SNR Classification Using Multiple CNNs

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Abstract : Noise estimation is essential in today wireless systems for power control, adaptive modulation, interference suppression and quality of service. Deep learning (DL) has already been applied in the physical layer for modulation and signal classifications. Unacceptably low accuracy of less than 50% is found to undermine traditional application of DL classification for SNR prediction. In this paper, we use divide-and-conquer algorithm and classifier fusion method to simplify SNR classification and therefore enhances DL learning and prediction. Specifically, multiple CNNs are used for classification rather than a single CNN. Each CNN performs a binary classification of a single SNR with two labels: less than, greater than or equal. Together, multiple CNNs are combined to effectively classify over a range of SNR values from −20 ≤ SNR ≤ 32 dB.We use pre-trained CNNs to predict SNR over a wide range of joint channel parameters including multiple Doppler shifts (0, 60, 120 Hz), power-delay profiles, and signal-modulation types (QPSK,16QAM,64-QAM). The approach achieves individual SNR prediction accuracy of 92%, composite accuracy of 70% and prediction convergence one order of magnitude faster than that of traditional estimation.

Keywords : classification, CNN, deep learning, prediction, SNR

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