AI-Generated Image Detection Using Semantic Feature

Hau-Ching Chen*, Yu-Pin Shen*, Yi-Hung Yeh*, Jiann-Liang Chen*

Department of Electrical Engineering, National Taiwan University of Science and Technology Taipei, Taiwan
M11207522@mail.ntust.edu.tw, M11207508@gapps.ntust.edu.tw, M11207510@mail.ntust.edu.tw,
lchen@mail.ntust.edu.tw

Abstract—**In recent years, the rapid advancement of deep learning has brought generative models to the forefront of technological innovation, enabling the creation of highly realistic images from simple text inputs. However, this progress has also introduced new challenges in distinguishing real from synthetic content, a concern particularly evident in the misuse of such technologies for malicious purposes. This paper investigates the generalization capabilities of the CLIP Vision Transformer (ViT) model for fake image detection, leveraging its semantic understanding of images. We employ a cross-validation approach using the GenImage dataset to evaluate the performance of CLIP ViT against traditional models like ResNet-50 and Swin-T. Results demonstrate that CLIP ViT exhibits superior generalization ability on unseen datasets, outperforming other models by focusing on high-level semantic features rather than dataset-specific patterns. This study highlights the potential of CLIP ViT in advancing the detection of generative model outputs by capturing underlying semantic relationships, suggesting a paradigm shift towards more robust and generalized detection techniques.**

Keyword—**Deep Learning, CLIP Vision Transformer, Fake Image Detection, Semantic Understanding, Cross-Validation**

Hau-Ching Chen was born in Taiwan in 1999. He received a B.S. degree in Electronic Engineering in 2023. He is currently pursuing an M.S. degree in Electrical Engineering at the National Taiwan University of Science and Technology (NTUST), Taipei. His main research interests include Deep Learning and Computer Vision.

Yu-Pin Shen was born in Taiwan in 1999. He received a B.S. degree in Electronic Engineering in 2022. He is currently pursuing an M.S. degree in Electrical Engineering at the National Taiwan University of Science and Technology (NTUST), Taipei. His main research interests include Artificial Intelligence, the Internet of Things (IoT), AI Image Detection, and Cybersecurity.

Yi-Hung Yeh was born in Taiwan in 2000. He received a B.S. degree in Electronic Engineering in 2022. He is currently pursuing an M.S. degree in Electrical Engineering at the National Taiwan University of Science and Technology (NTUST), Taipei. His main research interests include Artificial Intelligence, Human-Computer Interaction and Computer Vision.

Jiann-Liang Chen (Senior Member, IEEE) was born in Taiwan on December 15, 1963. He received a Ph.D. in Electrical Engineering from the National Taiwan University, Taipei, Taiwan, in 1989. Since August 1997, he has been with the Department of Computer Science and Information Engineering of National Dong Hwa University, where he is a professor and Vice Dean of Science and Engineering College. Prof. Chen joins the Department of Electrical Engineering, National Taiwan University of Science and Technology, as a Distinguished Professor and Dean. His research interests are cellular mobility management, cybersecurity, personal communication systems, and the Internet of Things (IoT).