

Master's Thesis, Forschungspraxis

Neural Networks (NNs) for Direct Detection

In [1] we consider a short-reach fiber-optic link with a single photodiode at the receiver, which is a so-called direct detector (DD). The DD outputs a signal, proportional to the squared **magnitude** of its input. At first glance, this makes phase modulation challenging. In [1] we showed that inter-symbol interference (ISI) can be used to retrieve the phase. A suboptimal symbol-wise MAP detector was then proposed for phase retrieval. However, the detector exhibits a large complexity, which grows exponentially in the amount of ISI.

The task of the student is to efficiently approximate the MAP detector using a NN. An appropriate NN type/structure needs to be selected. Finally, lower bounds on the achievable rates are computed to evaluate the performance of the NN and compare it to the MAP detector [1].

[1] D. Plabst et al., "Achievable Rates for Short-Reach Fiber-Optic Channels With Direct Detection," in *Journal of Lightwave Technology*, vol. 40, no. 12, pp. 3602-3613, 15 June 2022, doi: 10.1109/JLT.2022.3149574.

Prerequisites

Machine Learning

Statistical Signal Processing

Advisors

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