

## **Bidirectional Long Short-Term Memory-Based Signal Detection for Orthogonal Frequency Division Multiplexing With All Index Modulation**

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**Abstract :** This paper proposed the bidirectional long short-term memory (Bi-LSTM) network-aided deep learning (DL)-based signal detection for Orthogonal frequency division multiplexing with all index modulation (OFDM-AIM), namely Bi-DeepAIM. OFDM-AIM is developed to increase the spectral efficiency of OFDM with index modulation (OFDM-IM), a promising multi-carrier technique for communication systems beyond 5G. In this paper, due to its strong classification ability, Bi-LSTM is considered an alternative to the maximum likelihood (ML) algorithm, which is used for signal detection in the classical OFDM-AIM scheme. The performance of the Bi-DeepAIM is compared with LSTM network-aided DL-based OFDM-AIM (DeepAIM) and classic OFDM-AIM that uses (ML)-based signal detection via BER performance and computational time criteria. Simulation results show that Bi-DeepAIM obtains better bit error rate (BER) performance than DeepAIM and lower computation time in signal detection than ML-AIM.

**Keywords :** bidirectional long short-term memory, deep learning, maximum likelihood, OFDM with all index modulation, signal detection

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