TED UNIVERSITY

Department of Computer Engineering

CMPE 491 Analysis Report

Team Members:

- Arda Taha Sökelen (10342323378)

- Mehmet Alp Demiral (34937067942)

- Miray Aday (13849221628)

- Oğuzhan Altın (15052066386)

Supervisor: Hakkı Gökhan İlk
Jury Members:
- Gökçe Nur Yılmaz

1. Introduction

This report provides an analysis of the artificial intelligence supported chatbot called Project SAGE (Smart AI Guide for Education), which aims to facilitate the academic processes of TED University students. The main motivation of this project is to ensure that students have access to accurate and structured information during course selection.

Nowadays, students often consult their friends or department groups to learn about the courses. However, these methods often lead to incorrect or incomplete information. Project SAGE aims to eliminate these problems by analyzing the course curriculum and providing students with guidance appropriate to their academic needs.

In addition, the chatbot will facilitate students' time management by scanning students' email inboxes, determining important academic events (quizzes, midterms and final exams) and automatically adding them to Google Calendar[1]with the feature of Project SAGE.

Beyond academic support, the system will also offer social guidance for students who are just starting out at TEDU and provide information about various processes at the university. Project SAGE, which will have a modular and expandable structure, will be designed to adapt to future needs.

2. Current system

There are some existing systems at TED University where students can get information about course selection, activities and academic processes. However, these systems contain certain shortcomings and cannot always ensure that students can access the information they need quickly and effectively.

The current methods of obtaining information are:
- **Department Website:** The official website of the department provides basic information about course contents and academic programs. However, the information on the website is usually static and cannot always answer students' specific questions about course selection.

- **Student Communities:** Student communities at the university share information about various events and announcements. Students are usually informed about these activities through WhatsApp groups. However, some important announcements may be overlooked due to the high density of messages in the groups.

- **Academic Advisors:** Students can get general information about the school by meeting individually with their academic advisors and receive support regarding their course choices. However, it is not always possible to devote enough time to each student due to the intensity of the counselors.

3. Proposed system

3.1 Overview

Project SAGE (Smart AI Guide for Education) is an artificial intelligence supported chatbot system that aims to make the academic processes of TED University students more efficient. This system aims to help students in course selection, exam calendars, academic guidance and social activities within the university. SAGE aims to save time and reduce uncertainties in the educational process by making students' daily work easier.

Main Features:

1. **Course Selection Guidance:** The chatbot will guide students through the course selection process by analyzing TED University's course curricula. Students will be able to easily learn the course content, faculty members and course requirements via chatbot.

2. **Email Scanning and Calendar Integration:** Chatbot will scan students' email accounts to detect important events such as quiz and project deadlines from important exam dates and automatically add this information to students' Google Calendar[1]. This feature will allow students to be informed about important academic dates.

3. **Academic and Social Guidance:** The chatbot will not only provide students with general information and guidance about academic processes, but also provide information about social events, club activities and other student activities on campus.

4. **24/7 Support:** The chatbot will be available 24/7 to ensure that students can get the academic help they need at any time. In this way, students will also be able to get help when their advisors or faculty members are unavailable.

Technological Infrastructure

- **Google Calendar API Integration:**
  - Important dates will be automatically added to Google Calendar. Thus, students will be able to easily follow exams, assignments and other activities[1].

- **Academic Data Pool with Web Scraping:**
  - Data will be collected from TED University's website and academic announcement platforms by web scraping method. The collected data will be edited and an academic data pool will be created for the chatbot to respond.

- **Retrieval-Augmented Generation (RAG) Model:**
  - The chatbot will use the RAG model to provide up-to-date and contextually meaningful responses. This model will instantly answer students' questions by pulling the correct information from the academic data pool and school announcements[3].

Project SAGE aims to make students more aware and organized by facilitating their academic and social lives. Thanks to the integration of artificial intelligence and modern technologies, students will always have quick access to the most up-to-date information.

3.2 Functional Requirements

Core Features:

1. **Course Syllabus Retrieval:**
   - Allow students to search for courses by code, name, or keywords.
   - Display course syllabus information (content, learning outcomes, assessment methods, instructor, prerequisites).
   - Potentially display historical data like average grades or student reviews (if available and ethical)..

2. **Email Event Detection & Calendar Integration:**
   - Connect to a student's TEDU email account (with user permission).
   - Scan emails for keywords related to academic events (midterm, final, quiz, assignment, meeting, deadline).
   - Extract relevant information from emails (event type, date, time, course).
   - Allow users to confirm or edit extracted event details before adding to the calendar.

3. **General Information Provision:**
   - Provide information about administrative processes.
   - Offer guidance for new students.
   - Provide information about student clubs and activities.
   - Provide contact information for relevant university departments.

Advanced Features:

4. **Personalized Recommendations:**
   - Suggest courses based on a student's major, interests, and academic history.
   - Recommend relevant clubs or events based on student profiles.

5. **Interactive Learning Support:**
   - Provide summaries of course content.
   - Answer basic questions about course concepts.

6. **Task Management:**
   - Allow students to manually add tasks and deadlines.
   - Send reminders for upcoming deadlines.

7. **Multi-language Support:**
   - Support Turkish and English.
   - User Profile Management.
   - Allow students to create and manage their profiles.

8. **Feedback Mechanism:**
   - Allow students to provide feedback on the chatbot's responses and functionality.

9. **Push Notifications:**
   - Send notifications for important announcements, upcoming deadlines, or new events.

