

Forecasting COVID-19 in European Countries Using Long Short-Term Memory

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Effective time series forecasts are increasingly important in supporting judgment in various decisions. Various prediction models are available to support these projections based on how each area provides a diverse set of data with variable behavior. Artificial neural networks (ANNs) significantly contribute to medical research since using predictive ideas allows for the study of disease progression in the future, as well as the behavior of other variables. This study implemented the proposed model based on Long Short-Term Memory (LSTM) to forecast COVID-19 daily new cases, deaths, and ICU patients. The methodology uses quantitative and qualitative data from six European countries: Austria, France, Germany, Italy, Portugal, and Spain to predict the last 242 days of the COVID-19 pandemic. The dataset uses the healthcare parameters of the number of daily new cases, deaths, ICU patients, and mitigation procedures, such as the percentage of the population fully vaccinated, the mandatory use of masks, and the lockdown. Two approaches were used to evaluate the model's performance: the mean absolute error (MAE) and the mean square error (MSE). The results demonstrate that the LSTM model efficiently captures general trends in COVID-19 metrics but shows limitations when predicting data with low values or high variability, such as daily deaths. The model reported the lowest errors for Spain and Portugal, while France and Germany exhibited higher error rates due to differences in data reporting and pandemic dynamics. These findings highlight the importance of contextualizing predictive models based on specific regional characteristics.

Keywords: Supporting decision · COVID-19 · Artificial Neural Network · LSTM.