PROJECT DOCUMENTATION
EDUQUEST QUIZ APPLICATION

Problem Statement:

Traditional educational approaches often fail to cater to the diverse learning needs and preferences of individual students, leading to disengagement, inefficiency, and suboptimal academic outcomes. Additionally, students frequently struggle with time management, resulting in poor utilization of study hours and heightened stress levels due to impending deadlines. Furthermore, many educational platforms lack engaging mechanisms to sustain student motivation and foster active participation in the learning process.

Abstract:

EduQuest presents a pioneering educational software initiative aimed at transforming the learning experience through dynamic learning trails, effective time management, and captivating gamification driven by greedy algorithms. This project integrates state-of-the-art technologies to craft personalized learning journeys tailored to individual student requirements, while optimizing study schedules for heightened efficiency.

Dynamic Learning Trails:

EduQuest employs dynamic programming methodologies to curate adaptive learning trails customized to each student's unique learning preferences, pace, and proficiency levels. By analyzing historical data and performance metrics, the system dynamically adjusts the sequence and complexity of learning modules, ensuring an optimal learning trajectory.

Time Mastery:

Through the application of dynamic programming algorithms, EduQuest facilitates effective time management for students. By considering variables such as academic objectives, available study time, and impending deadlines, the software generates optimized study schedules, minimizing time wastage and maximizing productivity.

Key Features:

- Personalized learning trails tailored to individual student requirements.
- Optimized study schedules for enhanced time management efficiency.
- Immersive gamification elements fostering active student engagement.
- Real-time feedback and progress monitoring for continuous improvement.
- Seamless integration with existing educational platforms and curricula.

Benefits:

- Increased student engagement and motivation levels.
- Improved learning outcomes through personalized and adaptive learning experiences.
- Enhanced time management skills leading to heightened productivity and academic success.
- Streamlined integration with pre-existing educational ecosystems for simplified adoption and scalability.

Algorithms used :

1. **Dynamic Programming:**

   Knapsack Algorithm (0-1 Knapsack): Employed to optimize the allocation of points to users based on their rewards and proficiency levels.

2. **Divide and Conquer:**

   Merge Sort: Used to sort users based on their points for generating the leaderboard.

3. **Graph Algorithms:**

   NetworkX: Used for graph representation to analyze the proficiency levels of users in different subjects.

Expected Result:

The expected result of EduQuest quiz app depends purely on its objectives and functionality. Here are some potential expected outcomes:

1. **Engagement**: Users actively participate in quizzes, enjoying the learning process and finding the content engaging.
2. **Learning Progress**: Users demonstrate an improvement in their knowledge and skills over time, reflected in their quiz scores and proficiency levels.
3. **Customized Learning Paths**: The adaptive learning system suggests personalized learning paths to users based on their performance, helping them focus on weaker areas and enhance their strengths.
4. **Efficient Resource Allocation**: Points and rewards are allocated efficiently using algorithms like knapsack, ensuring optimal utilization of resources and motivating users to continue engaging with the platform.
5. **Community Interaction**: Users may engage in community features such as leaderboards, discussions, or collaborative learning, fostering a sense of belonging and encouraging peer-to-peer interaction.

6. **Data Insights**: The app provides valuable insights into user performance, areas of interest, and learning trends, enabling administrators to make data-driven decisions to improve the learning experience.

Overall, the expected result is to create a user-centric, engaging, and effective learning environment that supports continuous improvement and knowledge acquisition.

Concept used :

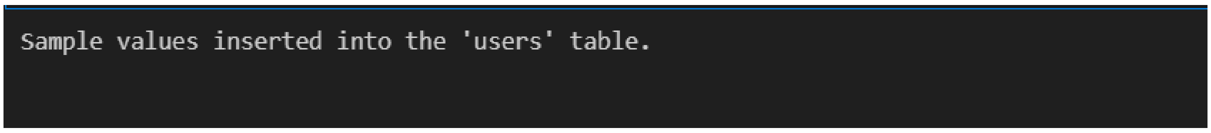
1. **SQLite Database**: Utilized for storing user data, quiz information, and other relevant details in a structured format.
2. **Object-Oriented Programming (OOP)**: Implemented through classes like **User** to encapsulate user data and functionalities, promoting code organization and reusability.
3. **Data Retrieval**: User data is fetched from the SQLite database using SQL queries, enabling the app to access and utilize stored information dynamically.
4. **Merge Sort Algorithm**: Employed for sorting user data based on points, facilitating the creation of a leaderboard to display user rankings.
5. **Web Development (Express.js)**: Used to create a web server and define routes for serving HTML pages enabling interaction with the quiz app through a web interface.
6. **Dynamic HTML Generation**: HTML content, including leaderboards and user suggestions, is dynamically generated based on fetched user data and algorithm outputs, providing a customized and interactive user experience.
7. **Algorithmic Techniques or Design Techniques**:
    - **Greedy Algorithms**: Used for heuristic-based approaches in suggestion generation and point allocation.
    - **Dynamic Programming**: Applied in the knapsack algorithm for efficient resource allocation and point distribution.
    - **Linear Programming**: Utilized for solving optimization problems, such as maximum flow in directed graphs.
8. **Graph Theory (NetworkX)**: Employed for representing user proficiency levels and relationships between subjects, enabling the identification of weaker areas and suggesting personalized learning paths.
9. **Adaptive Learning Systems**: Designed to provide personalized learning experiences, including tailored suggestions, resource allocation, and learning path recommendations based on user performance and interests.

Implementation:

```
import sqlite3
```

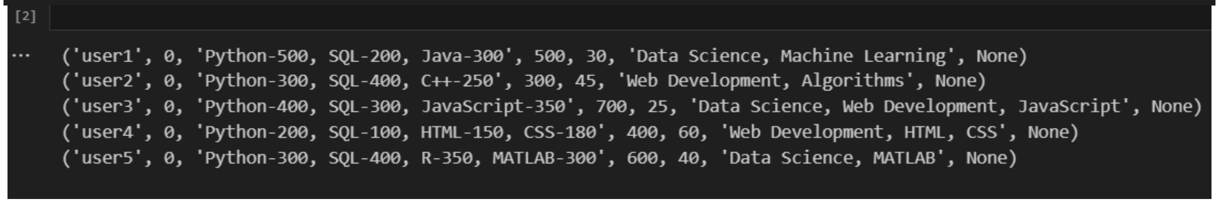
```python
# Connect to the SQLite database
conn = sqlite3.connect('quiz_database.db')
cursor = conn.cursor()
# Drop the 'users' table if it exists
drop_table_sql = '''
DROP TABLE IF EXISTS users;
'''
cursor.execute(drop_table_sql)
# Define the SQL statement to create the 'users' table with the new column
'areas_of_interest'
create_users_table_sql = '''
CREATE TABLE IF NOT EXISTS users (
    user_id TEXT PRIMARY KEY,
    reward INTEGER DEFAULT 0,
    subject_and_score TEXT,
    points INTEGER DEFAULT 0,
    time_taken INTEGER DEFAULT 0,
    areas_of_interest TEXT,
    suggestions TEXT  -- New column added for suggestions
);
'''
# Execute the SQL statement to create the 'users' table
cursor.execute(create_users_table_sql)
# Define the SQL statement to insert sample values into the 'users' table
insert_sample_values_sql = '''
INSERT INTO users (user_id, subject_and_score, points, time_taken,
areas_of_interest)
VALUES
    ('user1', 'Python-500, SQL-200, Java-300', 500, 30, 'Data Science, Machine
Learning'),
    ('user2', 'Python-300, SQL-400, C++-250', 300, 45, 'Web Development,
Algorithms'),
    ('user3', 'Python-400, SQL-300, JavaScript-350', 700, 25, 'Data Science,
Web Development, JavaScript'),
    ('user4', 'Python-200, SQL-100, HTML-150, CSS-180', 400, 60, 'Web
Development, HTML, CSS'),
    ('user5', 'Python-300, SQL-400, R-350, MATLAB-300', 600, 40, 'Data
Science, MATLAB');
'''

# Execute the SQL statement to insert sample values
cursor.execute(insert_sample_values_sql)

# Commit the changes
conn.commit()

# Close the connection
conn.close()
```

```
print("Sample values inserted into the 'users' table.")
```



```
Sample values inserted into the 'users' table.
```

```
import sqlite3

# Connect to the SQLite database
conn = sqlite3.connect('quiz_database.db')
cursor = conn.cursor()

# Retrieve all rows from the 'users' table
cursor.execute('SELECT * FROM users;')
user_details = cursor.fetchall()

# Display the user details
for user in user_details:
    print(user)

#print('no data')
# Close the connection
conn.close()
```



```
[2]
...  ('user1', 0, 'Python-500, SQL-200, Java-300', 500, 30, 'Data Science, Machine Learning', None)
     ('user2', 0, 'Python-300, SQL-400, C++-250', 300, 45, 'Web Development, Algorithms', None)
     ('user3', 0, 'Python-400, SQL-300, JavaScript-350', 700, 25, 'Data Science, Web Development, JavaScript', None)
     ('user4', 0, 'Python-200, SQL-100, HTML-150, CSS-180', 400, 60, 'Web Development, HTML, CSS', None)
     ('user5', 0, 'Python-300, SQL-400, R-350, MATLAB-300', 600, 40, 'Data Science, MATLAB', None)
```

