

Buildx Voovo Hackathon

AI-GENERATED REVISION QUESTIONS FOR MEDICAL STUDENTS

Enhancing Learning with AI-Powered Question Generation

Team

Health Hackers



GitHub Repo: <https://github.com/mbalabanov/healthhackers>

CHALLENGE



How can we develop an AI-driven automated workflow that generates structured, high-quality revision quizzes from different medical content to enhance medical students' learning and retention?

MEET OUR TEAM



BIKASH KUMAR
THE VOICE



GABRIELLA FELICIANO
THE EYES



KRISZTIÁN BERTALAN
THE BRAINS



MARIN BALABANOV
THE BEARD



**HOW DID WE SOLVE
THE CHALLENGE?**

OUR APPROACH

01

Tech Stack

Python, Google Gemini, OpenAI ChatGPT 4

02

Data Ingestion & Preprocessing

Collect and prepare diverse medical content for AI processing from text-based PDFs, e.g. lecture notes, textbooks, research papers. Use the topics and subtopics from JSON files.

03

Processing Steps

1. Extract key topics and subtopics using NLP techniques (e.g., entity recognition).
2. We standardize medical terminology using medical ontologies.
3. Generate the questions/answers.

OUR APPROACH

04

Generate Structured Revision Questions Tailored for Learning.

1. Prompt Engineering

- Structured prompts based on medical content.
- We fine-tuned Gemini to learn from the positive examples we had.
- One model summarizes, ensuring that outputs follow the taxonomy.

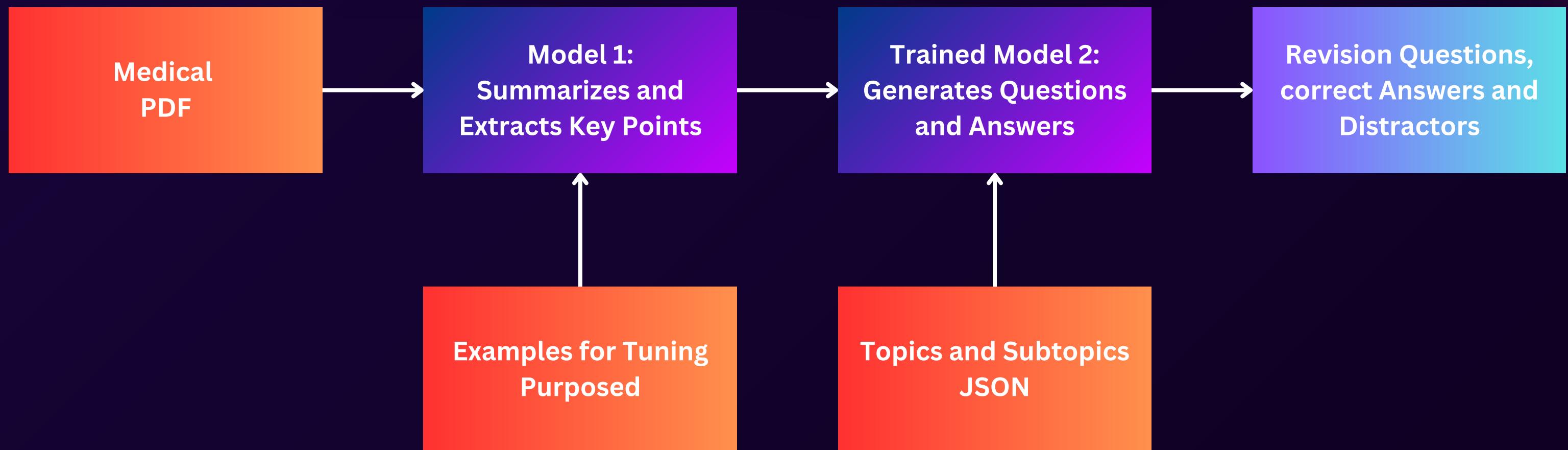
2. Multiple Choice (MCQs)

- One correct answer, four distractors, generated by the second model.

3. Supervised Learning for Quality Control

- **Example-based** learning to guide AI-generated output.
- **Validation** by medical educators.

OUR APPROACH



Generate output per question from tailored model on an example dataset (subtopic, expected quizzes combos)
Each previous question is stored in an array, thus no repetitive questions.



ISSUES WE ENCONTERED

01

Finding the Right Tonality & Scope

Multiple iterations needed to ensure revision questions didn't resemble test questions.

02

AI Hallucinations

In some settings, the AI generated both incorrect questions and incorrect answers.

03

Some Correct Answers Were Too Obvious

Some configurations led to answers being too predictable, reducing their effectiveness.

04

Dealing with Multiple PDF Files in a Directory

We ran into issues with multiple large PDF files.

05

Model Performance Comparison

Google's Gemini model provided better results than OpenAI's ChatGPT-4 in this task.



OUR OUTPUT

OUR OUTPUT

Examples from Reproductive System

```
{  
  "question": "How is a complete mole characterized, and what is its clinical behavior?",  
  "goodAnswer": "A complete mole is characterized by grossly identifiable villi that are often greater than 1 cm in size, the absence of fetal development, and the presence of excess tissue. It can lead to invasive disease or metastasize.",  
  "wrongAnswer_1": "A complete mole is characterized by the presence of two distinct villus populations (large with cisterns and small), irregular villus outlines, and syncytiotrophoblastic inclusions. It typically results in fetal anomalies but does not metastasize.",  
  "wrongAnswer_2": "A complete mole is characterized by focal villus hydrops and trophoblastic hyperplasia, with all villi being the same size. It rarely leads to invasive disease and has a high chance of spontaneous resolution.",  
  "wrongAnswer_3": "A complete mole is diagnosed when only a small portion of the placental tissue is examined, as opposed to a whole-mount evaluation. It is associated with normal fetal development and does not require any specific treatment.",  
  "wrongAnswer_4": "A complete mole is characterized by the presence of a clearly defined vascular network within the villi, supporting active fetal growth. It is often asymptomatic and does not require systemic therapy."  
},
```

```
{  
  "question": "How is gestational choriocarcinoma typically treated, and what is the rationale behind this approach?",  
  "goodAnswer": "Gestational choriocarcinoma is chemosensitive and is followed with bHCG levels and imaging.",  
  "wrongAnswer_1": "It is usually treated with surgery alone, as chemotherapy is too risky in pregnant women.",  
  "wrongAnswer_2": "Radiation therapy is the mainstay of treatment for gestational choriocarcinoma.",  
  "wrongAnswer_3": "We typically just monitor patients with regular blood tests and imaging without active treatment.",  
  "wrongAnswer_4": "The recommended treatment is a combination of chemotherapy, surgery, and immunotherapy."  
},
```



NEXT STEPS AND FUTURE ENHANCEMENTS

NEXT STEPS AND FUTURE ENHANCEMENTS



Multimodal AI Training: Use medical diagrams & images for the revision questions.



Speech-Enabled Quizzes: Voice-based questions for interactive learning.



Custom AI Tutor: Interactive AI chatbot for learning the materials and explaining quiz answers.



THANK YOU