year'
    elif 1 <= years_experience <= 3:
        experience_category = '1-3 years'
    elif 3 < years_experience <= 5:
        experience_category = '3-5 years'
    elif 5 < years_experience <= 10:
        experience_category = '5-10 years'
    else:
        experience_category = '>10 years'

    exp_points = experience_score_map.get(experience_category, 0)
    total_score += exp_points
    evaluation_summary.append(f"Experience Score: {exp_points} points ({applicant_data['experience']} years)")

    # Score based on education
    edu_points = education_score_map.get(applicant_data['education'], 0)
    total_score += edu_points
    evaluation_summary.append(f"Education Score: {edu_points} points ({applicant_data['education']})")

    return total_score, evaluation_summary

def main():
    print("Welcome to the Job Applicant Scoring System")

    while True:
        applicant_name = input("\nEnter applicant's name (or type 'exit' to quit): ").strip()
        if applicant_name.lower() == 'exit':
            break
```

```
    while True:
        applicant_name = input("\nEnter applicant's name (or type 'exit' to quit): ").strip()
        if applicant_name.lower() == 'exit':
            break

        try:
            skills_input = input("Enter skills (comma-separated, e.g., Python, SQL): ")
            skills = [s.strip() for s in skills_input.split(',') if s.strip()]

            experience = float(input("Enter years of experience: "))
            if experience < 0:
                print("Experience cannot be negative. Please try again.")
                continue

            education = input("Enter education level (e.g., High School, Associates, Bachelors, Masters, PhD): ").strip()
            if education not in ['High School', 'Associates', 'Bachelors', 'Masters', 'PhD']:
                print("Invalid education level. Please choose from: High School, Associates, Bachelors, Masters, PhD.")
                continue

            applicant_data = {
                'name': applicant_name,
                'skills': skills,
                'experience': experience,
                'education': education
            }

            score, summary = score_applicant(applicant_data)
            min_passing_score = 40 # Customizable passing score

            print(f"\n--- Applicant Score for {applicant_name} ---")
            for item in summary:
                print(f"  - {item}")
            print(f"Total Score: {score} points")

            if score >= min_passing_score:
                print(f"Recommendation: Recommended (Score meets/exceeds {min_passing_score} points)")
            else:
                print(f"Recommendation: Not Recommended (Score below {min_passing_score} points)")

        except ValueError:
            print("Invalid input. Please ensure years of experience is a number.")
        except Exception as e:
            print(f"An unexpected error occurred: {e}")

    print("Exiting Job Applicant Scoring System.")

if __name__ == "__main__":
    main()
```

OUTPUT:

```
Welcome to the Job Applicant Scoring System

Enter applicant's name (or type 'exit' to quit): adfdf
Enter skills (comma-separated, e.g., Python, SQL): python
Enter years of experience: 1
Enter education level (e.g., High School, Associates, Bachelors, Masters, PhD): High School

--- Applicant Score for adfdf ---
  - Skills Score: 0 points (from python)
  - Experience Score: 10 points (1.0 years)
  - Education Score: 5 points (High School)
Total Score: 15 points
Recommendation: Not Recommended (Score below 40 points)