10. Integration with other TEDU Systems:
- ● Potentially integrate with the university's learning management system (LMS) for accessing assignments or grades.

3.3 Nonfunctional Requirements

1. Performance
- ● The chatbot will be able to respond to a user's question within 2 seconds.
- ● The e-mail scanning process will be performed every 30 minutes, and the process of adding calendar information to the user will be completed in less than 3 seconds.
- ● The system must be scalable in such a way that it can serve at least 1000 users at the same time.
- ● The response time of database queries should not be longer than 1 second for every 1,000,000 records.

2. Security
- ● Data scanning process will be performed from the students' email accounts, high security measures should be taken to protect the students' personal data. User information must be stored securely and data security standards must be followed.

3. Data Accuracy
- ● The data provided by the chatbot must be accurate and up-to-date. It should be ensured that the academic data collected by web scraping method is reliable and accurate, misleading or erroneous information should not be given.

4. Traceability and Record Keeping
- ● The chatbot will be able to record student interactions and provide responses. In this way, the performance of the system can be monitored and, if necessary, feedback can be made on past interactions.

5. User-Friendly Interface
- ● The chatbot should have a simple and understandable interface with which users can easily interact. The interface should be simple and intuitive so that students can get fast and accurate answers to their questions.

3.4 Pseudo requirements

1. Language Support:
- ● The chatbot's native language will be English. However, support for Turkish and other languages may be added in the following stages.

2. University-Specific Use:
- ● Initially, the chatbot will be used only by TED University students and academic staff. However, in the future, systems that are customized for other universities may also be developed, but perform the same functions as each other.

3. E-mail Access:
- ● The chatbot's email scanning feature will only work with the explicit consent of the student. This feature will be disabled unless users allow the chatbot to access their emails.

4. Use of Third-Party API:

- The terms of use of the respective service providers for the Google Calendar API and other integrations must be accepted. In the event of an outage of API services, the chatbot may be temporarily unable to provide these services.

5. Output Format:
- The responses provided by the chatbot will be text-based. Voice response support is not planned, but this feature may be evaluated in future versions.

6. Frequency of Data Update:
- The academic data pool of the chatbot will be updated by web scraping method. These updates can be set on an hourly or daily basis, and sudden changes may not be reflected in the chatbot immediately.

7. Dependencies:
- All the systems necessary for the chatbot to work (database, email access, API integrations) should work smoothly. Any failures that will occur in these systems may affect the relevant features of the chatbot.

8. Legal and Ethical Compliance:
- The chatbot will operate in accordance with the KVKK (Personal Data Protection Law) and other relevant data privacy regulations. Users' data will not be shared with third parties in any way.

3.5 System models

3.5.1 Scenarios

Scenario 1: Personalized Course Recommendation and Study Plan Assistance

- Actor: Deniz, third-year Computer Engineering student, who is interested in specializing in Artificial Intelligence. They are looking for elective courses and want to create a study plan for the semester.
- Goal: Receive personalized course recommendations based on their interests and academic history, to organize their study schedule.
- Preconditions: Deniz has a user profile on SAGE with their academic history and interests filled out. Deniz has given SAGE access to their academic records.
- Steps:
1. Deniz opens the SAGE chatbot and types, "I'm interested in AI. What elective courses do you recommend?"
2. SAGE analyzes Deniz's academic history, including completed courses and grades, and matches them with AI-related electives.
3. SAGE presents a list of recommended courses, including CMPE 442 (Machine Learning), SENG 472(Natural Language Processing), and CMPE 465(Computer Vision), with brief descriptions and prerequisites.
4. Deniz asks, "Tell me more about CMPE 442 and its workload."
5. SAGE provides detailed information about CMPE 442, including the syllabus, learning outcomes, workload distribution (assignments, projects, exams), and student feedback (if available and ethically permissible).

6. Deniz decides to take CMPE 442 and SENG 472. Ask SAGE to help them create a study plan.
7. Deniz inputs their available study hours per week and other commitments.
8. SAGE integrates the course schedules from CMPE 442 and CMPE 465, along with the deadlines from their other courses (obtained from email analysis and calendar integration), and generates personalized study plan.
9. SAGE suggests time blocks for studying, completing assignments, and attending lectures.
10. SAGE reminds Deniz of upcoming deadlines and study sessions through notifications.

Postconditions: Deniz has a personalized study plan that helps them manage their time effectively and achieve their academic goals in their chosen specialization.

Scenario 2: Campus Life and Administrative Process Guidance for an International Student

- Actor: Kenji, first-year international exchange student from Japan, who is still adapting to life in Ankara and at TEDU.
- Goal: To obtain information about campus facilities, administrative procedures, and social activities.
- Preconditions: Kenji has access to the SAGE chatbot and has selected English as his preferred language.
- Steps:
1. Kenji opens the SAGE chatbot, which automatically detects his language preference and displays the interface in Japanese.
2. Kenji types, "Where is the international student office?".
3. SAGE provides the location of the international student office, along with directions and contact information.
4. Kenji asks, "How do I apply for a student residence permit?".
5. SAGE provides a step-by-step guide to the residence permit application process, including required documents and deadlines.
6. Kenji asks, "What social clubs are available?".
7. SAGE provides a list of student clubs, including the international student club and the Japanese language club, with descriptions and contact information.
8. Kenji asks, "Where can I find halal food near campus?".
9. SAGE provides a list of halal restaurants near campus, along with directions and reviews.
10. SAGE offers to add important dates concerning international students, like residence permit renewal dates, to Kenji's google calendar.

