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Comparative Analysis of Time Series Techniques for COVID-19 Forecasting: LSTM, Transformer, and ARIMA

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INTRODUCTION & AIM

The COVID-19 pandemic highlighted the critical need for accurate forecasting models to inform public health decision-making. This study compares the performance of three time series techniques—LSTM, Transformer models, and ARIMA—in predicting the spread of COVID-19.
Dataset: JHU CSSE COVID-19 Data Repository.

METHOD

We trained and evaluated LSTM, Transformer (Temporal Fusion Transformer), and ARIMA models using COVID-19 data on confirmed cases, deaths, vaccination rates, and socio-economic factors. Model performance was assessed using MAE and RMSE for 7-day and 14-day forecasting horizons.

Key Methods:
-LSTM: Captures temporal dependencies.
-Transformer: Handles long-range dependencies and combines diverse data.
- ARIMA: Traditional statistical method for time series analysis.

RESULTS & DISCUSSION

7-Day Forecast:
- Transformer: MAE: 85, RMSE: 120
- LSTM: MAE: 90, RMSE: 125
- ARIMA: MAE: 105, RMSE: 155

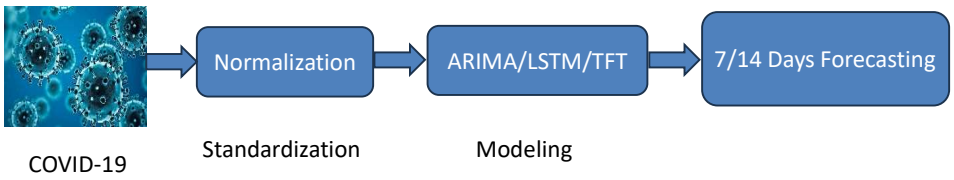
14-Day Forecast:
- Transformer: MAE: 110, RMSE: 150
- LSTM: MAE: 115, RMSE: 155
- ARIMA: MAE: 138, RMSE: 178

The Transformer model consistently outperformed both LSTM and ARIMA. The ability to capture long-range dependencies and incorporate diverse data sources contributed to its superior performance.

Future Directions:
-Integrate additional data sources
- Refine models for improved long-term forecasting.

CONCLUSION

The Transformer-based model demonstrates superior performance in COVID-19 forecasting compared to LSTM and ARIMA models. This highlights the potential of advanced deep learning techniques for public health modeling.



FUTURE WORK / REFERENCES

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