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MULTIFACETED DISEASE PROGNOSIS USING MACHINE LEARNING TECHNIQUES

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ABSTRACT

As the technology is growing very faster, people are coming together to digital life and digital communication. In all fields like hospitals, education, Military, Airports the technology is used. One of the major problem in hospitals are identification of Disease for a person remains a significant global health challenge, necessitating accurate and timely diagnosis for effective treatment and improved patient outcomes. This study proposes a novel approach for predicting Multiple diseases like Heart disease, Diabetes, Parkinson's Disease, Chronic Kidney Disease, Covid-19 using advanced Machine Learning Techniques. The proposed framework harnesses the power of advanced Machine Learning algorithms to analyze diverse healthcare datasets including medical reports and genetic data. Furthermore, model interpretability techniques are applied to gain insights into the underlying patterns and factors influencing disease prediction and outcomes.

Keywords: Heart Disease, Diabetes, Parkinson's Disease, Chronic Kidney Disease, Covid-19.

I. INTRODUCTION

Today's people are likely addicted to internet but they are not concerned about their physical health. People ignore the small problem and don't visit to visit hospital which turns into serious disease with time. Taking the advantage of this growing technology, the basis is to develop such a system that will predict the multiple diseases in accordance with symptoms put down by the patients without visiting the hospitals / physicians. Machine Learning provides an efficient platform in medical field to solve various healthcare issues at a much faster rate. Machine Learning is an application of Artificial Intelligence (AI) that has systems the flexibility to mechanically learn and improve from expertise but not being explicitly programmed. Machine Learning supports huge amount of algorithms that makes to train the model and also gives appropriate prediction and outcomes. Therefore in simple sense AI makes human to communicate with the machine easily. Thus the system we tend to is totally different from the current system. The system takes appropriate features and predicts the disease in an efficient manner.

II. METHODOLOGY

Initially, it is necessary to collect all patient reports from hospitals, clinics and convert into appropriate datasets. The Next step is to choose best algorithms for predicting diseases. The Machine Learning Model contains five interfaces for predicting appropriate diseases. For each disease, the appropriate algorithms were used. That is listed below:

DIABETES PREDICTION – SEQUENTIAL MINIMAL OPTIMIZATION

It is the improved version of SVM. The main idea behind SMO is to break down the large quadratic optimization problem involved in training a SVM into smaller, more manageable sub-problems that can be solved analytically or using numerical optimization techniques. It does so by iteratively selecting two Lagrange multipliers and optimizing them while holding the others fixed, thus making efficient use of memory and computational resources. The key advantage of SMO is its ability to solve the quadratic optimization problem involved in training an SVM, especially for large datasets where traditional methods may be expensive.

HEART DISEASE PREDICTION – GRADIENT SLOPE CLASSIFIER

It is an improved version of Logistic Regression Algorithm which typically involves optimization techniques like gradient descent to minimize a loss function while adjusting model parameters to fit the training data. Itworking is based on checking of convergence with a specified individuals.

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PARKINSONS DISEASE PREDICTION – ECOFOREST ALGORITHM

It is an improved version of Random Forest Algorithm. EcoForest is a novel ensemble learning algorithm that combines the strengths of both random forests and gradient boosting. It operates by building a collection of diverse decision trees, where each tree is trained on a randomly selected subset of the training data and features. The randomness introduced during training helps to reduce overfitting and increase robustness.

CHRONIC KIDNEY DISEASE PREDICTION – STOCHASTIC GRADIENT BOOSTING

It is an improved version of Decision Tree Algorithm. Stochastic Gradient Boosting, also known as Stochastic Gradient Boosting Machines (SGBM), is an ensemble learning technique that combines the principles of gradient boosting with stochastic sampling to build robust and high-performing predictive models.

COVID-19 PREDICTION – NICHING GENETIC ALGORITHM

Niching Genetic Algorithm (NGA) is a variant of the traditional Genetic Algorithm (GA) designed to handle multimodal optimization problems, where the goal is to find multiple optima or solutions in a single optimization run. NGA introduces mechanisms to encourage population diversity and maintain multiple subpopulations, each focusing on a different region of the search space corresponding to a different peak or mode.

