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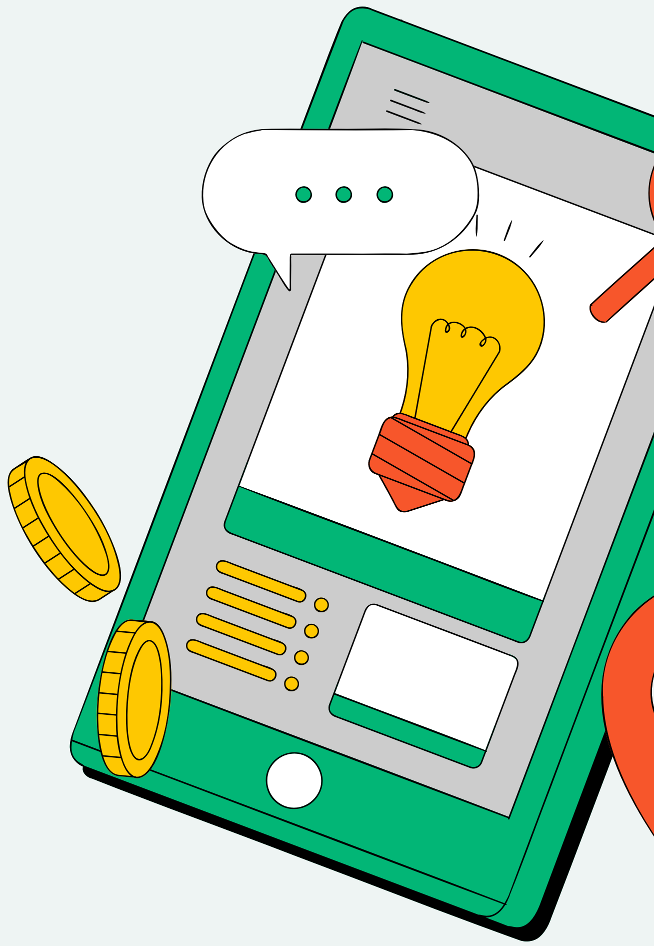

