



Enhancing Learning of Students in the computing Field Through Gaming

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Overview

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Introduction

Background

Computing education is essential but often difficult for students due to the complexity of topics like data structures, algorithms, and programming.



Introduction

Problem

Traditional teaching methods, such as textbooks and video tutorials, frequently fail to engage students or address individual learning needs.



Introduction

Focus

This project focuses on developing a gamified learning platform that leverages adaptive learning techniques and OpenAI's GPT-4 to improve engagement, comprehension, and retention of complex computing concepts.



Statement of Problem



01

Problem Statement

Many students struggle to grasp fundamental computing concepts, due to their complexity and abstract nature.

Statement of Problem



02

Problem Statement

Existing educational tools and platforms lack sufficient interactivity and engagement, making it difficult to sustain learner interest and motivation.

Statement of Problem



03

Problem Statement

Current resources often fail to provide adaptive and personalized learning experiences, leaving gaps in addressing individual learner needs and progress.

07

Statement of Problem

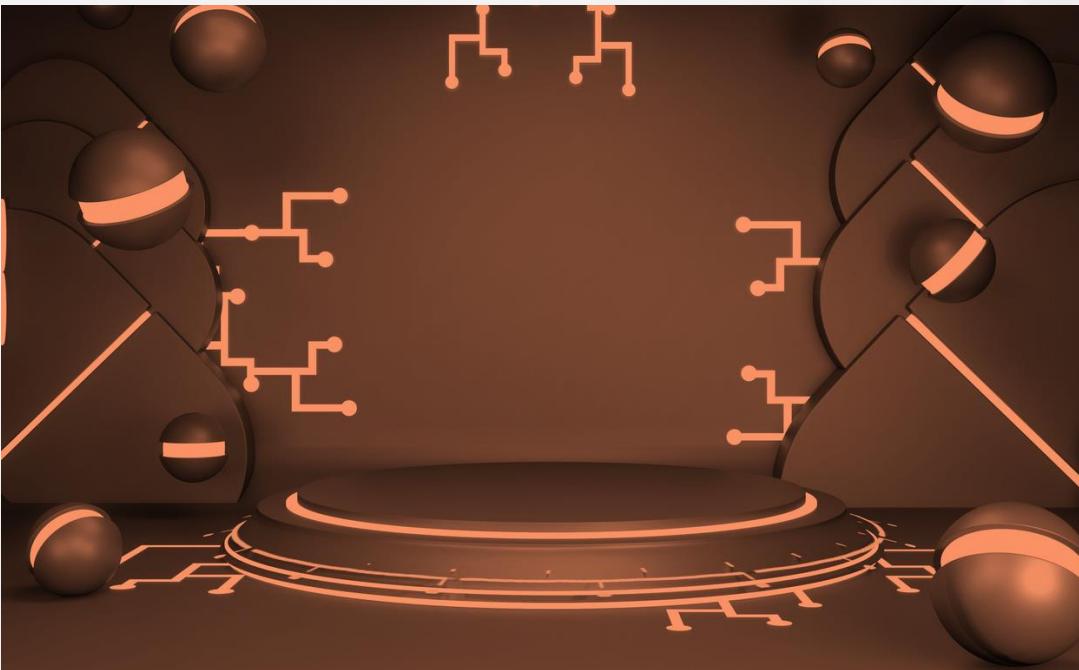


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Problem Statement

There is a shortage of curriculum-aligned gamified platforms that combine meaningful educational content with engaging game mechanics, particularly for advanced computing topics.

05



AIM OF THE STUDY



AIM

This research aims to design and evaluate a gamified web application to enhance the understanding of fundamental computing.

Objectives



First Objective

To collect and classify lecture materials in computing courses.

