Project Title: Quiz App

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Submitted by

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Semester Project Report

Software Engineering Department
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Finally, we thank [Sir Syed University of engineering and technology] for providing us with the necessary resources and platform to carry out this semester project.
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[M. Ahmed Raza, Syed Raza Rizvi, M. Ammar Ansari]

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ABSTRACT

The Python code presented implements a quiz application using the tkinter library for graphical user interface (GUI) development. The application consists of two main classes: `*Question*` and `*QuizApp*`**.** The `Question` class defines attributes for a quiz question such as the prompt, correct answer, and distractors. Meanwhile, the `*QuizApp*` class initializes a GUI window with a question label and dynamically created answer buttons. It allows users to answer questions interactively, providing immediate feedback on correctness via message boxes. The application shuffles questions and answer choices, ensuring variety in each session. This implementation demonstrates basic GUI programming and interactive user experience design in Python.

Key Word: Quiz, Quiz Application

INTRODUCTION

1.1 Introduction

Quiz applications are an integral part of modern education and entertainment. They provide a platform for users to test their knowledge on various subjects through interactive questions and answers. This specific quiz application is designed using Python's Tkinter library, which is known for its simplicity and effectiveness in creating graphical user interfaces (GUIs). The application presents questions to the user, collects responses, and provides feedback, making it a valuable tool for learning and self-assessment.

The code is structured around two main classes: *Question* and *QuizApp*. The *Question* class encapsulates the essential elements of a quiz question, including the prompt, the correct answer, and a set of distractors. The *QuizApp* class manages the application's interface and logic, handling everything from displaying questions to evaluating answers and keeping score.

1.2 Theoretical Background

➢ *Object-Oriented Programming (OOP)*

The design of this quiz application is heavily based on the principles of Object-Oriented Programming (OOP). OOP is a programming paradigm that uses "objects" to design applications and programs. These objects can represent real-world entities, with properties (attributes) and behaviors (methods). The key concepts of OOP include encapsulation, inheritance, polymorphism, and abstraction. In this application:

- **Encapsulation** is demonstrated through the `Question` and `QuizApp` classes, which encapsulate data (attributes) and methods that operate on the data.
- **Abstraction** allows the program to handle complex reality by modeling classes appropriate to the problem.

➢ *Graphical User Interface (GUI)*

The GUI is created using Tkinter, a standard Python library for building graphical interfaces. Tkinter provides various widgets such as buttons, labels, and frames, which can be used to construct the user interface. It is favored for its ease of use and straightforward integration with Python scripts. The main window of the application includes labels to display questions and buttons for answer choices.The

layout and styling are managed through configuration options, allowing customization of the application's appearance.

- *Event-Driven Programming*

The application uses event-driven programming, where the flow of the program is determined by events such as user actions (clicking buttons). Each button in the quiz application is linked to an event handler that checks the user's answer and updates the quiz state accordingly. This approach makes the application responsive and interactive, enhancing user engagement.

- *Randomization*

To ensure a varied and unpredictable experience, the application employs randomization in the selection and display of questions and answers. Random sampling of distractors and shuffling of answer choices are key aspects that prevent patterns and keep the quiz challenging.

