Name of Scholar: Naveen Kumar

Name of Supervisor: Prof. Anwar Ahmad

Name of Department: Department of Electronics & Communication Engineering

Topic of Research: Intelligent Mobile Communication: When 5G Meets Artificial Intelligence

Findings

In the evolving landscape of 5G communication systems, this thesis explores the integral role of Artificial Intelligence (AI) in revolutionizing cellular networks. As 5G standardization progresses, the sheer complexity and dynamic nature of the network parameters necessitate genuine AI capabilities for self-organization, optimization, and adaptability. The current limitations of 5G networks, such as static service types and reliance on centralized designs like Software Defined Networks (SDN), underscore the need for AI-driven solutions.

The thesis emphasizes the crucial link between AI and proposed 5G strategies, particularly in the context of network slicing, where parallel networks with distinct functionalities need intelligent management. It proposes a data-driven Machine Learning model for network slicing, addressing challenges such as resource allocation, quality of service, and traffic-aware dynamic slicing.

The coexistence problem between Ultra-Reliable Low-Latency Communications (uRLLC) and enhanced Mobile Broadband (eMBB) services in 5G is tackled through a reactive strategy based on Adaptive Neuro Fuzzy Inference System (ANFIS). Additionally, Cloud-Radio Access Network (C-RAN) is explored, introducing an efficient multi-class classification Radio Resources Management (RRM) scheme using AI techniques for dynamic QoS provisioning.

A realistic dataset is built for assessing Machine Learning-based techniques using 5G experimental prototype based on Open-air interface. The experimental results prove that the proposed approach contributes to the critical advancement for forecasting performance in accordance with the error analysis results.

The thesis concludes by presenting experimental results, validating the effectiveness of the proposed AI-driven approaches in enhancing Quality of Service, network throughput, and system utilization in the 5G context. Despite the challenges of handling vast network data and resource allocation complexities, AI, including Machine Learning and Deep Learning, emerges as a pivotal force in realizing the vision of an intelligent 5G era.