1. **Diabetes Detection with Machine Learning**

# I. Dataset and Data Analysis

1. A publicly available dataset from Kaggle (<https://www.kaggle.com/datasets/ankitbatra1210/diabetes-dataset>) was used to train the models.
2. Out of 13 types of diabetes, 4 major types were chosen, and the following mapping was applied to facilitate working with models that took only numberic values as input :
3. 'Prediabetic': 0,
4. 'Type 1 Diabetes': 1,
5. 'Type 2 Diabetes': 2,
6. 'Type 3c Diabetes ': 3
7. These types can be brielfy described.

**i. Prediabetic**

Prediabetes is a warning of Type 2 diabetes. Blood sugar levels are elevated, but not enough to be considered Type 2 diabetes. Lifestyle changes can be made to manage prediabetes, like getting more physical activity and adjusting eating patterns and habits.

Prediabetes usually have blood sugar levels ranging from 100 to 125 mg/dL.

According to the American Diabetes Association, for people 45 years old with prediabetes, the 10-year risk of developing Type 2 diabetes is 9% to 14%.

Family history of Type 2 diabetes, a BMI greater than 25, being physically active fewer than three times a week are general risk factors for prediabetes. Further, people who are 45 years of age or older are much likelier to fall into this category.

Some common symptoms experienced in this stage are : Increased thirst, Frequent urination, Increased hunger, Fatigue, Blurred vision, Numbness or tingling in the feet or hands, Frequent infections, Slow-healing sores and Unintended weight loss.

**ii. Type 1 Diabetes**

1. Type 1 diabetes is a chronic autoimmune disease that prevents the pancreas from making insulin. It requires daily management with insulin injections and blood sugar monitoring. Both children and adults can be diagnosed with Type 1 diabetes.
2. Lack of enough insulin causes a build uo of sugar in the blood, causing hyperglycemia (high blood sugar), resulting in the bosy not being able to use the food eaten for energy. This leads to serious health problems or even death if it’s not treated. People with Type 1 diabetes need synthetic insulin every day in order to live and be healthy.
3. Type 1 diabetes can appear at any age, but it appears at two noticeable peaks. The first peak occurs in children between 4 and 7 years old. The second is in children between 10 and 14 years old. Family history is another factor that is a risk factor.

Common symptoms include : Constant thirst, increased frequency of urination, constant hunger, significant weight loss, irritability, tiredness and blurry vision.

**iii. Type 2 Diabetes**

Type 2 diabetes happens when the body can’t use insulin properly. Without treatment, Type 2 diabetes can cause various health problems, like heart disease, kidney disease and stroke. It is a chronic condition that happens due to persistently high blood sugar levels (hyperglycemia). Patients have blood sugar levels of typically 126 mg/dL or higher.

Type 2 diabetes happens because the pancreas doesn’t make enough insulin, the body doesn’t use insulin properly, or both. Researchers estimate that this type of diabetes affects about 6.3% of the world’s population. It most commonly affects adults over 45, but people younger than 45 can have it as well, including children.

**iv. Type 3c Diabetes**

After this filtering, data from 21,539 patients were available.

1. Further, out of 33 attributes, 9 were selected. These attributes have been described in brief.
2. The Kernel Density Estimation curve is a smoothed estimate of the probability density function of the data, and is shown in blue.

## i. Insulin Levels

1. Measured in microunits per milliliter.

## ii. Age

## iii. BMI

## iv. Waist Circumference

1. Measured in inches.

## v. Cholesterol Levels

## vi. Blood Glucose Levels

## vii. Pancreatic Health

## viii. Neurological Assessments

## ix. Glucose Tolerance Test

# **II. Methodology**

For model training, 60% of the data was utilised, and the remaining 40% was used for testing.

6 different models were used for training and testing.

## i. Logistic Regression

# Bibliography

1. [https://www.mayoclinic.org/diseases-conditions/prediabetes/symptoms-causes/syc-20355278#:~:text=Prediabetes%20means%20you%20have%20a,to%20develop%20type%202%20diabetes](https://www.mayoclinic.org/diseases-conditions/prediabetes/symptoms-causes/syc-20355278" \l ":~:text=Prediabetes means you have a,to develop type 2 diabetes)[.](https://www.mayoclinic.org/diseases-conditions/prediabetes/symptoms-causes/syc-20355278" \l ":~:text=Prediabetes means you have a,to develop type 2 diabetes.)

# References

1. 1.