Objectives



Second Objective

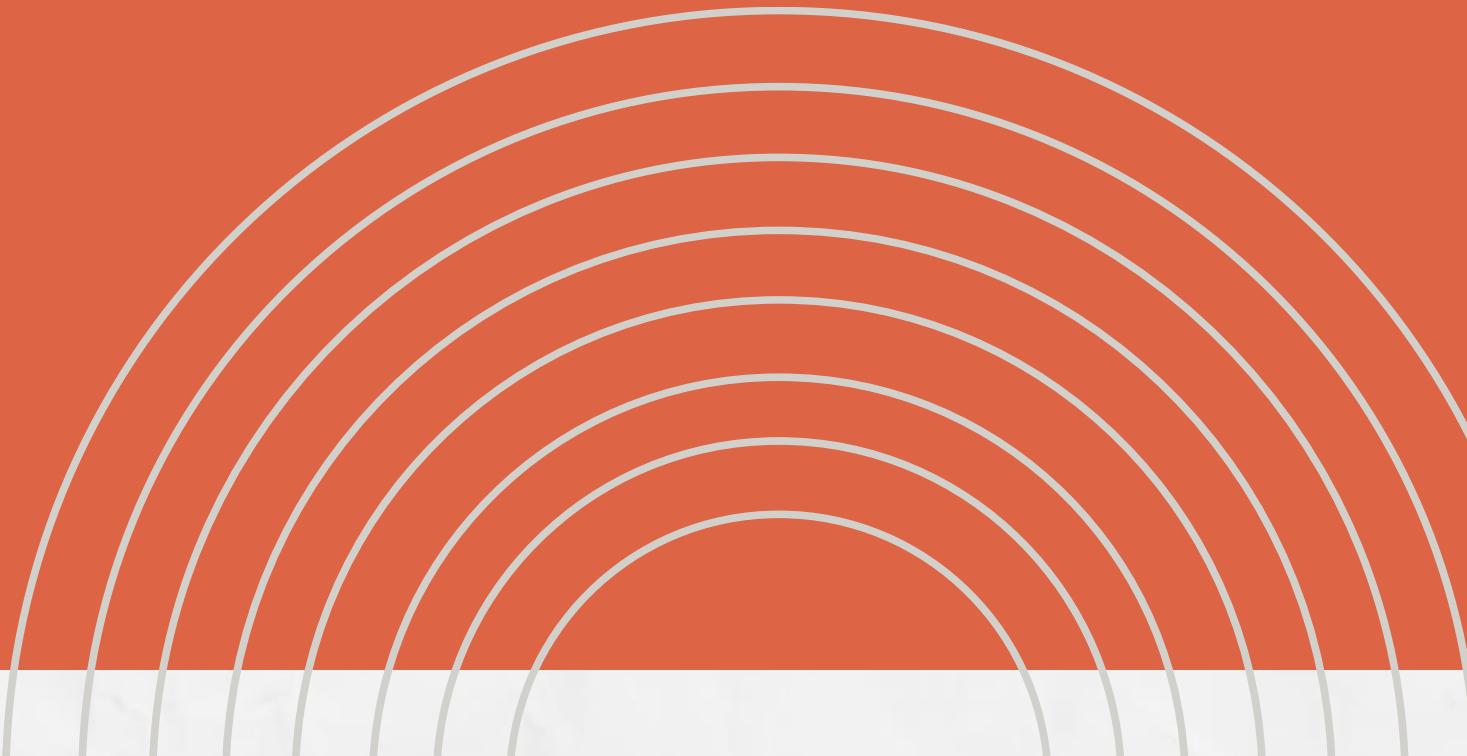
To design and implement a gamified question-generation engine.

Objectives

Third Objective

To develop and integrate gamification elements.

Objectives



Fourth Objective

To execute gameplay scenarios and collect user performance data.