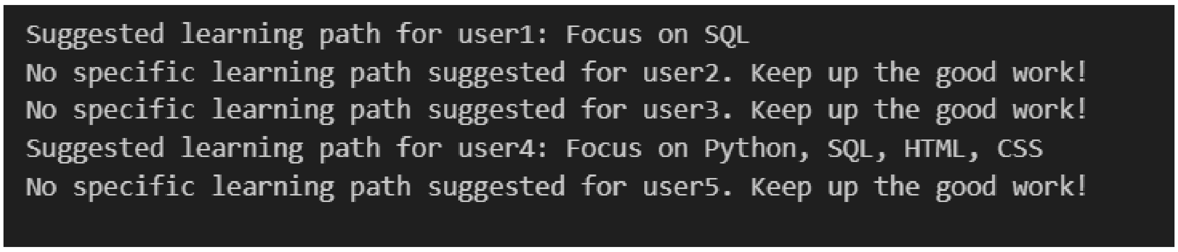
```
import sqlite3
import math
# Define the User class
class User:
    def __init__(self, user_id, subject_and_score, points, time_taken):
        self.user_id = user_id
        self.subject_and_score = subject_and_score
        self.points = points
        self.time_taken = time_taken
        self.reward = 0  # Initialize reward to zero
# Function to load user data from the database
def fetch_user_data():
    conn = sqlite3.connect('quiz_database.db')
    cursor = conn.cursor()
    cursor.execute('SELECT user_id, subject_and_score, points, time_taken FROM 
users;')
```

```python
    user_details = cursor.fetchall()
    conn.close()
    return [User(*user_info) for user_info in user_details]
# Load user data
users = fetch_user_data()
# Define parameters for reward calculation
marks_weight = 0.6  # Weight assigned to marks scored
time_weight = 0.4  # Weight assigned to time taken
benchmark_marks = 500  # Benchmark marks for comparison
benchmark_time = 60  # Benchmark time in minutes
# Calculate reward for each user and update the database
conn = sqlite3.connect('quiz_database.db')
cursor = conn.cursor()
for user in users:
    # Normalize time taken (assuming lower time is better)
    normalized_time = min(1, user.time_taken / benchmark_time)

    # Normalize marks scored (assuming higher marks is better)
    normalized_marks = min(1, user.points / benchmark_marks)

    # Calculate reward using weighted combination of normalized marks and time
    reward = math.ceil((normalized_marks * marks_weight + normalized_time *
time_weight) * 100)

    # Update the reward for the current user in the database
    cursor.execute("UPDATE users SET reward = ? WHERE user_id = ?", (reward,
user.user_id))
# Commit changes and close connection
conn.commit()
conn.close()
# Print the updated database
conn = sqlite3.connect('quiz_database.db')
cursor = conn.cursor()
cursor.execute('SELECT * FROM users')
updated_users = cursor.fetchall()
conn.close()
for user in updated_users:
    print(user)
```

```
...  ('user1', 80, 'Python-500, SQL-200, Java-300', 500, 30, 'Data Science, Machine Learning', None)
     ('user2', 66, 'Python-300, SQL-400, C++-250', 300, 45, 'Web Development, Algorithms', None)
     ('user3', 77, 'Python-400, SQL-300, JavaScript-350', 700, 25, 'Data Science, Web Development, JavaScript', None)
     ('user4', 88, 'Python-200, SQL-100, HTML-150, CSS-180', 400, 60, 'Web Development, HTML, CSS', None)
     ('user5', 87, 'Python-300, SQL-400, R-350, MATLAB-300', 600, 40, 'Data Science, MATLAB', None)
```

```python
import sqlite3
import networkx as nx
```

```
class User:
    def __init__(self, user_id, reward, subject_and_score, points, 
areas_of_interest):
        self.user_id = user_id
        self.reward = reward
        self.points = points
        self.subject_and_score = subject_and_score
        self.areas_of_interest = areas_of_interest
        self.subject_marks = {}
        self.graph = nx.DiGraph()  # Initialize a directed graph for the user

        # Parse areas_of_interest to extract subject marks and construct the 
graph
        self.parse_subject_and_score()

    def parse_subject_and_score(self):
        subjects = self.subject_and_score.split(', ')
        for subject in subjects:
            subject_name, mark = subject.split('-')
            self.subject_marks[subject_name] = int(mark)
            self.graph.add_node(subject_name, proficiency=int(mark))  # Add 
node with proficiency level

class WeakAreaIdentifier:
    def __init__(self, users):
        self.users = users

    def identify_weaker_areas(self, threshold):
        weaker_areas = {}
        for user in self.users:
            for subject, mark in user.subject_marks.items():
                if mark < threshold:
                    if user.user_id not in weaker_areas:
                        weaker_areas[user.user_id] = []
                    weaker_areas[user.user_id].append(subject)
        return weaker_areas

class AdaptiveLearningSystem:
    def __init__(self, users):
        self.users = users
        self.weak_area_identifier = WeakAreaIdentifier(users)

    def suggest_learning_path(self, user_id):
        weaker_areas = self.weak_area_identifier.identify_weaker_areas(250)  # 
Set threshold for weaker areas
        if user_id in weaker_areas:
            # Here, you could use graph algorithms to suggest a learning path based on user's current proficiency and graph structure
            return f"Suggested learning path for {user_id}: Focus on {', '.join(weaker_areas[user_id])}"
        else:
            return f"No specific learning path suggested for {user_id}. Keep up the good work!"

# Fetch user data from the database
def fetch_user_data():
    conn = sqlite3.connect('quiz_database.db')
    cursor = conn.cursor()
    cursor.execute('SELECT user_id, reward, subject_and_score, points, areas_of_interest FROM users;')  # Select only required columns
    user_details = cursor.fetchall()
    conn.close()

    users = []
    for user_info in user_details:
        user = User(*user_info)
        users.append(user)
    return users

if __name__ == "__main__":
    # Fetch user data from the database
    users = fetch_user_data()

    # Initialize the adaptive learning system
    adaptive_system = AdaptiveLearningSystem(users)

    # Example: Suggest learning path for each user
    for user in users:
        learning_path = adaptive_system.suggest_learning_path(user.user_id)
        print(learning_path)
```

