

# Sugar Rush: An Analysis of Diabetic Patient Readmission

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## 1. Motivation

Diabetes is a chronic disease affecting millions of people worldwide. An estimated 537 million adults aged 20-79 are currently living with diabetes. It is predicted to rise by 11.3% by the year 2030 (src). Hyperglycemia or diabetes is a condition that occurs when there is too much glucose in the blood plasma. Prompt and correct prognosis of diabetes can help improve the quality of patient health care. To reduce morbidity and mortality in high risk groups we aim to use machine algorithms to accurately predict the likelihood of readmission of a given patient. We want to work on this topic because there are health risks for a patient when he/she is readmitted again within 30 days of discharge. A timely prediction can help to reduce this risk.

## 2. Related Work

**[1] Impact of HbA1c Measurement on Hospital Readmission Rates: Analysis of 70,000 Clinical Database Patient Record:** This study provides insights about the Diabetes 130-US Hospitals for Years 1999-2008 dataset and is also the introductory paper for the same. The study analyzes 70,000 diabetic patients and records information such as their blood sugar level, their demographics - features, and rate of readmission - target variable. It also includes the challenges faced while working with large datasets and some statistical inferences.

**[2] Predicting 30-Day Hospital Readmission for Diabetes Patients using Multilayer Perceptron:** This study aims to make predictions using a MLP model. The authors note limitations of previously proposed models and perform feature engineering, data cleaning and preprocessing to achieve a higher score. They also talk about the risks related to readmission in less than 30 days of discharge. The goal of the study is to make better predictions so that hospitals are well-equipped with the necessary equipment and personnel, as to reduce the costs and improve the quality of care.

**[3] Predictive Modeling of Diabetes Hospital Readmission Using Machine Learning Algorithms:** This study focuses more on data engineering by selecting key features and removing columns with missing entries such as "weight", "payer\_code" and "medical speciality". The authors report metrics such as AUC and the average AUC comes to approximately 70%.

## 3. Timeline

- Week 1-2: Data Cleaning
- Week 3: Data Pre-Processing
- Week 4: Feature Extraction and Analysis

- Week 5: Exploratory Data Analysis & Data Visualization
- Week 6 - 8: Deploying ML models like Support Vector Classifier, Logistic Regression etc.
- Week 9: Improving the performance of models
- Week 10: Hyperparameter Tuning
- Week 11 - 12: Reporting the scores

## 4. Individual Tasks

Week	Tasks	Team Members
1 - 2	Data Cleaning	Saketh, Saumil
3	Data Pre-Processing	Ishwar, Rahul
4	Feature Extraction and Analysis	Saketh, Ishwar
5	Exploratory Data Analysis & Data Visualization	Saumil, Rahul
6-8	Deploying ML models like Support Vector Classifier, Logistic Regression etc.	All members
9-10	Improving the performance of models and Hyperparameter Tuning	All members
11-12	Reporting the scores	All members

## 5. Final Outcome

This project aims to develop a Machine Learning model with high accuracy in predicting the likelihood of re-admission for diabetic patients. The model is expected to achieve a target accuracy of at least 80% on the test dataset. By leveraging classical Machine Learning algorithms, the project seeks to uncover patterns in patient data, enabling the creation of a model that is not only accurate but also easily visualizable and continuously improvable for better prediction outcomes.

## 6. References

[1] Strack B, DeShazo JP, Gennings C, Olmo JL, Ventura S, Cios KJ, Clore JN. Impact of HbA1c measurement on hospital readmission rates: analysis of 70,000 clinical database patient records. Biomed Res Int. 2014;2014:781670. doi: 10.1155/2014/781670. Epub 2014 Apr 3.

[2] Ti'jay Goudjerkan and Manoj Jayabalan, "Predicting 30-Day Hospital Readmission for Diabetes Patients using Multilayer Perceptron" International Journal of Advanced Computer Science and Applications(IJACSA), 10(2), 2019.

[3] M. M. Sosa and D. F. Hernandez, "Predictive Modeling of Diabetes Hospital Readmission Using Machine Learning Algorithms," 2023 3rd International Conference on Electrical, Computer, Communications and Mechatronics Engineering (ICECCME), Tenerife, Canary Islands, Spain, 2023, pp. 1-6.