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Traffic Forecasting for Open Radio Access Networks Virtualized Network Functions in 5G Networks

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Abstract : In order to meet the stringent latency and reliability requirements of the upcoming 5G networks, Open Radio Access Networks (O-RAN) have been proposed. The virtualization of O-RAN has allowed it to be treated as a Network Function Virtualization (NFV) architecture, while its components are considered Virtualized Network Functions (VNFs). Hence, intelligent Machine Learning (ML) based solutions can be utilized to apply different resource management and allocation techniques on O-RAN. However, intelligently allocating resources for O-RAN VNFs can prove challenging due to the dynamicity of traffic in mobile networks. Network providers need to dynamically scale the allocated resources in response to the incoming traffic. Elastically allocating resources can provide a higher level of flexibility in the network in addition to reducing the OPerational EXpenditure (OPEX) and increasing the resources utilization. Most of the existing elastic solutions are reactive in nature, despite the fact that proactive approaches are more agile since they scale instances ahead of time by predicting the incoming traffic. In this work, we propose and evaluate traffic forecasting models based on the ML algorithm. The algorithms aim at predicting future O-RAN traffic by using previous traffic data. Detailed analysis of the traffic data was carried out to validate the quality and applicability of the traffic dataset. Hence, two ML models were proposed and evaluated based on their prediction capabilities.

Keywords : O-RAN, traffic forecasting, NFV, ARIMA, LSTM, elasticity
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