III. IMPLEMENTATION

The implementation process of Multifaceted disease prediction involves 5 stages. That are depicted below:

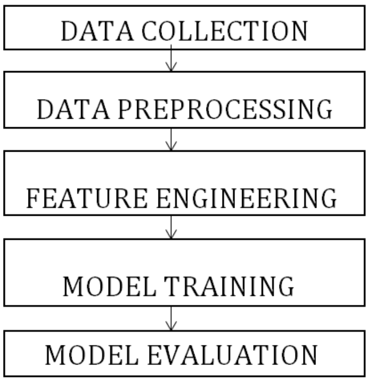

Fig 1: Model Implementation

IV. RESULTS

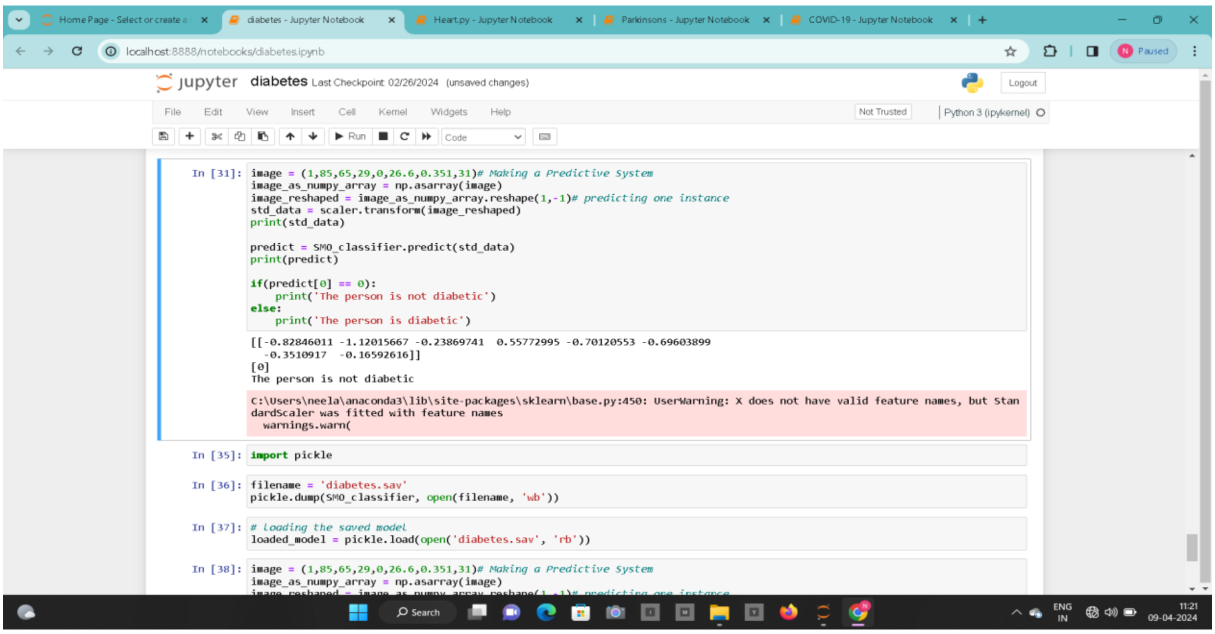

Fig 2: Diabetes Prediction

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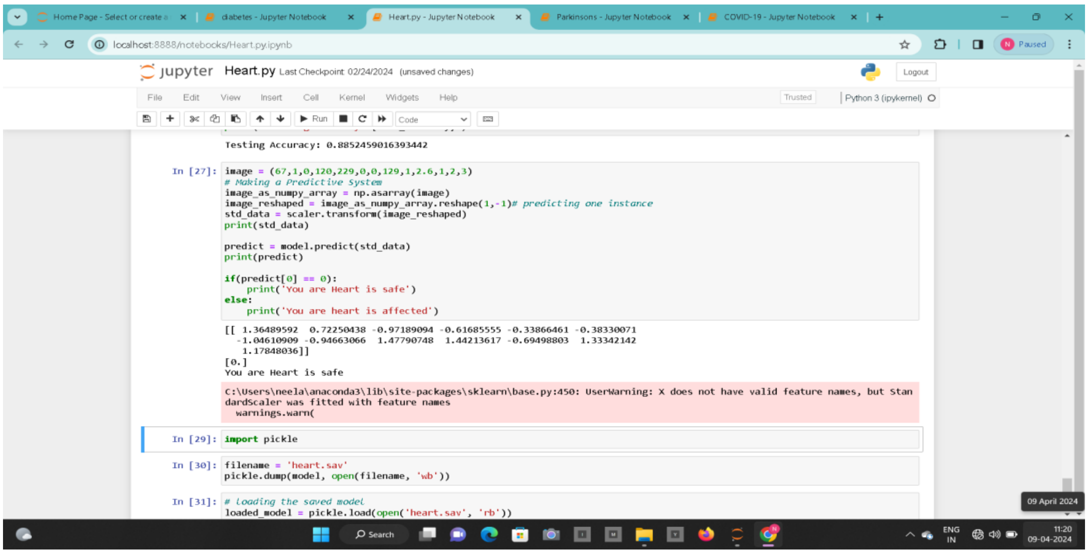

