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Optical Fiber Nonlinearity Equalizer Based Perturbation Theory on Deep Neural Network Classifier

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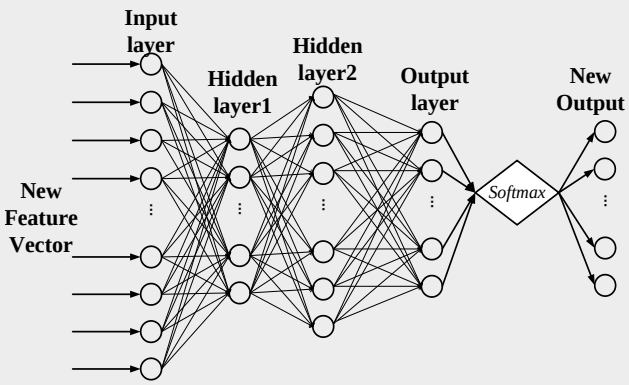
Abstract

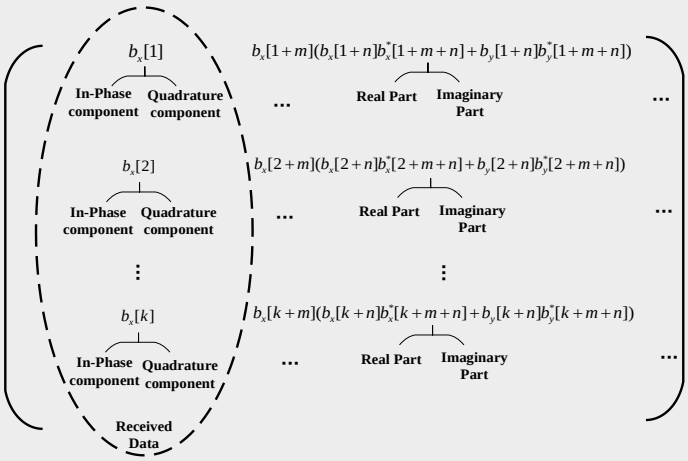
In this paper, based on DNN, we reconstructed input features through I/Q data at receiving side with perturbation theory and proposed a new classifier FEP-DNN.

Keywords- *optical fiber nonlinearity; neural network classifier; perturbation theory*.

Principles



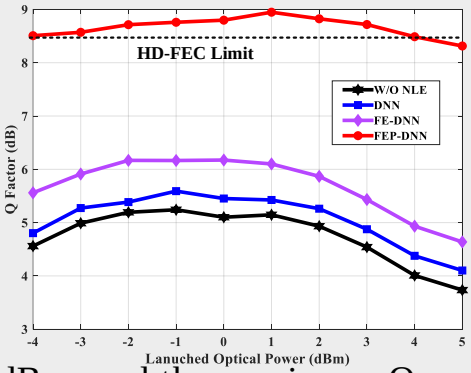
The structure of FEP-DNN classifier



New vector matrix of x-polarization direction

Results and Discussion

Fig in the right shows the Q-Factor dependence on the launch optical power after transmission through 375km for DNN, FE-DNN, FEP-DNN as well as without (W/O) employing NLE methods. When we use FEP-DNN, we construct a new feature matrix by perturbation method as the feature vectors, the Q-Factors can well exceed the HD-FEC when the launch optical power is in the range of -3 dBm to 3 dBm, and the maximum Q-Factor reaches 8.947 dB at 1 dBm launch optical power.



Conclusion

In this work, we revisited the use of neural network as classifier. We combined the traditional nonlinearity compensation method based on perturbation with neural network classifier. In case of 120Gb/s DP-64QAM coherent optical system with 375km transmission distance, we reconstructed the input characteristics of neural network, and demonstrated we can reach 8.947dB at the optimum launched optical power.

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