SIMATS ENGINEERING
Engineer to Excel
TECH STAR SUMMIT 2024
Name: Mr. Puneeth G
Register Number: 192211098
Guided by Dr. R. Senthil Kumar

Efficiency Enhancement of 5G Network Services using Artificial Neural Network (ANN) Algorithm in Comparison with Ridge Regression Algorithm

INTRODUCTION

- Research explores using cutting-edge machine learning, particularly ANNs, to enhance 5G infrastructure development.
- Introduces Ridge Regression as an alternative optimization method for addressing multicollinearity and overfitting concerns in complex data scenarios.
- Aims to compare effectiveness of ANN and Ridge Regression in enhancing 5G network services' performance.
- Highlights advantages and disadvantages of both approaches.
- Provides insights for implementing advanced machine learning techniques in 5G infrastructure.
- Offers practical implications for creating and managing 5G infrastructure.
- Emphasizes importance of implementing state-of-the-art machine learning methods for seamless operation of next-gen telecom systems.
- Examines the potential of Ridge Regression to improve 5G network services, particularly in handling complex data scenarios.
- Evaluates the practical applicability of both ANN and Ridge Regression in real-world 5G infrastructure settings.

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)

Ridge Regression
Using the Ridge regression 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.

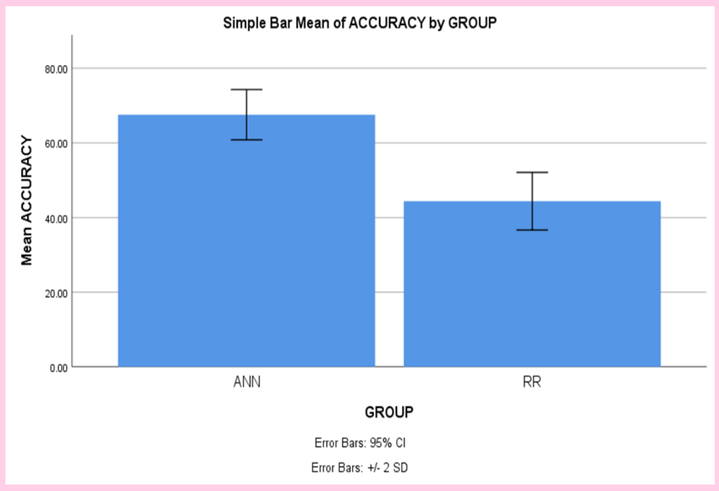
5G Network Services

MODEL ASSESSMENT
The efficacy of both the ANN and RR 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 Ridge Regression model performances were compared based on the chosen assessment metrics to ascertain which model generated superiority in predicting the Efficiency Enhancement of 5G Network Services .

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

RESULTS



S. No	Test Size	ACCURACY RATE	
		Artificial Neural Networks	Ridge regression
1	Test 1	69.75	44.94
2	Test 2	63.52	42.32
3	Test 3	64.56	40.31
4	Test 4	72.18	48.64
5	Test 5	67.39	43.59
6	Test 6	72.38	51.79
7	Test 7	69.27	46.26
8	Test 8	68.23	45.28
9	Test 9	63.75	41.24
10	Test 10	64.75	39.39
Average Test Results		71.40	45.34

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Accuracy	Artificial Neural Networks	10	67.5500	3.36913	1.06541
	Ridge Regression	10	44.3760	3.85726	1.21977

- Mean, Standard Deviation, and Standard error mean with an accuracy rate comparison of Artificial Neural Network over Ridge Regression

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	0.051	0.824	14.309	18	0.002	23.17400	1.61955	19.77145	26.57655
	Equal Variances not assumed			14.309	17.680	0.003	23.17400	1.61955	19.76703	26.58097

- A significant Threshold value of an Accuracy rate comparison of Artificial Neural Network, and Ridge Regression Algorithm

In the present work Artificial Neural Network is compared with Logistic regression 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%
  Ridge Regression(RR) - 45.35%
- 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.
- Innovative technologies like AR, VR, IoT, and driverless cars will proliferate thanks to 5G networks, transforming sectors and promoting economic growth through higher productivity and new business opportunities.
- A transformative era marked by groundbreaking improvements across industries is heralded by the development of 5G. Autonomous cars, AR, VR, and IoT are going to take off and change everything from the entertainment industry to healthcare. Beyond only connectivity, 5G offers enormous possibilities that will increase productivity, efficiency, and open up new commercial avenues. This innovation will propel economic expansion and usher in a time of digital change and increased global competitiveness.

BIBLIOGRAPHY

- A. M. Escolar, J. M. Alcaraz-Calero, P. Salva-Garcia, J. B. Bernabe and Q. Wang, "Adaptive Network Slicing in Multi-Tenant 5G IoT Networks," in IEEE Access, vol. 9, pp. 14048-14069, 2021, doi: 10.1109/ACCESS.2021.3051940.
- F. Debbabi, R. Jmal, L. C. Fourati and A. Ksentini, "Algorithmics and Modeling Aspects of Network Slicing in 5G and Beyonds Network: Survey," in IEEE Access, vol. 8, pp. 162748-162762, 2020, doi: 10.1109/ACCESS.2020.3022162.
- D. Zhao, J. Ren, R. Lin, S. Xu and V. Chang, "On Orchestrating Service Function Chains in 5G Mobile Network," in IEEE Access, vol. 7, pp. 39402-39416, 2019, doi: 10.1109/ACCESS.2019.2895316.
- Q. Zhang et al., "Artificial Intelligence-Enabled 5G Network Performance Evaluation With Fine Granularity and High Accuracy," in IEEE Access, vol. 12, pp. 36432-36446, 2024, doi: 10.1109/ACCESS.2024.3368854.
- M. Asad, A. Basit, S. Qaisar and M. Ali, "Beyond 5G: Hybrid End-to-End Quality of Service Provisioning in Heterogeneous IoT Networks," in IEEE Access, vol. 8, pp. 192320-192338, 2020, doi: 10.1109/ACCESS.2020.3032704.
- F. Alvarez et al., "An Edge-to-Cloud Virtualized Multimedia Service Platform for 5G Networks," in IEEE Transactions on Broadcasting, vol. 65, no. 2, pp. 369-380, June 2019, doi: 10.1109/TBC.2019.2901400.