Intelligent Interactive System- Milestone2:

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Project summary:

The project aims to address the problem of Passive Learning, which is characterized by a lack of active engagement in the learning process, leading to potential knowledge gaps and a misunderstanding of one's own learning progress (the 'Dunning-Kruger' effect). The proposed solution is an app, a personalized virtual learning companion that engages students with questions based on the text they are reading and their past interactions.
This tool sets itself apart from existing solutions by providing a highly personalized and integrated learning experience that adjusts to the individual's requirements. Our solution offers a user-friendly tool that can be used across various courses and materials. It generates questions based on the desired difficulty level and stores user data to offer personalized suggestions on subjects to practice. Additionally, it provides an overview of your performance, including success rates on questions.

Design Principles:

The design is guided by the following principles:

Make clear what the system can do: Creating a clean design and environment that involves having a clear understanding of the system's capabilities, achieved through straightforward interactions.

Show contextually relevant information: ask relevant questions regarding the current topic, add relevant information if possible.

Active Engagement: Encouraging users to actively participate in their learning process through interactive question-and-answer sessions.

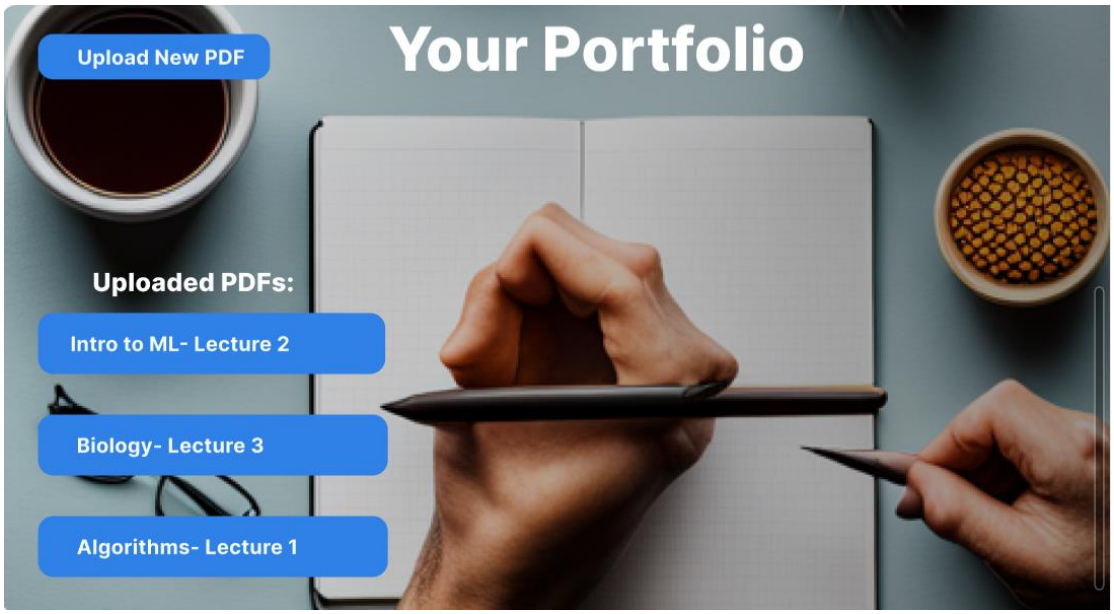
Learn from user behavior: Dynamically adjusting the difficulty and type of questions based on user feedback and performance.

