SIMATS ENGINEERING

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Provision of 5G Network Services with High Efficiency using Artificial Neural Network (ANN) Algorithm in Comparison with Decision Tree Algorithm

INTRODUCTION

- Introduction of 5G networks signifies a pivotal moment in digital connectivity.
- Challenge: Ensuring effective delivery of 5G services necessitates innovative solutions.
- Utilizing Artificial Neural Networks (ANN) and Decision Tree algorithms for optimizing 5G network services.
- Objective: Contrast effectiveness of ANN and Decision Tree algorithms in enhancing 5G efficiency.
- Importance of optimizing network efficiency in the era of 5G's low latency and high-speed connectivity.
- Need for novel computational techniques like ANN to meet dynamic 5G network demands.
- Decision Tree algorithms offer intuitive decision-making but lack exploration in optimizing 5G services.
- Study aims to bridge this gap through rigorous comparison analysis.
- Findings aim to inform telecom stakeholders on performance metrics like throughput and latency.
- Overall goal: Drive 5G network evolution for enhanced efficiency and seamless connectivity.
- This research endeavors to propel 5G networks to unprecedented levels of efficiency and performance, fostering seamless connectivity and digital innovation.

5G Network Services

MATERIALS AND METHODS

DATA COLLECTION
Improving the Efficiency of 5G Network Services has various sources 5G Network Performance Metrics, Network Parameters, User Behavior Data, Environmental Factors, Algorithm Training Data, Baseline Data, Feedback Mechanism Data, Comparative Analysis Metrics.

DATA PREPROCESSING
Gather and Preprocess the dataset(E.g., handling missing values encode categorical, scale features)

Decision Tree
Using the Decision Tree involves collecting and preprocessing 5G networks data, training the classifier, and evaluating its performance.

Artificial Neural Network(ANN)
Applying ANN algorithm to anticipate Improving the Efficiency of 5G Network Services encompasses initial data collection and preprocessing steps.

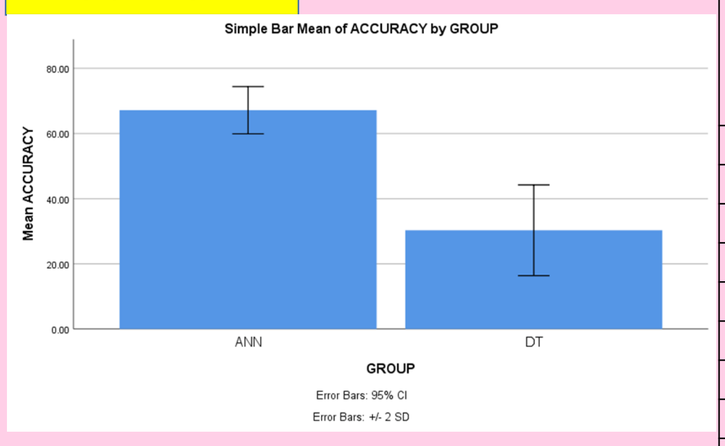
5G Network Services

MODEL ASSESSMENT
The efficacy of both the ANN and Decision Tree models was assessed on the testing set using suitable metrics to ascertain Improving the Efficiency of 5G Network Services.

COMPARISON OF THE MODELS
The ANN and Decision Tree model performances were compared based on the chosen assessment metrics to ascertain which model generated superiority in predicting the Provision of 5G Network Services with High Efficiency .

MODEL INCORPORATION
The incorporation of ANN and Decision Tree for a combined detection was considered, along with enriching RR using external data sources to improve the detecting Efficiency.

RESULTS



ANN and DT

S.No	Test Size	ACCURACY RATE	
		Artificial Neural Networks	Decision Tree
1	Test 1	69.75	43.37
2	Test 2	63.52	23.60
3	Test 3	64.56	17.73
4	Test 4	72.18	30.05
5	Test 5	67.39	40.26
6	Test 6	72.38	39.11
7	Test 7	69.27	33.94
8	Test 8	68.23	32.12
9	Test 9	63.75	26.63
10	Test 10	64.75	29.63
Average Test Results		71.40	37.15

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Accuracy	Artificial Neural Networks	**10**	**67.5500**	**3.36913**	**1.06541**
	Decision tree	**10**	**30.3090**	**6.95474**	**2.19928**

✓ **Mean, Standard Deviation, and Standard error mean with an accuracy rate comparison of Artificial Neural Network over Decision Tree**

Independent Variables

		Levene's test for equality of variances		T-test for equality means with 95% confidence interval						
		f	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std.Error difference	Lower	Upper
Accuracy	Equal variances assumed	1.580	0.225	14.855	18	0.002	36.83700	2.47982	31.62708	42.04692
	Equal Variances not assumed			14.855	13.550	0.003	36.83700	2.47982	31.50169	42.17231

❖ **A significant Threshold value of an Accuracy rate comparison of Artificial Neural Network, and Decision Tree Algorithm**

In the present work Artificial Neural Network is compared with Decision tree and it depicts that the proposed algorithm gives more accuracy when compared with the rest.

DISCUSSION AND CONCLUSION

- ✓ **Based on T-test Statistical analysis, the significance value of p=0.001 (independent sample T - test p<0.05) is obtained and shows that there is a statistical significant difference between the group 1 and group 2.**
- ✓ **Overall , the accuracy of the Artificial Neural Network (ANN) and it is better than the other algorithms.**

  Artificial Neural Network (ANN) - 71.40%

  Decision Tree Accuracy (DT) - 37.15%
- ✓ **From the work , it is concluded that the Artificial Neural Network attains the high accuracy when comparing with other Machine Learning Algorithms in 5G Network Services.**
- ✓ **Enhanced Efficiency: Utilizing ANN algorithms for 5G network services provisioning promises improved resource allocation, network optimization, and QoS management, leading to higher efficiency.**
- ✓ **Comparative Analysis: Contrasting ANN with decision tree algorithms offers insights into their efficacy in managing the complexities of 5G networks, paving the way for future research in developing tailored ANN architectures for advanced network management and scalability.**

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