Fig 3: Heart Disease Prediction

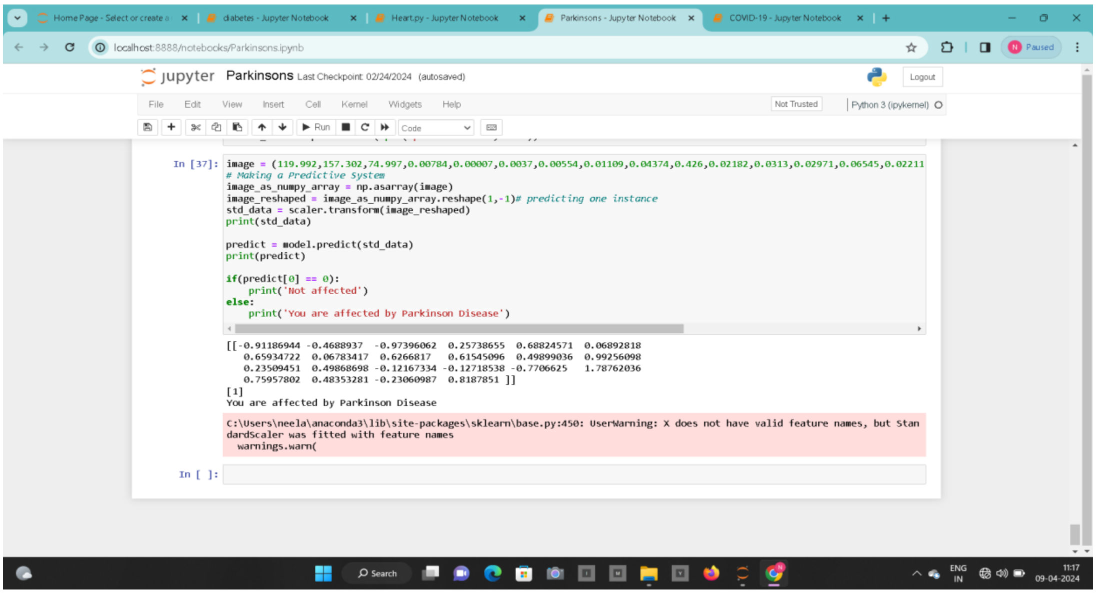

Fig 4: Parkinson's Disease Prediction

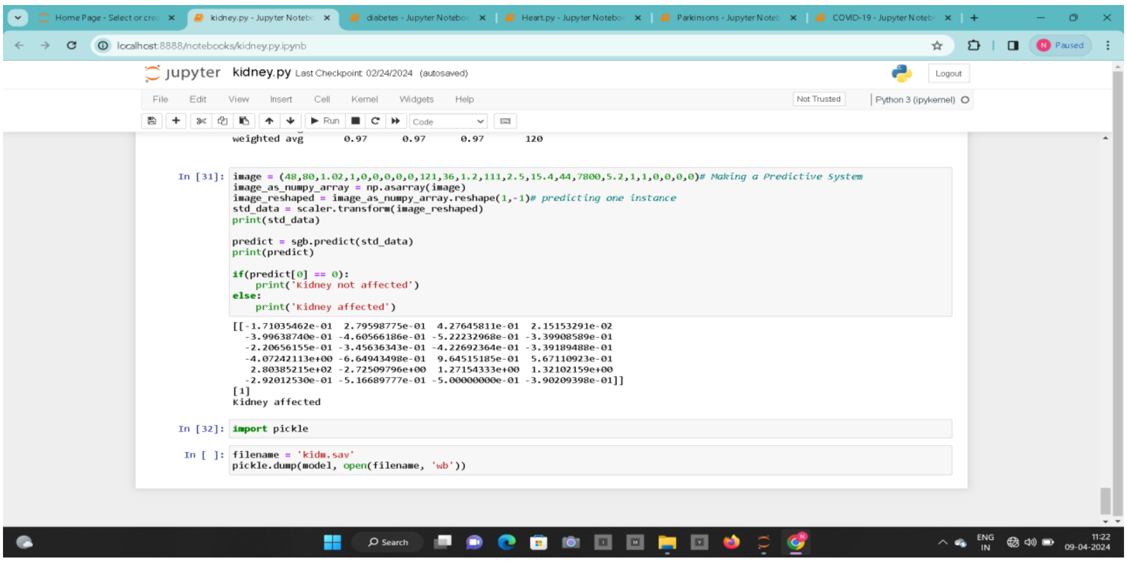

Fig 5: Chronic Kidney Disease Prediction

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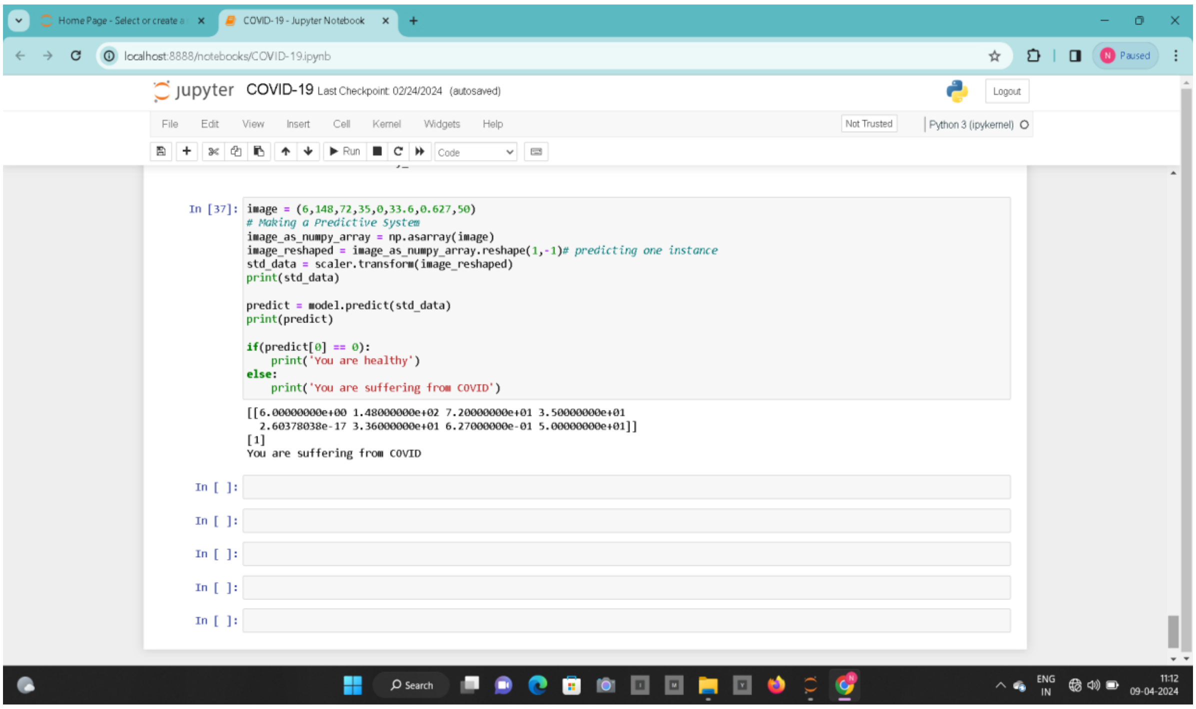

Fig 6: Covid-19 Prediction

Table 1: Algorithm Performance

SN.	Model Names	Algorithm Names	Accuracy
1	Diabetes Prediction	Sequential Minimal Optimization (Improved SVM)	77%
2	Heart Disease Prediction	Gradient Slope Classifier (Improved Logistic Regression)	85%
3	Parkinsons Disease Prediction	EcoForest Algorithm (Improved Random Forest)	79%
4	Chronic Kidney Disease Prediction	Stochastic Gradient Boosting (Improved Decision Tree)	96%
5	Covid-19 Prediction	Niching Genetic Algorithm	95%

V. FUTURE ENHANCEMENTS

In future work, this concept is converted into a Mobile Application that allows Patients to identify disease in their bodies. This can create a more participatory and engaged community, providing real-time feedback with predicting the systems. Integration of all other disease into a single application enhances more user support and better feedbacks.

VI. CONCLUSION

The development of Multifaceted Disease Prognosis System represents a significant leap forward in Healthcare Systems. The project has demonstrated efficient results in forecasting various medical conditions. By integrating diverse datasets and employing advanced algorithms, it achieved accurate predictions, aiding in early diagnosis and intervention. Challenges such as data quality, interpretability, and ethical considerations remain pivotal in the deployment of such models. Integrating, Multimodal data, enhancing model interpretability, and fostering collaborative research efforts are crucial for advancing predictive healthcare systems. It signifies the transformative potential of machine learning in healthcare, promising personalized and proactive disease management strategies.

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