ISTANBUL BILGI UNIVERSITY
DEPARTMENT OF COMPUTER ENGINEERING
SENIOR DESIGN PROJECT PROPOSAL CMPE 491
Academic Year 2023-2024

Title of The Project: Complaint Management System with AI-based Text Analysis

Project Advisor: Emel Küpçü

Name of Students:

1. **Emre Cem Kenarcı**
2. **Mustafa Deniz Demirhas**
3.

Description of the Project (provide a brief description of the project)**:**

This project aims to develop a web-based complaint management system that allows users to anonymously submit complaints about specific organizations without the need for login or account creation. Through a simple web interface, users can provide details about their complaint, select the relevant department (e.g., maintenance, security, etc.), and submit their feedback. The system will then use AI-powered text analysis to process these complaints.

The AI system will classify each complaint based on its content, identifying whether the complaint relates to issues like cleanliness, security, or another department. After this initial classification, the system will group similar complaints into clusters for more detailed analysis. For example, complaints about cleanliness may be further divided into subcategories like office cleanliness, restrooms, or outdoor areas.

The system will generate comprehensive feedback reports based on these classifications and clusters, providing organizations with actionable insights. This will help them track recurring issues, identify trends, and make informed decisions for service improvements. The web-based nature of the system makes it easy for any institution to implement, and users can quickly submit complaints via links or QR codes, ensuring a seamless experience for both the institution and its users.

Project Plan (list the main work packages necessary for the realization of the project and the provisionary responsible for each)**:**

	Work Package Description	Description	Expected Duration	Responsible
1	Project Planning and Research	Define the project scope, gather requirements, and conduct initial research on complaint management systems and machine learning algorithms for text analysis. Evaluate existing tools, libraries, and frameworks to choose the best fit for the project.	2 weeks	Both Students
2	Dataset Collection and Preparation	Gather real-world complaints from both the office building management and available datasets. Clean, preprocess, and label the data for use in training models. Handle missing data, outliers, and noise. Document data sources and methods.	3 weeks	Mustafa Deniz Demirhas
3	Database design and setup	Design the database scheme to support the storage of complaints and related information. Set up the MySQL database, define table structures, and ensure it can handle both structured and unstructured data	3 weeks	Emre Cem Kenarcı
4	Backend Development	Develop the backend API using Django and Django REST Framework. Implement CRUD operations for complaints and ensure smooth integration with the database. Create endpoints for frontend communication and AI model interaction. Secure and test all API endpoints.	4 weeks	Emre Cem Kenarcı
5	Frontend Development	Create the user interface using Angular. Implement features for users to submit and view complaints, categorize them, and display real-time feedback from the AI model. Focus on responsiveness and user experience. Ensure data from backend is displayed correctly.	4 weeks	Mustafa Deniz Demirhas
6	AI Model development	Develop and train machine learning models using algorithms such as SVM, Naive Bayes, and possibly LSTM for text classification. Experiment with different models, evaluate accuracy, and fine-tune hyperparameters. Implement the model in a production-ready state for integration.	5 weeks	Both Students
7	Integration and Testing	Integrate the frontend, backend, and AI models. Perform unit testing on individual components and end-to-end testing to ensure smooth communication between the database, backend, and frontend. Identify and fix bugs and conduct performance testing.	2 weeks	Both Students
8	Deployment	Deploy the application on a cloud platform. Ensure proper setup for production, including the web server, database connections, security configurations, and scalability.	2 weeks	Both Students

Technologies you plan to use

Technology	*Provide the names of the tools and technologies you are going to use and a brief description on why and how you are going to use it. **Fill all that applies** to your project. (delete the examples provided below in light blue before filling the form)*
□ Programming Language and platform	Python: Python will serve as the primary programming language for developing the backend using Django. Type script: will be used to facilitate the connection between the backend and frontend, ensuring seamless data communication and enhancing the overall development experience. Html: will be used to define the layout and content of the user interface, allowing users to interact with the complaint management system effectively. CSS: will be used to enhance visual appeal and user experience by styling the components VS Code: will be used as the primary development environment for writing both the Angular frontend and the Django backend code in one place.
□ Library & Frameworks	These libraries will be integral to our project for various data-related tasks. **Pandas** will be used for data manipulation and analysis, allowing us to efficiently handle and preprocess the complaint data. **NumPy** will provide support for numerical computing, enabling efficient operations on large arrays and matrices, which is essential for mathematical computations and data transformations. For machine learning tasks, we will use **scikit-learn**, which offers a robust suite of algorithms and tools for model training, evaluation, and validation, making it easier to implement our classification algorithms. **NLTK (Natural Language Toolkit)** will assist with natural language processing, helping us analyze and preprocess the text data within the complaints, such as tokenization, stemming, and sentiment analysis. Finally, **TensorFlow** will be utilized for more advanced machine learning and deep learning applications, if we choose to implement complex models that require greater computational power. As our project evolves, we anticipate the need to explore additional libraries and frameworks that may enhance our capabilities, such as **spaCy** for more advanced NLP tasks, **Keras** as a high-level API for building neural networks, or **Matplotlib** for data visualization. By remaining open to integrating new tools, we can ensure that our solution stays relevant and effective in addressing the challenges we encounter.
□ Database & Storage	MySQL: will be used to store and manage all complaint data, including user-submitted complaints and their respective classifications. It will serve as the primary relational database for efficiently handling structured data, ensuring secure storage and fast retrieval of information needed for analysis and reporting.

