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AI-Powered Detection of Deepfakes Using EfficientNet and Vision Transformer

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Abstract: *Deepfakes are artificially tampered videos generated by GANs that often present realistic yet fake scenes[1]. Given the rapid advancement of deep generative models, both the sophistication and ease of access to manipulation technologies have increased significantly, thus increasing the difficulty of detection[1]. Most of the existing deepfake detection methods are built on top of CNNs, with very good performance in individual target datasets but poor generalization to unseen manipulation techniques due to overfitting[1]. In this paper, we develop a novel deepfake detection model, termed MEViT, that leverages a meta-learning framework to enhance generalization across unseen forgery types on top of EfficientNet Vision Transformer[1]. More concretely, MEViT introduces Pair-Discrimination Loss (PDL) that pushes away the feature representations of fake samples from the real ones at the embedding level[1]. On top of PDL, it introduces Domain Adjustment Loss (DAL) to reduce domain shifts across different manipulation methods by pushing all feature representations to a common embedding center[1]. Our extensive experiments on two widely benchmarked datasets, FaceForensics++ and CelebDF-v2, show that MEViT consistently outperforms the state- of-the-art approaches, especially in challenging cross-domain testing scenarios where generalization to unseen manipulations is most critical[1].*

Keywords: Deepfake detection, Meta-learning, Domain generalization, EfficientNet, Vision Transformer, GANs, Pair- Discrimination Loss, Domain Adjustment Loss

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