**SYNOPSIS**

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**Project Title:** Smart Congestion Control In Multi Hop Wireless Networks Using   Machine Learning

**Name of the Guide:**  Dr. Venkata Subramanian N, AP-II, School of Computing, SASTRA University

**Abstract:**

This project focuses on improving network congestion control using machine learning. Traditional congestion control methods struggle to adapt to dynamic network conditions, leading to packet loss and delays. We propose a system that uses the **CatBoost algorithm** to predict congestion levels based on network parameters like packet loss, delay, and jitter. The system adjusts the transmission rate to control congestion and improve network performance. The proposed solution was tested through simulations, showing better packet delivery and reduced congestion compared to traditional methods.

**SPECIFIC CONTRIBUTION**

• Configured and executed NS-2 simulations, designing topologies and traffic scenarios.

•Extracted and preprocessed key features(packet loss ,jitter ,delay) for congestion detection .

• Trained CatBoost,,RF, SVM with CatBoost performed best.and created visuals for presentation.

**SPECIFIC LEARNING**

• Learned feature engineering improves accuracy with metrics like packet loss, jitter, and delay.

• CatBoost outperforms SVM and Logistic regression based on network topology.

• Binary classification improves precision and reduce false negatives in congestion detection.

**TECHNICAL LIMITATIONS & ETHICAL CHALLENGES FACED**

• NS2 struggles with large-scale simulations and lacks real-time monitoring.

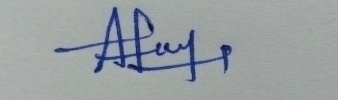
• Data accuracy depends on simulation quality; misconfigurations affect model performance.

• AI misclassification can degrade network performance highlighting the need for interpretability.

***Keywords:*** *Congestion Control, Machine Learning, Network Simulation, Packet Loss, Quality of Service (QoS).*

**Name & Signature of the Student** **Signature of Guide** Midathala Amruthaharini A close up of a signature

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