# ICU ADMISSION PREDICTION FOR COVID-19 PATIENTS USING MACHINE LEARNING AND DATA ANALYSIS WITH COMPLETE BLOOD COUNTS

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**Abstract**
The creation of prognostic Machine Learning (ML) models for COVID-19 progression is covered in this article; more specifically, the problem of forecasting intensive care unit (ICU) admission within the next five days is covered. On the basis of 4995 Complete Blood Count (CBC) tests, we created three ML models. We suggest three ML models—two completely interpretable models and a black box—that differ in their interpretability. The decision tree and logistic regression models each have an AUC of.81 and.83, respectively, while the black-box model has an AUC of.88 (an ensemble). This demonstrates that the cost-effectiveness of using CBC data and ML algorithms to predict COVID-19 patients' admission to the ICU, as the CBC can be acquired rapidly through routine blood exams, our models could also be applied in resource-limited settings and to get fast indications at triage and daily rounds.

**Introduction**
More than 100 million individuals have been infected with the SARS-CoV-2 corona virus in the year since it first emerged, and it has caused about three million fatalities globally. The application of AI approaches to create tools that help physicians in various activities has gained growing interest as a means of reducing this pandemic's extraordinary spread. The creation of prognostic models, either to forecast ICU admission or other outcomes (including mortality) or to stratify patients by risk, has so far lagged behind, despite encouraging results for the diagnostic job (i.e., the discovery of COVID-19): Recent studies reveal significant flaws (in terms of bias or over fitting risk) in the current solutions. To address these limitations, in this work we report a retrospective study aimed at developing prognostic Machine Learning models to predict ICU admission, which can be seen as a proxy of disease severity or an outcome of worsening conditions.

**System design**
UML stands for unified modeling language. UML is aa standardized general-purpose modeling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group.
The goal is for UML to become a common language for creating models of object-oriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML.
The Unified Modeling Language isa standard language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modeling and other non- software systems.
The UML represents a collection of best engineering practices that have proven successful in the modeling oflarge and complex systems. The UML is a very important part of developing object-oriented software and the software development process.
**Use case diagram**
A use case diagram in the Unified Modeling Language (UML) is a type of behavioural diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies

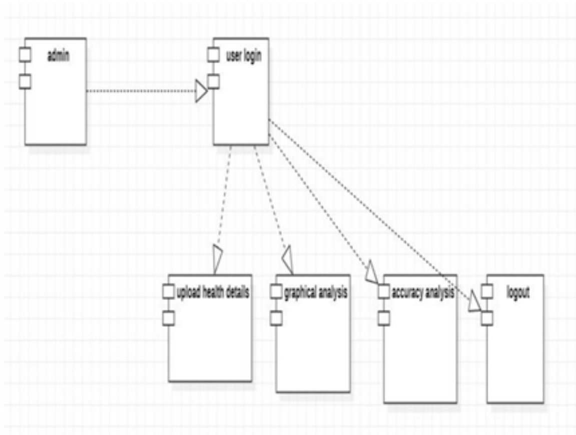
between those use cases.

Use case describes set of sequence of actions that a system performs that yields an observable result of value to a particular actor.

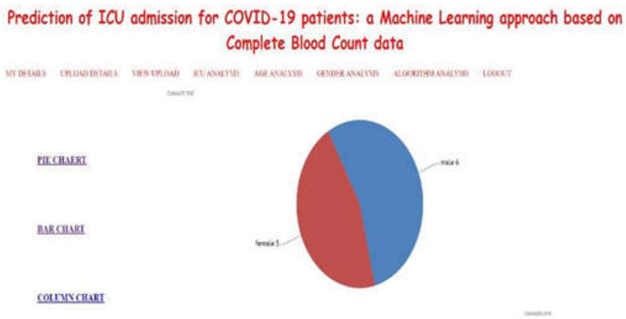
A use case diagram shows a set of use cases, actors and their relationships. An actor can be a human or a system.