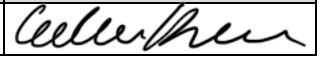
□ Networking & communication		
□ Web App.	□ Frontend	Angular: Angular will be used to create the user interface (UI) that allows users to anonymously submit complaints without needing to log in. The UI will enable users to specify the department they are complaining about and provide the details of their complaint. The system will be intuitive and responsive, ensuring ease of use for all users. Additionally, Angular will manage the display of AI-generated feedback and reports, which will be accessible to the organization for actionable insights based on the analyzed and categorized complaints.
	□ Backend	Django: A Python-based web framework, will manage backend operations such as processing and storing user complaints, managing database transactions, and running AI models for complaint analysis. It will be responsible for ensuring the efficient execution of AI-based text classification and generating feedback reports for the organization. Additionally, Django will ensure that all backend tasks are performed securely and reliably.
	□ Web server	Apache: Will be used to host the Django backend and serve static files, such as HTML, CSS, and JavaScript, ensuring reliable and efficient access to the web application. It will provide a stable environment for handling web traffic, ensuring that the application remains accessible and performs efficiently under various loads.
□ Mobile App. Framework		
□ 3D Library & Game development platform		
□ Research Project	□ Dataset	For the first phase of the project, we will use publicly available datasets from platforms like **Kaggle**. Specifically, we plan to start with complaint databases related to management or operational issues, such as complaints about services or products in business environments. This will provide a diverse range of labeled complaints, allowing us to train and evaluate our AI models. In the second phase, we will incorporate **real-world complaints** collected from an actual office building, focusing on operational and management-related issues. These real complaints will be gathered through direct outreach to businesses and organizations within the local area, ensuring that we capture genuine feedback that reflects actual customer experiences. This hybrid approach—using pre-existing datasets in the first term and real-world data in the second—will allow us to refine our AI models and improve their ability to handle real complaints effectively.
	□ Article	
	□ Algorithm	For the classification of consumer complaints, we will explore and experiment with multiple machine learning algorithms, selecting the most effective one based on performance metrics like accuracy and precision. Initially, we will implement algorithms such as **Support Vector Machines (SVM)**, **Naive Bayes**, and **Random Forests**, which are well-suited for text classification tasks. After

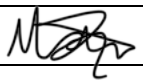
		training and evaluating these models on the dataset, we will compare their performance to determine the most accurate algorithm for classifying complaints. Depending on the results, we may also explore deep learning approaches, such as **Long Short-Term Memory (LSTM)** networks, for more advanced text analysis if necessary. The final model will be chosen based on its ability to effectively classify and group complaints for actionable insights.

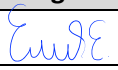
□ Embedded Computing Project	□ Microcontroller, Platform, board	
	□ Embedded dev. language	
	□ Sensors and other electronics	
□ Other		Postman: Will be used as a powerful tool to test the backend of our complaint management system. It allows us to send requests to our API endpoints and verify the responses, ensuring that the backend processes user's complaints correctly and efficiently. With Postman, we can perform various types of requests (GET, POST, PUT, DELETE) to simulate user interactions, check for expected behaviors, and troubleshoot any issues that arise during development. This will help ensure the robustness and reliability of our backend before deployment. GitHub: Will serve as our version control platform for the entire project, enabling collaborative development and code management. It allows us to track changes in our codebase, collaborate seamlessly with team members, and manage different branches for feature development and bug fixes. Using GitHub, we can document our progress, share code reviews, and maintain a history of modifications, which is essential for maintaining code quality and accountability. Additionally, GitHub will facilitate easy deployment of our application and provide a backup of our project files, ensuring that our work is secure and accessible.

Academic Regulations-Academic Integrity

Academic dishonesty in the form of cheating, plagiarism, or collusion are serious offenses and are not tolerated at Istanbul Bilgi University. University Academic Regulations and the Regulations for Student Disciplinary Matters clearly define the policy and the disciplinary action to be taken in case of academic dishonesty. Failure in academic integrity may lead to suspension and expulsion from the University. Cheating includes, but is not limited to, copying from a classmate or providing answers or information, either written or oral, to others. Plagiarism is borrowing or using someone else's writing or ideas without giving written acknowledgment to the author. This includes copying from a fellow student's paper or from a text (whether printed or electronic) without properly citing the source. Collusion is getting unauthorized help from another person or having someone else write a paper or assignment.

Student ID	Student Name	Date	Signature
121200150	**Emre Cem Kenarcı**	22.10.2024	

121200144	**Mustafa Deniz Demirhas**	22.10.2024	

	Name	**Date**	**Signature**
Project Advisor	**Emel Küpçü**	**22/10/2024**	
Project Coordinator	Tuğba Dalyan	22.10.2024	

Students must give a copy of this form to the project coordinator.