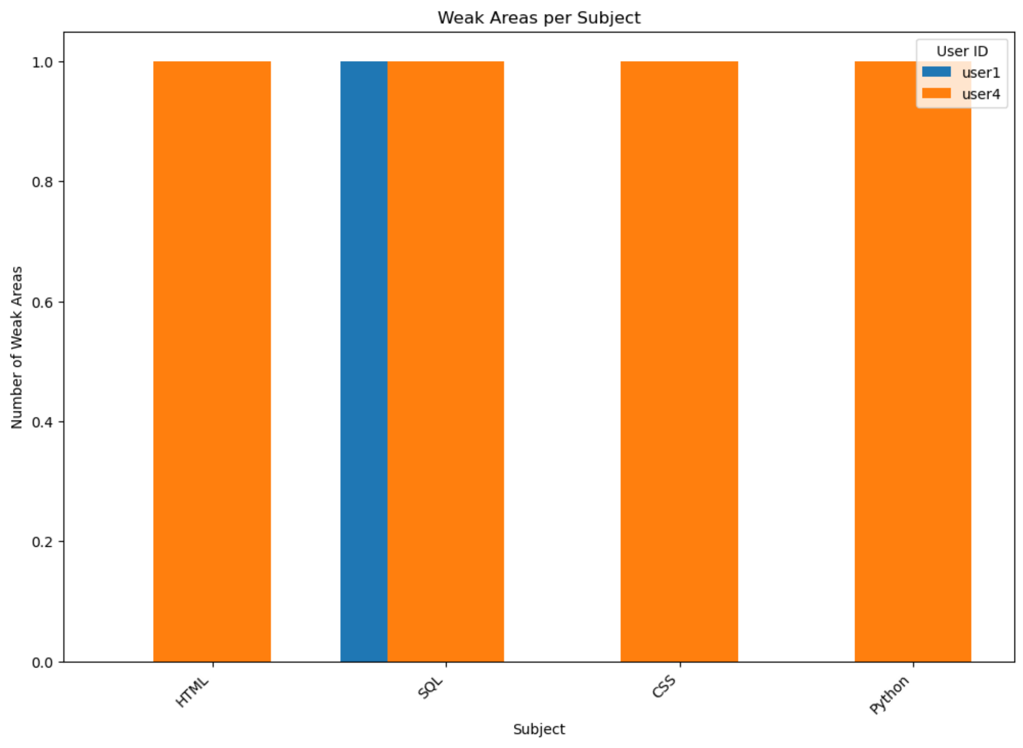


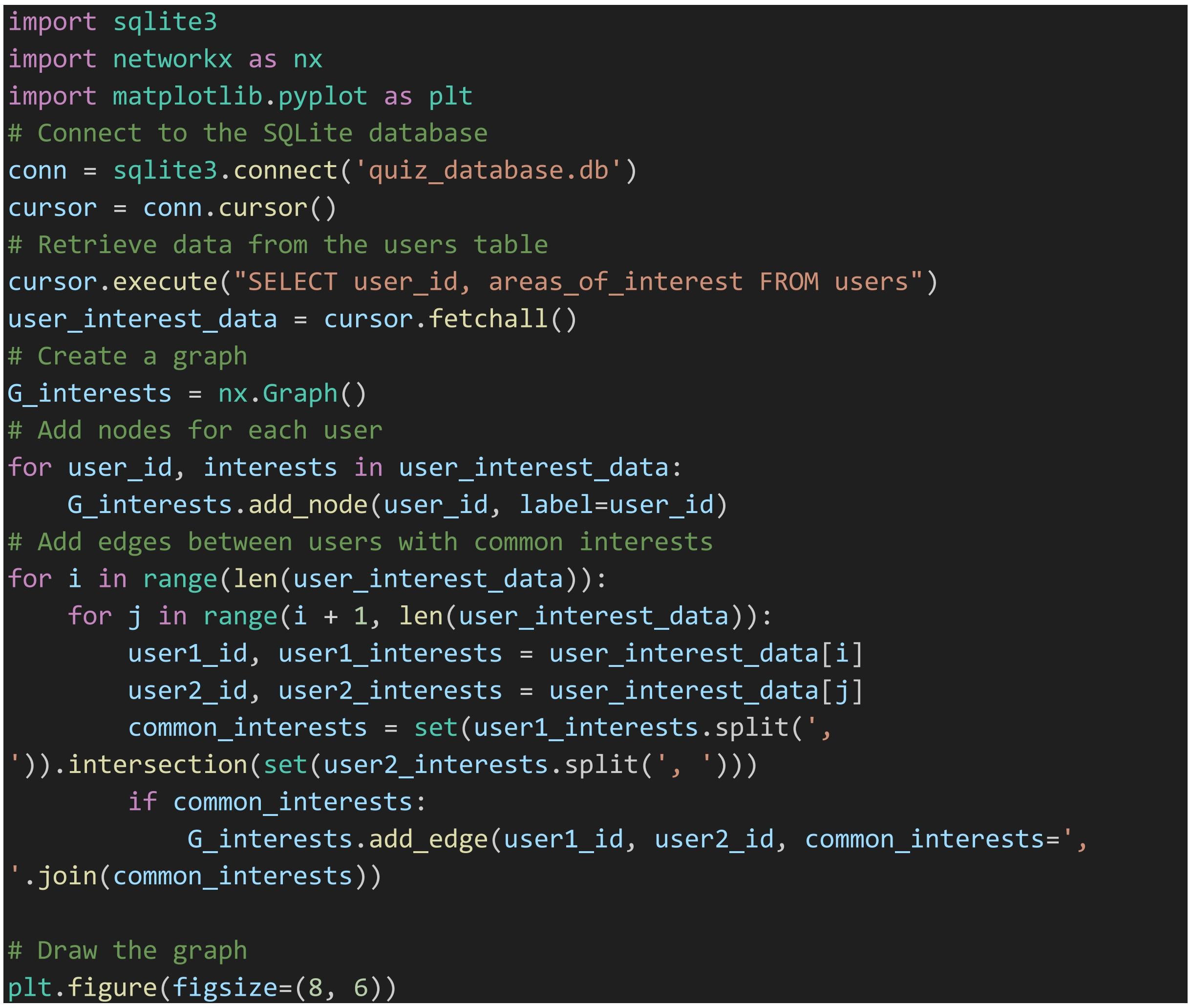
```
Suggested learning path for user1: Focus on SQL
No specific learning path suggested for user2. Keep up the good work!
No specific learning path suggested for user3. Keep up the good work!
Suggested learning path for user4: Focus on Python, SQL, HTML, CSS
No specific learning path suggested for user5. Keep up the good work!
```

```
import sqlite3
import math
import networkx as nx
import numpy as np
```

```python
import matplotlib.pyplot as plt
from collections import defaultdict

class User:
    def __init__(self, user_id, reward, subject_and_score, points,
areas_of_interest):
        self.user_id = user_id
        self.reward = reward
        self.points = points
        self.subject_and_score = subject_and_score
        self.areas_of_interest = areas_of_interest
        self.subject_marks = {}
        self.graph = nx.DiGraph()  # Initialize a directed graph for the user

        # Parse areas_of_interest to extract subject marks and construct the
graph
        self.parse_subject_and_score()

    def parse_subject_and_score(self):
        subjects = self.subject_and_score.split(', ')
        for subject in subjects:
            subject_name, mark = subject.split('-')
            self.subject_marks[subject_name] = int(mark)
            self.graph.add_node(subject_name, proficiency=int(mark))  # Add
node with proficiency level

class WeakAreaIdentifier:
    def __init__(self, users):
        self.users = users

    def identify_weaker_areas(self, threshold):
        weaker_areas = {}
        for user in self.users:
            for subject, mark in user.subject_marks.items():
                if mark < threshold:
                    if user.user_id not in weaker_areas:
                        weaker_areas[user.user_id] = []
                    weaker_areas[user.user_id].append(subject)
        return weaker_areas

class AdaptiveLearningSystem:
    def __init__(self, users):
        self.users = users
        self.weak_area_identifier = WeakAreaIdentifier(users)

    def suggest_learning_path(self, user_id):
        weaker_areas = self.weak_area_identifier.identify_weaker_areas(250)  #
Set threshold for weaker areas
```

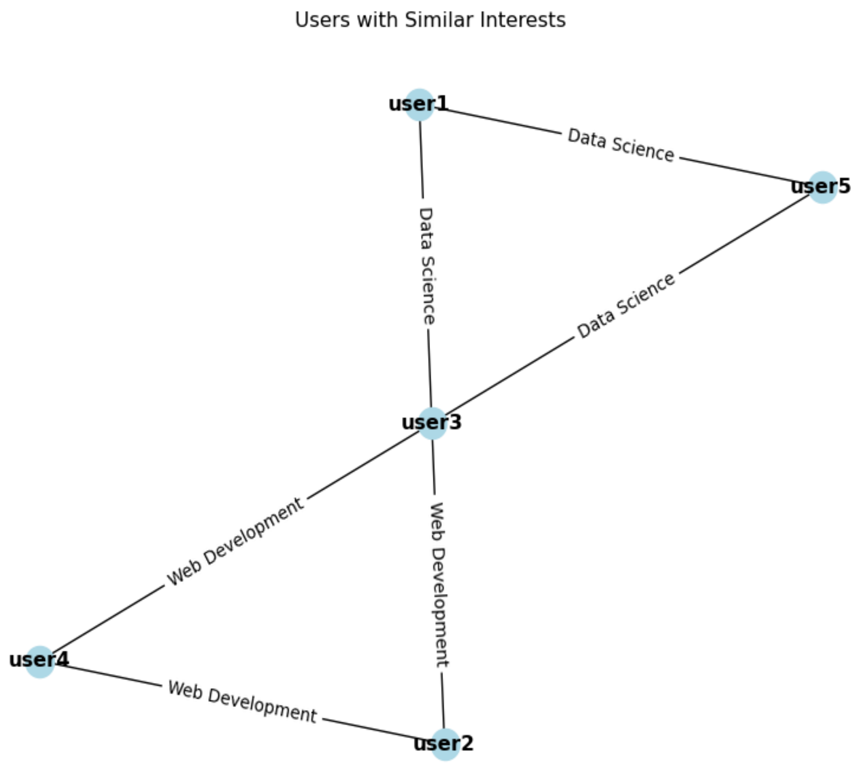
```
        if user_id in weaker_areas:
            # Here, you could use graph algorithms to suggest a learning path
based on user's current proficiency and graph structure
            return f"Suggested learning path for {user_id}: Focus on {',
'.join(weaker_areas[user_id])}"
        else:
            return f"No specific learning path suggested for {user_id}. Keep
up the good work!"

    def plot_weak_areas_per_subject(self):
        weaker_areas = self.weak_area_identifier.identify_weaker_areas(250)
        subjects = set(subject for user_weaknesses in weaker_areas.values()
for subject in user_weaknesses)
        user_ids = list(weaker_areas.keys())

        # Create a defaultdict to store the count of weak areas for each
subject and user
        subject_user_weakness_count = {subject: {user_id: 0 for user_id in
user_ids} for subject in subjects}

        # Count the occurrences of weak areas for each subject and user
        for user_id, user_weaknesses in weaker_areas.items():
            for subject in user_weaknesses:
                subject_user_weakness_count[subject][user_id] += 1

        # Extract subjects, user IDs, and their corresponding weakness counts
for plotting
        subjects = list(subject_user_weakness_count.keys())
        user_ids = list(weaker_areas.keys())  # user IDs extracted from
weaker_areas dictionary
        weakness_counts = [[subject_user_weakness_count[subject][user_id] for
subject in subjects] for user_id in user_ids]

        # Convert weakness counts to numpy array for plotting
        weakness_counts_array = np.array(weakness_counts)

        # Create positions for bars
        bar_positions = np.arange(len(subjects))

        # Create a bar chart
        plt.figure(figsize=(12, 8))
        for i, user_id in enumerate(user_ids):
            plt.bar(bar_positions + i * 0.2, weakness_counts_array[i],
width=0.5, label=user_id)

        plt.xticks(bar_positions + 0.2, subjects, rotation=45, ha='right')
        plt.ylabel('Number of Weak Areas')
        plt.xlabel('Subject')
        plt.title('Weak Areas per Subject')
        plt.legend(title='User ID')
        plt.show()

# Fetch user data from the database
def fetch_user_data():
    conn = sqlite3.connect('quiz_database.db')
    cursor = conn.cursor()
    cursor.execute('SELECT user_id, reward, subject_and_score, points,
areas_of_interest FROM users;')  # Select only required columns
    user_details = cursor.fetchall()
    conn.close()
    users = []
    for user_info in user_details:
        user = User(*user_info)
        users.append(user)
    return users

if __name__ == "__main__":
    # Fetch user data from the database
    users = fetch_user_data()

    # Initialize the adaptive learning system
    adaptive_system = AdaptiveLearningSystem(users)

    # Example: Suggest learning path for each user
    for user in users:
        learning_path = adaptive_system.suggest_learning_path(user.user_id)
        print(learning_path)

    # Plot weak areas per subject
    adaptive_system.plot_weak_areas_per_subject()
```