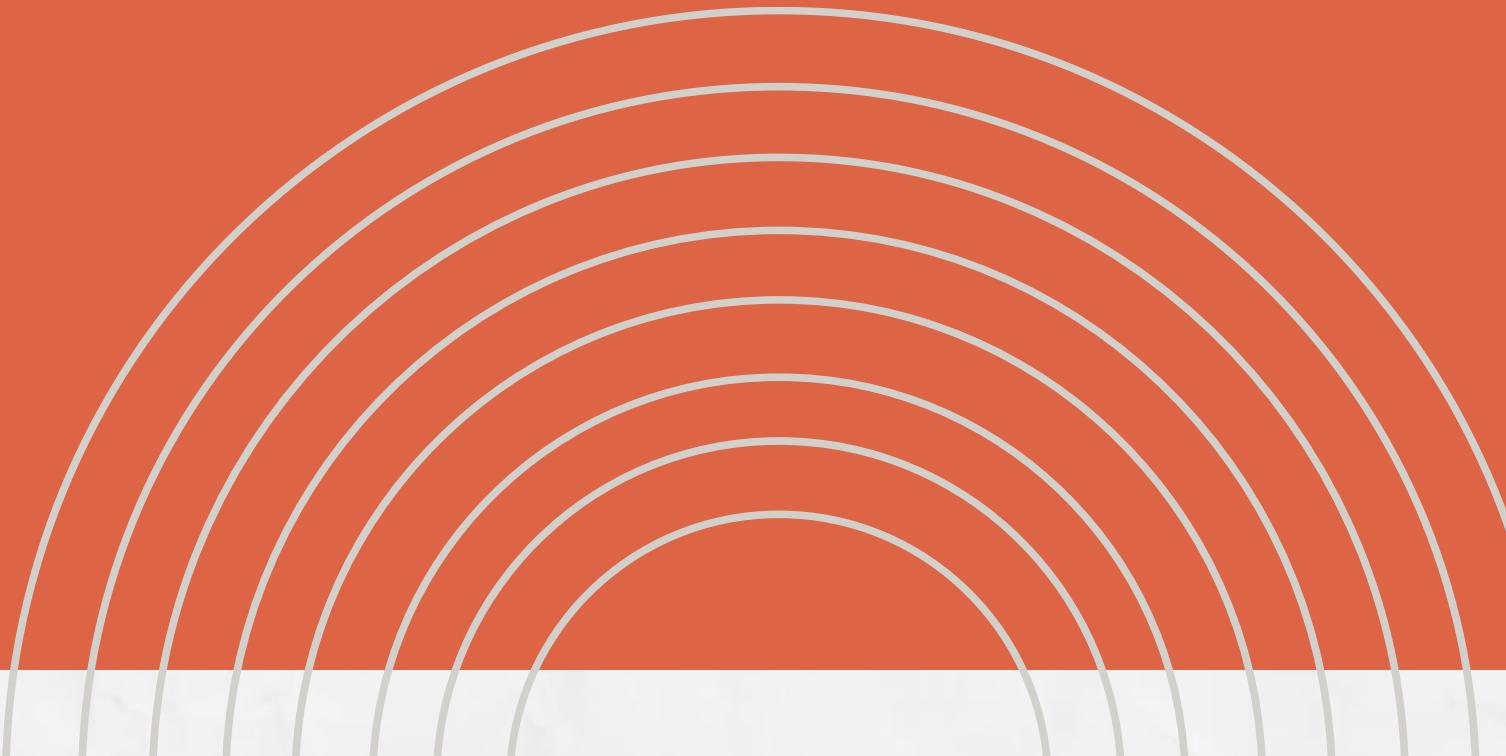
Objectives



Fifth Objective

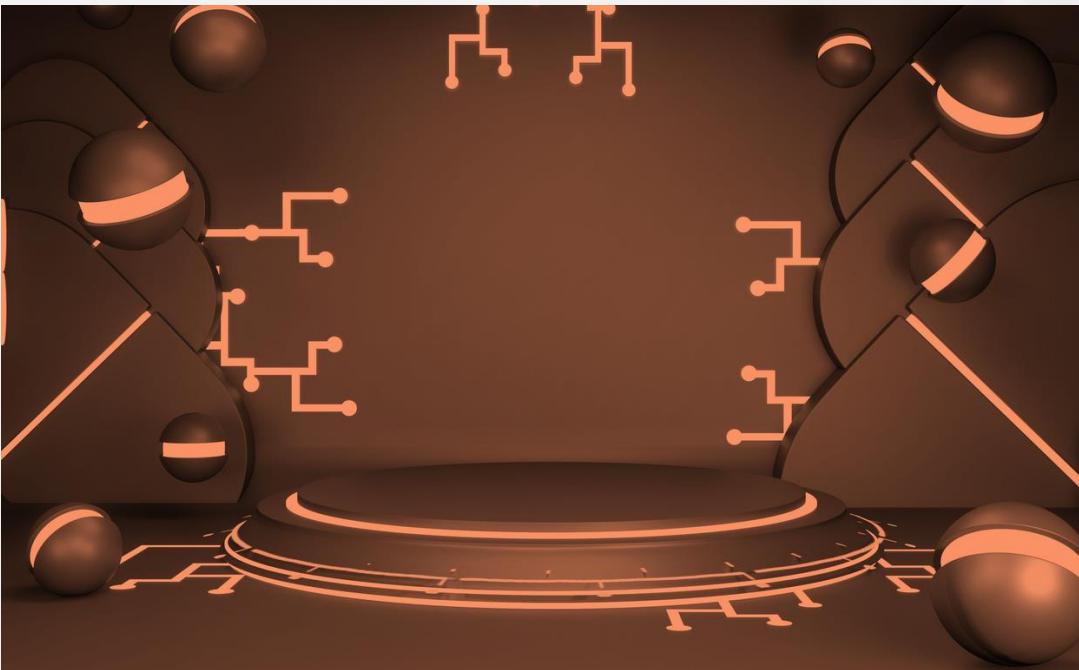
To analyse user data to identify engagement patterns.

