NWDAF Implementation: Addressing Ping-Pong Issues in 5G Networks for Abnormal Behaviour Analytics

Quang-Vinh Tran*, Tuan-Bach Phan*, Quang-Diep Pham*, Kieu-Ha Phung**

**Viettel High Technology Industries Corporation, Viettel Group, Hanoi, Vietnam*

***Hanoi University of Science and Technology, Hanoi, Vietnam*

vinhtq24@viettel.com.vn, bachpt1@viettel.com.vn, dieppq@viettel.com.vn,ha.phungthikieu@hust.edu.vn

***Abstract*—The complexity of 5G networks demands sophisticated automated monitoring systems, with artificial intelligence transforming network management through data-driven insights. The 3GPP-standardized Network Data Analytics Function (NWDAF) enables this automation by collecting and analyzing network data to optimize performance. This study employs NWDAF's abnormal behavior analysis to address ping-pong phenomena—excessive handovers between cells that degrade service quality through increased network load and latency. We propose a machine learning-driven handover management framework that proactively identifies potential ping-pong events before occurrence. Applied to real-world subscriber data from Viettel's core network, our approach demonstrates substantial reduction in ping-pong occurrences while preserving seamless connectivity. These findings offer practical insights for optimizing handover processes in high-density 5G deployments, directly improving user experience and network efficiency.**

***Keyword*—ping-pong, 3GPP, NWDAF, abnormal behavior, XGBoost, 5G core network, handover.**

Vinh Tran was born in Vietnam in 2000. received the Engineer degree in electronics and telecommunications from Hanoi University Science and Technology, Hanoi, Vietnam, in 2023.

He is currently working at Viettel Group as a member of the research team focusing on artificial intelligence and data mining for telecommunications networks. His work involves applying machine learning, anomaly detection, and large-scale data analytics to optimize network performance, enhance service quality, and explore new AI-driven solutions for modern communication systems. His technical interests include machine learning, AI applications in telecommunications, network data analytics, anomaly detection, and intelligent network optimization.

Bach T Phan was born in Hanoi, Vietnam. He received the Bachelor of Science degree in information science and technology from Temple University, Philadelphia, PA, USA, in 2018.

He has been a Software Engineer for seven years and is currently working at Viettel High Tech, Vietnam. His previous work includes developing AI platforms and optimizing 5G network infrastructure. He has published research on enhancing 5G network performance by minimizing false alarms with machine learning techniques, presented at the ADMA 2025 conference. His current research interests include emerging technologies and applying artificial intelligence to telecommunications networks.

Mr. Quang Diep Pham received the B.Eng. degree from the Hanoi University of Science and Technology, Vietnam, 2010. He is currently Technical Principle Engineer of Viettel High Technology Industry Cooperation – a branch of Viettel Group, Vietnam. He has more than 14 years of experience in designing and developing telecommunication network components from the radio network layer to the core network layer, spanning 2G, 3G, 4G, 5G NSA/SA network generations. Currently, his main job is developing Autonomous Network functionality for 5G networks. He has published research at ICTC, NFV-SDN, ICICT, ICEIS, KubeCon.

Kieu-Ha Phung receved the B.Eng. degree from the Hanoi University of Science and Technology, Vietnam, 2001, the MS in Modeling and Simulation, ICTP and SISSA, Italy, 2003, and Dr. Engineering from Vrije University Brussel, Belgium, 2014. She is currently a Lecturer and Researcher of Electrical and Electronic Engineering with HUST. Her research includes Traffic Engineering techniques in MPLS for optical networks, energy-efficient communications in low-power wireless mesh technologies, LoRa, NB-IoT, Internet of Things, Internet of Vehicles, intelligent transportation; Exploiting AI/ML techniques for performance optimization, operation automation in 5G/6G mobile network – re-design and optimization for cloud-native deployment and automate operation, network slicing, ORAN, mobility management issues, development of solutions and validation on “proof-of-concept” system.