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Prediction of ICU Admission Analysis for Covid-19 Patients

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Abstract: ***A rapid spread of SARS COVID-19 disease was first observed in China since early January 2020 and then in Italy. Covid 19 spread rapidly spread amongst many countries from one person to another person the deaths due to the pandemic continued to increase as all the countries faced many problems due to rapid spread of Coronavirus the health department was also clueless on how to provide facilities to the patients who needed ICU emergency beds in the hospitals as the cases increased all over the world. The SARS coronavirus has infected more than 100 million people and has resulted in almost three million deaths worldwide. In this project, the development of Machine Learning (ML) models for COVID-19 progression is discussed. As the pandemic situation was increased this Machine Learning model builds a web application framework where using the previous datasets we can create a complete blood count data based on which we will be able to the analysis of the ICU admitted patients. The proposed system is a Machine Learning approach which predicts the analysis of ICU and non ICU Patients. The analysis is made by uploaded details of patient which is based on CBC data only. The details of the patient data are data pre-processed and trained so that the system can predict the analysis of the entered data and gives the graphical representation through graphs. The proposed approach is a web application framework using Html, CSS, JavaScript as front end technology and for the validations. Python is an object oriented programming language which is the sever side language in this project. The data visualization is given by considering the analysis of the prediction in ICU***
Keywords: Covid 19, Machine Learning, Progression Analysis, Complete Blood Count

I. INTRODUCTION

S Over 100 million individuals have been infected with the SARS coronavirus, which has also caused over three million fatalities globally. This project discusses the creation of Machine Learning (ML) models for COVID-19 advancement [1]. As the pandemic scenario worsened, our machine learning model constructs a web application framework where we can develop a comprehensive blood count dataset based on the prior datasets and analyse patients who have been admitted to the ICU. The suggested technique includes three interpretability-different ML models. This demonstrates that the cost-effective prediction of ICU admission for COVID-19 patients can be done using CBC data and ML algorithms [2]. Particularly, CBCs may be rapidly produced utilising customary. Our approach may be modified to offer quick readouts for categorization and daily rounds even in environments with limited resources. The proposed system is a Machine Learning approach which predicts the analysis of ICU and non-ICU patients. The analysis is made by uploaded details of the patient which is based on CBC data only. The details of the patient data are data pre-processed and trained so that the system can predict the analysis of the entered data and gives the graphical representation through graphs [3]. The proposed approach is a web application framework using HTML, CSS, and JavaScript as front-end technology and for the validations. A python is an object-oriented programming language which is the server-side language in this project. The data visualization is given by considering the analysis of the prediction in the ICU [4]. The proposed methodology consists of Complete Blood Count details uploaded by the patient and based on this available data ICU, Age and Gender analysis is graphically represented. Algorithm analysis is also equally important so as to produce the sensitivity, specificity and exact accuracy of the predicted model. The model is predicted based on the classification of the dataset..

II. LITERATURE SURVEY

Early in January 2020, SARS-COVID-19 sickness was initially noted to be rapidly spreading in China, then Italy. Rapid international transmission of Covid-19 from one person to another. The number of deaths caused by the epidemic grew over time. The health department had no idea how to accommodate patients who need ICU emergency beds in the hospital as the number of cases rose throughout the world as all the countries dealt with several issues as a result of the coronavirus's fast spread [5].

Routine laboratory tests provide a prediction of which cov-19 patients are most likely to be admitted to the ICU [6]. This research focuses on analysing the impact of changes in laboratory test parameters on ward-based and ICU patients.

In order to predict intensive care unit (ICU) admission and mortality in cov-19 patients, risk scores based on clinical features at presentation were developed. 641 hospitalised patients with laboratory-confirmed were chosen from 4997 people under examination. This analysis revealed the crucial independent clinical factors that predicted ICU admission and pandemic-related death [7].

In order to allocate resources to the ICU most effectively, the constructed machine learning model can reliably analyse admission, ICU stay duration, and patient death. The prediction may be made using clinical data that was gathered between one and fifteen days prior to the actual admission [8]. The Machine Learning models demonstrated strong prognostication skills, making them useful for accurately predicting patient risks, monitoring hospital resource allocation, organising medical resources, and improving the management of the unprecedented pandemic [9].

There are two components to the issue at hand: Using the clinical samples' laboratory results, predict the confirmed cases of COVID among the suspected cases. For those who did well on the cov-19 prediction in the first job, forecast admission to general, semi-ICU, and ICU wards. We address this problem using approaches from Classification from Supervised Learning [10–11]. Here, they introduce CLIP (Covid Litigation Prediction), a modelling strategy enabled by swarm intelligence created to predict the utilisation of intensive care units using time series.

This article describes how a simulation model was created to aid in the short-term planning of the hospital beds required to handle the cov-19 in Navarre, Spain. The hospital's patient flow may result in an admission to the intensive care unit. In-hospital mortality and intense ICU hospitalizations were the study's main results. Other outcomes included end-organ symptoms such pneumonia, acute renal damage, myocardial injury, cardiac failure, and stroke, as well as the need for additional oxygen or mechanical ventilation [12].