Postconditions: Kenji feels more comfortable and integrated into campus life, having received comprehensive guidance on administrative processes and social activities. He is also able to navigate the city more easily.

3.5.2 Use case model

Actors:

- Student: The primary user of the SAGE chatbot.

- Google Calendar: An external system for managing events.
- TEDU Website/Database: Source of course syllabus and university information.
- Email Server: Hosts student email inboxes.
- Academic Advisor (Indirectly): Benefits from students being better informed.

Use Cases:

1. **Get Course Syllabus Information:**
    - Description: The student interacts with SAGE to retrieve details about a specific course syllabus.
    - Actor: Student
    - Preconditions: The student has access to SAGE and knows the course code, name, or keywords.

    Basic Flow:

    - Students initiate a query for course syllabus information.
    - SAGE prompts for course identification (if not specific enough).
    - Students provide course details.
    - SAGE retrieves and displays the syllabus information (description, learning outcomes, assessment, instructor, prerequisites, schedule).

    Alternative Flows:

    - Student provides an invalid course code/name: SAGE informs the student and prompts for correction.
    - Syllabus information is not found: SAGE informs the student.

2. **Automatically Add Academic Event to Calendar:**

    - Description: SAGE scans the student's email, automatically adds detected academic events to their Google Calendar.
    - Actor: Student, Google Calendar
    - Preconditions: The student has granted SAGE permission to access their TEDU email and Google Calendar. An email containing academic event information has been received.

    Basic Flow:

    - SAGE periodically scans the student's email inbox.
    - SAGE identifies an email containing potential academic event information.
    - SAGE extracts relevant details (event type, date, time, course).
    - SAGE (optionally) presents the extracted information to the student for confirmation.
    - Student confirms (or edits) the event details.

- SAGE adds the event to the student's Google Calendar.

Alternative Flows:

- SAGE cannot extract sufficient information: SAGE may ask the student for clarification or skip the event.
- Student denies adding the event: SAGE does not add the event to the calendar.

3. **Manage User Profile (Future):**
   - Description: The student can manage their profile settings, such as preferred language, calendar integration permissions, and interests.
   - Actor: Student
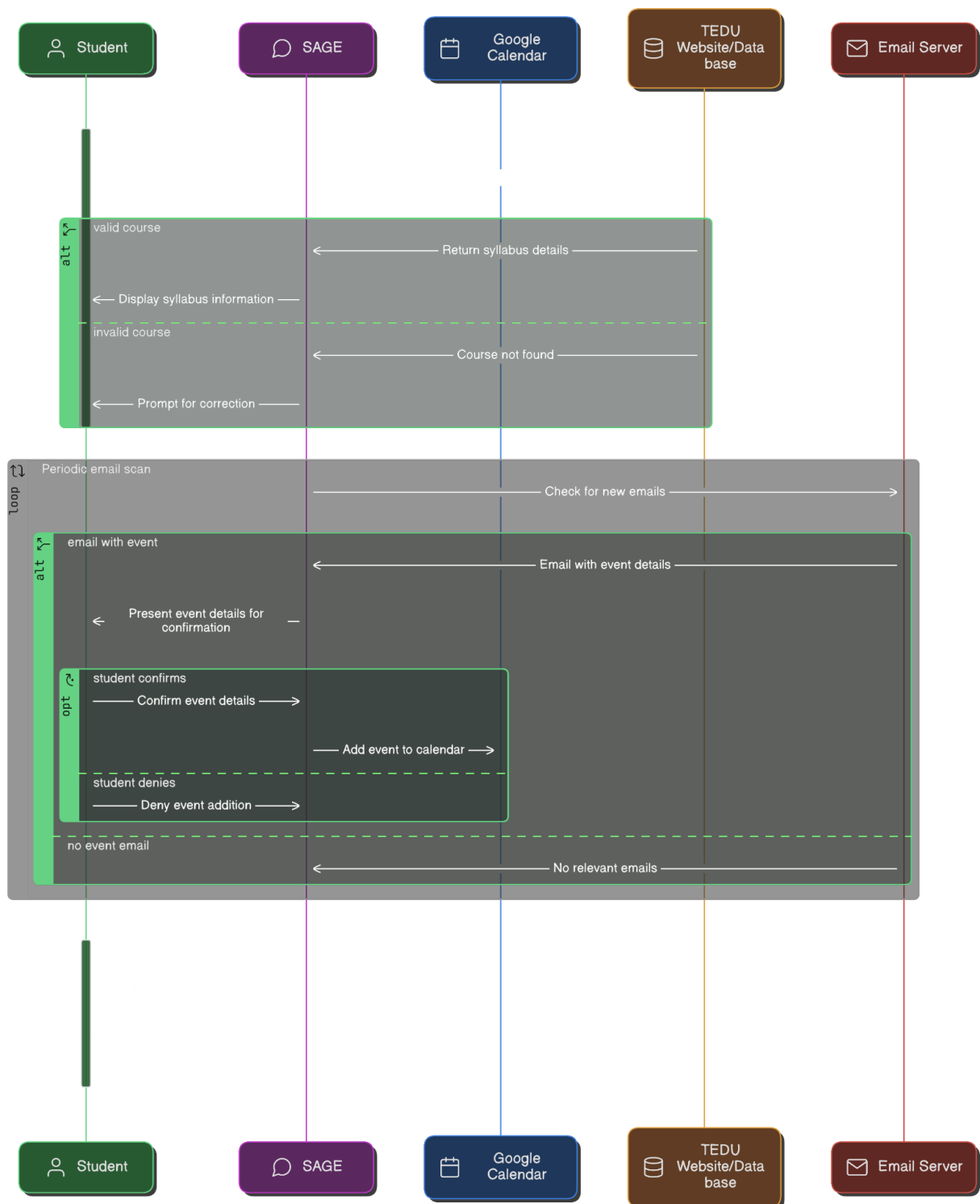   - Preconditions: The student has an account with SAGE.