Objectives

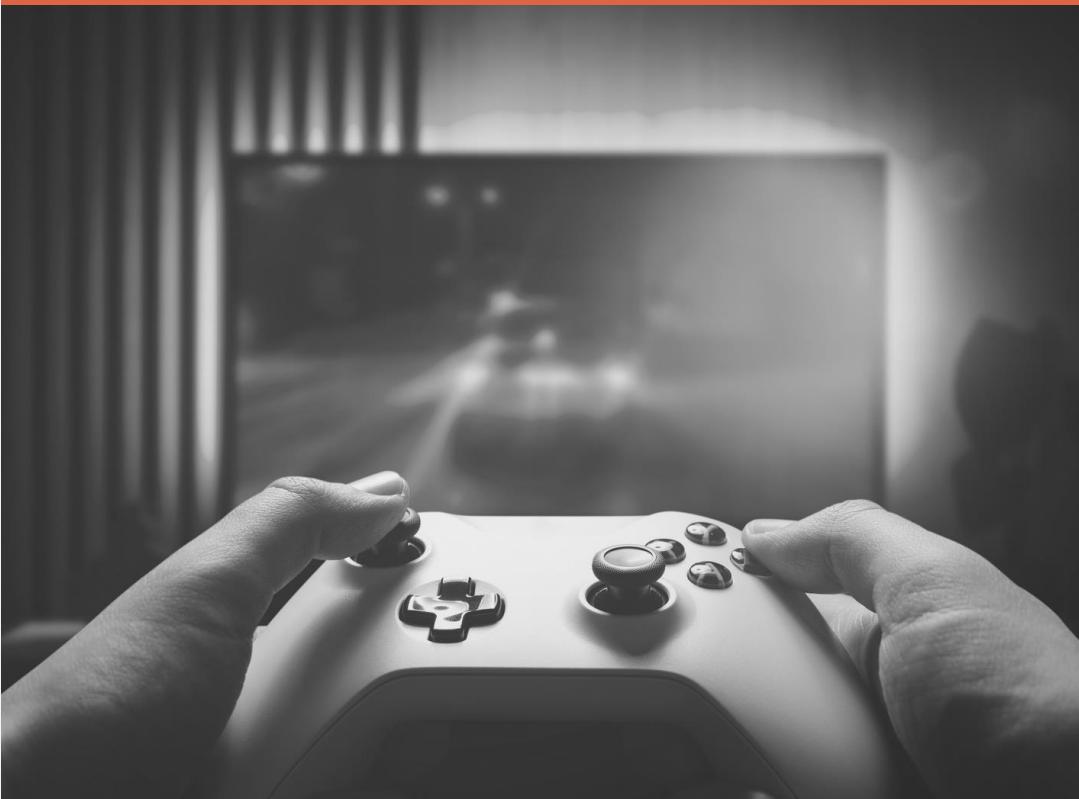


Sixth Objective

To evaluate the application's effectiveness in improving comprehension and retention of computing concepts.