To analyse the machine-learned blood data from 313 people, 7 blood test items were used. As the feature amount, produced a successful linear SVM prediction model for severe/non-severe disease (recall: 93.55 percent, specificity: 93.22 percent), and for patients with critical sickness, developed a three-stage evaluation of the degree of severe level [13]. Performance examination of several algorithms demonstrates this model's potency in predicting cov-19-infected individuals. The ANN model outperformed other employed ML models with the best accuracy rate (97.9%). Conclusion: Based on the clinical features of cov-19 patients, this article may help ICU personnel forecast ICU admission [14].

III. SUMMARY OF LITERATURE REVIEW

The main motivation behind this project is to help the hospitals and the patients to check the availability of ICU beds in particular hospitals based on the previous data collected from 2020 regarding cov-19 [15]. Due to the pandemic situation the country faced a lot of problems while admitting patients to the intensive care unit. This also improves the efficiency and reduces the fear among the patients so that they can easily check the ICU admitted and non-admitted patients based on the reports available in the database as entered by the patient [16]. As we come to know that this method can help people and the hospital organization come up with better solutions so that predictions of the next 5 days for ICU patients can be analyzed.

IV. EXISTING SYSTEM

The existing system used and processed one of the most reliable datasets made available so far for COVID-19 analysis(which is shared on the European open-access repository Zenodo1) [17]. From this dataset, a small set of features regarding routine blood exams that are both inexpensive and quick to get, for its wide application in a number of diagnostic and monitoring tasks.

To this aim, three models are presented, one model has been selected for its high accuracy, despite its low clinical interpretability because of its black-box nature [18-19]. The other two models, i.e., a decision tree and a logistic regression, have been selected because of their explainability, despite their lower accuracy with respect to the model. Indeed, these models can provide clinicians with more interpretable indications that can help them in their decision-making during the management and treatment of COVID-19 patients.

V. PROPOSED SYSTEM

Over 100 million individuals have been infected with the SARS coronavirus, which has also caused over three million fatalities globally. In this project, we go through how machine learning (ML) models for COVID-19 progression were developed [20]. As the pandemic scenario worsened, our machine learning model constructs a web application framework where we can produce comprehensive blood count data based on the prior datasets and analyze patients who have been admitted to the ICU.

The suggested technique includes three interpretability-different ML models. This demonstrates that the cost-effective prediction of ICU admission for COVID-19 patients may be done using CBC data and ML algorithms [21]. Our models might be used in situations with limited resources to obtain quick indications during triage and daily rounds, in particular because the CBC can be quickly gathered through regular blood examinations.

A. *Scope of the Project*

1) Using data from Complete blood counts, develop a model that predicts ICU admission for COVID-19 patients.
2) To build ICU, age & gender analysis based on a number of admissions. The analysis is made based on the uploaded details by the patient.
3) To analyse the accuracy, specificity & sensitivity of the trained model.

VI. ARCHITECTURE

Fig1 Fig 4.1 describes the overview of the system where the user/patient will log in on successful login the patient can upload his complete blood count data and can view the details which will be stored in the database based on this data the analysis of the prediction model will be in the form of graphical charts. The trained model gives an accurate analysis of the algorithm specifying the sensitivity, specificity etc

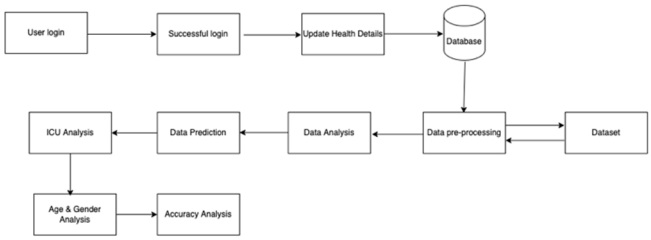

Fig. 1: Block Diagram of the System

VII. METHODOLOGY

Three ML models that may be comprehended in three distinct ways are included in the suggested technique. This illustrates how machine learning methods and CBC data may be used to predict COVID-19 patient ICU admission with high accuracy. Our models may be utilised in resource-constrained scenarios to get rapid indications during triage and daily rounds, in particular since the CBC may be readily obtained by routine blood tests. Computers now have the ability to learn without explicit programming thanks to the research on machine learning. One of the most interesting technologies one might have ever encountered is machine learning (ML) [22]. It provides a feature that lends computers a more human-like quality, as the name would imply. To categorise issue descriptions and identify suitable solutions and objectives, machine learning methods are utilised [23].

VIII. SYSTEM REQUIREMENTS

A. *Hardware Requirements*

1) RAM: 2GB minimum (4+ GB RAM recommended)
2) Storage: 2GB minimum (8 GB recommended)

B. *Software Requirements*

1) OS: Ubuntu 18.04
2) Configuration management tool: Django, Pycharm, MysqlClient, Wamp Server

IX. RESULT AND DISCUSSION

The COVID-19 test cases for the Prediction of ICU Admission Analysis Patients are in charge of doing the checks for the authentication page, where they are treated as users, and the registration page is also checked for any blank fields. The module specification is done based on the Unit & Integrated testing. Testing is an important factor for any system so as to provide security and any kind of malpractices, robots can also be found out by such cases which tells us who are humans and bots. Test cases also allow us to build the project so that the user can easily understand what details he has to fill in if he has to register or move to a further module.

