Multidisciplinary Team Contribution and Gains Report

Project Title: **ML-Powered Anemia Detection**

Group Members:

- Umut Bayar (Computer Engineering)
- Ahmet Arda Nalbant (Computer Engineering)
- Burçe Peker (Chemical Engineering)
- Muharrem Kerem Paçacı (Bioengineering)

Umut Bayar – Computer Engineering

I took a leading role in the design and implementation of the machine learning algorithms used in our project. My primary responsibility was the development and performance evaluation of classification models such as Decision Tree (Entropy and Gini), K-Nearest Neighbors (KNN), Support Vector Machines (SVM), Artificial Neural Networks (MLPClassifier), and Naive Bayes. I also took on tasks initially assigned to our fifth member, such as assisting with documentation, especially for the statistical significance testing between classifiers (p-value, t-test).

In addition, I worked on the visualization of ROC curves and confusion matrices, which had been a shared responsibility. Integrating these graphics into our report and interpreting them for various anemia classes (0–4) provided valuable experience in biomedical data visualization.

This multidisciplinary experience strengthened my communication skills, as I had to coordinate technical implementations while understanding domain-specific insights from chemical and bioengineering peers.

Ahmet Arda Nalbant – Computer Engineering

My key contributions were in data preprocessing, feature selection, and model evaluation. I applied methods such as Information Gain, ANOVA F-score, and Random Forest importance to select the top features. I created the feature normalization pipeline and generated the final feature subset used in all classification models.

I also assumed some responsibilities previously handled by Züleyha, including EDA visualizations (heatmaps, boxplots) and identifying correlation patterns in the dataset. These visualizations played a key role in shaping our clustering analysis.

This project significantly improved my ability to work with real-world, imbalanced medical data and to interact effectively with colleagues from non-CS disciplines. I also learned how to translate domain insights into technical processing steps.

Burçe Peker – Chemical Engineering

I was responsible for providing domain expertise on blood-related metrics, helping the team understand variables like ferritin, MCV, MCH, and B12 in the context of anemia diagnosis. I led the analysis of Apriori association rules, interpreting clinical patterns like “Iron Deficiency Signature” and the “Microcytic Anemia Triad.”

To support the project after Züleyha's departure, I also helped with business and clinical implication designs, especially with the "Smarter Hospital Spending" and "Patient Triage Plan" sections. These involved designing actionable protocols for anemia subtypes based on clustering results (K-means and DBSCAN).

This interdisciplinary setting taught me how my chemical engineering knowledge of blood chemistry can translate into actionable clinical analytics. I also gained experience working with data mining techniques and translating clinical findings into visualizations and rule-based decision systems.

Muharrem Kerem Paçacı – Bioengineering

My role focused on ensuring biomedical accuracy and clinical interpretability throughout the project. I took responsibility for defining the anemia classes based on hemoglobin thresholds and helped map medical features to machine learning targets. I worked closely with computer engineering teammates during the clustering phase, interpreting K-means, Hierarchical, and DBSCAN outputs to define biologically plausible subgroups.

Following Züleyha’s departure, I took on gender-specific protocol planning, such as identifying patient groups that require different treatment strategies based on gender, HGB level, and ferritin values. This was especially valuable during the decision support table design and rule definition for clinical actions.

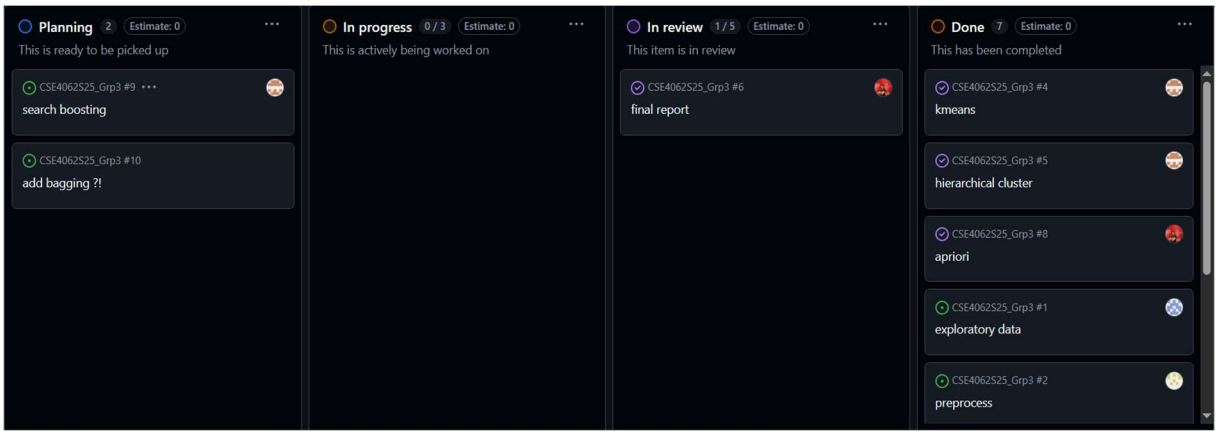
This multidisciplinary work deepened my understanding of how to turn raw medical data into meaningful health interventions. Collaborating with CS and chemical engineers enhanced my ability to frame medical logic within algorithmic systems.

Team Dynamics and Multidisciplinary Gains

We used the KANBAN methodology for assigning and tracking tasks, which enabled a structured, transparent, and iterative workflow. After Züleyha’s withdrawal, we redistributed her tasks collectively without compromising the quality or progress of the project. Each member not only fulfilled their core responsibilities but also stepped up to support others where needed.

Working in a multidisciplinary team was enriching. Our computer engineers built robust ML pipelines, while domain experts in chemical and bioengineering ensured clinical relevance and interpretability. This fusion of expertise improved the overall impact of the project and gave each of us experience in navigating interdisciplinary teamwork, which will be critical in our future careers

Delivery 2- EXAMPLE CANBAN PHOTO



Delivery 3 - EXAMPLE CANBAN PHOTO