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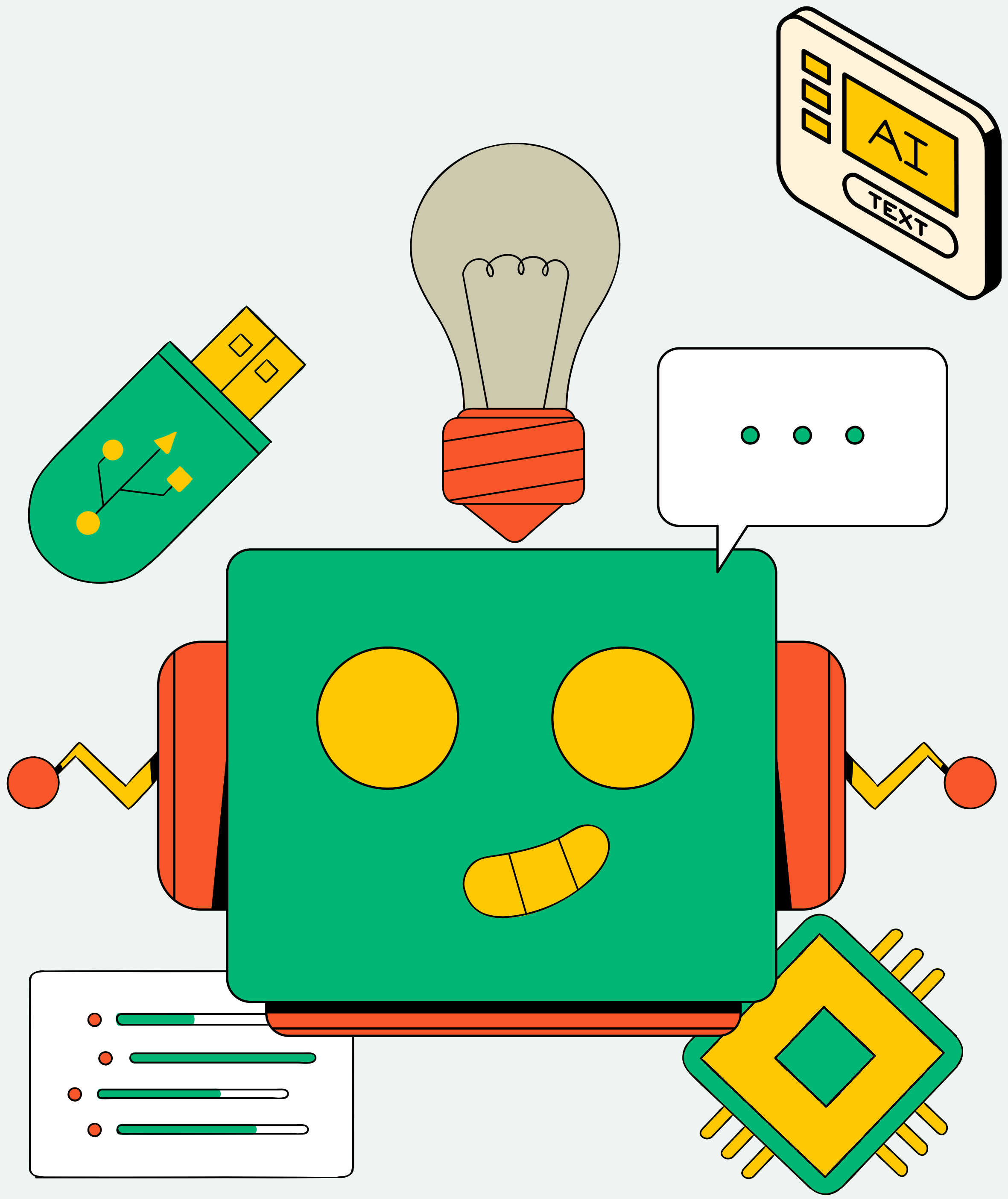

POST-HCT SURVIVAL PREDICTIONS

MACHINE LEARNING

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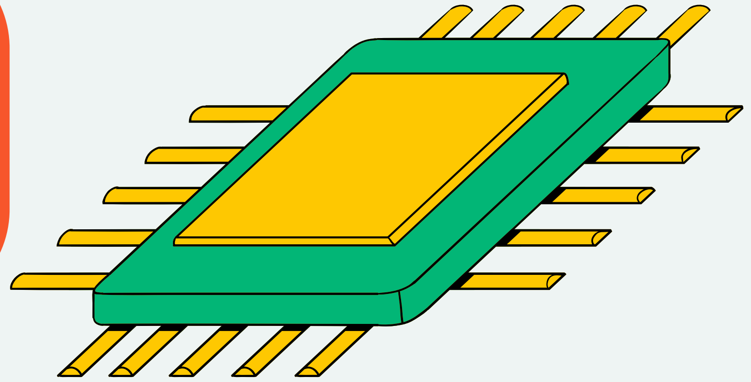


PRESENTATION OUTLINE

- ABSTRACT
- LITERATURE REVIEW
- FLOWCHART (ACTIVITY DIAGRAM)
- SEQUENCE DIAGRAM
- SYSTEM ARCHITECTURE
- USE CASE DIAGRAM
- CLASS DIAGRAM

ABSTRACT

PROBLEM STATEMENT: Existing HCT survival prediction models fail to account for racial and medical disparities, leading to biased and less accurate predictions.

PROPOSED SOLUTION: An ensemble model combining XGBoost and CatBoost to improve survival predictions for HCT patients. This approach leverages gradient boosting techniques to handle both numerical and categorical clinical variables efficiently. The ensemble is trained on a synthetic survival dataset and evaluated using the Stratified Concordance Index (C-Index) to ensure fairness across racial groups.