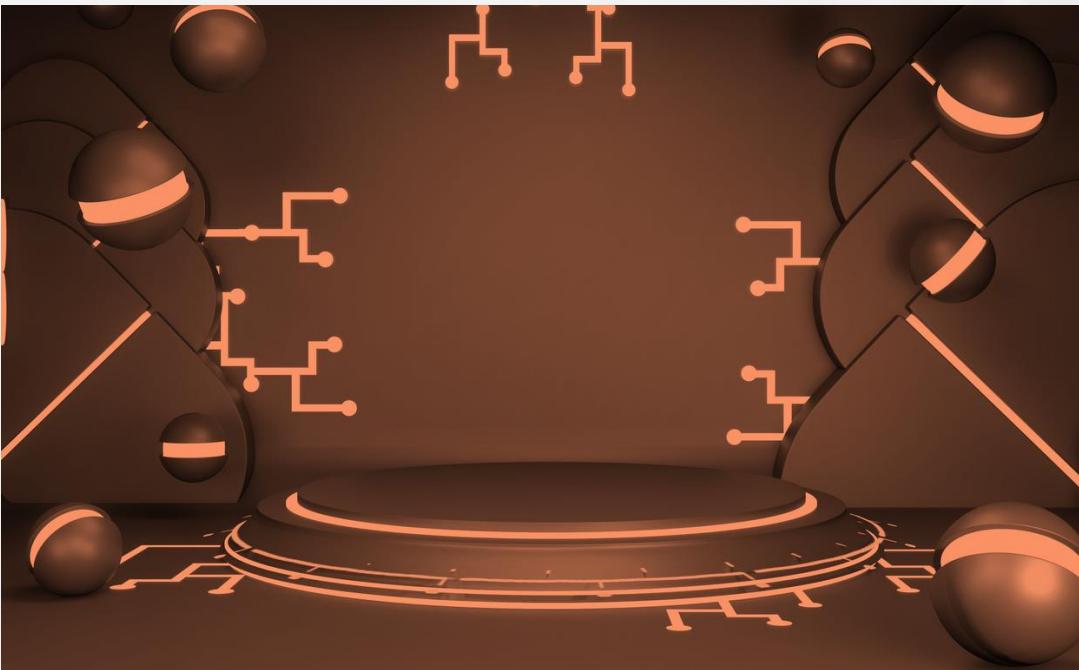


OBJECTIVE ONE

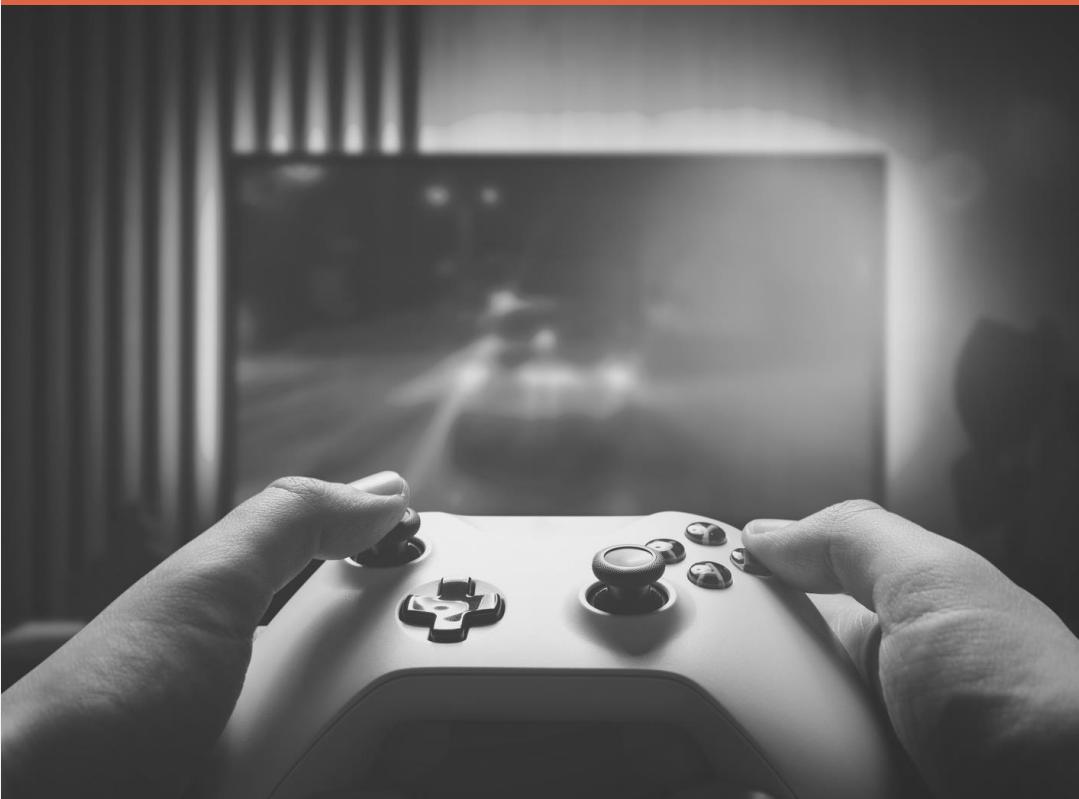


METHODOLOGY

- Identify essential computing topics like programming, algorithms, and data structures.
- Collect and organize materials into a structured, expert-validated database.
- Use Prisma, and PostgreSQL for efficient storage and retrieval.