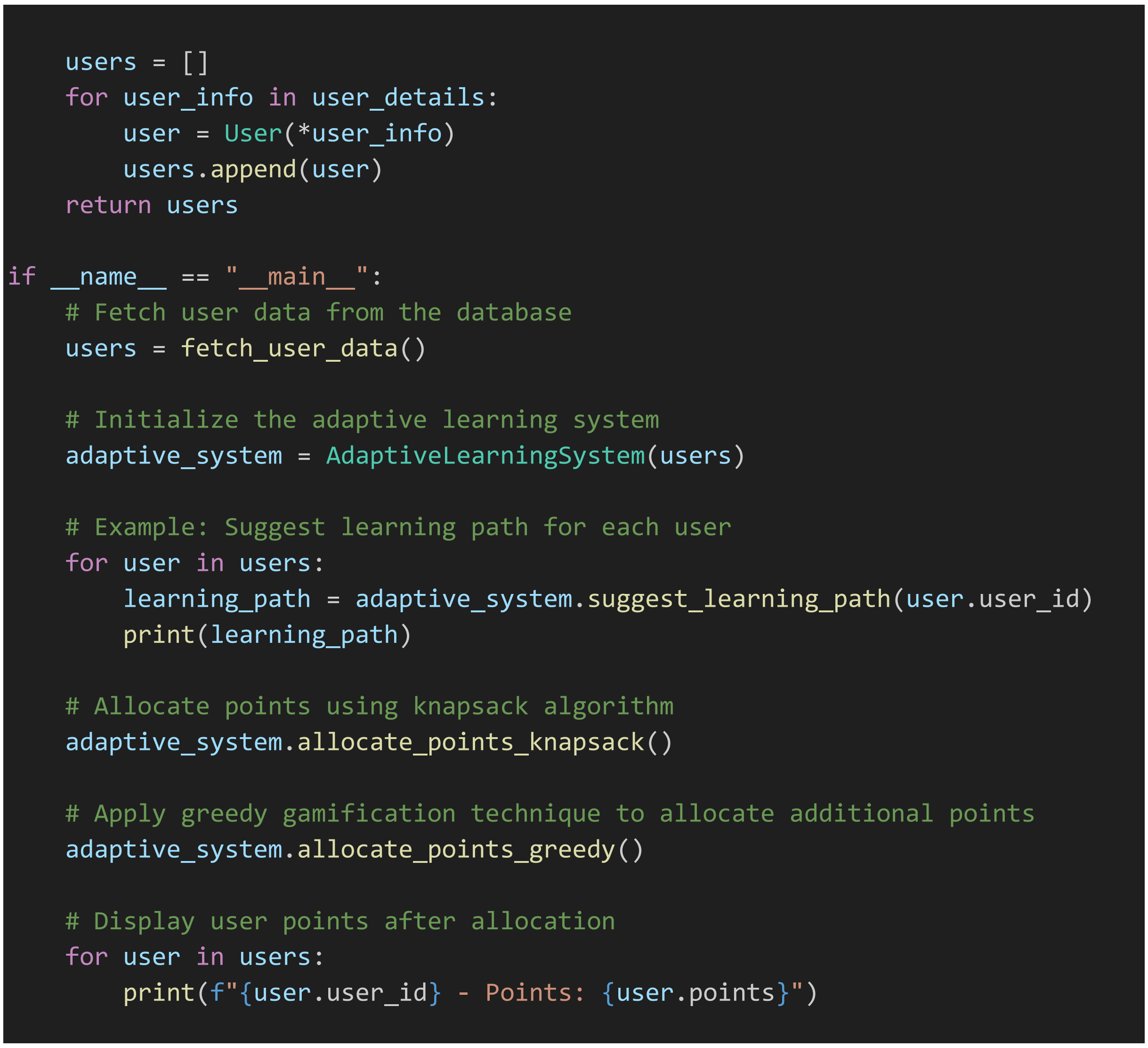


```python
import sqlite3
import networkx as nx
import matplotlib.pyplot as plt
# Connect to the SQLite database
conn = sqlite3.connect('quiz_database.db')
cursor = conn.cursor()
# Retrieve data from the users table
cursor.execute("SELECT user_id, areas_of_interest FROM users")
user_interest_data = cursor.fetchall()
# Create a graph
G_interests = nx.Graph()
# Add nodes for each user
for user_id, interests in user_interest_data:
    G_interests.add_node(user_id, label=user_id)
# Add edges between users with common interests
for i in range(len(user_interest_data)):
    for j in range(i + 1, len(user_interest_data)):
        user1_id, user1_interests = user_interest_data[i]
        user2_id, user2_interests = user_interest_data[j]
        common_interests = set(user1_interests.split(',
')).intersection(set(user2_interests.split(', ')))
        if common_interests:
            G_interests.add_edge(user1_id, user2_id, common_interests=',
'.join(common_interests))

# Draw the graph
plt.figure(figsize=(8, 6))
```

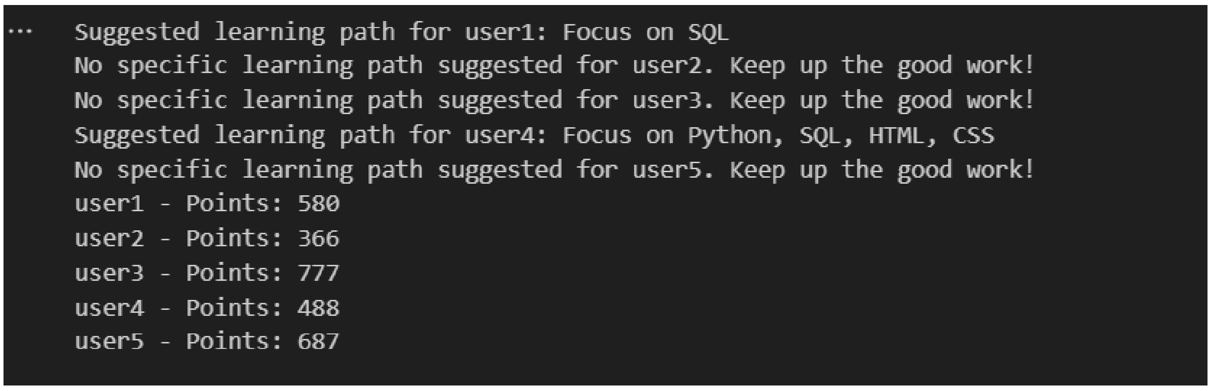
```
pos = nx.spring_layout(G_interests, seed=42)  # Position nodes using the
spring layout algorithm
nx.draw(G_interests, pos, with_labels=True, node_color='lightblue',
font_weight='bold', labels=nx.get_node_attributes(G_interests, 'label'))
edge_labels = nx.get_edge_attributes(G_interests, 'common_interests')
nx.draw_networkx_edge_labels(G_interests, pos, edge_labels=edge_labels)
plt.title('Users with Similar Interests')
plt.show()
# Close the connection
conn.close()
```



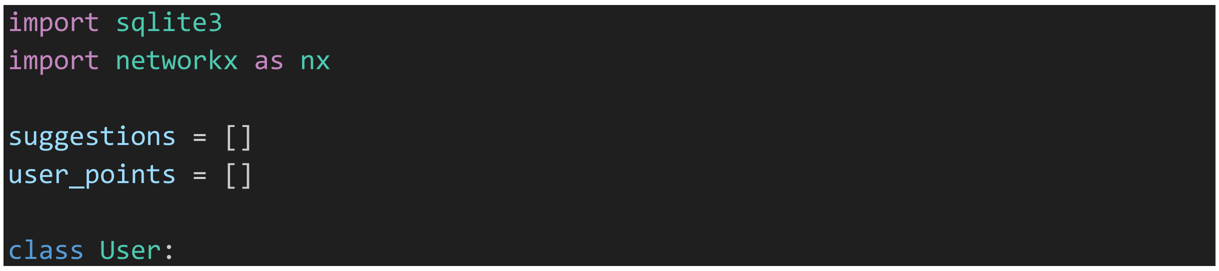
```
import sqlite3
import networkx as nx

class User:
    def __init__(self, user_id, reward, subject_and_score, points,
areas_of_interest):
        self.user_id = user_id
        self.reward = reward
        self.points = points
        self.subject_and_score = subject_and_score
        self.areas_of_interest = areas_of_interest
        self.subject_marks = {}
        self.graph = nx.DiGraph()  # Initialize a directed graph for the user
        # Parse areas_of_interest to extract subject marks and construct
the  graph
        self.parse_subject_and_score()

    def parse_subject_and_score(self):
        subjects = self.subject_and_score.split(', ')
        for subject in subjects:
            subject_name, mark = subject.split('-')
            self.subject_marks[subject_name] = int(mark)
            self.graph.add_node(subject_name, proficiency=int(mark))  # Add
node with proficiency level

class WeakAreaIdentifier:
    def __init__(self, users):
        self.users = users

    def identify_weaker_areas(self, threshold):
        weaker_areas = {}
        for user in self.users:
            for subject, mark in user.subject_marks.items():
                if mark < threshold:
                    if user.user_id not in weaker_areas:
                        weaker_areas[user.user_id] = []
                    weaker_areas[user.user_id].append(subject)
        return weaker_areas

class AdaptiveLearningSystem:
    def __init__(self, users):
        self.users = users
        self.weak_area_identifier = WeakAreaIdentifier(users)

    def suggest_learning_path(self, user_id):
        weaker_areas = self.weak_area_identifier.identify_weaker_areas(250)  #
Set threshold for weaker areas
        if user_id in weaker_areas:
            # Here, you could use graph algorithms to suggest a learning path
based on user's current proficiency and graph structure
            return f"Suggested learning path for {user_id}: Focus on {',
'.join(weaker_areas[user_id])}"
        else:
            return f"No specific learning path suggested for {user_id}. Keep
up the good work!"

    def allocate_points_knapsack(self):
        # Define knapsack parameters
        knapsack_capacity = 500  # Maximum total proficiency level
        rewards = [user.reward for user in self.users]  # Values
        proficiencies = [sum(user.subject_marks.values()) for user in
self.users]  # Weights

        # Solve knapsack problem
        dp = [[0] * (knapsack_capacity + 1) for _ in range(len(self.users) +
1)]
        for i in range(1, len(self.users) + 1):
            for j in range(1, knapsack_capacity + 1):
                if proficiencies[i - 1] <= j:
                    # Try to include the current user's reward while
respecting the capacity
                    dp[i][j] = max(dp[i - 1][j], rewards[i - 1] + dp[i - 1][j
- proficiencies[i - 1]])
                else:
                    # If the current user's proficiency exceeds the capacity,
exclude them
                    dp[i][j] = dp[i - 1][j]

        # Backtrack to find selected users
        selected_users = []
        i, j = len(self.users), knapsack_capacity
        while i > 0 and j > 0:
            if dp[i][j] != dp[i - 1][j]:
                selected_users.append(self.users[i - 1])
                j -= proficiencies[i - 1]
            i -= 1

        # Allocate points to selected users
        for user in selected_users:
            user.points += user.reward

    def allocate_points_greedy(self):
        # Sort users by reward in descending order
        sorted_users = sorted(self.users, key=lambda x: x.reward,
reverse=True)

        for user in sorted_users:
            # Allocate points based on user's reward
            user.points += user.reward


# Fetch user data from the database
def fetch_user_data():
    conn = sqlite3.connect('quiz_database.db')
    cursor = conn.cursor()
    cursor.execute('SELECT user_id, reward, subject_and_score, points,
areas_of_interest FROM users;')  # Select only required columns
    user_details = cursor.fetchall()
    conn.close()
```



```python
    users = []
    for user_info in user_details:
        user = User(*user_info)
        users.append(user)
    return users

if __name__ == "__main__":
    # Fetch user data from the database
    users = fetch_user_data()

    # Initialize the adaptive learning system
    adaptive_system = AdaptiveLearningSystem(users)

    # Example: Suggest learning path for each user
    for user in users:
        learning_path = adaptive_system.suggest_learning_path(user.user_id)
        print(learning_path)

    # Allocate points using knapsack algorithm
    adaptive_system.allocate_points_knapsack()

    # Apply greedy gamification technique to allocate additional points
    adaptive_system.allocate_points_greedy()

    # Display user points after allocation
    for user in users:
        print(f"{user.user_id} - Points: {user.points}")
```



```
...   Suggested learning path for user1: Focus on SQL
      No specific learning path suggested for user2. Keep up the good work!
      No specific learning path suggested for user3. Keep up the good work!
      Suggested learning path for user4: Focus on Python, SQL, HTML, CSS
      No specific learning path suggested for user5. Keep up the good work!
      user1 - Points: 580
      user2 - Points: 366
      user3 - Points: 777
      user4 - Points: 488
      user5 - Points: 687
```