Basic Flow:

- Student navigates to the profile settings.
- Students modify their profile information or preferences.
- SAGE saves the changes.

Use Case Diagram:
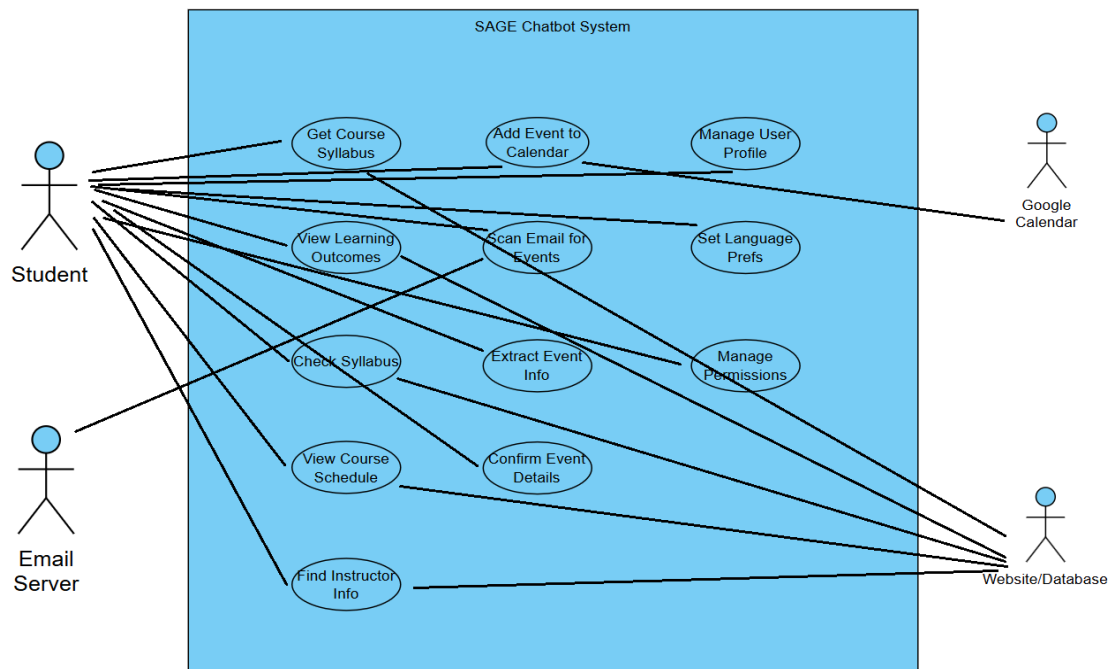
Sequence Diagram

3.5.3 Object and class model

In this section, we present the overall class structures of our project; the below part consists of attributes of each class, their relations with each other and their functions, which help us understand what each class does. This part helps us to have an overall understanding about our project SAGE and allows us to view how the project's components interact with each other.

1. **User Class**
   - **Attributes:** UserID, Name, Surname, Email, Password, Role, Interests, CalendarIntegrationStatus, EmailAccessStatus.
   - **Relations:**
     - **User - ChatbotSession** (Association): A user may have several chatbot sessions.

     - **User - Event** (Association): A user can attend multiple events, and an event can have multiple users.

     - **User - Course** (Association): A user can enroll in multiple courses

     - **User - EmailOperations** (Composition): A user has at most 1 email operations integration (when a user is deleted its email operations connection is deleted as well).

     - **User - GoogleCalendar** (Composition): A user has exactly 1 Google Calendar integration (if a user is deleted, their Google Calendar is deleted).
   - **Methods**: SignIn(), SignUp(), ChangePassword(), UpdateProfile(), ToggleEmailAccess(), ToggleCalendarSync(), myEvents(), myCourses().

2. **ChatbotSession Class**
   - **Attributes**: SessionID, UserID, StartTime, ConversationLog, CurrentContext, Language, ModelVersion.
   - **Relations**:
     - **ChatbotSession - User** (Association): A chatbot session is related to one user, so multiple sessions belong to one user.

     - **ChatbotSession - Database** (Aggregation): The database stores chatbot session data, but sessions can exist independently of the database.

     - **ChatbotSession - EmailOperations** (Association): Chatbot session retrieves email data through email operations interactions.

     - **ChatbotSession - GoogleCalendar** (Association): Chatbot session fetch calendar data using Google calendar integration.
   - **Methods**: StartSession(), EndSession(), ProcessInput(), GenerateResponse(), FetchFromEmail(), FetchFromCalendar(), SuggestCourse(), RetrieveData(), AddToCalendar(), NotifyUser(), FetchUpcomingEvents().

