Effect of network topology on accuracy of optical quality of transmission prediction algorithm

Rakesh Nair, Master of Science in Computer Science

University of Dublin, Trinity College, 2022

Supervisor: Dr. Marco Ruffini

During the past decade, there has been a rapid growth of data traffic in optical transmission. The demand for network bandwidth keeps on growing with the emergence of internet applications such as streaming, cloud, virtual reality, 5G, internet of things. The increase in data traffic will affect the response time and quality of services provided over the network and increase demand in the backbone Dense Wavelength Division (DWDM) Multiplexing network traffic. The quality of transmission needs to be evaluated before a solution is introduced. Thus, the machine learning method is proposed to assess the quality of transmission. The performance of the optical transmission is measured with the help of signal-to-noise ratio, Q-factor, and dispersion. The network capacity throughout optimization is one of the most critical features in terms of a solution's commercial viability. This algorithm will improve the path performance estimation accuracy by interrogating optical performance monitoring (OPM) devices in the network. Before being implemented in a real system, the algorithm's scalability will be verified using a Mininet-Optical packet-network simulator. We will be able to examine the optical network impairments for varying topologies with the aid of this development. The Watts-Strogatz technique is utilized to configure different combinations of topologies, and metrics datasets gathered with OPM were used to train the model. The model used for this study has demonstrated a 99% accuracy in predicting QoT of established lightpaths in various topologies built using the emulator.