- *User Feedback and Interaction*

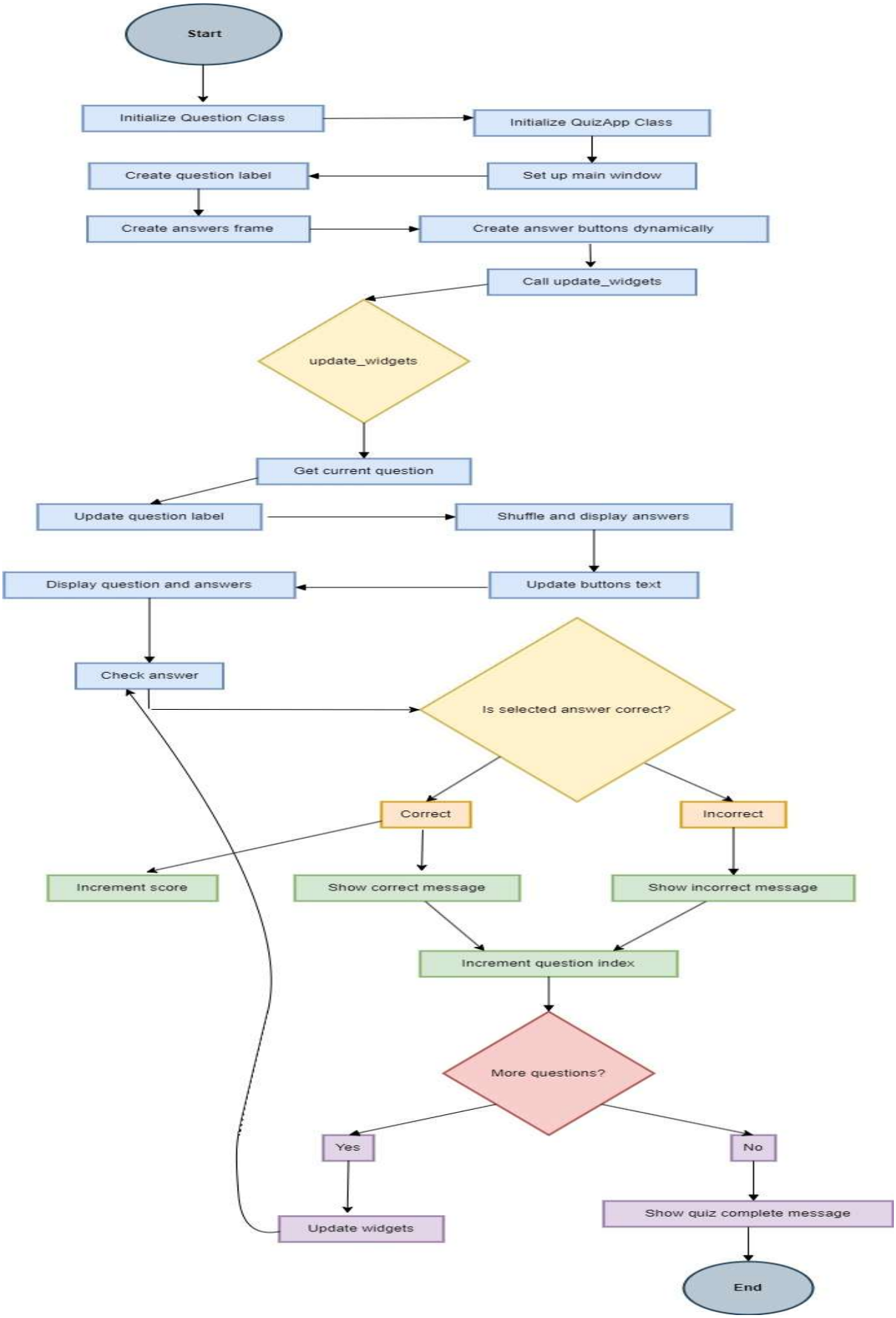
The application provides immediate feedback to the user based on their responses. Correct answers are acknowledged with a positive message, while incorrect answers prompt a correction. This immediate feedback loop is crucial for effective learning, as it reinforces correct knowledge and corrects misunderstandings promptly.

- *User Interface Design*

The design of the user interface focuses on simplicity and clarity. The main window is configured to a fixed size to ensure consistency, and the background and button colors are chosen to create a visually appealing and user-friendly environment. The use of frames for organizing widgets helps in maintaining a structured layout, making the application intuitive to navigate.

PROJECT DETAILS

2.1 Flow Chart


Start
Initialize Question Class
Initialize QuizApp Class
Create question label
Set up main window
Create answers frame
Create answer buttons dynamically
Call update_widgets
update_widgets
Get current question
Update question label
Shuffle and display answers
Display question and answers
Update buttons text
Check answer
Is selected answer correct?
Correct
Incorrect
Increment score
Show correct message
Show incorrect message
Increment question index
More questions?
Yes
No
Update widgets
Show quiz complete message
End

2.2 Description of Flow Chart Blocks

- *Start:*
  - The starting point of the quiz application process.
- *Initialize Question Class:*
  - This block represents the initialization of the Question class, which is responsible for creating question objects with a prompt, the correct answer, and distractors.
- *Initialize QuizApp Class:*
  - This block involves initializing the QuizApp class, which manages the quiz interface and logic.
- *Create question label:*
  - This step creates a label in the GUI to display the current quiz question.
- *Set up main window:*
  - This block involves setting up the main window of the application, including its size, title, and background color.
- *Create answers frame:*
  - This step involves creating a frame within the main window to hold the answer buttons.
- *Create answer buttons dynamically:*
  - In this block, the application creates buttons for the answer choices dynamically, based on the current question.
- *Call update_widgets:*

- This step involves calling the update_widgets method to update the displayed question and answer choices.

