Case study: Analyze history of covid case and also analyze the performance of the model.

Aim:

To study various methods used in the recent papers for COVID and also analyze the performance of the methods in predicting a covid case.

Literature review:

S. No.	Research Paper	Author Name	Mertis and Demerits	Reference Link
1.	Comparative study of machine learning methods for COVID-19 transmission forecasting	Abdelkader Dairi et al	• Investigates the use of multiple deep learning and baseline machine learning models to forecast COVID-19 trends, providing a comparison of their performance. • Finds that hybrid deep learning models (such as LSTM-CNN and GAN-GRU) outperform baseline machine learning models and that LSTM-CNN performs the best. • Provides potential improvements to COVID-19 forecasting accuracy over the long term.	https://www.sciencedirect.com/science/article/pii/S1532046421001209
2.	COVID-19 Pandemic Prediction for Hungary; A Hybrid Machine Learning Approach	Gergo Pinter et al	• Proposes a hybrid machine learning approach to predicting COVID-19 that combines adaptive network-based fuzzy inference system (ANFIS) and multi-layered perceptron-imperialist competitive algorithm (MLP-ICA). • Demonstrates the potential of the proposed approach to	https://www.mdpi.com/2227-7390/8/6/890

			predict COVID-19 trends in Hungary and provides promising results. • Uses multiple validation methods to evaluate model performance.	
3.	A Comparative Study of Machine Learning Models for COVID-19 prediction in India	Vartika Bhadana et al	• Conducts a comparative study of five machine learning models for forecasting COVID-19 trends, including linear regression, decision tree, LASSO, random forest, and support vector machine. • Finds that using machine learning techniques with a six-degree polynomial can improve accuracy. • Provides potential improvements to COVID-19 forecasting accuracy in the short term.	https://ieeexplore.ieee.org/abstract/document/9312112
4.	COVID-19 Detection from CBC using Machine Learning Techniques	Asma Akhtar et al	• Investigates the use of complete blood count tests and multiple machine learning algorithms for early detection of COVID-19. • Uses multiple performance evaluation measures to assess model performance. • Provides potential improvements to early detection of COVID-19 using machine learning.	https://journals.gaftim.com/index.php/ijtim/article/view/22
5.	Comparison of deep learning approaches to predict COVID-19 infection	Talha Burak Alakus et al	• Develops a machine learning model to predict COVID-19 test results using only eight binary features. • Uses nationwide data publicly reported by the Israeli Ministry of Health. • Provides potential improvements to COVID-19 testing prioritization.	https://www.sciencedirect.com/science/article/pii/S0960077920305178
6.	Machine learning-based prediction of COVID-19	Yazeed Zoabi et al	• Develops a machine learning model to predict the spread of COVID-19 infections in multiple countries and the time frame for eradication.	https://www.nature.com/articles/s41746-020-

	diagnosis based on symptoms		• Finds a high level of accuracy (R2 of 0.99) in predicting confirmed cases. • Provides potential improvements to COVID-19 forecasting accuracy in the long term.	00372-6
7.	The COVID-19 pandemic: prediction study based on machine learning models	Zohair Malki et al	• The use of machine learning to predict the spread of COVID-19 can provide valuable insights for public health officials and policymakers. • Achieving an overall R2 of 0.99 is a very high level of accuracy and indicates that the proposed model is likely to be effective in predicting the spread of the virus.	https://link.springer.com/article/10.1007/s11356-021-13824-7
8.	COVID-19 Outbreak Prediction with Machine Learning	Peter M. Atkinson et al	• Provides a comparative analysis of machine learning and soft computing models with traditional SIR and SEIR models for predicting the COVID-19 outbreak. • Finds that machine learning models, specifically MLP and ANFIS, show promising results. • Suggests that machine learning can be an effective tool for modelling the outbreak, particularly given the complex nature of the COVID-19 outbreak and the variation in its behavior across nations. • Proposes a novel approach of combining machine learning and SEIR models for outbreak prediction.	https://www.mdpi.com/1999-4893/13/10/249
9.	An approach to forecast impact of Covid-19 using supervised machine learning model	Senthilkumar Mohan et al	• Proposes a hybrid machine learning technique, EAMA, for long-term forecasting of COVID-19 related parameters in India and globally. • Uses two datasets from the Ministry of Health and Family Welfare of India and Worldometers for the study. • Finds that the predicted data is very similar to real-time	https://onlinelibrary.wiley.com/doi/abs/10.1002/spe.2969

			values. • Conducts state-wise predictions in India and country-wise predictions around the world.	
10.	Supervised Machine Learning Models for Prediction of COVID-19 Infection using Epidemiology Dataset	L. J. Muhammad et al	• Mexico. • Compares the performance of multiple learning algorithms such as logistic regression, decision tree, support vector machine, naive Bayes, and artificial neural network. • Finds that the decision tree model has the highest accuracy among the tested algorithms. • Conducts correlation coefficient analysis between dependent and independent features of the dataset.	https://link.springer.com/article/10.1007/s42979-020-00394-7

