



TED UNIVERSITY

Department of Computer Engineering

CMPE 491 Project Specifications Report

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1. Introduction

1.1 Description

This project aims to develop an artificial intelligence supported chatbot system in order to facilitate the academic processes of TED University students. One of the most common problems faced by students is that they cannot access sufficient and accurate information about the course content during the course selection process. Usually, students try to obtain information by consulting their friends or department groups, but this method is often inefficient.

The chatbot to be developed will be able to analyze the course curriculum in detail and guide students through the course selection process. Thanks to the e-mail scanning feature of the bot, it will be enabled to analyze students' mail inboxes, determine important meeting, midterm, final and quiz dates and automatically add them to Google Calendar.

The system will also have additional features that can support the academic and social lives of TEDU students. Oct. For example, by informing students from outside the city about the problems they often encounter, they will be able to provide guidance on various processes at TEDU. The chatbot will be designed in an extensible structure with different plug-ins and will be left as an updatable system according to the needs of TEDU students.

1.2 Constraints

Economic Constraints:

- The Project SAGE's (Smart AI Guide for Education) expenses will consist of API services for email integration, AI model development, cloud hosting, secure data storage, and maintenance. System updates, frontend-backend development, and future upgrades may also be included in costs of the project.

Social Constraints:

- The Chatbot will be designed to have a user-friendly and comprehensive language, ensuring that TEDU students from various regions, cultures and backgrounds can easily access and use the Chatbot .

Ethical Constraints:

- Significant concerns for Project SAGE are privacy and transparency, particularly the email scanning feature. The system will only process necessary data and ensure storage and sharing of user information by managing it responsibly.

Health and Safety Constraints:

- Project SAGE will notify students about significant events at regular intervals for helping them to organize their schedules. The chatbot will help students to meet their needs without wasting time with its fast and efficient design.

Manufacturability:

- The Project SAGE's system will be implemented considering to have a modular structure, allowing feature expansion without a total system rebuild and can adapt to TEDU's system changes with updatable structure.

Sustainability:

- Project SAGE's comprehensive and well-documented framework will ensure students' long-term accessibility and academic support. Regular maintenance and updates, together with optimum data storage, will keep the system secure, efficient, and adaptable.

1.3 Professional and Ethical Issues

1. Data Security and Privacy:

Private student information, such as email correspondence and calendars, will be handled by the chatbot. To safeguard such data, we will implement appropriate security protocols, such as encryption during transmission and storage. Student information will be strictly restricted to authorized staff members only.

We will be in adherence to all applicable data privacy legislation, including [Mention laws, i.e., Turkish Personal Data Protection Law (KVKK)]. Retention policies shall be defined in plain terms, and students can ask for erasure of their data.

2. Bias and Fairness:

AI models are susceptible to biases in their training data. We will actively address potential biases in the chatbot's response and recommendation. We will provide diverse training data for student community representation and conduct rigorous testing for the identification and prevention of biases. We will monitor the chatbot performance on a watchlist for discriminatory outcomes and correct them whenever required.

3. Transparency and Explainability:

Students will be provided with clear explanations of how the chatbot works and how their data is used. We shall make every effort to make the decision-making of the chatbot transparent, as well as why it provides certain suggestions. We shall provide users with information on what the limitations of the AI are, and potential errors.

4. Accountability and Responsibility:

The chatbot's behavior and any errors that may follow will be the responsibility of the project team, which will be headed by Hakkı Gökhan İlk. We shall have a clearly stated complaint processing and resolution procedure, e.g., a stated student feedback channel and support for it. We shall provide an error process with a negative impact on students, e.g., procedures for remediation.

5. Informed Consent:

Students will be required to provide explicit consent prior to their data being collected and processed by the chatbot. We will provide students with clear and simple information about the purpose of the chatbot, the type of data collected, and how it will be utilized. Students will have the right to opt out of the service at any moment and request the erasure of their data.

6. Academic Integrity:

We will have safeguards to make sure the chatbot cannot be used to cheat on coursework. The chatbot will not provide answers to questions on assignments or exams. We will monitor usage patterns so we can recognize and stop misuse of the chatbot that is inconsistent with academic integrity.

7. Accessibility:

All TED University students, including those with disabilities, will have access to the chatbot. To meet various needs, we will take into account various input and output interfaces, including speech and text. Using students with disabilities, we will test the usability and implement accessibility strategies.

8. Intellectual Property:

We will be fully in adherence to all applicable licenses for use in the project any third-party APIs or libraries that we may be using. We will identify code and data ownership of the chatbot and abide by intellectual property policies at TED University.

9. Impact on Student Welfare

We will monitor student feedback and usage patterns and track and reverse any negative effects.

10. Conclusion:

We will examine and evaluate the performance on a regular basis and resolve any moral conundrums that may arise. We believe that by following these rules, we can create a useful tool that improves TED University students' educational experiences without compromising the highest moral standards.

2. Requirements

Core Functionality:

- **Syllabus Information Retrieval:** The chatbot should retrieve and provide accurate syllabus details for each course.
- **Email Scanning & Calendar Integration:** The chatbot will scan students' email inboxes for quiz/exam schedules and automatically sync them with Google Calendar.
- **Academic & Social Guidance:** The chatbot should answer FAQs related to academic processes and provide guidance to new students.
- **24/7 Support:** The system should be available at all times to assist students with their academic inquiries.

Technology and Integrations:

- **Google Calendar API** for automatic scheduling.
- **Retrieval-Augmented Generation (RAG)** model for providing accurate and context-aware responses.
- **TEDU Academic Database Integration** for syllabus and course-related information retrieval.

User Interface:

- A **simple and intuitive chat-based interface** that enables students to interact effortlessly.
- **Responsive UI** across web and mobile platforms.
- **Dark mode support** for better accessibility.
- **Voice command support** for enhanced usability.

Security Requirements:

- **End-to-end encryption** for all chatbot communications to prevent unauthorized access.
- **Multi-factor authentication (MFA)** to ensure only TEDU students can access course-specific data.
- **Data anonymization techniques** to protect personally identifiable information (PII).
- **Role-based access control (RBAC)** to define and restrict user privileges.
- **Secure API communication** using OAuth 2.0 for integrations.
- **Audit logging and monitoring** to detect and prevent potential security breaches.
- **Compliance with GDPR and local regulations** to ensure legal and ethical data handling.

Performance Requirements:

- The chatbot should have a **response time of under 1.5 seconds** for optimal user experience.
- The system should be capable of handling **over 10,000 concurrent users** without performance degradation.
- **Auto-scaling mechanisms** should be in place to manage traffic spikes efficiently.
- **99.9% uptime guarantee**, with scheduled maintenance periods to minimize disruption.
- **-Efficient caching strategies** to reduce repeated database queries and improve response time.
- **Regular system updates and backups** to prevent data loss and ensure smooth operation.
- **AI model retraining every semester** to keep responses accurate and relevant.

3. References

- [1] Association for Computing Machinery, "ACM Code of Ethics and Professional Conduct,". Available: <https://www.acm.org/code-of-ethics>.
- [2] IEEE Computer Society, "Software Engineering Code of Ethics,". Available: <https://www.computer.org/education/code-of-ethics>.
- [3] Institute of Electrical and Electronics Engineers (IEEE), "IEEE Code of Ethics,". Available: <https://www.ieee.org/about/corporate/governance/p7-8.html>.
- [4] Stanford Encyclopedia of Philosophy, "Computer and Information Ethics,". Available: <https://plato.stanford.edu/archives/sum2020/entries/ethics-computer/>.