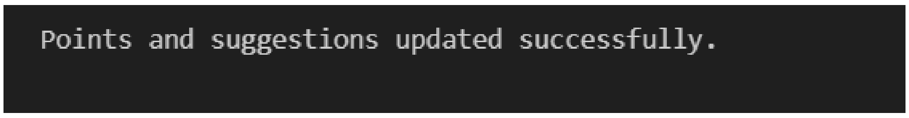
```python
import sqlite3
import networkx as nx

suggestions = []
user_points = []

class User:
    def __init__(self, user_id, reward, subject_and_score, points,
areas_of_interest):
        self.user_id = user_id
        self.reward = reward
        self.points = points
        self.subject_and_score = subject_and_score
        self.areas_of_interest = areas_of_interest
        self.subject_marks = {}
        self.graph = nx.DiGraph()  # Initialize a directed graph for the user

        # Parse areas_of_interest to extract subject marks and construct the
graph
        self.parse_subject_and_score()

    def parse_subject_and_score(self):
        subjects = self.subject_and_score.split(', ')
        for subject in subjects:
            subject_name, mark = subject.split('-')
            self.subject_marks[subject_name] = int(mark)
            self.graph.add_node(subject_name, proficiency=int(mark))  # Add
node with proficiency level

class WeakAreaIdentifier:
    def __init__(self, users):
        self.users = users

    def identify_weaker_areas(self, threshold):
        weaker_areas = {}
        for user in self.users:
            for subject, mark in user.subject_marks.items():
                if mark < threshold:
                    if user.user_id not in weaker_areas:
                        weaker_areas[user.user_id] = []
                    weaker_areas[user.user_id].append(subject)
        return weaker_areas

class AdaptiveLearningSystem:
    def __init__(self, users):
        self.users = users
        self.weak_area_identifier = WeakAreaIdentifier(users)

    def suggest_learning_path(self, user_id):
        weaker_areas = self.weak_area_identifier.identify_weaker_areas(250)  #
Set threshold for weaker areas
        if user_id in weaker_areas:
            suggestion = f"Suggested learning path for {user_id}: Focus on {',
'.join(weaker_areas[user_id])}"
        else:
            suggestion = f"No specific learning path suggested for {user_id}.
Keep up the good work!"
        suggestions.append(suggestion)

    def allocate_points_knapsack(self):
        # Define knapsack parameters
        knapsack_capacity = 500  # Maximum total proficiency level
        rewards = [user.reward for user in self.users]  # Values
        proficiencies = [sum(user.subject_marks.values()) for user in
self.users]  # Weights

        # Solve knapsack problem
        dp = [[0] * (knapsack_capacity + 1) for _ in range(len(self.users) +
1)]
        for i in range(1, len(self.users) + 1):
            for j in range(1, knapsack_capacity + 1):
                if proficiencies[i - 1] <= j:
                    dp[i][j] = max(dp[i - 1][j], rewards[i - 1] + dp[i - 1][j
- proficiencies[i - 1]])
                else:
                    dp[i][j] = dp[i - 1][j]

        # Backtrack to find selected users
        selected_users = []
        i, j = len(self.users), knapsack_capacity
        while i > 0 and j > 0:
            if dp[i][j] != dp[i - 1][j]:
                selected_users.append(self.users[i - 1])
                j -= proficiencies[i - 1]
            i -= 1

        # Allocate points to selected users
        for user in selected_users:
            user.points += user.reward
        for user in self.users:
            user_points.append(user.points)

# Fetch user data from the database
def fetch_user_data():
    conn = sqlite3.connect('quiz_database.db')
    cursor = conn.cursor()
    cursor.execute('SELECT user_id, reward, subject_and_score, points,
areas_of_interest FROM users;')  # Select only required columns
    user_details = cursor.fetchall()
    conn.close()

    users = []
    for user_info in user_details:
```

```python
        user = User(*user_info)
        users.append(user)
    return users

if __name__ == "__main__":
    # Fetch user data from the database
    users = fetch_user_data()

    # Initialize the adaptive learning system
    adaptive_system = AdaptiveLearningSystem(users)

    # Example: Suggest learning path for each user
    for user in users:
        adaptive_system.suggest_learning_path(user.user_id)

    # Allocate points using knapsack algorithm
    adaptive_system.allocate_points_knapsack()

    # Display suggestions and user points
    for suggestion in suggestions:
        print(suggestion)

    for user_point in user_points:
        print(user_point)
```

```
Suggested learning path for user1: Focus on SQL
No specific learning path suggested for user2. Keep up the good work!
No specific learning path suggested for user3. Keep up the good work!
Suggested learning path for user4: Focus on Python, SQL, HTML, CSS
No specific learning path suggested for user5. Keep up the good work!
500
300
700
400
600
```

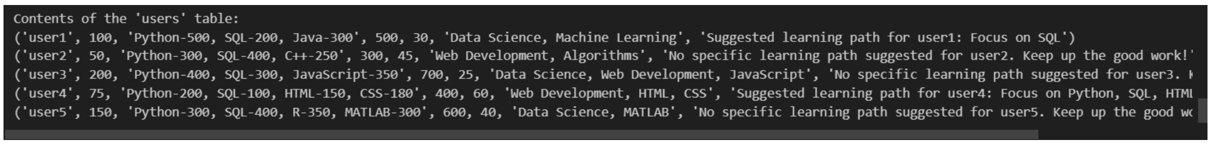
```python
import sqlite3

# Open connection to the database
conn = sqlite3.connect('quiz_database.db')
cursor = conn.cursor()

# Update the 'points' and 'suggestions' columns in the 'users' table
for i, (points, suggestion) in enumerate(zip(user_points, suggestions),
start=1):
    cursor.execute("UPDATE users SET points = ?, suggestions = ? WHERE rowid =
?", (points, suggestion, i))
```

```python
# Commit changes and close connection
conn.commit()
conn.close()

print("Points and suggestions updated successfully.")
```



