

Design of a Channel Code for CV- QKD using Neural Networks

Master's Thesis

Project

Continuous-variable quantum key distribution (CV-QKD) is a promising technique for secure communication based on quantum mechanics principles. However, one of the main challenges in CV-QKD is to design efficient channel codes that can correct the errors introduced by the noisy quantum channel and the imperfect detection devices.

Most of the existing channel codes for CV-QKD are based on low-density parity-check (LDPC) codes, which have near-Shannon-limit performance but require high decoding complexity and long block lengths. In this thesis, a novel channel code for CV-QKD that can achieve a low frame error rate (FER) rather than a bit error rate (BER), which is more relevant for the secret key rate of CV-QKD, will be designed using neural networks. Different neural network architectures and training methods will be explored to optimize the code performance and complexity. The proposed code is compared with the state-of-the-art LDPC codes in terms of FER, decoding latency, and complexity.

Tasks

1. Formulation of the design problem as a supervised learning problem.
2. Training and testing the NN-based code.
3. Evaluating and comparing the performance and complexity.

Requirements

- ✓ (optimally) Good skills in MATLAB/C++/Python
- ✓ Interest in channel coding

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