Lab 1 – Version 1

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1. Introduction

Artificial intelligence (AI) technologies are changing how students and educators interact with academic work. Some students are turning to AI to speed up homework and writing tasks, while instructors are struggling to evaluate whether submitted work reflects learning. This shift has sparked debate across higher education about the balance between efficiency, integrity, and long-term skill development.

1.1. Concerns Around AI in Education

Artificial intelligence tools like ChatGPT and Grammarly are becoming integral to students' everyday academic routines. While these tools can be helpful, there are growing concerns that relying too much on them may negatively affect essential skills such as creativity, critical thinking, and problem-solving. Research has shown that students who depend heavily on AI for assignments can score up to 20% lower on writing tasks compared to those who use it more thoughtfully. Similarly, a 2024 systematic review reported that students who lean too much on AI dialogue systems often struggle with analytical reasoning and independent thinking. In addition, many users tend to trust AI-generated responses without verifying them, a habit that is often influenced by cognitive biases affecting their judgment.

1.2. Solution Requirements and Challenges

A major challenge of LLM use among students is the substantial decline in the development of essential skills such as critical thinking, independence, and effective learning. Our solution must therefore include safeguards that teach students how to use LLMs as an educational tool rather than as a shortcut. Another challenge is that educators are increasingly receiving lower-quality work, often generated in part by an LLM. To address this, our solution will focus on preventing students from using LLM technology to obtain direct answers without engaging in meaningful

problem-solving. Additionally, educators often struggle to identify work that has been plagiarized or overly dependent on AI. To resolve this, our solution will provide educators with tools to review and monitor student interactions with LLMs.

1.3. Introduction to EduSense

EduSense is currently in development as a mobile and web-based application designed to help students and educators use AI tools more intentionally. Rather than providing direct answers, the app encourages students to think first by offering guided questions, reflective prompts, and challenge modes that limit or delay AI input. Educators also can upload assignments, monitor interactions with AI, and identify areas where students may struggle with comprehension. Key features of EduSense include copy/paste restrictions, usage tracking, and administrative controls to provide oversight. Ultimately, the goal of EduSense is not to replace learning but to support it by helping students and other learners strengthen their problem-solving and critical thinking skills.

2. Product Description

EduSense is a web and mobile application developed to support structured use of large language models (LLMs) in education. The application is intended to reduce student overreliance on AI tools by guiding learners to attempt assignments independently before requesting AI assistance. It also provides instructors with visibility into how students interact with the system, allowing them to review usage patterns and adjust instruction as needed. The product is designed with three main objectives. It encourages students to work through problems before accessing AI responses, it gives educators the ability to monitor and control the way AI is used in their courses, and it includes integration with learning management systems such as Canvas while remaining adaptable to future LLM updates.

2.1. Key Product Features and Capabilities

EduSense provides a set of features that regulate how students interact with large language models and how instructors can monitor and evaluate that use. One central capability is the use of reflective prompts, which require students to provide an initial explanation or reasoning before receiving AI-generated responses. This ensures that learners engage with material independently rather than relying solely on the system. In addition, EduSense includes challenge modes that can delay or restrict AI responses. These modes are configurable by instructors and encourage students to attempt problem-solving without immediate assistance. Assignments uploaded by instructors are directly linked to EduSense conversations so that interactions remain aligned with coursework. The system also incorporates usage tracking, recording data such as frequency and duration of AI interactions, which allows instructors to review student behavior and identify areas where additional instruction may be needed. Finally, EduSense manages stored interactions by automatically deleting conversation records after a set time period or when an assignment has been completed. This prevents unnecessary data accumulation while keeping the system focused on current tasks.

2.2. Major Components (Hardware/Software)

The overall structure of EduSense is shown in the Major Functional Component Diagram (MFCD) in *Figure 1*. The diagram illustrates how the system connects its main components, including the user interface, backend, database, learning management system integration, and external large language models. Each element in the diagram plays a distinct role in supporting

student interactions and instructor oversight.