3. **Event Class**
   - **Attributes:** EventID, UserID, Title, Date, Time, Source (Email/Manual/Calendar), CourseCode.
   - **Relations:**
     - **Event - User** (Association): An event can be associated with one or more users (students). A user can attend multiple events.
     - **Event - Database** (Aggregation): Event data is stored and managed in the database. Aggregation because event data can exist independently.
     - **Event - GoogleCalendar** (Association): Multiple events can be synced with Google Calendar.
   - **Methods:** AddEvent(), EditEvent(), DeleteEvent(), SyncToCalendar().

4. **Database Class**
   - **Attributes:** DatabaseID, DataType (Course/Event/Email), LastUpdated, LinkedEntities.
   - **Relations:**
     - **Database - ChatbotSession** (Aggregation): The database stores chatbot session data.
     - **Database - Course** (Aggregation): The database stores course data.
     - **Database - Event** (Aggregation): The database stores event data.
     - **Database - EmailOperations** (Aggregation): The database stores email data.
     - **Database - GoogleCalendar** (Aggregation): The database stores Google Calendar data.
   - **Methods:** SearchData(), FetchRelevantInformation(), StoreEventData(), StoreCourseData(), UpdateData().

5. **EmailOperations Class**
   - **Attributes:** EmailID, UserID, EmailToken, Inbox, LastScanTime.
   - **Relations:**
     - **EmailOperations - User** (Association): An email operation is associated with one specific user.
     - **EmailOperations - Database** (Aggregation): Email data is stored and processed in the database. Aggregation because emailOperations can exist independently.
   - **Methods**: ScanInbox(), ExtractEventDetails(), ForwardToDatabase(), SyncInbox().

6. **GoogleCalendar Class**
   - **Attributes:** UserID, GoogleCalendarToken, CalendarEvents.

- **Relations:**
  - **GoogleCalendar - User** (Association): Google Calendar is linked to a specific user.

  - **GoogleCalendar - Event** (Association): Google Calendar can sync with events.

  - **GoogleCalendar - Database** (Aggregation): Google Calendar data is stored in the database. Aggregation because Google Calendar can exist independently.
- **Methods**: AddEventToCalender(), RemoveEvent(), FetchUpcomingEvents(), SyncEventsToDatabase().

7. **Course Class**
   - **Attributes:** CourseCode, Name, Description, Instructor, Prerequisites.
   - **Relations:**
     - **Course - User** (Association): A user can be enrolled in multiple courses, and a course can have multiple users (students) enrolled.

     - **Course - Database** (Aggregation): Course data is stored in the database. It is aggregation because course data can exist independently.
   - **Methods**: GetCourseInfo(), MatchWithUserInterest(), AddCourse(), UpdateCourse(), DeleteCourse().
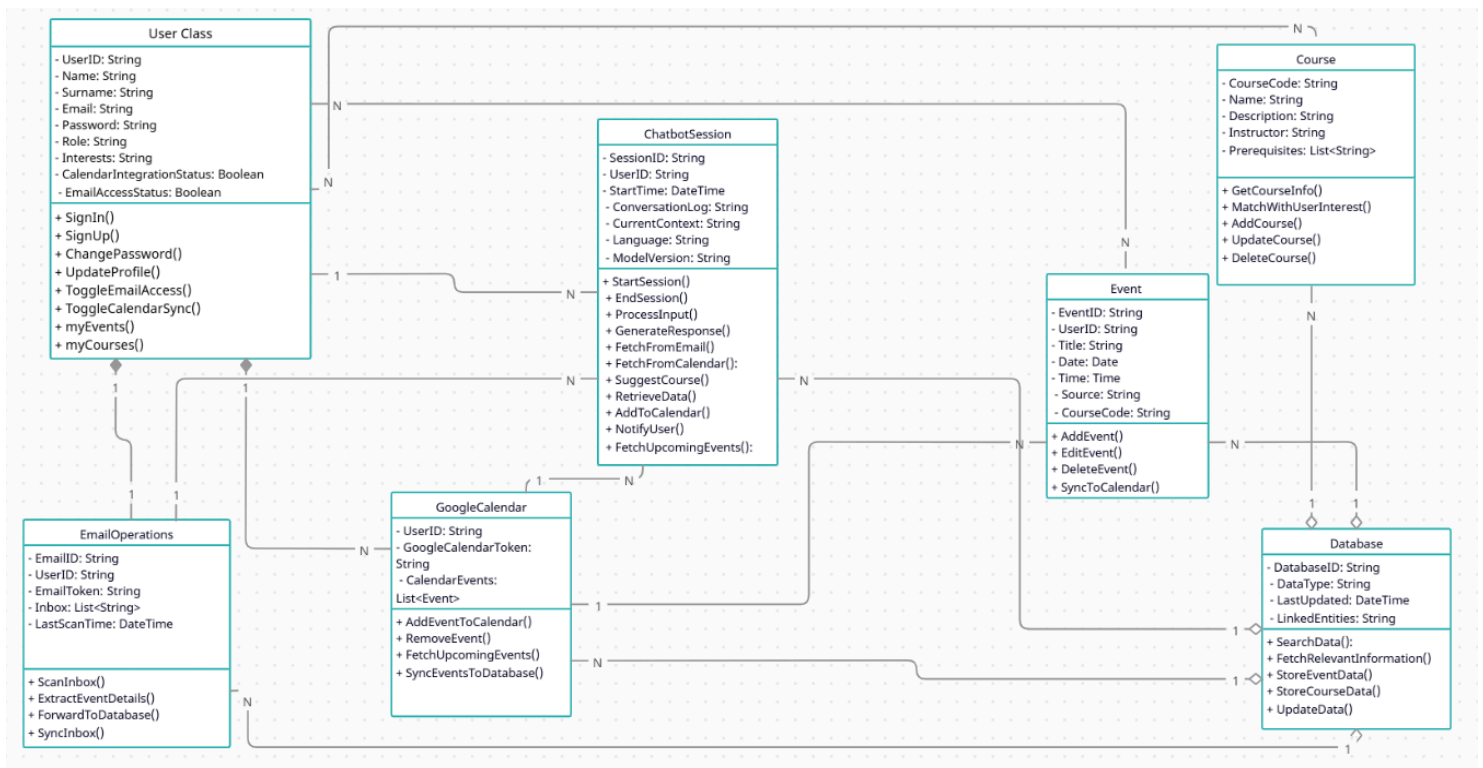
3.5.4 Dynamic models

