

Master thesis No. 1062

Designing Autoencoder Neural Networks for Efficient IP-Optical Networking



Methods

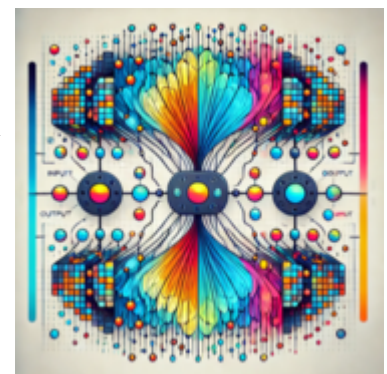
Simulation
Programming
Autoencoders

Topics

Multi-layer networks
Network control
Machine learning

Background

Today, communication networks have evolved into intricate and complex systems responsible for handling vast amounts of data, making efficient management and optimization crucial. The network is characterized by metrics collected into the network state. Effectively encoding the network state is crucial to implement machine learning (ML) algorithms that tackle complex problems like the Routing and Spectrum Assignment (RSA) problem in IP-optical networks. The RSA problem is a significant challenge in networking and involves determining the best path and spectrum allocation for data transmission.



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Autoencoders, a type of artificial neural network, have garnered significant attention due to their potential to learn efficient data representations, sparking optimism for their application in networking. These architectures consist of an encoder that compresses the input data into a lower-dimensional latent space and a decoder that reconstructs the original input from this latent space. By leveraging autoencoders to compress network state information into a lower-dimensional latent space, the complexity of these machine learning models can be significantly reduced. This has the potential to greatly enhance their performance, efficiency, and generalizability.

Problem Description

In the context of this thesis, you are called to use autoencoders to compress network state information for machine learning applications. More specifically, the thesis consists of the following steps:

- Familiarize yourself with the related Julia packages and provided datasets
- Perform supervised machine learning to solve the RSA problem
- Implement autoencoders for the state fed to the network
- Evaluate the impact of autoencoders on solving the RSA problem

Acquired Knowledge and Skills

In this thesis, you will enrich your knowledge of neural networks and autoencoders, a method of encoding an input vector to a latent space for machine learning. You will also experiment with the scientific programming language Julia. Finally, you will get a great insight into networking and network services.

Requirements

Programming Experience
Basics of neural networks

Desirable knowledge

Communication Networks Architecture and Design

Programming Experience in Julia

Contact

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