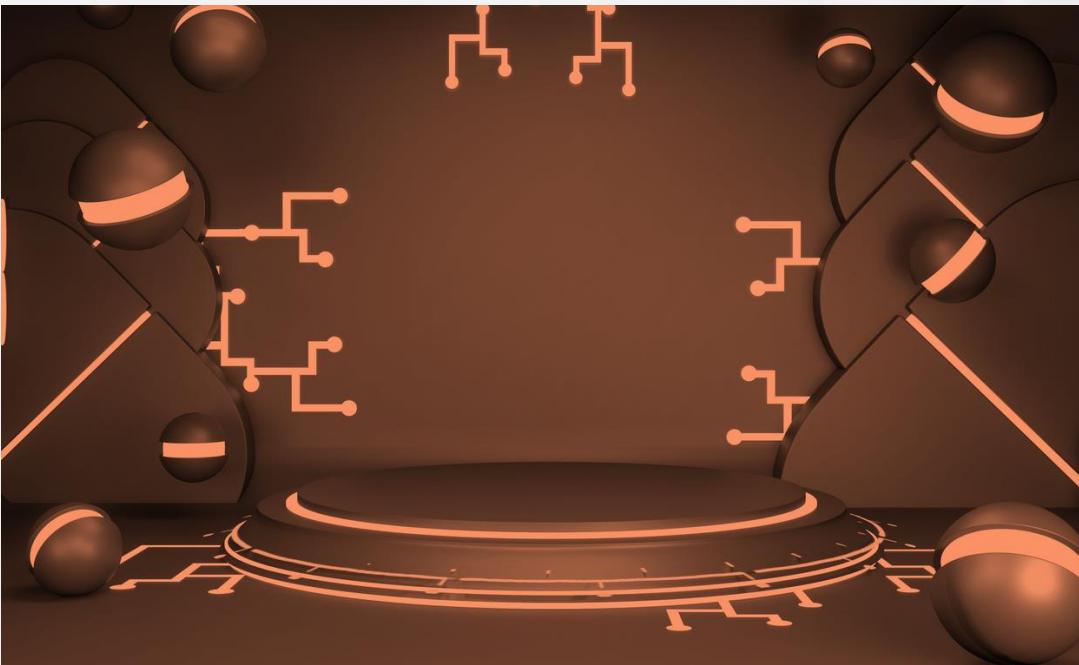


OBJECTIVE TWO



METHODOLOGY

- Build a question-generation engine using Next.js and React.
- Integrate GPT-4 for adaptive question creation and difficulty adjustment.
- Provide hints and explanations powered by GPT-4 for better comprehension.