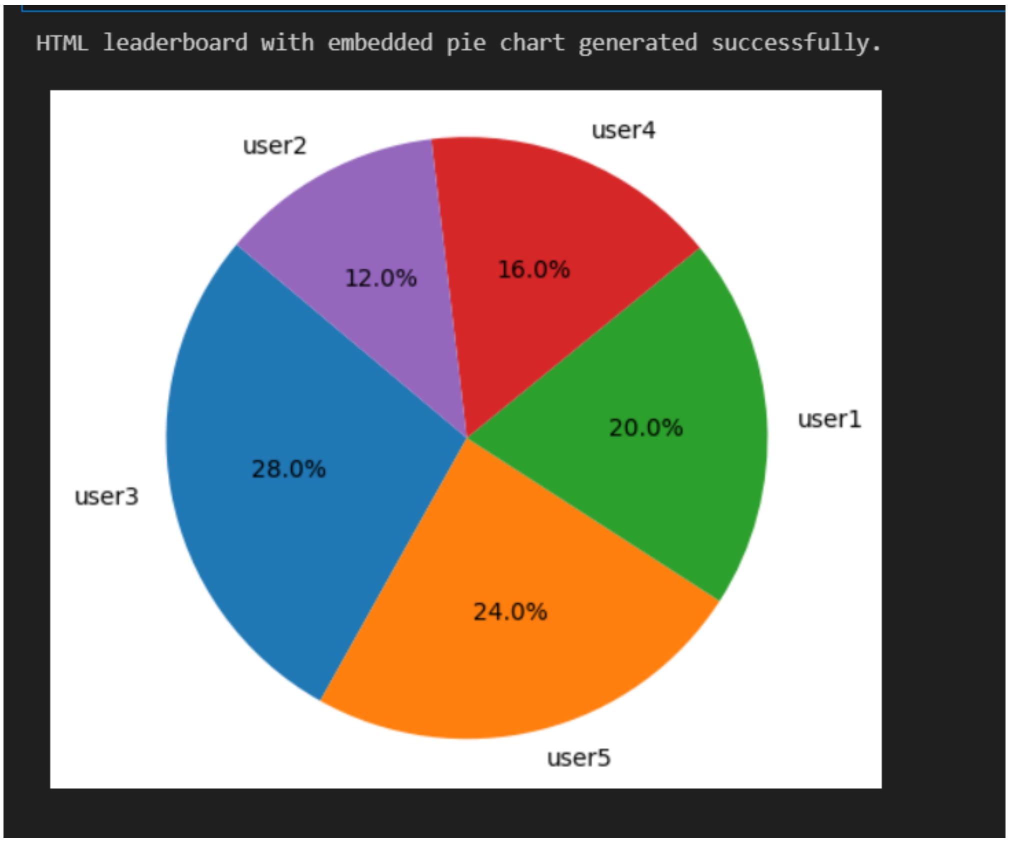
```
Points and suggestions updated successfully.
```

```python
import sqlite3

# Connect to the SQLite database
conn = sqlite3.connect('quiz_database.db')
cursor = conn.cursor()

# Fetch and display the contents of the 'users' table
cursor.execute('SELECT * FROM users')
users_data = cursor.fetchall()

print("Contents of the 'users' table:")
for user in users_data:
    print(user)

# Close the connection
conn.close()
```



```
Contents of the 'users' table:
('user1', 100, 'Python-500, SQL-200, Java-300', 500, 30, 'Data Science, Machine Learning', 'Suggested learning path for user1: Focus on SQL')
('user2', 50, 'Python-300, SQL-400, C++-250', 300, 45, 'Web Development, Algorithms', 'No specific learning path suggested for user2. Keep up the good work!'
('user3', 200, 'Python-400, SQL-300, JavaScript-350', 700, 25, 'Data Science, Web Development, JavaScript', 'No specific learning path suggested for user3.
('user4', 75, 'Python-200, SQL-100, HTML-150, CSS-180', 400, 60, 'Web Development, HTML, CSS', 'Suggested learning path for user4: Focus on Python, SQL, HTML
('user5', 150, 'Python-300, SQL-400, R-350, MATLAB-300', 600, 40, 'Data Science, MATLAB', 'No specific learning path suggested for user5. Keep up the good w
```

```python
import sqlite3
import matplotlib.pyplot as plt
import io
import base64

# Define the User class
class User:
    def __init__(self, user_id, reward, subject_and_score, points, time_taken, 
areas_of_interest, suggestions):
        self.user_id = user_id
        self.reward = reward
        self.subject_and_score = subject_and_score
        self.points = points
        self.time_taken = time_taken
        self.areas_of_interest = areas_of_interest
        self.suggestions = suggestions

# Define the fetch_user_data function to retrieve user data from the database
def fetch_user_data():
    conn = sqlite3.connect('quiz_database.db')
    cursor = conn.cursor()
    cursor.execute('SELECT * FROM users;')
    user_details = cursor.fetchall()
    conn.close()
    return [User(*user_info) for user_info in user_details]

# Call the fetch_user_data function to get user data from the database
users = fetch_user_data()

# Implement merge sort for User objects based on points
def merge_sort(users):
    if len(users) <= 1:
        return users

    # Divide the list into two halves
    mid = len(users) // 2
    left_half = users[:mid]
    right_half = users[mid:]

    # Recursively sort each half
    left_half = merge_sort(left_half)
    right_half = merge_sort(right_half)

    # Merge the sorted halves
    return merge(left_half, right_half)

def merge(left_half, right_half):
    merged = []
    left_index, right_index = 0, 0

    # Merge the two sorted lists based on points
    while left_index < len(left_half) and right_index < len(right_half):
        if left_half[left_index].points > right_half[right_index].points:
            merged.append(left_half[left_index])
            left_index += 1
        else:
            merged.append(right_half[right_index])
            right_index += 1

    # Add any remaining elements from the left and right lists
    merged.extend(left_half[left_index:])
    merged.extend(right_half[right_index:])
    return merged

# Function to generate HTML leaderboard with embedded pie chart
def generate_html_leaderboard(users):
    # Extract points and user IDs for the pie chart
    points = [user.points for user in users]
    user_ids = [user.user_id for user in users]

    # Create the pie chart
    plt.figure(figsize=(6, 5))
    plt.pie(points, labels=user_ids, autopct='%1.1f%%', startangle=140)
    plt.axis('equal')  # Equal aspect ratio ensures that pie is drawn as a
circle


    # Convert the pie chart to a base64 encoded string
    buffer = io.BytesIO()
    plt.savefig(buffer, format='png')
    buffer.seek(0)
    image_base64 = base64.b64encode(buffer.read()).decode('utf-8')

    # Generate the HTML content with embedded pie chart
    html_content = f"""
    <!DOCTYPE html>
    <html lang="en">
    <head>
        <meta charset="UTF-8">
        <meta name="viewport" content="width=device-width, initial-scale=1.0">
        <title>Leaderboard</title>
        <style>
            table {{
                font-family: Arial, sans-serif;
                border-collapse: collapse;
                width: 50%;
                margin: auto;
            }}

            th, td {{
                border: 1px solid #dddddd;
                text-align: left;
                padding: 8px;
            }}

            th {{
                background-color: #f2f2f2;
            }}
            .pie-chart-container {{
                text-align: center;
            }}
        </style>
    </head>
    <body>
        <br>
        <h2><center>Leaderboard</center></h2>
        <br>
        <table>
            <tr>
                <th>Rank</th>
                <th>User ID</th>
                <th>Points</th>
            </tr>
    """

    for rank, user in enumerate(users, start=1):
        html_content += f"""
            <tr>
                <td>{rank}</td>
                <td>{user.user_id}</td>
                <td>{user.points}</td>
            </tr>
        """

    html_content += """
        </table>
        <div class="pie-chart-container">
            <h3>Points Distribution</h3>
            <img src="data:image/png;base64,{}" alt="Pie Chart">
        </div>
    </body>
    </html>
    """.format(image_base64)

    return html_content

if __name__ == "__main__":
    # Assuming 'users' is the list of User objects fetched from the database
    sorted_users = merge_sort(users)
    html_leaderboard = generate_html_leaderboard(sorted_users)

    # Write HTML content to a file
    with open("leaderboard_with_chart.html", "w") as file:
        file.write(html_leaderboard)

    print("HTML leaderboard with embedded pie chart generated successfully.")
```



```
HTML leaderboard with embedded pie chart generated successfully.
```

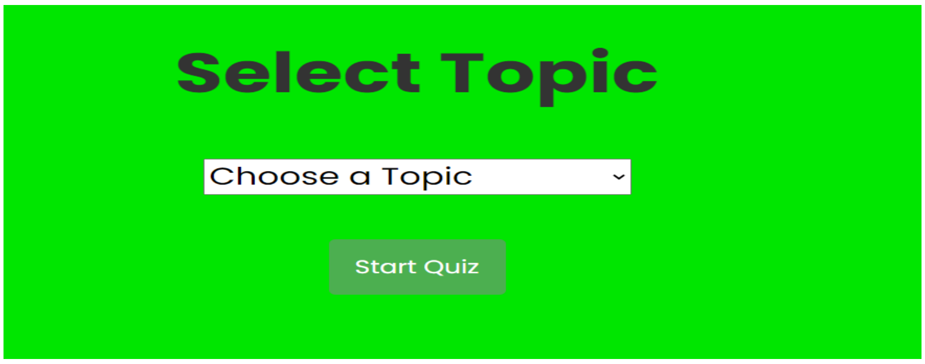
```python
import sqlite3

# Function to fetch user data from the database
def fetch_user_data(user_id):
    conn = sqlite3.connect('quiz_database.db')
    cursor = conn.cursor()

    # Fetch data for the specified user from the 'users' table
    cursor.execute('SELECT * FROM users WHERE user_id = ?', (user_id,))
    user_data = cursor.fetchone()

    conn.close()

    return user_data

# Function to get user ID from the user using input
def get_user_id():
    # Prompt the user to enter their ID using input()
    user_id = input("Please enter your user ID: ")

    return user_id

# Get the user ID from the user
```

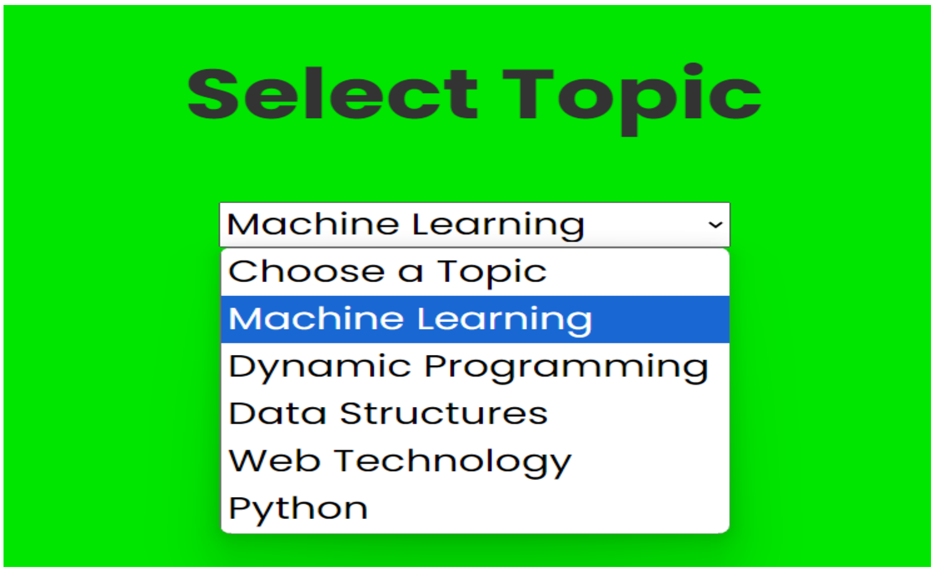
```
user_id = get_user_id()

if user_id:
    # Fetch data for the specified user
    user_data = fetch_user_data(user_id)

    # If user data is found, generate HTML content
    if user_data:
        html_content = f"""
        <!DOCTYPE html>
        <html lang="en">
        <head>
            <meta charset="UTF-8">
            <meta name="viewport" content="width=device-width, initial-
scale=1.0">
            <title>User Details</title>
            <style>
                body {{
                    background-color: #00CED1; /* Bright turquoise background
*/
                    font-family: Arial, sans-serif;
                    color: #333; /* Text color */
                }}
                .container {{
                    width: 60%;
                    margin: 0 auto; /* Center the container */
                }}
                table {{
                    width: 70%;
                    border-collapse: collapse;
                }}
                th, td {{
                    padding: 8px;
                    text-align: center;
                    border-bottom: 1px solid #ddd;
                }}
                th {{
                    background-color: #f2f2f2;
                }}
                tr:hover {{
                    background-color: #f5f5f5;
                }}
            </style>
        </head>
        <body >
            <h1 align="center" >User Details</h1><br> <br>
            <table border="1" align="center">
                <tr>
```

```
                    <th>User ID</th>
                    <th>Reward</th>
                    <th>Subject and Score</th>
                    <th>Points</th>
                    <th>Time Taken</th>
                    <th>Areas of Interest</th>
                </tr>
                <tr>
                    <td>{user_data[0]}</td>
                    <td>{user_data[1]}</td>
                    <td>{user_data[2]}</td>
                    <td>{user_data[3]}</td>
                    <td>{user_data[4]}</td>
                    <td>{user_data[5]}</td>
                </tr>
            </table>
            <br><br><br><br>
            <center><a
href="leaderboard_with_chart.html"<button>Leaderboard</button></center>
        </body>
        </html>
        """

        # Write HTML content to a file
        with open(r"user_details.html", "w") as file:
            file.write(html_content)

        print("HTML file generated successfully.")
    else:
        print("User not found in the database.")
else:
    print("No user ID provided.")
```

```
HTML file generated successfully.
```

