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CNN-Based Spectrum Sensing System for Eavesdroppers in Low Probability of Intercept Communication

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Abstract: This paper proposes a convolutional neural network (CNN)-based spectrum sensing system for eavesdroppers to enhance the efficiency of low probability of intercept (LPI) communication. LPI communication plays a critical role in military and security applications, focusing on concealing signals to prevent detection by eavesdroppers or adversaries. To achieve this, transmitted signals are hidden by leveraging environmental noise or artificial signal characteristics, while received signals are designed to ensure safe and covert data transmission by avoiding detection.

In this study, we generate spectrograms by visualizing the frequency spectrum of received signals from the perspective of eavesdroppers and utilize these for spectrum sensing techniques to determine the presence or absence of signals. Simulation results show that when using an FFT point size of 256 and an observation length of 128, the proposed system achieves equal or superior performance compared to traditional energy detection methods, which rely on simple calculations to determine signal presence.

This research contributes to improving the design and security of LPI communication systems and is expected to enhance their applicability in various communication environments.

Keywords: LPI, Spectrum Sensing, Deep Learning, CNN