1. Event Flows:
- **User Interaction and System Responses**
    - When the user opens SAGE, the first screen and language preference are determined.
    - When the user starts interacting with the system, the system is configured to provide the correct answers instantly.
    - When the user enters a course code, the system queries the database and current curriculum information and quickly provides the details of the course to the user.

2. Time-Based Events:
- **Email Scanning**
    - The system scans the e-mail box at intervals (for example, every 30 minutes) and detects important academic events (exam dates, homework deadlines).
    - These events are automatically added to the student's calendar.
- **Reminders**
    - The system sends push notifications informing the student of upcoming deadlines and events.
    - It allows users to view and organize events in the calendar.

3. Data Flows:
- **Database and Integrated System Data Flow**
    - Course queries made by the user match the database in the system. The course curriculum, faculty members and requirements are received and transmitted instantly according to the student's query.
    - Email data is a stream that will often be used to get information about academic events. These data are integrated into the student's calendar.
- **Google Calendar Integration**
    - Events that appear during the e-mail scanning process are added to the calendar after user approval. It is important to verify and update user information during this process.

4. User Interaction Models:
- **Personalized Course Recommendation**
    - When the student asks SAGE questions about the field he is interested in (for example, "Artificial Intelligence"), SAGE makes personalized recommendations, taking into account the user's previous courses and academic background.
- **Calendar Integration and Automated Reminders**
    - The student shares the activity information received by email with SAGE. SAGE automatically Octets these events to the student calendar and sends timely reminders.

3.5.5 User interface - navigational paths and screen mock-ups

| TED University | EN \| TR |

SAGE

Welcome to Project SAGE

SmartAI Guide for Education
Your personal assistant for academic guidance at TED University

Login with TEDU Credentials

New user? Register here

© 2025 TED University - Project SAGE
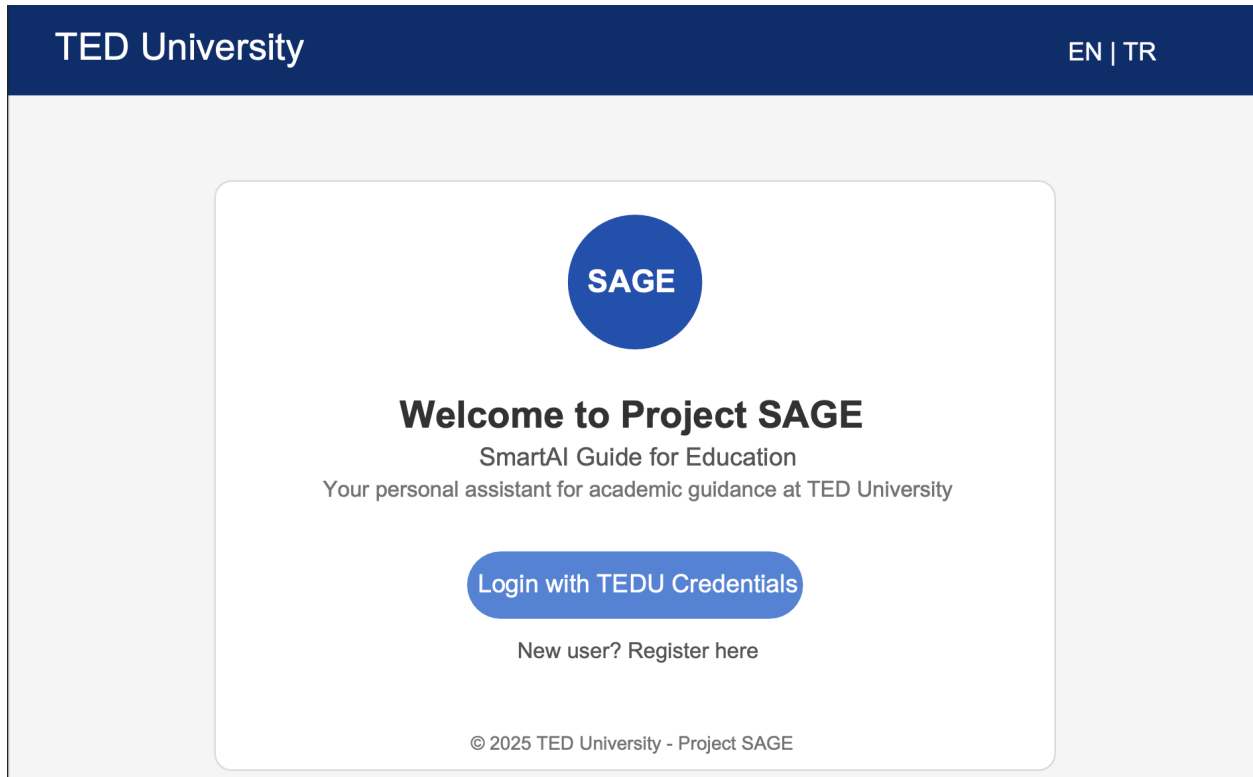
Welcome Screen - Project SAGE

The Purpose of The Page

The page serves as the **TED University Academic Support System** announcement for users, introducing them to the **SAGE** platform.

