5G Network Traffic Prediction using Text and Image

A PROJECT REPORT

Submitted by,

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Under the guidance of,

MR. LAKSHMISHA S K

in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND TECHNOLOGY

At

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PRESIDENCY UNIVERSITY

BENGALURU

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PRESIDENCY UNIVERSITY

SCHOOL OF COMPUTER SCIENCE ENGINEERING

CERTIFICATE

This is to certify that the Project report "5G Network Traffic Prediction using Text and Image" being submitted by "Asima Siddiqua, Syed Azam, Syed Fuzail, Zubiya Sadaf" bearing roll number(s) "20211CST0093, 20211CST0113, 20211CST0089, 20211CST0047" in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Technology is a bonafide work carried out under my supervision.

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DECLARATION

We hereby declare that the work, which is being presented in the project report entitled 5G Network Traffic Prediction using Text and Image in partial fulfillment for the award of Degree of Bachelor of Technology in Computer Science and Technology, is a record of our own investigations carried under the guidance of Mr. Lakshmisha S K, School of Computer Science Engineering, Presidency University, Bengaluru.

We have not submitted the matter presented in this report anywhere for the award of any other Degree.

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ABSTRACT

The increasing complexity and scale of modern communication networks, particularly with the advent of 5G, necessitate advanced techniques for network traffic prediction and optimization. Efficient network management is crucial for reducing congestion, improving bandwidth allocation, and minimizing latency, ensuring seamless communication for users. Traditional approaches, including statistical models and rule-based systems, often fall short in adapting to dynamic and unpredictable network conditions. As a result, artificial intelligence (AI) and machine learning (ML) techniques have emerged as promising solutions for predictive network traffic analysis.

This study presents an approach for network traffic prediction using Long Short-Term Memory (LSTM) neural networks, a deep learning model well-suited for handling time-series data. A synthetic dataset simulating real-world 5G network traffic is created, incorporating key performance metrics such as latency, jitter, packet loss, and bandwidth usage. The data undergoes preprocessing, including normalization and sequence generation, to prepare it for model training. The LSTM model is then trained to forecast future network conditions, enabling proactive traffic management and performance optimization.

In addition to traffic prediction, this work integrates an anomaly detection system using the Isolation Forest algorithm. Anomalies in network traffic, such as unexpected spikes in latency or packet loss, can indicate potential system failures, cyberattacks, or network congestion. By identifying and mitigating these anomalies in real-time, network operators can take corrective actions before performance degradation occurs. The combination of predictive modelling and anomaly detection significantly enhances the efficiency, reliability, and security of network operations.

The proposed model is evaluated based on its prediction accuracy, ability to detect anomalies, and overall performance in real-time network environments. Experimental results demonstrate that the LSTM model outperforms traditional statistical methods in forecasting network behaviour, capturing temporal dependencies effectively. The anomaly detection system also exhibits high sensitivity in identifying unusual traffic patterns, further improving network resilience.

Compared to conventional approaches, this AI-driven system offers several advantages, including improved adaptability to fluctuating network conditions, scalability for large-scale deployments, and real-time decision-making capabilities.

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