### Component diagram

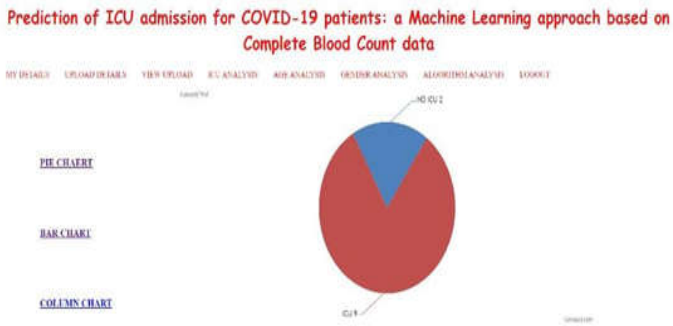
Component diagram describes how a software system is split up into components and shows the dependencies among thesecomponents.

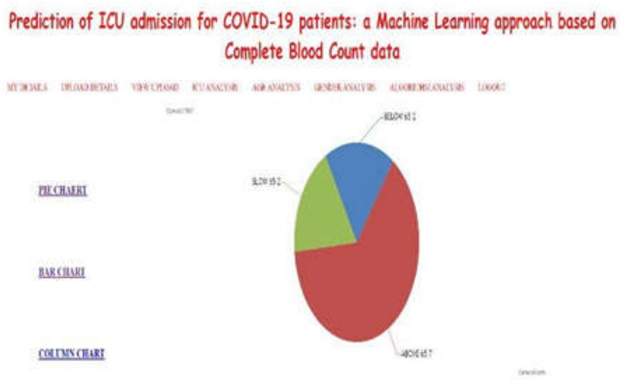



### OUTPUT SCREEN SHOTS

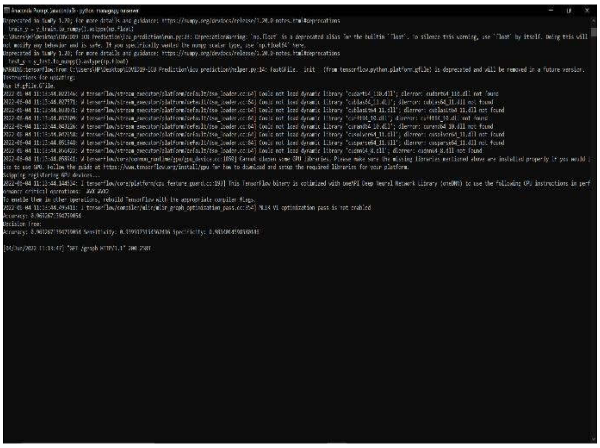



Within this screen, we can see that we have apie chart of gender analysis of covid patients.






Within this screen, we can see that we have apie chart of different age group people.
Within this screen, we can see that we have a pie chart of ICU of covid patients, weatherthey are going to admit in the ICU or not.



In the above screen, we can see the accuracy of the decision algorithm that wehave used to predict the ICU admissionmore accurately.

## Conclusion

For the purpose of tackling the difficult problem of determining if a COVID-19 patient would need to be transferred to the ICU within the next five days while they are in the hospital, we presented a retrospective research. The suggested method, which was based on both interpretable and black-box models, had positive findings. Our techniques are also economical since they just rely on two demographic factors and the results of the CBC test, which is their greatest advantage in terms of acceptable accuracy. Our models can thus be helpful in contexts with limited resources, such as healthcare institutions dealing with a spike in sick patients and unable to do more frequent COVID-specific tests (e.g., inflammatory markers, interleukins, and coagulation parameters [34]) on a daily basis. For future work, we aim to externally validate our models with data coming from other hospitals and other time periods: This would allow testing the modelin light of possible virus mutations and different patient management and therapeutic policies. Since these latter ones depend on the number of cases to deal with and on the continuous advancement of what we know about COVID-19 and its effective treatment (changing its prognosis), phenomena related toconcept drift cannot be ruled out in any existing predictive model, including ours

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