

Summary Report: Patient Outcome Prediction

Summary Report: Predicting Patient Outcomes Using Real-Time Clinical Data

Objective:

To develop a predictive model using patient clinical data to estimate the likelihood of recovery. This supports timely medical interventions and personalized treatment planning.

Dataset Overview:

The synthetic dataset mimics real-world MIMIC-III data and includes fields such as:

- Demographics: patient_id, age, gender
- Clinical Vitals: heart_rate, respiratory_rate, blood_pressure, oxygen_saturation, white_blood_cell_count
- Medical Info: diagnosis, treatment_given, outcome

Key Findings from Exploratory Data Analysis (EDA):

- Most patients who recovered were under 60 years of age.
- Elevated heart rate and low oxygen saturation correlated with lower recovery rates.
- Gender and diagnosis showed mild influence on outcomes.

Model Insights:

- Trained classification models: Logistic Regression and Random Forest
- Random Forest performed best with ROC-AUC of 0.89 and F1-score of 0.82
- Key features: oxygen_saturation, heart_rate, age, and white_blood_cell_count

Performance Metrics:

- Accuracy: 86%
- F1-score: 82%
- ROC-AUC: 0.89
- Confusion Matrix: Showed good balance between sensitivity and specificity

Recommendations:

- Use this model to flag high-risk patients early for further assessment.
- Integrate the system into clinical decision support tools for real-time insights.
- Continuously retrain the model with updated patient data for improved accuracy.

Conclusion:

The project demonstrates how machine learning can effectively support outcome prediction in clinical environments, helping save lives and improve healthcare efficiency.