➢ *update_widgets (Diamond):*

- This decision point determines the current state of the quiz by updating the question and answers displayed on the GUI.

➢ *Get current question:*

- This block fetches the current question from the list of questions.

➢ *Update question label:*

- This step updates the text of the question label to display the current question.

➢ *Shuffle and display answers:*

- This block shuffles the answer choices and displays them on the answer buttons.

➢ *Display question and answers:*

- The question and shuffled answers are displayed to the user.

➢ *Update buttons text:*

- The text on the answer buttons is updated to reflect the shuffled answers.

➢ *Check answer:*

- This block involves checking the answer selected by the user against the correct answer.

➢ *Is selected answer correct? (Diamond):*

- This decision point checks if the selected answer is correct or incorrect.

- *Correct:*
  - If the answer is correct, this block is executed.
- *Incorrect:*
  - If the answer is incorrect, this block is executed.
- *Increment score:*
  - This block increments the user's score if the answer is correct.
- *Show correct message:*
  - This step displays a message to the user indicating that their answer is correct.
- *Show incorrect message:*
  - This step displays a message to the user indicating that their answer is incorrect and shows the correct answer.
- *Increment question index:*
  - This block increments the index to move to the next question in the list.
- *More questions? (Diamond):*
  - This decision point checks if there are more questions remaining in the quiz.
- *Yes:*
  - If there are more questions, this path is taken.
- *No:*
  - If there are no more questions, this path is taken.

- *Update widgets:*
  - This block calls the update_widgets method again to update the displayed question and answers.
- *Show quiz complete message:*
  - This step displays a message indicating that the quiz is complete and shows the user's final score.
- *End:*
  - The endpoint of the quiz application process.

METHODOLOGY

3.1 Data Collection

The data collection for this quiz application involved gathering various question sets from different sources, including educational websites, textbooks, and online quizzes. Each question set was carefully curated to include a prompt, a correct answer, and several distractors to provide a comprehensive and challenging quiz experience. The questions were categorized into different topics such as general knowledge, mathematics, literature, and science to ensure diversity and to cater to a broad audience. This structured approach to data collection ensured that the quiz application would offer a wide range of questions, enhancing the user's learning and engagement.

Source	Type	Description
User Input	Quick responses	User's answers to the quiz questions
Question Dataset	Predefined Data	A set of questions, including prompts, answers, distractors
User Interaction Data	Interaction Logs	User interactions with the application, such as button clicks and timings

3.2 Data Analysis

Data analysis in the context of this project focused on ensuring the quality and appropriateness of the questions. Each question was evaluated for clarity, relevance, and difficulty level. The distractors were analyzed to ensure they were plausible and would challenge the user without being misleading. Additionally, the distribution of questions across different topics was analyzed to maintain a balanced quiz experience. User feedback was collected post-quiz to understand the difficulty level and engagement, which was then used to refine and improve the question sets continuously.

Analysis Method	**Description**	**Outcome**
Response Accuracy	Comparing user's answers to correct answer	Calculation of user score and correctness rate
Interaction Timing	Measuring time taken for each question	Analysis of response time patterns
Question Difficulty	Assessing which questions were not frequently missed	Identifications of challenging questions

SYSTEM SOFTWARE

4.1 Programming Languages and Technologies

The primary programming language used for the development of this quiz application was Python, chosen for its simplicity and robust libraries. The *tkinter* library was utilized to create the graphical user interface (GUI), providing a user-friendly and interactive experience. Python's `random` module was used to shuffle the questions and answers, ensuring each quiz session was unique. The *messagebox* module from *tkinter* was employed to display feedback to the user upon answering each question.