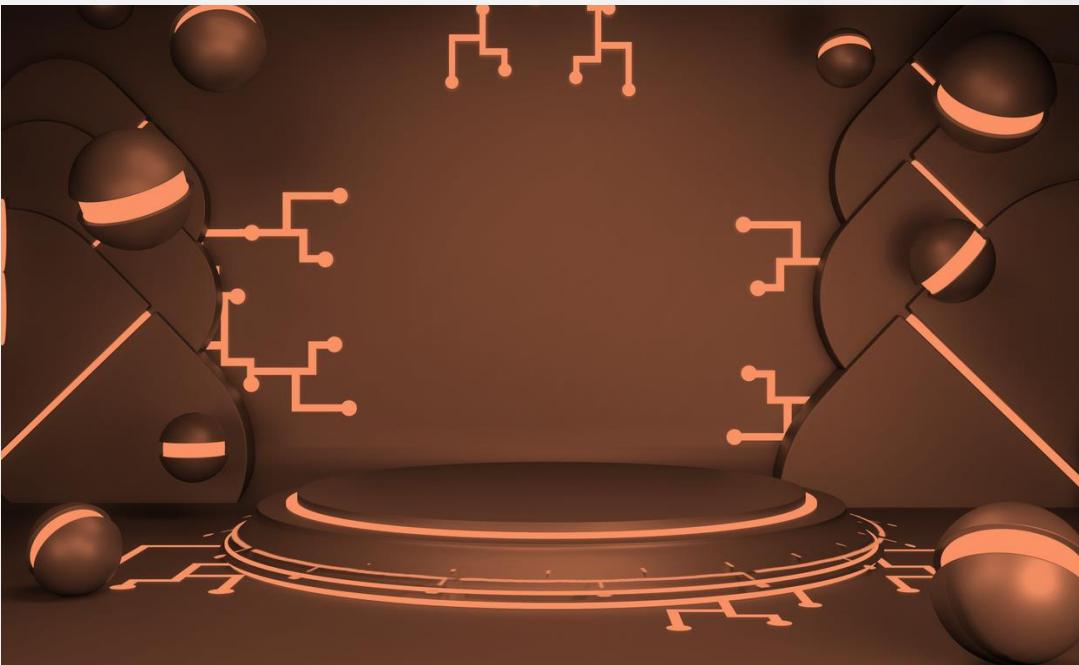


OBJECTIVE THREE



METHODOLOGY

- Add gamification elements like badges, leaderboards, and achievements.
- Calculate scores based on accuracy, speed, and question complexity.
- Use Next.js and Framer Motion for dynamic visuals and animations.

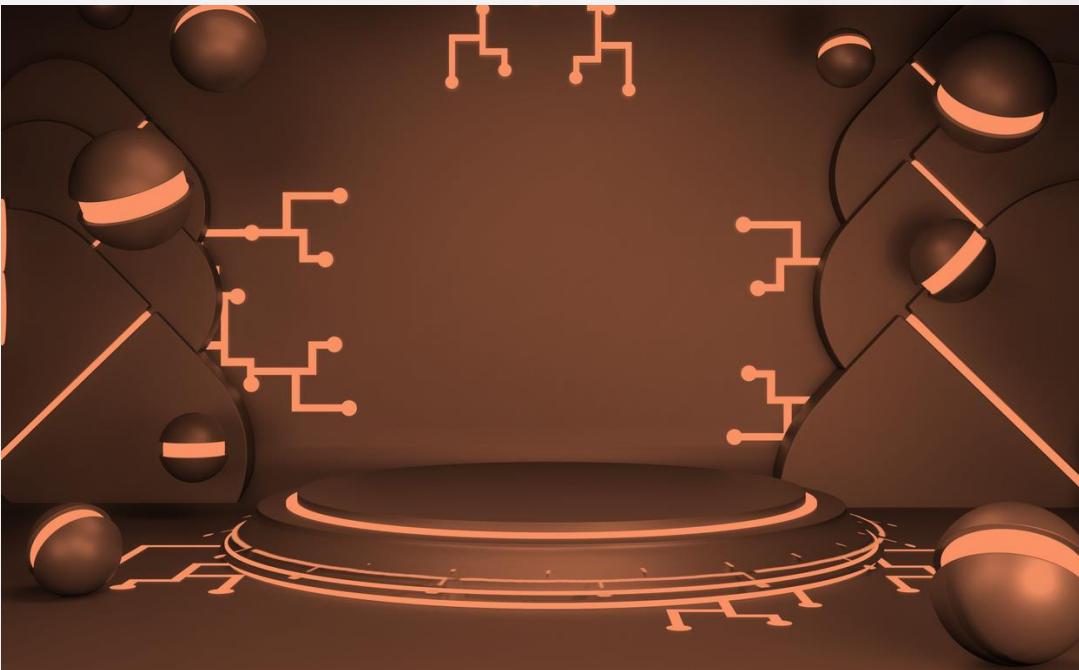


OBJECTIVE FOUR



METHODOLOGY

- Test the platform with a sample group of computing students.
- Log user actions, accuracy, and task completion time with Next.js.
- Track performance trends using Firebase Analytics and PostgreSQL.

