Topic 1 — "A Software-Defined Framework for Intelligent Resource Allocation in Wi-Fi 7 Wireless Networks"

This research proposes the design and evaluation of a Software-Defined Networking framework that intelligently manages radio resource allocation in Wi-Fi 7 (IEEE 802.11be) networks. Wi-Fi 7 introduces several advanced MAC-layer features including Multi-Link Operation (MLO), multi-RU OFDMA allocation, and 320 MHz channel bandwidth across the 2.4, 5, and 6 GHz bands that existing static and vendor-default allocation mechanisms are not equipped to exploit optimally. The proposed framework decouples the resource allocation decision logic from the access points by centralizing it in an SDN controller, which collects real-time network state information (channel quality, queue lengths, active links per device) and runs an intelligent allocation algorithm either a reinforcement learning agent or an optimization-based scheduler to dynamically assign channels, spatial streams, and OFDMA resource units to competing stations. The system will be implemented and evaluated in NS-3 using the 802.11be module, comparing the proposed framework against default Wi-Fi 7 allocation and a non-SDN baseline across metrics of throughput, latency, fairness, and spectrum utilization under varying traffic loads and device densities.

Topic 2 — "Performance Analysis of Wi-Fi 7 Networks under SDN-Controlled Traffic Engineering"

This research conducts a systematic performance analysis of Wi-Fi 7 networks in which traffic engineering is governed by an SDN controller, with the goal of characterizing how SDN-driven policies affect network behavior and deriving improved traffic engineering strategies specific to Wi-Fi 7's capabilities. While Wi-Fi 7 significantly increases raw throughput through MLO and wider channels, how traffic engineering decisions at the controller level interact with these physical-layer advancements remains understudied. The study will design and deploy a controlled simulation environment in NS-3 or GNS3 where an SDN controller (Ryu or ONOS) manages flow routing and load distribution across a Wi-Fi 7 topology under diverse traffic scenarios including video streaming, bulk transfer, and latency-sensitive IoT traffic. From the analysis of these experiments, the research will identify performance bottlenecks and propose a set of traffic engineering policies tailored to Wi-Fi 7's multi-link and multi-band architecture, validating that the proposed policies deliver measurable improvements in throughput, end-to-end delay, and jitter over conventional OpenFlow-based traffic engineering applied to earlier Wi-Fi generations.