User Experience

- The user is greeted with a **clean login interface** where they can enter their **TED University credentials** to log in to **SAGE**.
- Both **new and returning users** can browse the system in their **preferred language** (English or Turkish).
- **SAGE** functions as a **personal assistant** for students, integrating tasks, reminders, and university resources into one seamless experience. This helps students stay informed about their academic work and available resources.

Features

- **Meta Content**: SAGE is an **artificial intelligence-based tutoring platform** designed to assist students.

- **Multilingual Support**: The platform is available in both **English (EN)** and **Turkish (TR)** to cater to different student demographics.

- **Registration**: New users can **easily register** for the service using their **university credentials**.

- **Academics**: SAGE provides assistance with **class schedules**, **academic tasks**, and access to **university resources**.

Usage Scenario

This **landing page** is the **first point of contact** for students seeking **academic support**. Its **simplified structure** allows users to sign in quickly and easily, helping them find the academic help they need on their **educational journey** at TED University.

Brand Elements

On this page, you will find **SAGE branding** along with the **TED University identity**, which brings both **trust** and **institutional recognition** to the platform.

SAGE   ME

| Course Info |
| Calendar |
| Academic Guide |
| Campus Life |
| Settings |

Hello! I'm SAGE, your academic assistant at TED University. How can I help you today?

10:30 AM

I need information about CMPE 491.

10:31 AM

CMPE 491: Senior Project

Instructor: Hakkı Gökhan İlk Prerequisites: CMPE 390 Would you like to see the full syllabus or project requirements?

10:31 AM

[Syllabus]   [Project Requirements]

Type your message...   ➤

Project SAGE - Main Chat Screen

The Purpose of The Page

To create a conversational interface that allows students to get information about academic progress and advice regarding specific courses at TED University in real-time through the SAGE academic assistant.

User Experience

- Students interact with SAGE through an intuitive chat interface, Questions about courses receive instant, relevant responses
- Navigation menu provides easy access to academic services while maintaining conversation flow
- Interaction mimics speaking with a personal assistant, providing structured information with actionable options

Features

- Navigation Menu: Quick access to key sections
  - Course Info, Calendar, Academic Guide, Campus Life, Settings
- Natural Language Q&A:
  - Students type messages in conversational language, Real-time responses powered by LLM backend
- Interactive Response Options:
  - Clickable buttons (e.g., "Syllabus," "Project Requirements"), Explore specific information without typing additional queries
- Course Information Access:
  - Quick details about courses, Instructor names, Prerequisites, Course descriptions

Usage Scenario

This chat interface is frequently used by students seeking specific information about their courses, requirements, and academic schedules. The conversational format makes it much easier for students to quickly find exactly what they need without navigating through multiple pages or systems.

CMPE 491: Senior Project

Add to My Courses

Instructor Information
Instructor: Hakkı Gökhan İlk Email: gokhan.ilk@tedu.edu.tr Office Hours: Monday
13:00-15:00, Wednesday 10:00-12:00

Course Description
This course focuses on the development of a comprehensive project that applies
computer engineering concepts to solve real-world problems. Students will work
in teams to design, implement, and present their solutions.