Fig. 2: Details of the Patient

X. CONCLUSION

The difficult challenge of determining whether a COVID-19 patient will need to be moved to the ICU within the next five days while they are in the hospital is addressed in the reported retrospective analysis. Results from the suggested method, which is based on both interpretable and black-box models, were positive. We may anticipate the ICU analysis for the admitted patient during the following five days using the three ML models that were used to build this project. This prediction will be made utilising the patient's entire blood count data. Prediction of ICU analysis for COVID-19 patients is a web application framework where the user may register and ICU analysis, gender analysis, and age analysis can be graphically depicted based on the submitted CBC data. automation engine to save time and be more valuable. Organization can devote more time on improvement to make the procedure more cost-effective.

XI. ACKNOWLEDGMENT

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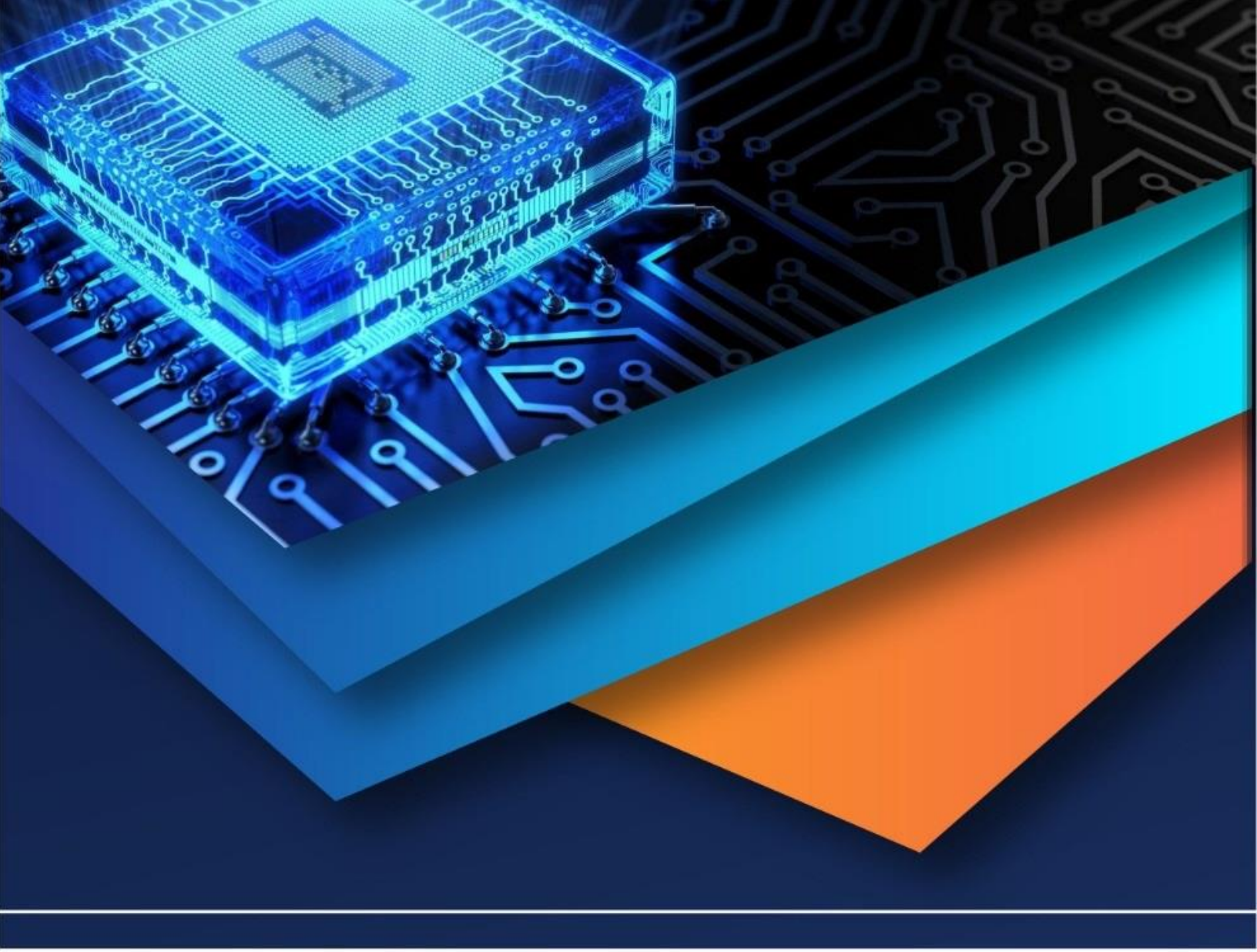

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