Output:

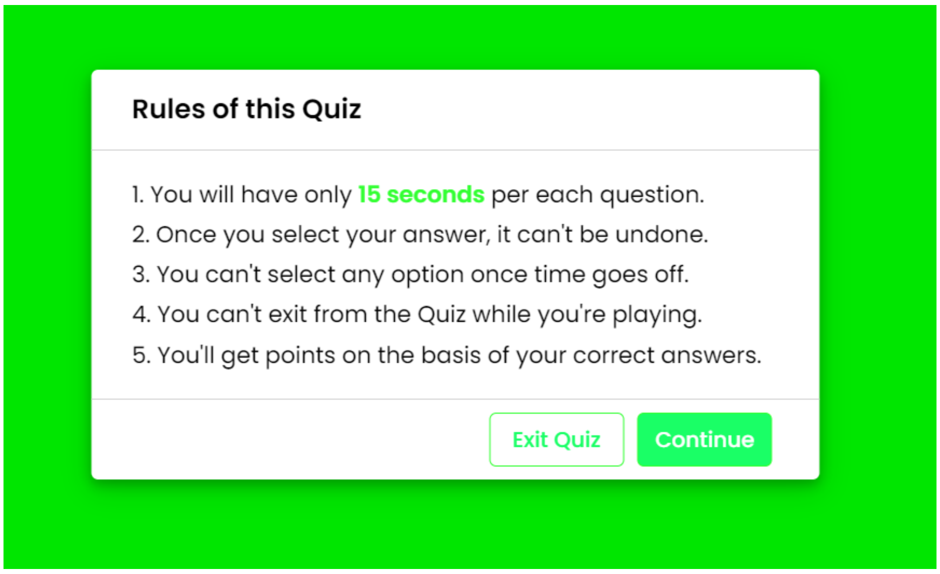




Select Topic

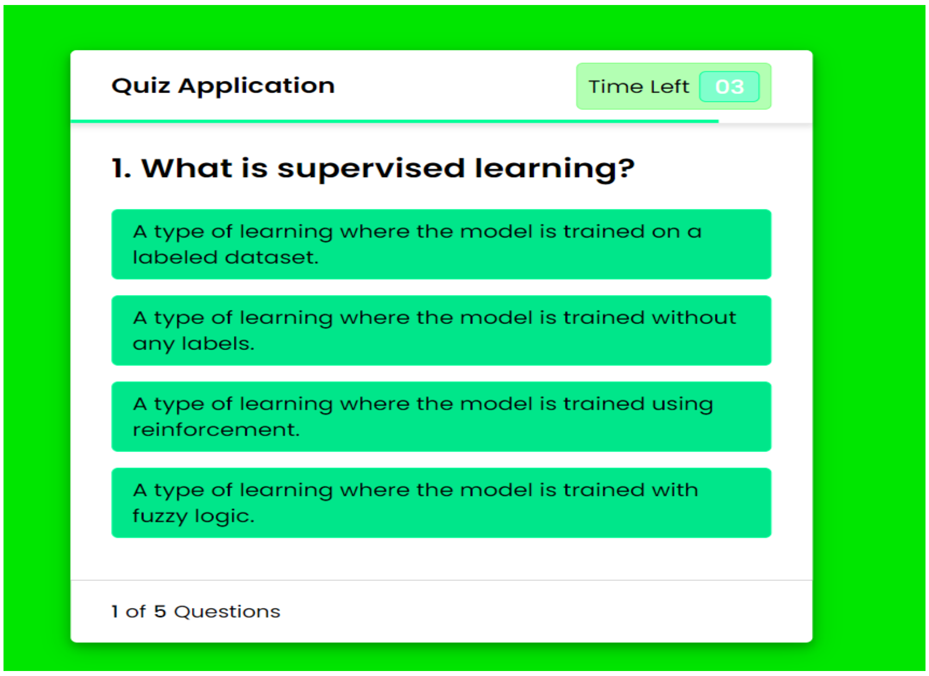
Machine Learning

Choose a Topic
Machine Learning
Dynamic Programming
Data Structures
Web Technology
Python



Rules of this Quiz

1. You will have only **15 seconds** per each question.
2. Once you select your answer, it can't be undone.
3. You can't select any option once time goes off.
4. You can't exit from the Quiz while you're playing.
5. You'll get points on the basis of your correct answers.



Quiz Application

Time Left 03

1. What is supervised learning?

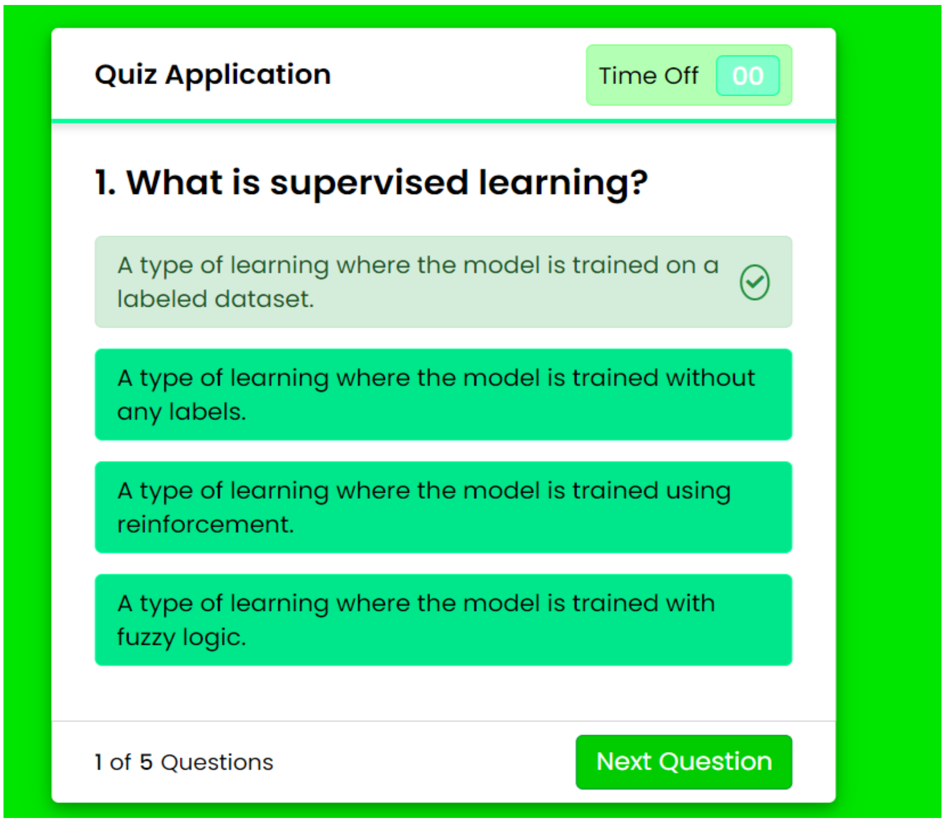
A type of learning where the model is trained on a labeled dataset.

A type of learning where the model is trained without any labels.

A type of learning where the model is trained using reinforcement.

A type of learning where the model is trained with fuzzy logic.

1 of 5 Questions



Quiz Application

Time Off 00

1. What is supervised learning?

A type of learning where the model is trained on a labeled dataset. ✓

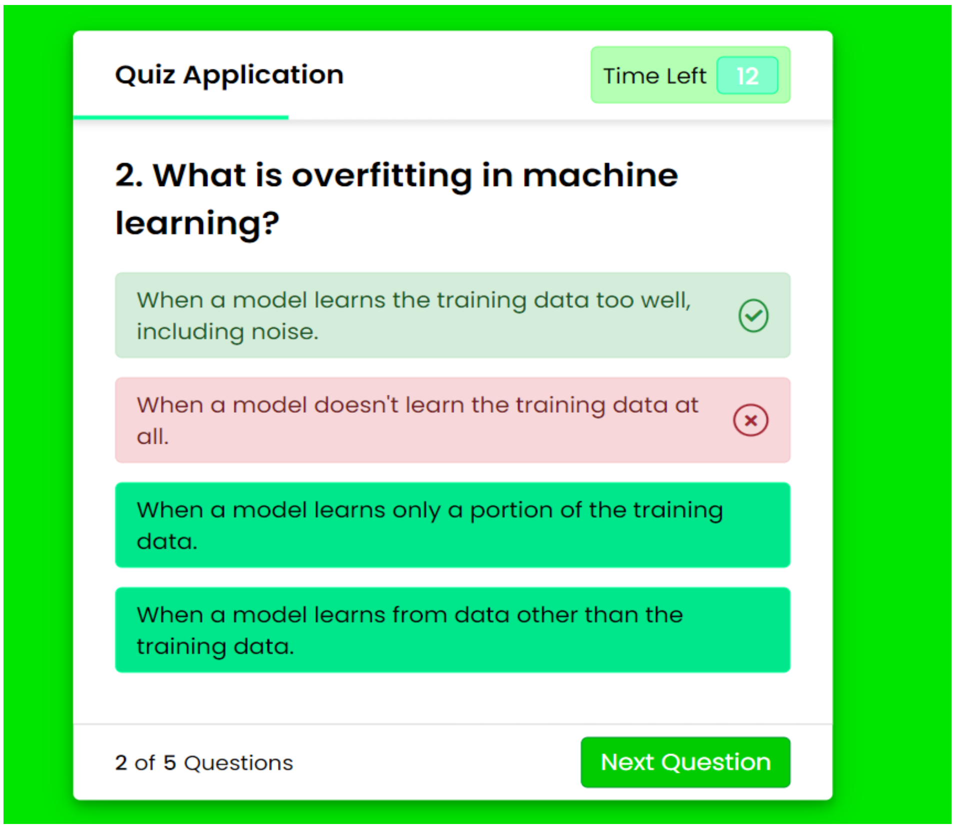
A type of learning where the model is trained without any labels.