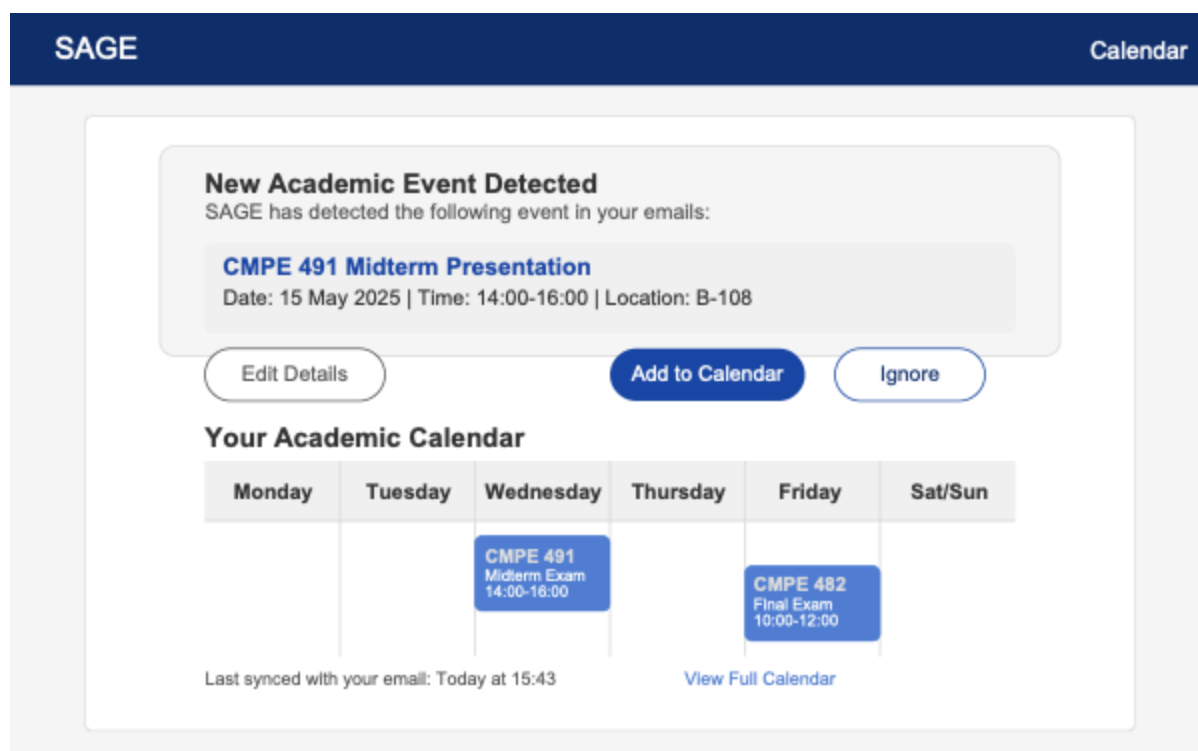**Prerequisites**

CMPE 390

Assessment

| Midterm Report (30%) | Final Project Demo (40%) | Weekly Progress (20%) | Attendance (10%) |

| Overview | Syllabus | Schedule | Resources |

Comprehensive information about CMPE 491: Senior Project, including prerequisites, assessment criteria, instructor details, and course description, can be found on the Project SAGE – Course Information Screen. Students can easily locate pertinent information about the requirements and structure of the course thanks to the page's clear category organization. Contact details for the instructor, a synopsis of the course, and a summary of the evaluation criteria (attendance, weekly progress, final project demo, and midterm report) are important components. The interactive "Add to My Courses" button makes it simple for students to sign up for the course, and navigation tabs provide extra views like Overview, Syllabus, Schedule, and Resources. Students frequently use this screen to comprehend the expectations of the course and make appropriate preparations.

SAGE   Calendar

New Academic Event Detected
SAGE has detected the following event in your emails:

CMPE 491 Midterm Presentation
Date: 15 May 2025 | Time: 14:00-16:00 | Location: B-108

(Edit Details)   **Add to Calendar**   (Ignore)

Your Academic Calendar

Monday	Tuesday	Wednesday	Thursday	Friday	Sat/Sun
		CMPE 491 Midterm Exam 14:00-16:00		CMPE 482 Final Exam 10:00-12:00	

Last synced with your email: Today at 15:43   View Full Calendar

   The Project SAGE | Calendar Integration Screen allows students to see their academic timetable and important university dates all at once; it's able to intelligently scan their inbox to make suggestions on new academic events. Automatically populating student calendars by identifying relevant information (like exam dates and deadlines) in student email and allowing quick addition of events to their calendar. The weekly calendar view allows students to prioritize their academic activities with a picture of upcoming events and deadlines, and interactive actions such as "Edit Details," "Add to Calendar," or "Ignore" give students power to include or disregard. The screen is synced with the student's email so they know what to do and when. This feature has been found particularly useful by students when they are busy with exams or project deadlines and can have all their events appear on the calendar once it's fully integrated.

4. Glossary

- **Artificial Intelligence (AI):** Technology that mimics the human-like learning, problem-solving and decision-making abilities of computer systems.
- **Chatbot:** A software program that can interact with users in natural language and perform certain tasks.
- **Academic Advisor:** Academic staff who guide students about course choices and academic processes.
- **Course Curriculum:** An academic plan that includes the content, learning outcomes, assessment methods and prerequisites of a course.
- **Web Scraping:** The process of collecting data from websites. Project SAGE analyzes the academic announcements of the university with this method.
- **Google Calendar API**: A Google service that allows users to automatically add and manage their activities.
- **Retrieval-Augmented Generation (RAG):** A model that allows artificial intelligence to produce accurate and up-to-date information by scanning previously recorded data[2].
- **Personalized Recommendation:** Courses and activities recommended in accordance with the user's past preferences and academic information.
- **Email Scanning:** The process of detecting important academic dates by scanning emails with the user's permission.
- **KVKK (Personal Data Protection Law):** The legal regulation in Turkey that ensures the protection of users' personal data.
- **User Profile:** The system component in which the user's interests, academic history and preferences are stored.
- **Learning Management System (LMS):** An online platform where universities manage course materials, assignments and grades.
- **Scenario:** A case study that shows how a system works and defines how users will interact with the system.
- **System Model:** A structural design that shows the components of a system and the relationships of these components to each other.
- **Academic Calendar:** A timeline containing the start and end dates of courses at the university, exam periods and other important academic events.
- **API (Application Programming Interface):** An interface that allows different software to communicate Decently with each other.

5. References

[1] Google Developers. (n.d.). *Calendar API overview*. Retrieved from https://developers.google.com/calendar

[2] Lewis, M., Perez, E., Piktus, A., Petroni, F., Karpukhin, V., Goyal, N., ... & Riedel, S. (2020). *Retrieval-augmented generation for knowledge-intensive NLP tasks*. Advances in Neural Information Processing Systems. Retrieved from https://arxiv.org/abs/2005.11401

[3] Keith Bourne; Shahul Es, Unlocking Data with Generative AI and RAG: Enhance generative AI systems by integrating internal data with large language models using RAG , Packt Publishing, 2024. https://ieeexplore.ieee.org/document/10769240