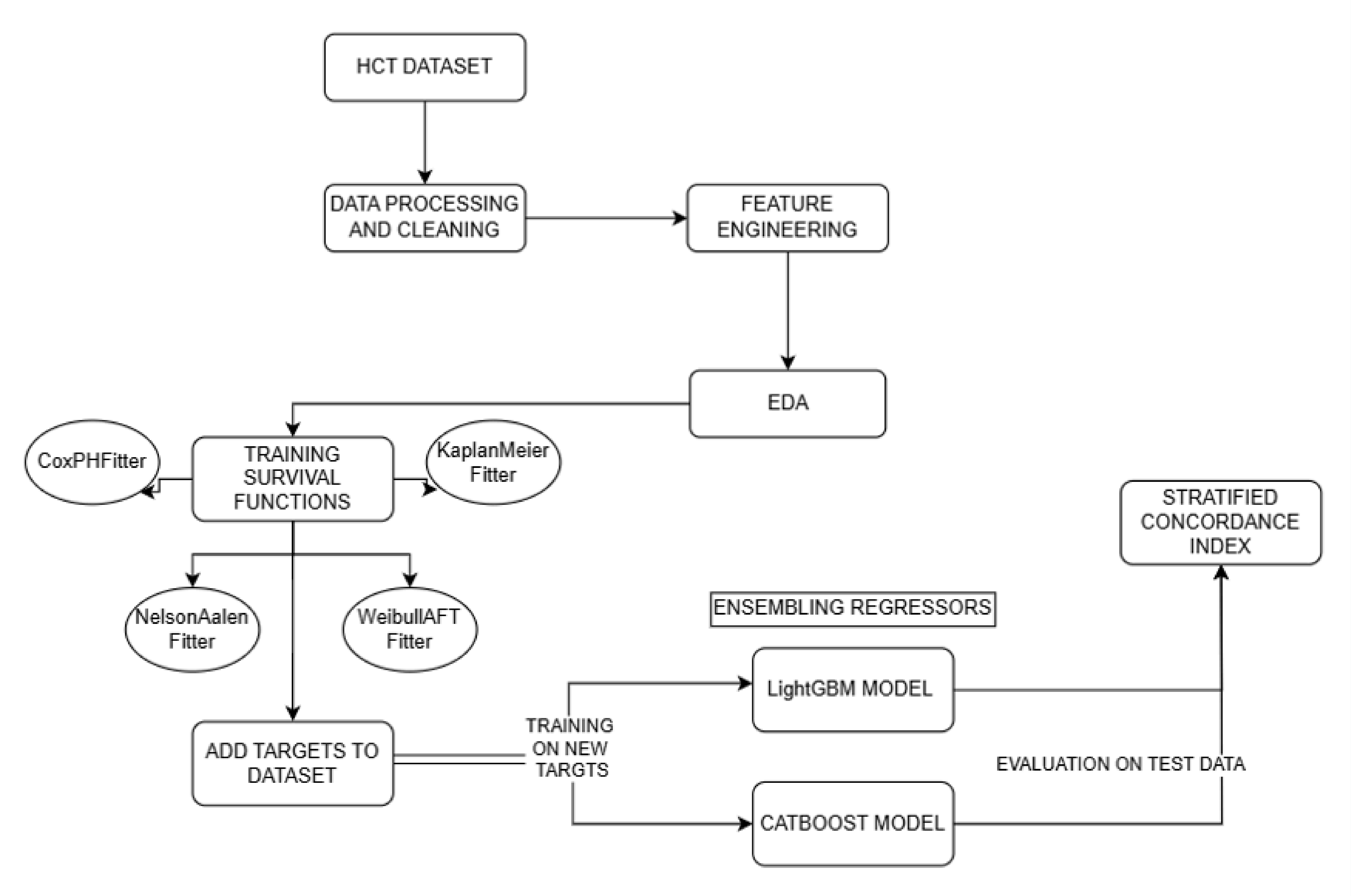
LITERATURE REVIEW

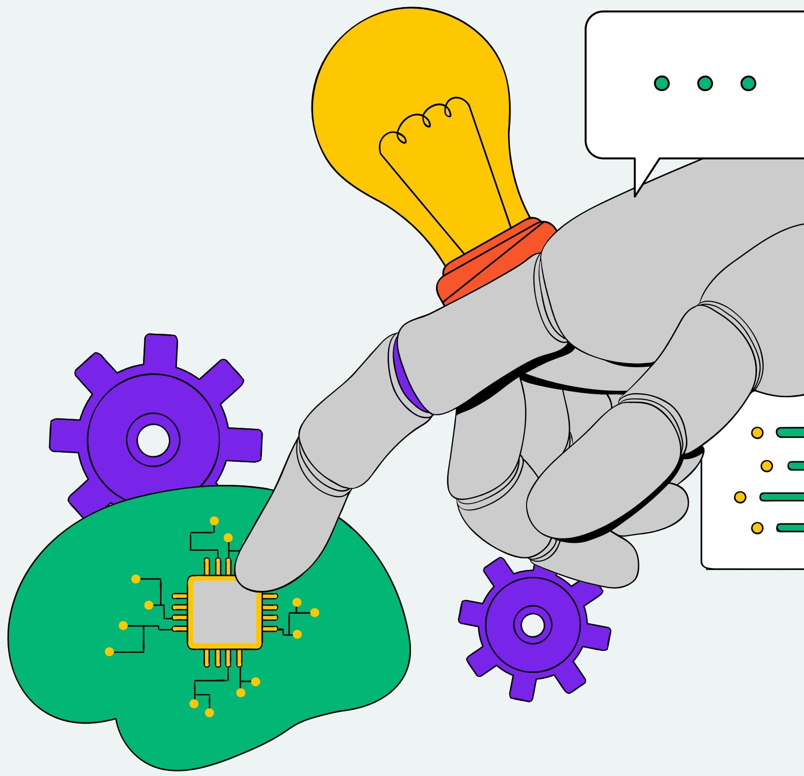
Author	Title	Year	Methodology/ concept used/summary	Merits	Demerits
Gonca Buyrukoğlu	Survival Analysis in Breast Cancer: Evaluating Ensemble Learning Techniques for PredictioN	2024	Evaluates Cox PH, Random Survival Forest, and Conditional Inference Forest for breast cancer survival prediction.	RSF and Cforest outperform Cox PH, improving predictive accuracy.	Limited to two specific datasets.
Hussam Alawneh, Ahmad Hasasneh	Survival Prediction of Children After Bone Marrow Transplant Using Machine Learning Algorithms	2024	Uses ML models (RF,XGBoost, AdaBoost, etc.) to predict pediatric bone marrow transplant survival.	Achieves 97.37% accuracy using feature selection and hyperparameter tuning.	Does not account for time-dependent covariates.

Hamed Shourabizadeh, Dionne M. Aleman, Louis-Martin Rousseau, Arjun D. Law, Auro Viswabandya, Fotios V. Michelis	Machine Learning for the Prediction of Survival Post-Allogeneic Hematopoietic Cell Transplantation: A Single-Center Experience	2023	Investigates ML models for HCT survival prediction using 2,697 patient records. RF achieved the best AUC of 0.71.	Identifies significant clinical predictors for survival stratification.	Limited to a single-center dataset, requiring external validation.
Yaroslav Tolstyak etal.	The Ensembles of Machine Learning Methods for Survival Predicting After Kidney Transplantation	2021	Applies ensemble ML models and Kaplan-Meier estimation to predict kidney transplant survival.	Uses multiple feature selection techniques for better predictive accuracy.	Limited dataset generalizability, requiring further validation.

