Capstone Project: AI Invigilator

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Introduction

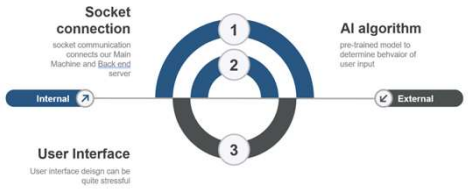
- The AI invigilator project is a solution that contains a **web front-end interface** and **back-end AI models** that monitor and prevents cheating in exams. The web front-end interface allows instructors to set up and manage exams, monitor student activity during exams, and review exam reports.
- The software design for an AI invigilator project with a front-end and back-end consists of two main components: the user interface and the AI models.

- The front-end part is responsible for providing a user-friendly interface for supervisors and staff members to interact with the system.
- The back-end part is responsible for processing and storing data, and performing the machine learning algorithms that detect suspicious behaviors.

Inspiration

- The idea of the project is inspired by the online exam monitoring software, we want to design and implement a solution that is secure, reliable, and user-friendly for exam monitoring. It can also reduce the workload of human invigilators and provide a more efficient and cost-effective solution for exam administration and monitoring.

System Design



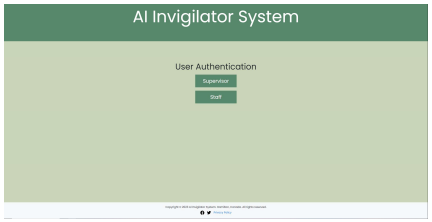
- The advantage of this software design is that it **separates the concerns** of the user interface from the detection models, making it easier to maintain and scale the system. The front-end and back-end can be developed and tested independently, allowing for faster development and deployment times. The **modular design** also allows for easy integration of third-party services and APIs, making it easier to add new features and functionality to the system. The implementation process involves designing and developing the front-end and back-end parts independently, and then integrating them into a cohesive system. Testing and deployment are also important steps in the implementation process, to ensure the system is reliable and secure.

Project Scope

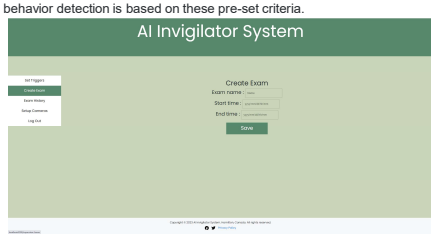
- An important issue in this project is **defining "suspicious behavior" in an exam** because it enables the system to accurately detect cheating and prevent false positives. Without a clear definition of what constitutes suspicious behavior, the AI invigilator may flag innocent behavior as cheating or miss actual instances of cheating.
- In order to provide transparency and accountability in the monitoring process, we decide to use triggers that **encapsulate** suspicious behavior into customizable factors. For example, a trigger could be looking around for more than 10 seconds. Since the system would never make any final decisions or conclusions saying that a student is cheating, the design of customizable triggers can solve the issue of defining "suspicious behavior".

Software Features

- **Supervisors Authentication**
- This feature is a part of the WI system, and it's embedded in the react app. In the react app, users are required to identify their user type (supervisor or staff member) and authenticate using institution id and code. Once the authentication succeeds, the users will be redirected to the corresponding homepage. The main functionality of the authentication is to classify users and give them different levels of access.



- **Exam Management**
- The system shall allow the leading supervisors to input exam information, set up timers, change the rules and add any specifications about the exam. The system shall also allow supervisors to customize pre-set triggers that the system will detect suspicious behaviors depending on. The suspicious behavior detection is based on these pre-set criteria.



Software Features (continued)

- **Suspicious Behavior Detection**
- Once the supervisor starts the exam, the system will detect suspicious behavior of the examinee and flag an examinee if the pre-set criteria are met.

- **Generating report**
- The system shall generate a report including exam information and timestamps of operations (detected suspicious behaviors, cancelled highlighted behaviors, etc.) when the exam is ended.

- **Streaming camera feeds**
- The system shall display a GUI that allows supervisors to control (start and end) the stream of camera feeds to the BE and MM.

References

- Genemo, M. D. (2022). Suspicious activity recognition for monitoring cheating in exams. Proceedings of the Indian National Science Academy, 88(1), 1–10. https://doi.org/10.1007/s43538-022-00069-2
- Debnath, Partha & Rashed, Md. Golam & Das, Dipankar. (2018). Detection and Controlling of Suspicious Behaviour in the Examination Hall.

Conclusions

- In conclusion, the process of this project provides valuable learning experiences and skills for us that are highly applicable to the professional world. In the process of transforming an idea into a real software system, we go through the entire process of software products including designing, preparing documents, designing the structure, implementing and testing.
- We realize that implementing an idea into a real software product often involves solving complex problems and challenges, and we not only apply previous course contents but also develop important project management and problem-solving skills.

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