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Patient Monitoring Systems for Diabetes in Healthcare

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Abstract:

Healthcare is growing very fast and now a days doctors mainly depend on smart monitoring for patients particularly for Diabetes. In this research paper we have checked how good can the help of AI works for the disease diabetes. To check how our idea can work we took an existing real-world dataset, downloaded the dataset and worked out the analysis in using python tool dividing the data into train and test. Next, we built a model to predict the diabetes for the upcoming next 10 years. Created graphs like Heatmap, Histogram and Confusion matrix. Basically, our model works and give the predictions based on the details we give to the algorithm like name, age, body mass index, smoking history.

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I. INTRODUCTION

The health care is growing very fast as the disease diabetics is increasing rapidly among people and because of this the hospitals are filling fast. Due to this we have got the solution of doing Smart systems which can predict the diabetes early and can take necessary precautions as early as possible. The ole generation people who had got the diabetes had to go to hospital once a month to get checked and they used to get the blood reports done and based on those reports doctors used to give the medication. But what our concern is what is sugar rise up drastically one fine night or even we don't know what might happen in the next few days to our health. Our model is very simple as it takes data from the clinics or hospitals gives the health report summary generated, doctor then prints the report and give it to the patient. We have built our model so that it can work even with small and deserted villages.

II. Literature Review

In the coming years the healthcare sector is going to be digital especially for diabetes patients. Our model can predict the diabetes early and gives certain measures to take so that out life can be free from the disease.

What we did was took a dataset and gave it to the model and it gave results as there is an nearly 80% risk in the coming 10 years it suggested was to take limited use of sweets.

We have another example where we had a patient who asked us what if the reports ended up online. Our answer to this was our model runs offline input the data we got from the labs then process it using the system which will be available in the clinic and what reports we get will convert it into pdf and hands the hardcopy to

the patients. No usage of cloud, internet so no risk. It is so simple that works on the lab machine laptops and give clear, neat and understandable health report.

III. Methodology

Our research paper tells how the use of AI can help us to predict the risk of rising diabetes among the people. We first collected a real and existing dataset.

First collected a dataset as we can't do anything without the real dataset which is available online. Dataset name was Diabetes Prediction Dataset from Kaggle by Mustafa in the year 2021. This is a solid dataset as it contains over 1,00,000 records and consists of attributes like age, gender, hypertension, heart disease, smoking history, body mass index, HbA1c level, blood glucose level and diabetes.

Secondly, we did data preprocessing because raw data will never be consistent, hence cleaned it one by one in Jupyter notebook and applied preprocess techniques like missing values, outliers, numbers and categories.

Thirdly did the Data analysis before performing the testing. Just wanted to check what the data was saying. Even ran the exploratory data analysis for a quick health check. Plotted a heat map using seaborne, created histograms for the attributes like body mass index, glucose and HbA1c. Lastly did the confusion matrix as well after training to count.

Fourthly, did the Model Training and Testing, we divided the data in train and test, 70% training and 30% of testing. We chose the classification as Random Forest as it can handles a greater number of rows and it also works with mixed data, gives the feature importance as well.

Fifth, did the model evaluation because we did confusion matrix it gives us important information like true positive, false positive, true negative and false negatives. To find out the most important parameters and feature importance did the Random Forest.

At last, we performed the accuracy and its results. In the test Dataset Random Forest became a basic approach in terms of accuracy. The most important feature for diabetics according to the model was glucose and HbA1c values. Each of the attributes were also important in predicting the diabetes for personalized health reports in further 10 years in time.