Interface instruction:

The following page is our homepage for new users:

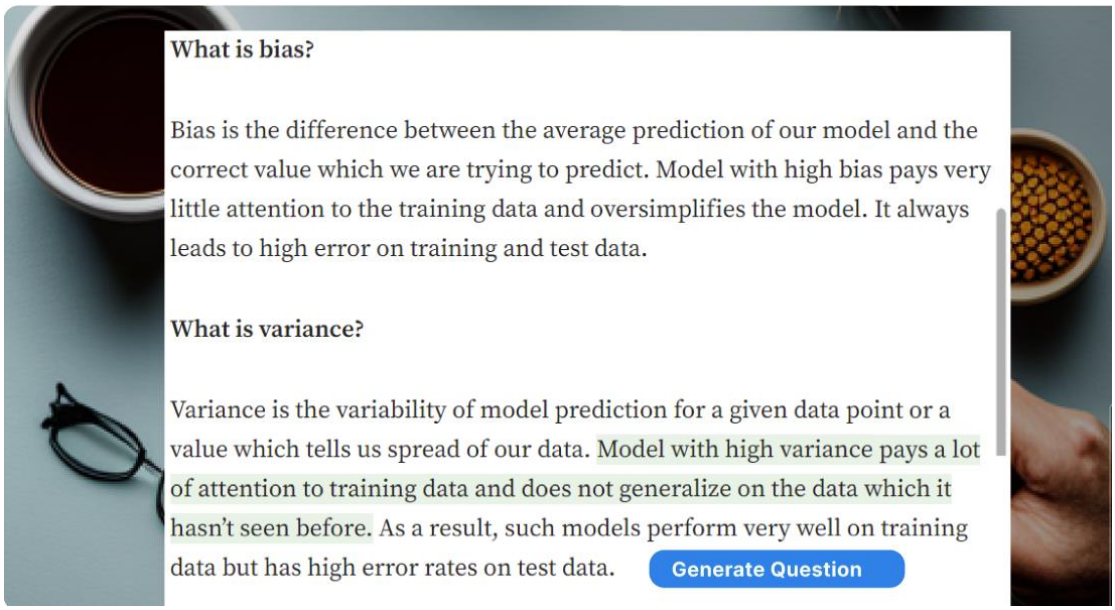
When clicking on ‘Start for free’, the user will be required to create an account/ log in via Google/Facebook. This is required for the personalized experience AskMe provides to the user.

The next page is called “Your Portfolio”:



In this page the user can access previous documents uploaded. Also, the user can upload a new pdf file here.

The following is an example of the tool in action:



The user is reading the course material when suddenly a question pops out-

At this stage there is a button for the interaction, we will try to implement a system where the cursor is recognized hovering and by this recognition a question is popped out to the user.

The last page captures an interaction between the user and the learning assistant. A question is generated about the text the user was reading. The user chose the answer 'A' to the question instead of the correct answer 'B'.

The user has the option of returning to the pdf, asking for a harder question or asking for an easier question.

Algorithmic Approach:

LangChain Framework: Utilizing LangChain to integrate and fine-tune different Large Language Models (LLMs) tailored to the specific domain of the text the user is studying. This approach enables the generation of more relevant and challenging questions than a general-purpose model could provide.

- **Model Selection and Fine-Tuning**: Researching and selecting the most appropriate LLMs for various domains (e.g., history, science) and fine-tuning these models based on user feedback and performance to enhance personalization and effectiveness.

An example of an appropriate model for mathematics: Llemma: An Open Language Model For Mathematics

- **Feedback Loop**: Implementing a system to capture and analyze user feedback (e.g., question difficulty adjustments, preference for question types) to continually refine question generation algorithms and personalize the learning experience for the users needs.

RAG-Retrieval Augmented Generation:

RAG takes input and retrieves a set of relevant/supporting documents given a source (e.g., Wikipedia). The documents are concatenated as context with the original input prompt and fed to the text generator which produces the final output. RAG allows language models to bypass retraining, enabling access to the latest information for generating reliable outputs via retrieval-based generation.

RAG can be useful in our project, as it allows us to bypass retraining the models on specific domain knowledge.

This backend approach emphasizes creating a dynamic, responsive system that evolves with the user's learning journey, ensuring that the virtual learning companion remains an effective and engaging tool for combating passive learning and promoting deeper comprehension and retention of material.