3. Experimental results

- Deep learning methods such as hybrid convolutional neural networks-Long short-term memory (LSTM-CNN), hybrid gated recurrent unit-convolutional neural networks (GAN-GRU), GAN, CNN, LSTM, and Restricted Boltzmann Machine (RBM), as well as baseline machine learning methods such as logistic regression (LR) and support vector regression, were investigated (SVR). The use of hybrid models (such as LSTM-CNN and GAN-GRU) is expected to improve the forecasting accuracy of COVID-19 future trends in the long run. Furthermore, the results confirmed that deep learning models outperformed the two baseline machine learning models. Furthermore, the results showed that LSTM-CNN performed better, with an averaged mean absolute percentage error of 3.718%, among other things.

- The epidemiological models have been challenged in terms of providing higher accuracy for long-term prediction due to a lack of essential data and uncertainty. This study proposes a hybrid machine learning approach to predict COVID-19 as an alternative to susceptible-infected-resistant (SIR)-based models, and

we demonstrate its potential using data from Hungary. To predict time series of infected individuals and mortality rate, hybrid machine learning methods of adaptive network-based fuzzy inference system (ANFIS) and multi-layered perceptron-imperialist competitive algorithm (MLP-ICA) are proposed. The models predict that by late May, the outbreak and overall morale will have significantly decreased. The validation is carried out for 9 days and yields promising results, confirming the model's accuracy.

- To forecast the threatening variables of COVID-19, a comparative study of five machine learning standard models such as Linear regression (LR), decision tree, least absolute shrinkage and selection operator (LASSO), random forest, and support vector machine (SVM) was conducted. Each model forecasts three types of data in the next five days: total active cases, total deaths, and total recoveries. The paper's findings suggest that using these techniques for the current COVID-19 pandemic scenario is a promising strategy. We used a six-degree polynomial to improve accuracy. The results of the experiments show that poly LR and poly LASSO produce the best results, followed by LR, LASSO, random forest, and decision tree. SVM produces a poor prediction result.

- The Covid-19 pandemic has had a devastating impact on humanity, resulting in massive deaths all over the world. There is an urgent need for timely and reliable detection of Corona virus patients in order to provide better and earlier treatment and prevent the spread of the infection. Having said that, recent studies have revealed some critical advantages of using complete blood count tests for early detection of COVID-19 positive individuals. In this study, we used different machine learning algorithms to predict COVID-19 using a full blood count. "K Nearest Neighbor, Radial Basis Function, Naive Bayes, kStar, PART, Random Forest, Decision Tree, OneR, Support Vector Machine, and Multi-Layer Perceptron" are among the algorithms. Further, "Accuracy, Recall, Precision, and F-Measure" are the performance evaluation measures that are utilised in this study.

- Using deep learning and laboratory data, create clinical predictive models that predict which patients are likely to get COVID-19. Precision, F1-score, recall, AUC, and accuracy scores were calculated to evaluate the predictive performance of our models. Models were validated using 10 fold cross-validation and train-test split approaches with 18 laboratory findings from 600 patients. Our predictive models identify patients with COVID-19 disease with an accuracy of 86.66%, an F1-score of 91.89%, a precision of 86.75%, a recall of 99.42%, and an AUC of 62.50%, according to the experimental results.

- A machine-learning method that was trained on data from 51,831 tested individuals (of whom 4769 were confirmed to have COVID-19). The test set contained data from the subsequent week (47,401 tested individuals of whom 3624 were confirmed to have COVID-19). Our model predicted COVID-19 test results with high accuracy using only eight binary features: sex, age ≥60 years, known contact with an infected individual, and the appearance of five initial clinical symptoms. Overall, we developed a model that detects COVID-19 cases using simple features accessed through basic questions based on nationwide data publicly reported by the Israeli Ministry of Health. When testing resources are limited, our framework can be used to prioritise COVID-19 testing, among other things.

- The experimental results of the proposed model showed that the overall R2 is 0.99 from the perspective of confirmed cases. A machine learning model has been developed to predict the spread of the COVID-19 infection in many countries, as well as the time frame after which the virus can be stopped. Globally, our findings predicted that COVID-19 infections would plummet during the first week of September 2021, when the virus would be eradicated.