4.2 Development Tools and Environment

The development environment for this project included Python 3.x and an Integrated Development Environment (IDE) such as *Thonny* or Visual Studio Code. These tools provided a comprehensive platform for writing, testing, and debugging the code. Version control was managed using *Git*, allowing for efficient collaboration and version tracking. The application was tested on various operating systems, including Windows, *macOS*, and Linux, to ensure compatibility and smooth performance across different platforms.

OBSERVATIONS & RESULTS

5.1 Observations

- *Initialization of Classes*

  - **Question Class:** Effectively creates question objects with prompts, correct answers, and distractors.
  - **QuizApp Class:** Manages the quiz interface, user interaction, and application logic.

- *User Interface Setup*

  - **Main Window Configuration:** Sets up the main window with a fixed size, title, and background color.
  - **Question Label Creation:** Displays the current question using a label widget.
  - **Answer Buttons Frame:** Organizes buttons for answer choices within a frame.

➢ *Dynamic Answer Buttons*

- **Creation of Answer Buttons:** Dynamically generates buttons for each question, ensuring a fresh setup for each question displayed.
- **Button Colors:** Uses distinct colors to differentiate answer buttons, enhancing user experience.

➢ *Widget Updates*

- **update_widgets Method:** Central function for updating the question and answer choices displayed.
- **Fetching Current Question:** Retrieves and displays the current question and its answers.
- **Shuffling Answers:** Randomizes answer choices to prevent pattern recognition.

➢ *Answer Checking Mechanism*

- **User Answer Selection:** Captures and checks the user's selected answer.
- **Correct Answer Handling:** Increments score and displays a positive feedback message if correct.
- **Incorrect Answer Handling:** Provides correct answer feedback and increments question index.

➢ *Progression Through Questions*

- **Incrementing Question Index:** Moves to the next question after each answer.
- **Completion Check:** Determines if there are more questions to display or if the quiz is complete.

➢ *Quiz Completion*

- **Final Score Display:** Shows a completion message with the user's final score.
- **Application Termination:** Ends the quiz once all questions have been answered.

- *Randomization*

  - **Shuffling Questions and Answers:** Enhances quiz variability and difficulty by shuffling both questions and answer choices.

- *Code:*

  Here is the following code which is being observed.

```python
import tkinter as tk
from tkinter import messagebox
import random

class Question:
    def __init__(self, prompt, answer, distractors):
        self.prompt = prompt
        self.answer = answer
        self.distractors = distractors

class QuizApp:
    def __init__(self, root, questions):
        self.root = root
        self.questions = questions
        self.score = 0
        self.question_index = 0

        # Set up main window
        self.root.title("Quiz App")
        self.root.geometry("600x400")
        self.root.configure(bg='#2c3e50')  # Background color
        self.root.resizable(True, True)

        # Question label
        self.question_label = tk.Label(self.root, text="", font=("Helvetica", 16), wraplength=500, bg='#2c3e50', fg='#ecf0f1')
        self.question_label.pack(pady=20)

        # Frame for answer buttons
        self.answers_frame = tk.Frame(self.root, bg='#2c3e50')
        self.answers_frame.pack(pady=20)

        # Create answer buttons dynamically
        self.buttons = []
        button_colors = ['#3498db', '#e74c3c', '#2ecc71', '#f39c12']  # Button colors
        for i in range(4):
            button = tk.Button(self.answers_frame, text="", font=("Helvetica", 14), width=30, bg=button_colors[i], fg='#ecf0f1', command=lambda i=i: self.check_answer(i))
            button.pack(pady=5)
            self.buttons.append(button)

        self.update_widgets()

    def update_widgets(self):
        # Update question and answer buttons
        current_question = self.questions[self.question_index]
```