A type of learning where the model is trained using reinforcement.

A type of learning where the model is trained with fuzzy logic.

1 of 5 Questions

Next Question



Quiz Application

Time Left 12

2. What is overfitting in machine learning?

When a model learns the training data too well, including noise. ✓

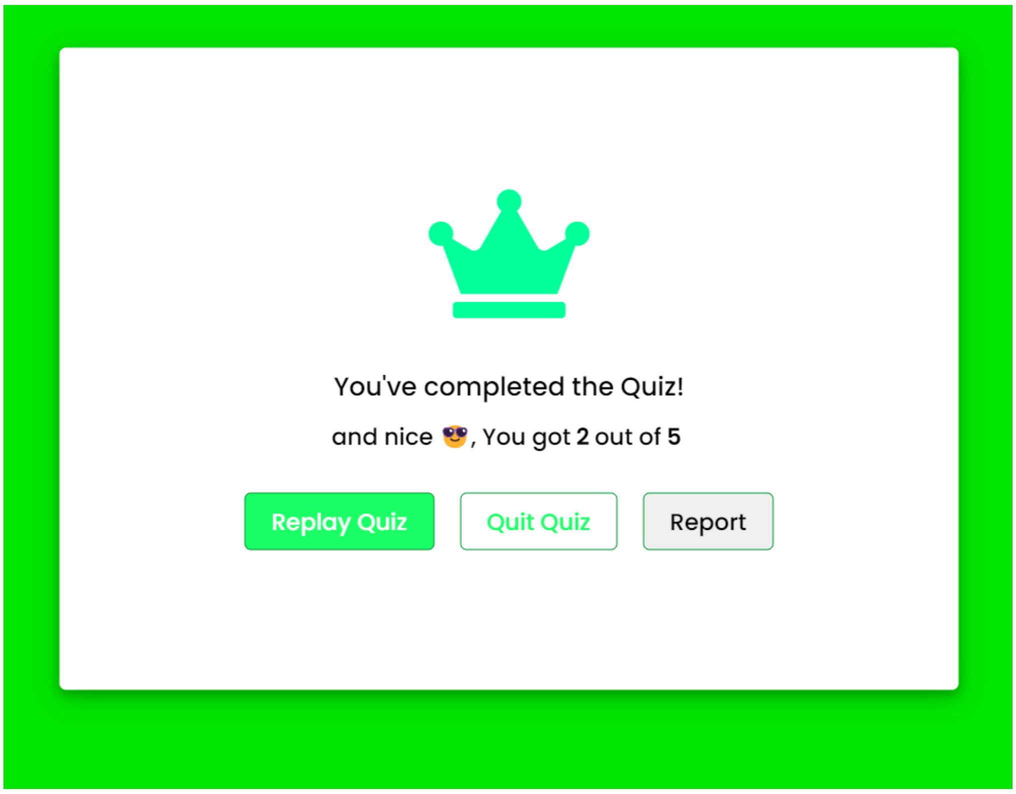
When a model doesn't learn the training data at all. ✗

When a model learns only a portion of the training data.

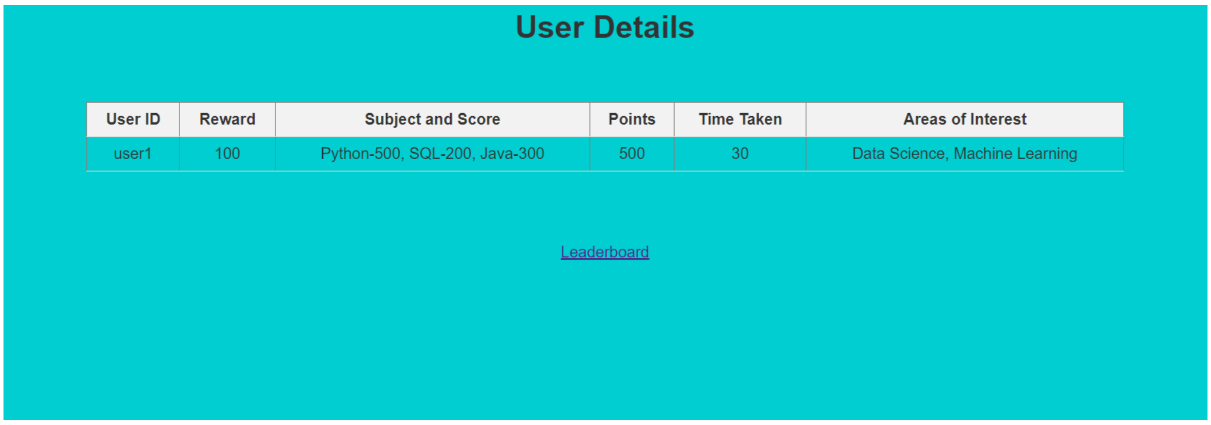
When a model learns from data other than the training data.

2 of 5 Questions

Next Question

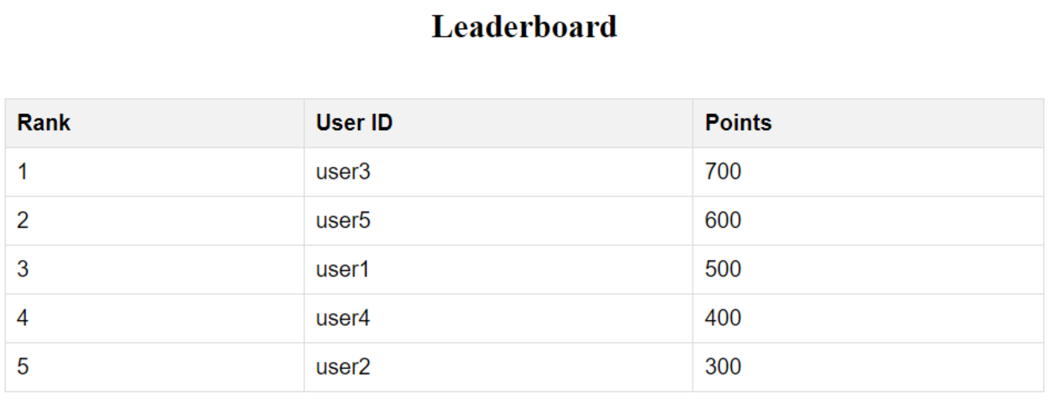

You've completed the Quiz!

and nice 😎, You got **2** out of **5**


User Details

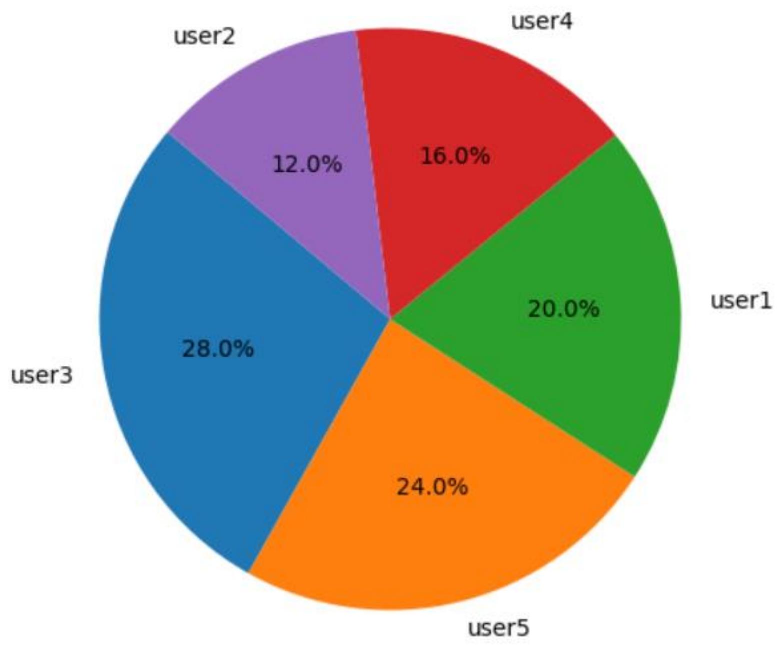
User ID	Reward	Subject and Score	Points	Time Taken	Areas of Interest
user1	100	Python-500, SQL-200, Java-300	500	30	Data Science, Machine Learning

Leaderboard


Leaderboard

Rank	User ID	Points
1	user3	700
2	user5	600
3	user1	500
4	user4	400
5	user2	300

Points Distribution



Conclusion:

EduQuest represents a groundbreaking advancement in educational software, offering a comprehensive solution for enriching learning experiences through dynamic trails, time mastery, and gamified engagement. By harnessing the power of dynamic programming and greedy algorithms, EduQuest empowers students to navigate their learning journey effectively, achieve academic excellence, and unlock their full potential.