- A comparative analysis of machine learning and soft computing models to predict the COVID-19 outbreak as an alternative to susceptible-infected-recovered (SIR) and susceptible-exposed-infectious-removed (SEIR) models. Two models showed promising results among a wide range of machine learning models investigated

(i.e., multi-layered perceptron, MLP; and adaptive network-based fuzzy inference system, ANFIS). Based on the findings, and given the highly complex nature of the COVID-19 outbreak and the variation in its behaviour across nations, this study suggests machine learning as an effective tool for modelling the outbreak. This paper provides an initial benchmarking to demonstrate machine learning's potential for future research. This paper also suggests that by combining machine learning and SEIR models, a genuine novelty in outbreak prediction can be realised.

- EAMA is a multimodel machine learning technique that has been proposed for forecasting Covid-19 related parameters in the long term, both within India and globally. This proposed EAMA hybrid model is well-suited to predictions based on past and present data. Two datasets from the Ministry of Health and Family Welfare of India and Worldometers were used for this study. Using these two datasets, long-term data predictions for both India and the world were outlined, and it was discovered that predicted data was very similar to real-time values. The experiment was also carried out for statewise predictions in India and countrywise predictions around the world, and the results are included in the Appendix.

- This study used epidemiology labelled dataset for positive and negative COVID-19 cases in Mexico to develop supervised machine learning models for COVID-19 infection using learning algorithms such as logistic regression, decision tree, support vector machine, naive Bayes, and artificial neutral network. Prior to developing the models, the correlation coefficient analysis between various dependent and independent features was performed to determine the strength of the relationship between each dependent and independent feature of the dataset. The models were trained using 80% of the training dataset, with the remaining 20% used for testing. The outcome of the models' performance evaluation revealed that the decision tree model has the highest accuracy (94.99%), followed by the Support Vector Machine model (93.34%) and the Naive Bayes model (94.30%).

4. Discussions

The analysis of the history of COVID-19 cases using machine learning, deep learning, and artificial intelligence techniques has shown promising results. These techniques have the potential to revolutionize the way we detect, diagnose, and treat COVID-19. The use of these techniques can potentially lead to faster and more accurate predictions, detections, and diagnosis of COVID-19 cases, which can ultimately improve patient outcomes and save lives.
However, there are also limitations and challenges associated with the use of these techniques. For example, some models may suffer from overfitting or lack transparency, making it difficult to interpret the results. Additionally, the availability and quality of data can also affect the performance of these techniques.

Therefore, it is important to carefully evaluate and interpret the results of these techniques in the context of real-world data and limitations. Further research is also needed to address these limitations and challenges and to improve the performance and applicability of these techniques.'

5. Conclusion

These research papers employ different machine learning algorithms and models, such as deep learning, hybrid models, standard machine learning models, and soft computing models, to predict future trends, infected individuals, mortality rate, active cases, total deaths, and total recoveries, among others.

The findings of these studies show promising results in terms of accuracy and efficiency of the proposed models. For instance, the hybrid deep learning models such as LSTM-CNN and GAN-GRU outperform the baseline machine learning models such as logistic regression and support vector regression. The hybrid machine learning

approach of ANFIS and MLP-ICA accurately predicts the time series of infected individuals and mortality rate in Hungary, with a significant decrease in the outbreak and overall morale by late May. Furthermore, the comparative study of five standard machine learning models and the use of a six-degree polynomial to improve accuracy show that poly LR and poly LASSO produce the best results, followed by LR, LASSO, random forest, and decision tree.

Moreover, machine learning models show potential in the early detection of COVID-19 positive individuals, as complete blood count tests can be used for this purpose. Different machine learning algorithms such as K Nearest Neighbor, Radial Basis Function, Naive Bayes, kStar, PART, Random Forest, Decision Tree, OneR, Support Vector Machine, and Multi-Layer Perceptron can be employed for this purpose.

Additionally, deep learning and laboratory data can be used to create clinical predictive models that predict which patients are likely to get COVID-19. The predictive models identify patients with COVID-19 disease with high accuracy, F1-score, precision, recall, and AUC.

The studies suggest that machine learning can be an effective tool for modelling the COVID-19 outbreak and predicting its future trends. The findings of these studies provide an initial benchmarking to demonstrate machine learning's potential for future research. Furthermore, machine learning can be used to prioritize COVID-19 testing, among other things, when testing resources are limited.

In conclusion, the studies presented in the given text showcase the potential of machine learning techniques in predicting and analyzing the COVID-19 outbreak. The findings provide insights into the efficiency and accuracy of various machine learning models, algorithms, and techniques that can be used for future research in this area.