6/24/2019

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**Machine Learning for Communications with Short Block Lengths**

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This report focused on applying recent developments in machine learning to the field of communications to improve performance over channels which are unknown or difficult to model. It has been shown that optimising each stage of a communication system individually gives suboptimal performance, leading to investigating end-to-end learnt communication systems, where the optimal communication system can be learnt for a particular channel, environment and for specific hardware non-idealities.

The report reproduces results from two recent papers [1,2] on the subject, exploring unsupervised models and investigating supervised models with additive white Gaussian noise (AWGN), Rayleigh block fading (RBF). It then goes further by applying the above methods to Ricean fading (RF) channels.

The report produced predominantly similar results to [1] for supervised models, giving identical performance for two of the three (*n*,*k*) configurations. However, differences were found, sometimes showing lower performance of the technology in question or less aesthetic t-distributed stochastic neighbor embedding (t-SNE) based constellation diagrams, which the original authors overlooked.

[1] T. O’Shea and J. Hoydis. An introduction to deep learning for the physical layer.*IEEE Trans. on Cogn. Commun. Netw.*, 3(4):563–575, July 2017.

[2] F. A. Aoudia and J. Hoydis. End-to-end learning of communications systems without a channel model.*Nokia Bell Labs*, Apr. 2018.