Generative Artificial Intelligence for Medical Imaging

Generative Artificial Intelligence (AI) is revolutionizing the field of medical imaging, introducing unprecedented capabilities for image synthesis, enhancement, and analysis. The integration of generative AI models into medical imaging workflows is reshaping diagnostics, treatment planning, and research by addressing challenges such as data scarcity, image quality enhancement, and multimodal integration. Generative models may also provide opportunities for creating future-state predictions, such as forecasting disease progression using synthetic imaging techniques.

This Special Issue aims to highlight the latest advancements in generative AI applications specifically tailored for medical imaging, emphasizing methodological innovations, clinical applicability, and ethical considerations. By fostering collaboration between AI researchers, healthcare professionals, and domain experts, this collection seeks to accelerate the adoption of generative AI technologies in clinical practice.

Topics include but are not limited to:

1. **Synthetic Medical Image Generation:** Exploring the generation of high-quality synthetic images to address data imbalances and augment training datasets for diagnostic and prognostic tasks.
2. **Image-to-Image Translation:** Advancing the use of generative AI in translating between imaging modalities (e.g., MRI to CT, PET to CT) to facilitate comprehensive patient evaluations.
3. **Super-resolution and Image Enhancement:** Employing generative techniques for improving image resolution and quality, particularly for low-quality or compressed datasets.
4. **Noise Reduction and Artifact Correction:** Utilizing generative models to mitigate noise and correct artifacts in medical images, enhancing diagnostic reliability.
5. **Multimodal Imaging Modalities Integration:** Developing innovative generative architectures to fuse information from multiple imaging modalities (e.g., MRI, CT, PET, ultrasound, etc.) for more comprehensive diagnostic and prognostic insights.
6. **Explainability and Model Interpretability:** Addressing the challenge of making generative AI models understandable and explainable in medical imaging.
7. **Training in Data-Scarce Environments:** Employing strategies like transfer learning, data augmentation, and synthetic data generation to improve model performance in limited data scenarios.
8. **Disease Progression Forecasting**: Predicting future states of medical images using generative models to aid early intervention and treatment planning.
9. **Diffusion and Foundation Models**: Exploring how diffusion models can be integrated into foundation models for robust, scalable, and generalizable solutions in medical imaging.

To ensure both workflow reproducibility and generalization capabilities, the proposed models should be trained on public datasets and validated on external datasets (proprietary and/or public).

Researchers are encouraged to submit high-quality, original methodological research articles, but also applicative papers are welcome. Submissions should align with the Special Issue's scope and thematic areas, presenting state-of-the-art generative AI applications or novel methodologies for medical imaging. Submissions should demonstrate a substantial extension of approximately 60–70% compared to any related conference papers. Authors are encouraged to highlight the additional contributions in their cover letters. All manuscripts will undergo rigorous peer review to ensure the highest quality and scientific rigor.

Important Dates

- **Submission Open Date**: 01/02/2025
- **Final Manuscript Submission Deadline**: 01/09/2025

- **Editorial Acceptance Deadline**: 31/12/2025

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