IEEE TBIOM SPECIAL ISSUE

Generative AI and Large Vision-Language Models for Biometrics

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CALL FOR PAPERS

Motivation

In the rapidly advancing field of artificial intelligence, generative AI and large-scale vision-language models are becoming key areas of interest, revolutionizing numerous research fields, including natural language processing and computer vision. Generative AI models are designed and trained to approximate the underlying distribution of a dataset, enabling the generation of new samples that reflect the patterns and regularities within the training data. Among the various types of generative models, such as Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), flow-based, autoregressive, and diffusion models, GANs and diffusion models have gained significant attention and are widely applied to tasks such as image synthesis, image manipulation, text generation, and speech synthesis. These models have shown remarkable success in modeling and interpreting the probability distributions of real-world data. Vision-language models, on the other hand, integrate visual and textual data, learning to associate these modalities to enhance understanding and enable multimodal reasoning-based applications.

The advancements in generative AI and vision-language models (LVMs) are also making a significant impact on biometrics, offering new possibilities for addressing longstanding challenges. Generative AI, with its ability to synthesize highly realistic data, has the potential to address privacy concerns related to collecting, sharing, and using sensitive biometric data. This synthetic data can also be used to increase diversity and variation in training datasets through augmentation, thus improving model generalizability and reducing potential bias induced by imbalanced training data. At the same time, large vision-language models offer the capability to process and understand multimodal information by combining visual features with contextual data, such as semantic insights from natural language. Furthermore, large-scale vision-language models can be optimized for downstream tasks, such as template extraction, using zero or few-shot learning approaches, making them highly versatile for biometric applications.

Although generative AI and vision-language models offer a rich set of tools that can be utilized to address challenges in biometrics, the misuse of these technologies presents a threat to the field. Generative AI models have the ability to incorporate conditions in the generation process to take control over the generated samples. This enables a wide range of applications such as image-to-image translation, text-to-image synthesis, and style transfer. However, this capability also allows for creating

deepfake attacks, e.g., images, videos, and audio that are indistinguishable or nearly indistinguishable from real content. The increased realism and widespread public accessibility of generative AI have raised concerns about the potential misuse of this technology for malicious purposes. This highlights the need for solutions to detect generated AI content and mitigate the potential misuse of generative AI models.

The proposed TBIOM special issue will provide a platform to discuss the latest advancements and technical achievements related to Generative AI and Large vision-language models when applied to problems in biometrics. The topics of interest of the special issue include, but are not limited to:

- Novel generative AI models for responsible synthesis of biometric data
- Novel generative models for conditional data synthesis
- Biometrics interpretability and explainability through large language-vision models
- Few-shot learning from large language-vision models
- Generative AI and LVMs for detecting attacks on biometrics systems
- Generative AI-based image restoration
- Information leakage of synthetic data
- Data factories and label generation for biometric models
- Quality assessment of AI generated data
- Synthetic data for data augmentation
- Detection of generated AI contents
- Bias mitigation using synthetic data
- LLMs and VLMs for biometrics
- Watermarking AI generated content
- New synthetic datasets and performance benchmarks
- Security and privacy issues regarding the use of generative AI methods for biometrics
- Ethical considerations regarding the use of generative AI methods for biometrics
- Parameter efficient fine-tuning of VLMs for biometrics applications

Important Dates

- Submission deadline: **31 May 2025**
- First round of reviews completed (first decision): **August 2025**
- Second round of reviews completed **October 2025**
- Final papers due **December 2025**
- Publication date: **Q1 2026**

Paper Submission

Papers should be submitted through the TBIOM submission portal before the deadline using the TBIOM journal templates: https://ieee.atyponrex.com/journal/tbiom and selecting the article type: "*Generative AI and Large Vision-Language Models for Biometrics*".