Enter applicant's name (or type 'exit' to quit): exit
Exiting Job Applicant Scoring System.
```

EXPLANATION:

In this task, the job applicant scoring system evaluates candidates based only on skills, experience, and education, which are directly related to job performance. The program does not use personal details like name, gender, or age, so it avoids unfair bias. Since the scoring criteria are clearly defined and job-relevant, the system follows ethical principles and promotes fair decision-making.

Task 5: Inclusiveness and Ethical Variable Design

Scenario

Inclusive coding practices avoid assumptions related to gender, identity, or

roles and promote fairness in software design.

Task Description

Use an AI tool to generate a Python code snippet that processes user or

employee details.

Analyze the code to identify:

• Gender-specific variables (e.g., male, female)

• Assumptions based on gender or identity

• Non-inclusive naming or logic

Modify or regenerate the code to:

• Use gender-neutral variable names

• Avoid gender-based conditions unless strictly required

• Ensure inclusive and respectful coding practices

Expected Output

• Original AI-generated code snippet

• Revised inclusive and gender-neutral code

• Brief explanation of:

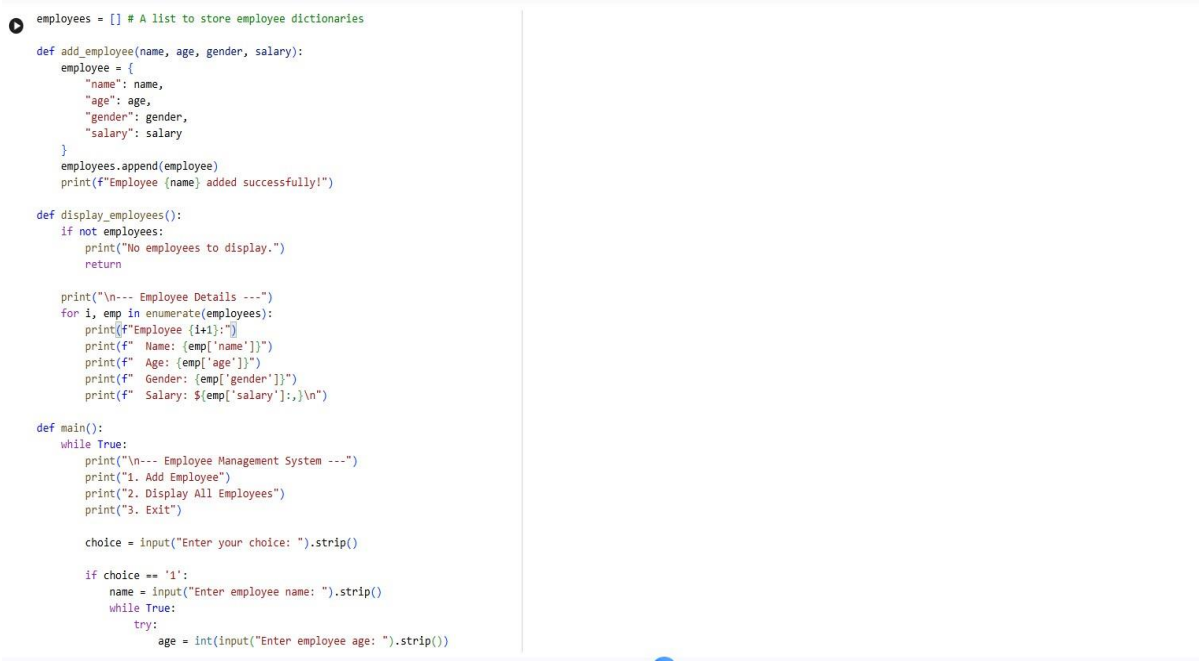
o What was non-inclusive

o How inclusiveness was improved

PROMPT:

Create a Python program that processes employee details such as name, age, gender, and salary.

CODE:



```
employees = [] # A list to store employee dictionaries

def add_employee(name, age, gender, salary):
    employee = {
        "name": name,
        "age": age,
        "gender": gender,
        "salary": salary
    }
    employees.append(employee)
    print(f"Employee {name} added successfully!")

def display_employees():
    if not employees:
        print("No employees to display.")
        return

    print("\n--- Employee Details ---")
    for i, emp in enumerate(employees):
        print(f"Employee {i+1}:")
        print(f"  Name: {emp['name']}")
        print(f"  Age: {emp['age']}")
        print(f"  Gender: {emp['gender']}")
        print(f"  Salary: ${emp['salary']:,}\n")

def main():
    while True:
        print("\n--- Employee Management System ---")
        print("1. Add Employee")
        print("2. Display All Employees")
        print("3. Exit")

        choice = input("Enter your choice: ").strip()

        if choice == '1':
            name = input("Enter employee name: ").strip()
            while True:
                try:
                    age = int(input("Enter employee age: ").strip())
```

```
                    age = int(input("Enter employee age: ").strip())
                    if age <= 0:
                        print("Age must be a positive number.")
                        continue
                    break
                except ValueError:
                    print("Invalid age. Please enter a number.")
            gender = input("Enter employee gender (Male/Female/Other): ").strip()
            while True:
                try:
                    salary = float(input("Enter employee salary: ").strip())
                    if salary < 0:
                        print("Salary cannot be negative.")
                        continue
                    break
                except ValueError:
                    print("Invalid salary. Please enter a number.")
            add_employee(name, age, gender, salary)
        elif choice == '2':
            display_employees()
        elif choice == '3':
            print("Exiting Employee Management System.")
            break
        else:
            print("Invalid choice. Please try again.")

if __name__ == "__main__":
    main()
```

OUTPUT:

```
--- Employee Management System ---
1. Add Employee
2. Display All Employees
3. Exit
Enter your choice: 2
No employees to display.

--- Employee Management System ---
1. Add Employee
2. Display All Employees
3. Exit
Enter your choice: 1
Enter employee name: dsa
Enter employee age: 23
Enter employee gender (Male/Female/Other): male
Enter employee salary: 2000
Employee dsa added successfully!

--- Employee Management System ---
1. Add Employee
2. Display All Employees
3. Exit
Enter your choice: 2

--- Employee Details ---
Employee 1:
  Name: dsa
  Age: 23
  Gender: male
  Salary: $2,000.0


--- Employee Management System ---
1. Add Employee
2. Display All Employees
3. Exit
Enter your choice: 3
Exiting Employee Management System.
```

EXPLANATION:

In this task, the employee management system processes details like name, age, gender, and salary without making decisions based on gender. Although gender information is collected, it is not used to affect salary or employee handling, which helps avoid bias. The program treats all employees equally and uses neutral logic, making it more inclusive and ethically designed.