



**FINAL YEAR PROJECT REPORT**

# **ENERGY CONSUMPTION FORECASTING IN SMART GRIDS USING DEEP LEARNING**

**In fulfillment of the requirement  
For degree of  
BS (COMPUTER SCIENCES)**

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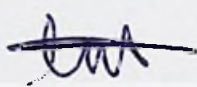
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**DECLARATION**

We hereby declare that this project report is based on our original work except for citations and quotations which have been duly acknowledged. We also declare that it has not been previously and concurrently submitted for any other degree or award at Bahria University or other institutions.

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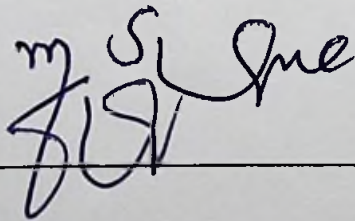
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**APPROVAL FOR SUBMISSION**

I certify that this project report entitled **“ENERGY CONSUMPTION FORECASTING IN SMART GRIDS USING DEEP LEARNING”**, prepared by **Jawad Ahmed Khan, Yusra Arshad, and Mariam Mumtaz** has met the required standard for submission in partial fulfilment of the requirements for the award of Bachelor of Computer Science at Bahria University.

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## **ACKNOWLEDGEMENTS**

We want to express our deepest gratitude to our supervisor, Dr Muhammad Tariq Siddique, for his guidance, constant support, and immense patience throughout this project. His expertise and encouragement have been important in shaping our research and pushing us toward achieving our objectives. This project would not have been possible without his advice and mentorship.

In addition, we would like to express our gratitude to our loving parents and friends, who have helped and encouraged us in doing this project.

# **Energy Consumption Forecasting in Smart Grid Using Deep Learning**

## **ABSTRACT**

Smart Grids are intelligent electricity networks that are being adopted worldwide as modern grid systems have become complex. Networks with dynamic behaviour in Smart Grids require precise energy forecasting to achieve optimal management of loads while minimising operational expenses between various suppliers and consumers. This research develops a specific AI-based energy forecasting system that caters to Pakistan's national energy network requirements. The system uses LSTM, GRU, Bidirectional LSTM, XGBoost, DeepAR together with historical data and socio-economic variables to generate electricity demand predictions. Standard forecasting accuracy evaluation metrics like MAE, MSE, and  $R^2$  measure the model's performance. The system also implements a user-friendly web dashboard that utilises React and Supabase as well as Plotly as part of its modern technology foundation. The visual dashboard allows users to monitor predictions in addition to tracking patterns and automatically producing current reports. The developed system will help Pakistan's energy sector achieve smarter grid management by implementing data-driven decision systems which enhance power loss reduction and increase grid reliability.

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