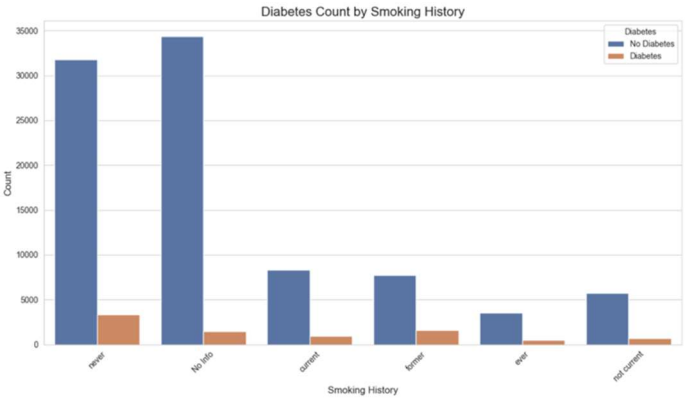

Fig 1. Image shows Diabetes count by looking at the attribute of smoking history

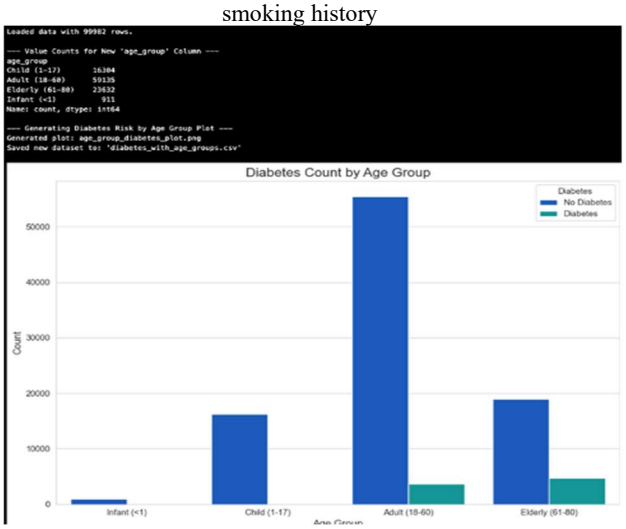

Fig 2. Different age groups having Diabetes

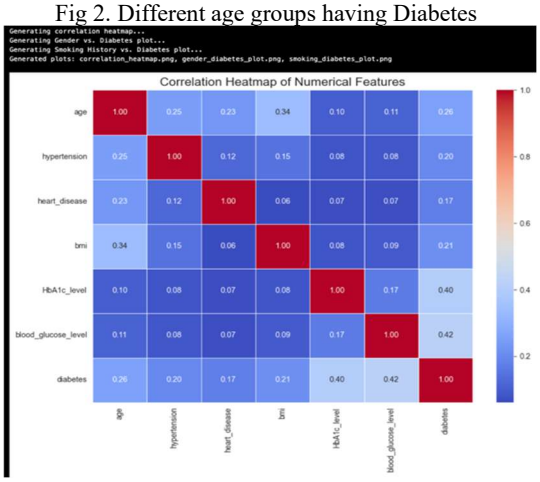

Fig 3. Correlation heat map showcasing of all attributes

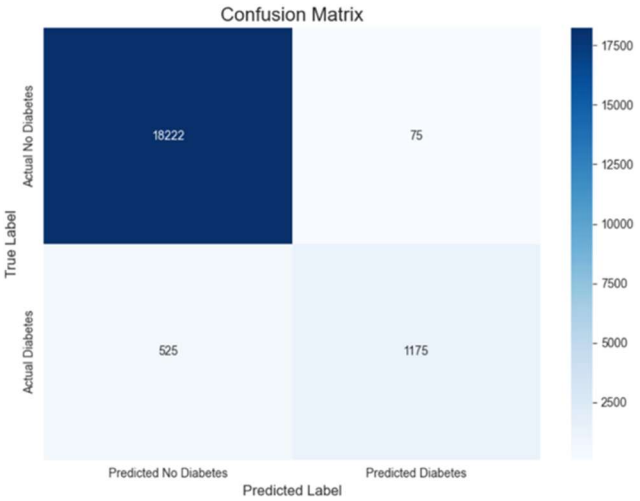

Fig 4. Confusion Matrix of predict and actual values of labels

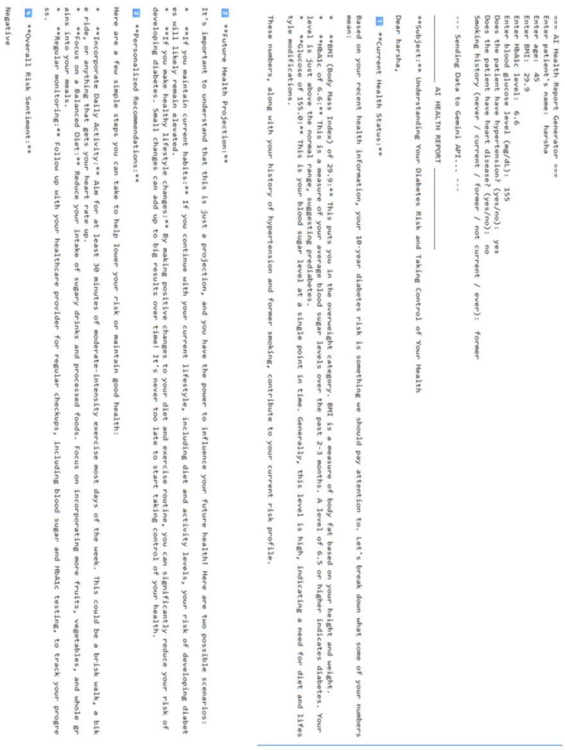

Fig 5. Healthcare report of a person of former smoking habits

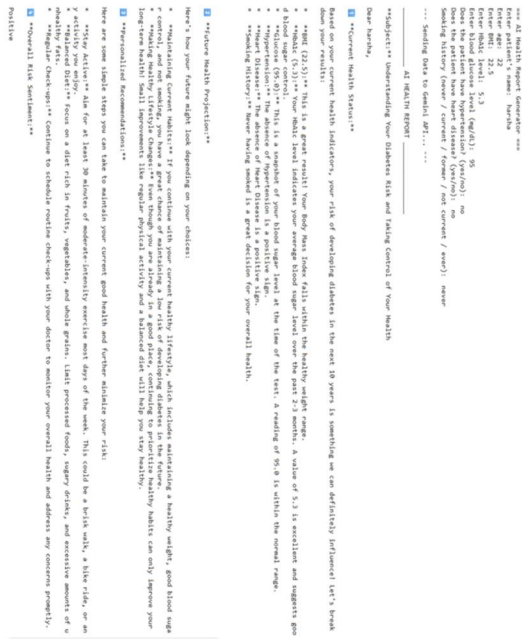

Fig 6. Healthcare report of a person of No Smoking Habits

CONCLUSIONS

We have worked with an existing dataset. It covers all the necessary checks for clinics like age, body mass index, blood glucose, blood pressure status smoking history habit and it was perfect to build a model.

As we ran the exploratory data analysis in in Jupyter notebook, in the Heatmap it displayed that two attributes that is glucose and HbA1c were the most dangers for the disease diabetics. Body mass index also mattered but next doubt come to the mind is what about the main attribute that was smoking history as it barely shows.

But the Histogram chart confirmed the glucose numbers if it is more than 200 then it is mostly diabetic. This results is what the doctors says, as it is not surprise or shocking because not it has been proven with numbers.

The confusion Matrix proved that the approach to find the diabetics can help reduce the mistakes as it is an important criteria to manage the chronic diseases because finding them early in the starting stage can prevent major effects to be faced in the future.

Apart from the model performance, our paper mainly focuses on converting the data into real helping. Created an simple and easy one page health report that can be read in a few seconds. Each reports shows the 10 years ahead diabetics risk like if the risk is high, medium or low. Also tells us what's the main risk factor is affecting our health. It also tells which causes the main factors like high sugar, weight or HbA1c. It also tells us what are the measures we can do it reduce the diabetes like reduce the use of sweets, walk or do exercise for 3o to 40 minutes daily and check the count of sugar regularly.

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