Jennifer Clarke, Mike West	Bayesian Weibull Tree Models for Survival Analysis of Clinico-Genomic Data	2007	Uses Bayesian Weibull tree models for survival prediction via recursive partitioning.	Integrates genomic and clinical data effectively for personalized predictions.	Computationally intensive and requires domain expertise.

FLOWCHART (ACTIVITY DIAGRAM)

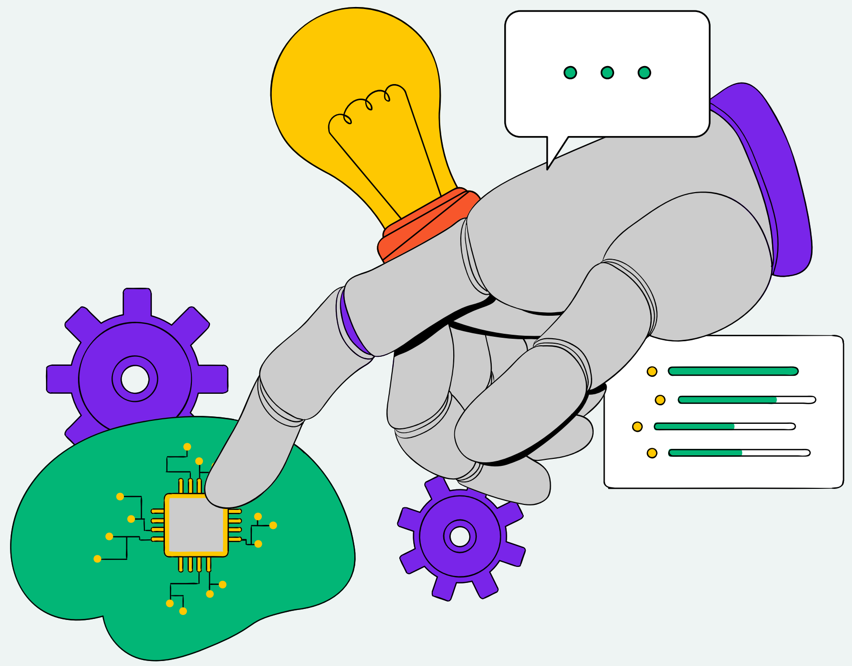


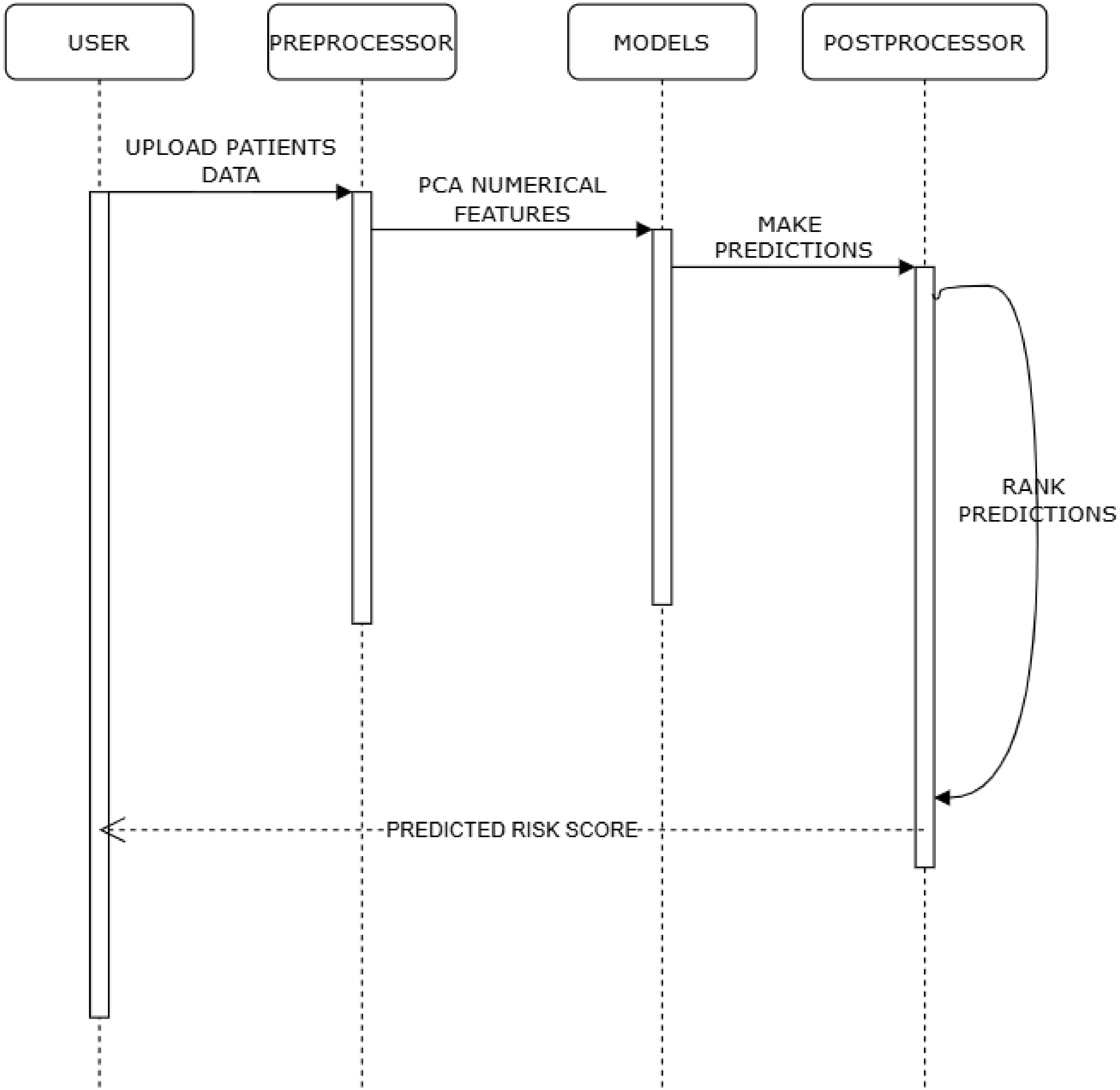


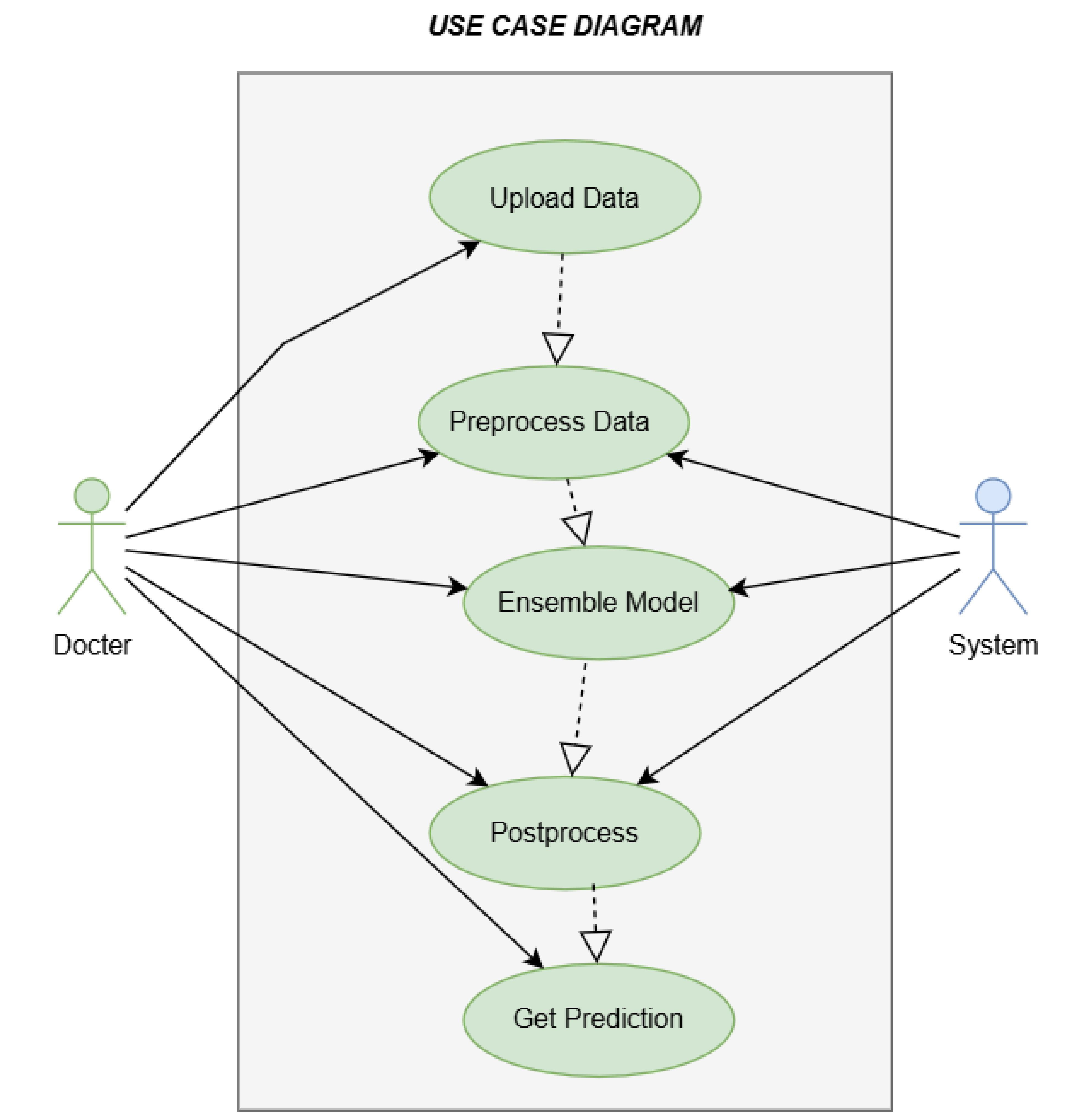
SEQUENCE DIAGRAM

COMPONENTS:

- USER
- PREPROCESSOR
- ENSEMBELED MODELS
