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Open-Set Human Activity Recognition Based on Micro-Doppler Signatures

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Abstract

Open-set activity recognition remains as a challenging problem because of complex activity diversity. In previous works, extensive efforts have been paid to construct a negative set or set an optimal threshold for the target set. In this paper, a model based on Generative Adversarial Network (GAN), called ‘OpenGAN’ is proposed to address the open-set recognition without manual intervention during the training process. The generator produces fake target samples, which serve as an automatic negative set, and the discriminator is redesigned to output multiple categories together with an ‘unknown’ class. We evaluate the effectiveness of the proposed method on measured micro-Doppler radar dataset and the MOTion CAPture (MOCAP) database from Carnegie Mellon University (CMU). The comparison results with several state-of-the-art methods indicate that OpenGAN provides a promising open-set solution to human activity recognition even under the circumstance with few known classes. Ablation studies are also performed, and it is shown that the proposed architecture outperforms other variants and is robust on both datasets.

Keywords: Open-set Recognition, Generative Adversarial Network (GAN), Human Activity, Micro-Doppler Radar

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