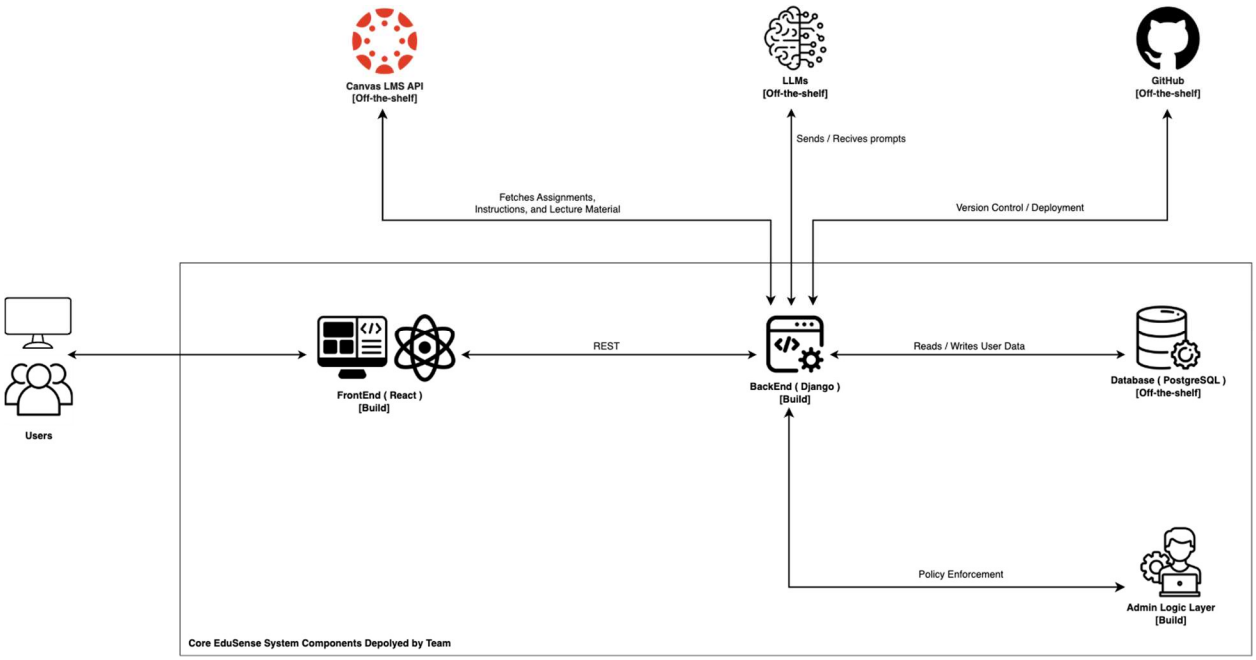

Figure 1: Major Functional Component Diagram

2.2.1 Hardware Components

The prototype is designed to run on any modern laptop, desktop, or tablet capable of supporting a web browser. The system requires network access through an 802.11ac network adapter. No specialized hardware is needed beyond these requirements.

2.2.2 Software Components

The software architecture of EduSense is divided into several layers, each handling a specific function of the system. The frontend manages user interaction, the backend coordinates requests and system logic, the database stores assignments and interaction records, the large language model provides AI-generated responses, and integration components connect EduSense to external services such as the Canvas learning management system.

2.2.2.1 Frontend

The prototype will be developed using HTML, CSS, and JavaScript as the core web technologies, with the Django framework providing interactivity, functionality, and styling support.

2.2.2.2 Backend

The backend will be built in Python, which will handle user requests, manage interactions with the large language model, and process assignment uploads.

2.2.2.3 Database

PostgreSQL or Firebase will serve as the database solution, storing assignments, interaction logs, and user data

2.2.2.4 LLM

EduSense will integrate with large language models such as OpenAI, Claude, or LLaMA. These models will provide the AI capabilities necessary to generate guided prompts, reflective questions, and supportive feedback for students

2.2.2.5 Integration

To connect seamlessly with existing academic workflows, EduSense will integrate with the Canvas LMS API. This integration will allow assignments to sync directly from the learning management system and provide tracking of student-AI interactions within the classroom environment.

3. Identification of Case Study

EduSense is being developed primarily for students and educators in higher education, where large language models are increasingly used to support coursework and assignments. The initial prototype will be applied in a university setting, using Old Dominion University courses. Students are the primary users of the system. For them, EduSense introduces reflective prompts and challenge modes that encourage independent reasoning before seeking AI-generated responses. This design helps students strengthen critical thinking and problem-solving skills rather than relying exclusively on automated answers. Instructors represent the second core user group. EduSense provides tools for uploading assignments, reviewing student–AI interactions, and monitoring overall usage patterns. These functions give educators greater oversight of how AI is being applied in their classrooms, supporting both academic integrity and more targeted instruction.

Although the prototype is focused on university courses, the potential applications extend further. Other colleges, high schools, and professional training programs could use EduSense to address similar challenges of balancing AI support with independent learning. Corporate trainers and lifelong learners may also benefit from the system's ability to encourage thoughtful engagement with material while maintaining accountability and oversight.

4. Glossary

- Artificial Intelligence (AI): A commonly used term encompassing any machine learning algorithm designed to train from a given input to provide an expected output.
- Large Language Model (LLM): An advanced machine learning algorithm trained on massive text datasets to understand and generate human-like language.
- Canvas LMS: A learning management system used by educators to manage course content, assignments, and communication with students.
- Challenge Mode: Setting that encourages learners to try on their own before getting help. It limits access to answers to encourage thinking through the assignment first.
- Guided prompts: Targeted questions or hints created to help students think critically and come up with their own solution.
- MFCD (Modified Functionality Component Diagram): A diagram showing the major hardware and software components of the product and how they interact.
- Usage Tracking: The process of recording how users interact with the system, such as which features they use or how they engage with LLM prompts.

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5. References

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