- POSTPROCESSOR



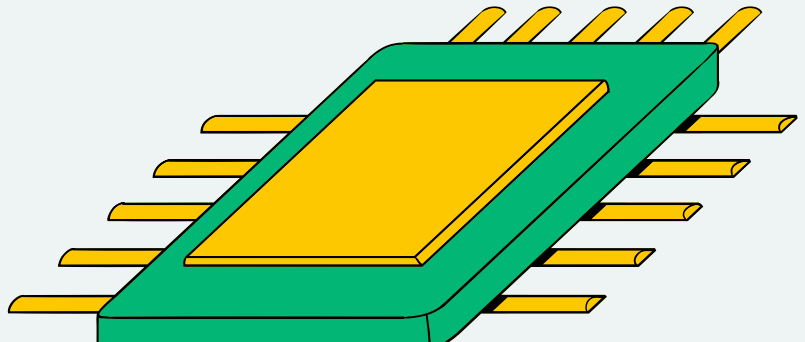




USE CASE DIAGRAM

ACTIONS:

- UPLOAD DATA
- PREPROCESS: Normalize and PCA to numerical Data.
- ENSEMBELED MODELS: XgBoostRegressor and CatBoostRegressor
- POSTPROCESSOR: Rank Outputs and apply weights.



CLASS DIAGRAM