Figure: 5.1 Observation Code

```
        current_question = self.questions[self.question_index]
        self.question_label.config(text=current_question.prompt)

        # Shuffle and display answer choices
        answers = [current_question.answer] + random.sample(current_question.distractors, 3)
        random.shuffle(answers)
        for i in range(4):
            self.buttons[i].config(text=answers[i])

    def check_answer(self, idx):
        current_question = self.questions[self.question_index]
        selected_answer = self.buttons[idx].cget("text")
        if selected_answer == current_question.answer:
            self.score += 1
            messagebox.showinfo("Correct", "Correct answer!", parent=self.root)
        else:
            messagebox.showerror("Incorrect", f"Wrong answer! The correct answer is: {current_question.answer}", parent=self.root)

        self.question_index += 1
        if self.question_index < len(self.questions):
            self.update_widgets()
        else:
            messagebox.showinfo("Quiz Complete", f"Quiz completed!\nYour score: {self.score}/{len(self.questions)}", parent=self.root)
            self.root.destroy()

def main():
    # Sample questions
    questions = [
        Question("What is the capital of France?", "Paris", ["London", "Berlin", "Madrid"]),
        Question("Who wrote 'Romeo and Juliet'?", "Shakespeare", ["Jane Austen", "William Wordsworth", "Charles Dickens"]),
        Question("What is 2 + 2?", "4", ["3", "5", "6"]),
        Question("Which planet is known as the Red Planet?", "Mars", ["Venus", "Jupiter", "Saturn"]),
        Question("What is the largest mammal?", "Blue whale", ["Elephant", "Giraffe", "Lion"])
    ]

    random.shuffle(questions)  # Shuffle questions

    root = tk.Tk()
    app = QuizApp(root, questions)

    root.mainloop()

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

Figure: 5.2 Observation Code

5.2 Result

Figure: 5.3 Result

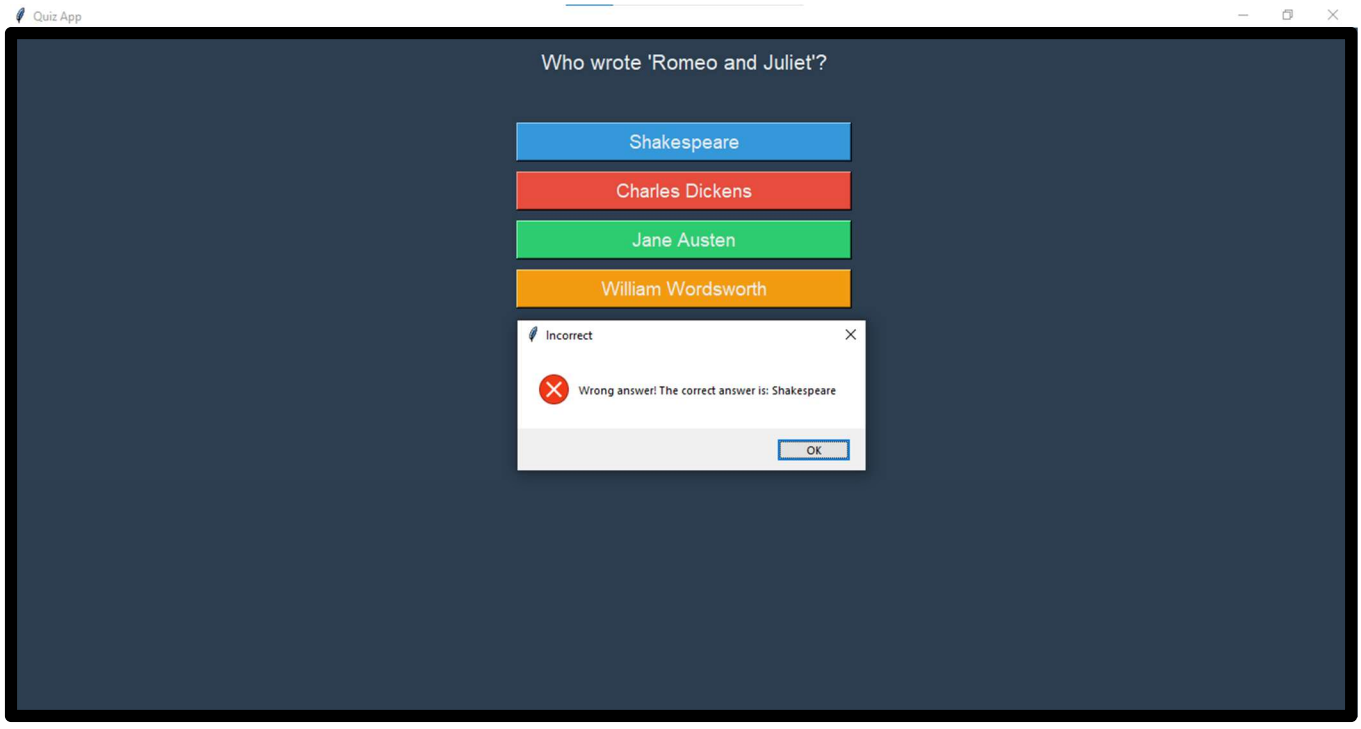


Figure: 5.4 Result

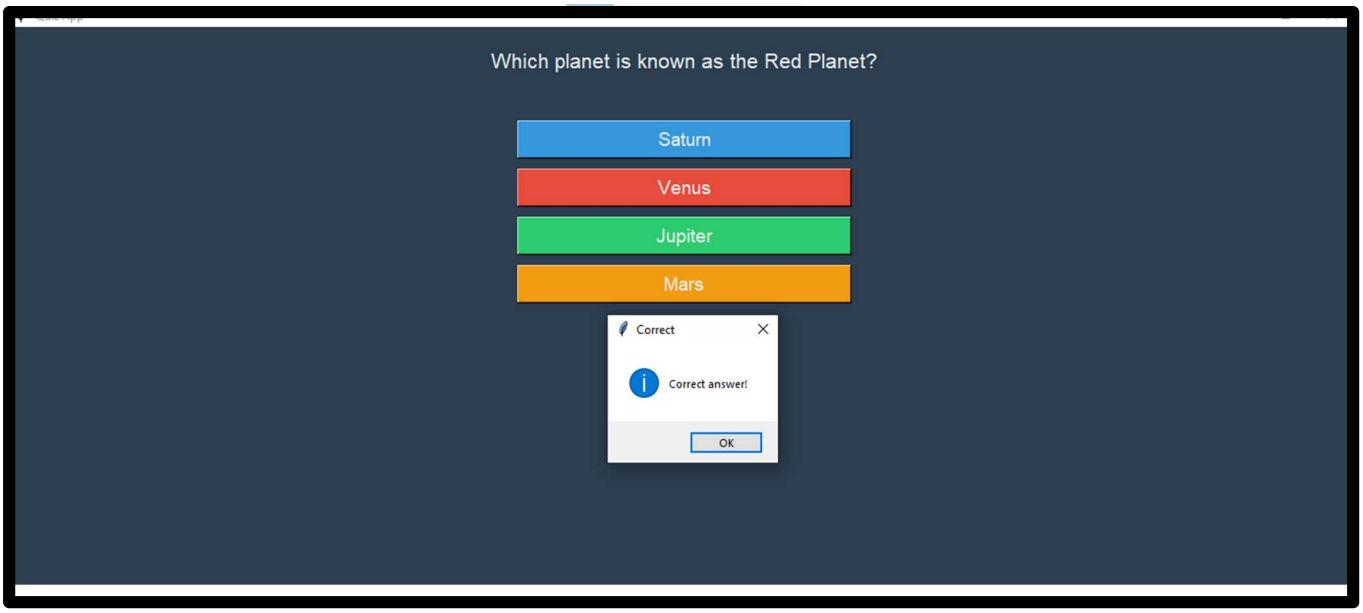


Figure: 5.5 Result

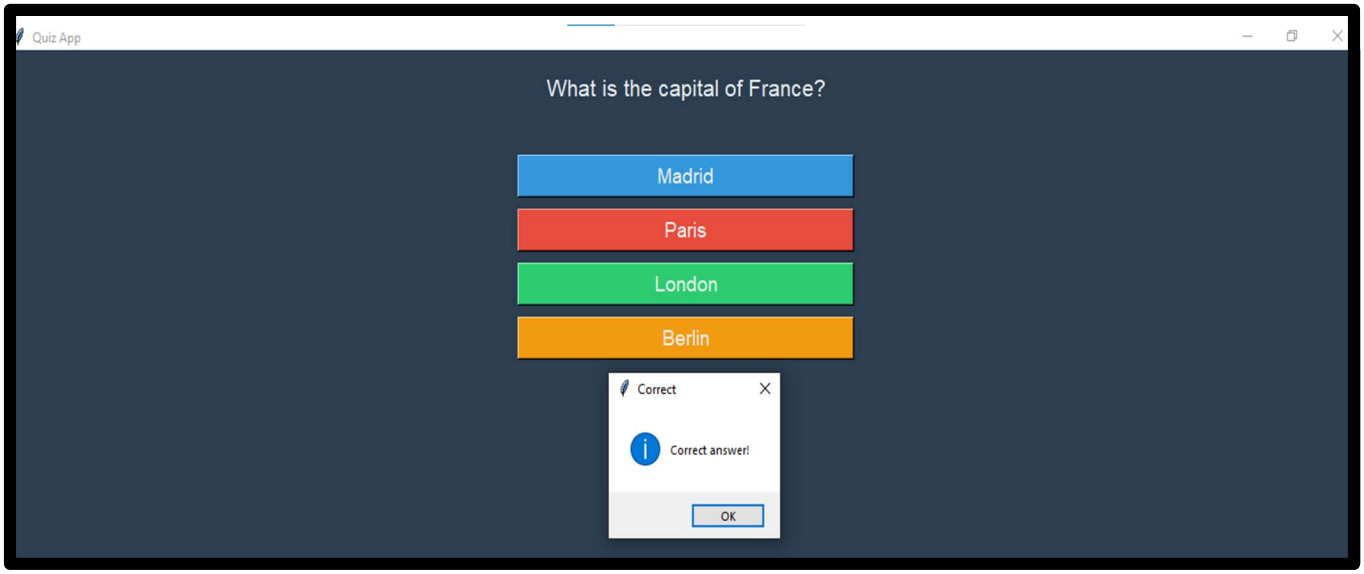


Figure: 5.6 Result

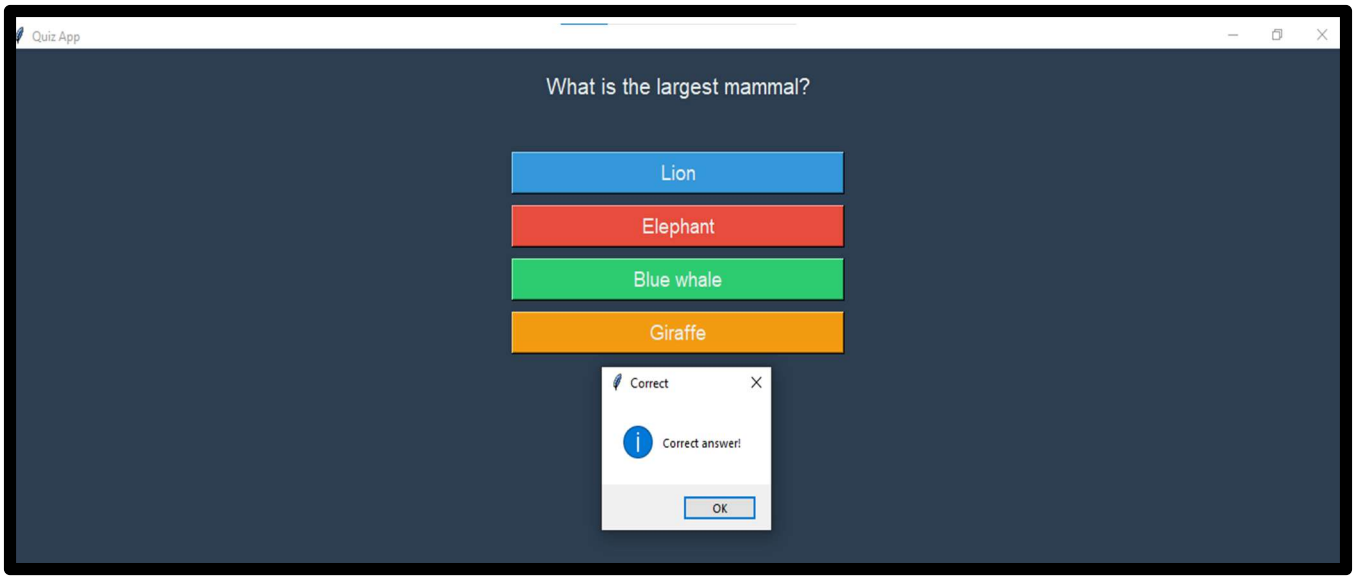


Figure: 5.7 Result

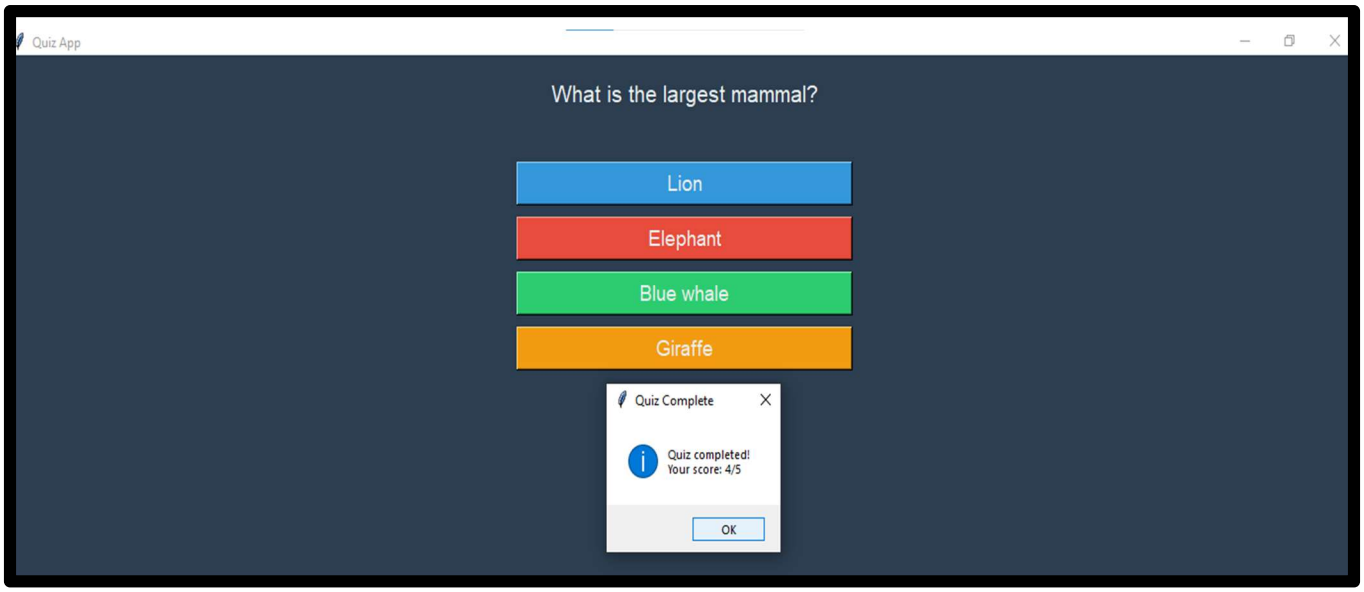


Figure: 5.8 Result

Conclusion & Future Recommendations

Conclusion:

The implementation of the QuizApp using Python's tkinter library demonstrates a practical and interactive approach to creating educational tools. By leveraging object-oriented programming principles, the application efficiently manages quiz questions, user interactions, and scoring. The seamless integration of GUI components ensures a user-friendly experience, making learning engaging and fun. The modular design, comprising the *Question* and *QuizApp* classes, promotes code reusability and maintainability. This project exemplifies how Python can be used to develop interactive applications that can cater to various educational needs.

Future Recommendations:

1. **Enhanced Question Management:**
    - Implement a database or external file system to manage a larger set of questions. This would allow for easier updating and scaling of the quiz content without modifying the codebase.

2. **User Progress Tracking:**
    - Add user authentication and progress tracking features. This could include saving user scores, tracking improvements over time, and providing personalized feedback based on performance.

3. **Multimedia Integration:**
    - Incorporate multimedia elements such as images, audio, and video into questions. This would enhance the learning experience by catering to different learning styles and making the content more engaging.

4. **Timed Quizzes:**
    - Introduce a timer for each question or the entire quiz to add an element of challenge and simulate exam conditions, improving the user's time management skills.

5. **Adaptive Quizzing:**
    - Develop adaptive quizzing algorithms that adjust the difficulty of questions based on the user's performance. This personalized approach can help in better assessing and improving the user's knowledge level.

6. **Mobile Compatibility:**
    - Expand the application to be compatible with mobile devices by using frameworks like Kivy or by developing a web-based version using Flask or Django. This would make the quiz accessible to a wider audience.

7. **Advanced Analytics:**
    - Integrate advanced analytics to provide insights into user performance, common mistakes, and areas that need improvement. This data-driven approach can significantly enhance the learning process.

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