

QuizMaster: Adaptive Quiz Generation

Advanced RAG Hackathon

April 12-29 2024

Abstract

Aim

This study aims to develop an AI quiz generation system for engineering students to enhance personalized learning through adaptive quiz generation.

Literature Review

Our literature review method employs a systematic approach, analyzing peer-reviewed articles and a notable gap was identified - the lack of LLM-based adaptive quiz generation methods for science and engineering education.

Methodology

Our methodology involved sourcing relevant structured dataset, data pre-processing, embeddings generation, vector database storage, hybrid-search retrieval, LLM query results feed, prompt engineering, and context-based response.

Results and Evaluation

Evaluation includes answer relevancy, context precision, context recall, and a factual consistency score. Preliminary results indicate promising results for generation of precise and contextually appropriate questions with minimal hallucinations.

Introduction

- This project explores the development of an AI-based quiz generation system utilizing Large Language Models GPT-3.5 for personalized and adaptive learning experiences.
- Leverages the SciQ dataset within a Retrieval-Augmented Generation framework.
- Our app produces dynamic, accurate quiz questions that enhance science skills and adapt to student performance.



Challenges Addressed



The primary challenge addressed is the insufficient customization in quiz generation

Scarcity of relevant Multiple Choice Dataset (MCQ) dataset related to engineering education.

Overcoming the challenge of generating precise and contextually relevant quiz questions that minimize the risk of LLM generating incorrect or misleading information (hallucinations).

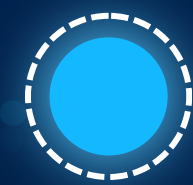
Dataset



The SciQ dataset encompasses 13,679 multiple-choice questions across scientific disciplines. This dataset was chosen due to its research-based, structured content, and data segmentation into test, train, and validate sets.



Each entry in the SciQ dataset is formatted in a JSON structure that includes a primary question, three distractors as incorrect answers, a correct answer, and context.



Even though it is not directly related to engineering education, it provides foundational support for pipeline development, rigorous testing, and eventual upgradation



Retrieval augmented generation (RAG)

Prevention of Overfitting

RAG prevents overfitting and catastrophic forgetting by referencing broad data sets.

Enhanced Explainability

RAG enhances explainability and reduces costs of continuous fine-tuning.



VECTARA (RAG)

Data Ingestion

Data uploading, embeddings generation, and vector database.

API access Retrieval

Data preprocessing, indexing, and LLM integration,



STREAMLIT DEPLOYMENT

Data Ingestion

Data uploading, embeddings generation, and vector database.

API access Retrieval

Data preprocessing, indexing, and LLM integration,

Methodology



Data Preparation and Indexing

**Enhanced Document Retrieval
and Structuring**

**Database Configuration and
Hybrid Search Integration**

**Dynamic MCQ Generation and
Response Handling**

**Adaptive Quiz System Using
LangChain**

**Evaluation and
Optimization**



STREAMLIT APP

CONTEXT: SCIENCE QUIZ

QUIZ ON SCIENCE TOPICS ON
SCHOOL LEVEL

DOCUMENT UPLOAD

CUSTOMIZED QUIZ GENERATION



STREAMLIT APP

APP LINK

QUIZ MASTER

<https://ai-quiz-master.streamlit.app>

Index Documents

Choose Documents

Drag and drop files here

Limit 200MB per file • TXT, PDF, DOC, DOCX, PPT, PPTX, XLS, XLSX

Browse files

Index Documents

Quiz Configuration

Enter a topic to generate MCQs on:

VOLCANO

Select the number of questions:

5

Generate Quiz

Fork this app



AI Quiz Master

Discover limitless learning with AI Quiz Master, your ultimate AI-powered tool for creating custom, engaging quizzes instantly! 🎓🚀

Question 1: What creates a volcano?

Choose your answer:

- A: Erosion of rocks
- B: Accumulation of ash
- C: Layer upon layer of lava
- D: Tectonic plate movements

Question 2: What is one type of feature that forms from extrusive rocks?

Choose your answer:

- A: Mountains
- B: Valleys
- C: Canyons
- D: Volcanoes

Question 3: What are the different shapes of volcanoes?



TEAM

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Thank you