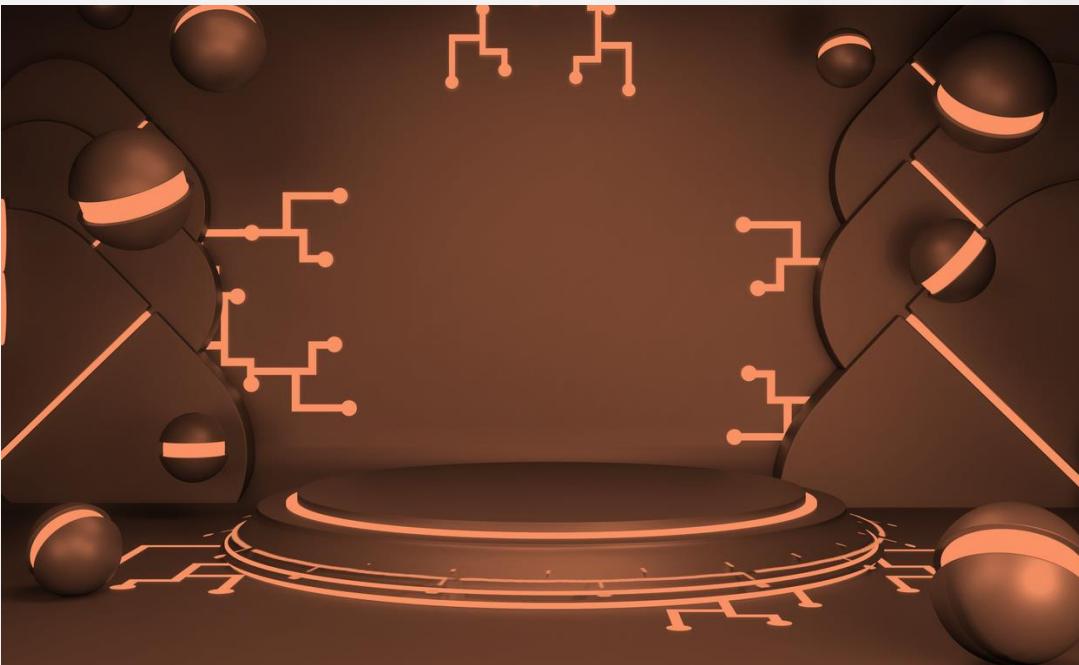


OBJECTIVE FIVE



METHODOLOGY

- Process gameplay data using Python libraries like pandas and scikit-learn.
- Use clustering and visualization to identify engagement patterns.
- Group users by performance to gain insights into learning behavior.



OBJECTIVE SIX



METHODOLOGY

- Conduct pre- and post-tests to measure comprehension and retention.
- Gather feedback through surveys and focus group discussions.
- Analyze results with SPSS to compare platform effectiveness and guide improvements.

Literature Review



Literature 01 - Videnovik, M., Vold, T., Kiønig, L., Bogdanova, A. M., & Trajkovik, V. (2023). Game-based learning in computer science education: a scoping literature review

Relevance: Highlights the role of gamification in improving engagement and comprehension in computer science, aligning with my research objectives.

Implementation Insights: Identifies the lack of standardized methodologies, guiding my inclusion of adaptive and curriculum-aligned features.

Summary: Reviews 113 studies, showing growing interest in gamification while identifying gaps in methodology and application scope.

Literature Review



Literature 02 - Triantafyllou, S. A., Sapounidis, T., & Farhaoui, Y. (2024). Gamification and Computational Thinking in Education: A systematic literature review

Relevance: Demonstrates how gamification fosters computational thinking and problem-solving skills, supporting my goal to use gamification for improving comprehension in computing education.

Implementation Insights: Highlights the importance of combining theoretical foundations with practical game mechanics to engage learners effectively, informing my use of adaptive and interactive gamified elements.



SIGNIFICANCE OF THE STUDY

Describes the parties that would benefit from the study

The platform provides students with a tailored, interactive approach to mastering complex computing concepts, while offering educators insights into student performance for targeted support.

Educational institutions can enhance academic outcomes and foster active learning, and researchers can leverage this study as a reference for integrating gamification into education.

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CONCLUSION

1

Enhances engagement, understanding, and retention in computing education through gamification and adaptive learning.

2

Students benefit from personalized tasks and real-time feedback, helping them master complex concepts.

2

It lays the groundwork for future research in adaptive gamified learning solutions.

REFERENCES

- Triantafyllou, S. A., Sapounidis, T., & Farhaoui, Y. (2024). Gamification and Computational Thinking in Education: A systematic literature review. Salud, Ciencia y Tecnología. <https://doi.org/10.56294/sctconf2024659>
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**thank
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