



IEEE Transactions on Medical Imaging

Special Issue on Advancements in Foundation Models for Medical Imaging

Foundation models, e.g., ChatGPT/GPT-4/GPT-4V, at the forefront of artificial intelligence (AI) and deep learning, represent a pivotal leap in the domain of computational intelligence. These models serve as the bedrock upon which a myriad of advanced applications are built, offering a versatile and powerful framework for solving complex problems across diverse domains. In the context of machine learning, foundation models act as comprehensive learning architectures, pre-trained on vast datasets to capture a broad understanding of patterns and features. Their significance lies not only in their ability to achieve state-of-the-art performance in specific tasks but also in their potential to serve as the starting point for fine-tuning and transfer learning across a spectrum of applications. As catalysts for innovation, foundation models have redefined the landscape of artificial intelligence, showcasing unprecedented capabilities in natural language processing, computer vision, and beyond. Foundation models in medical imaging inherit all the abovementioned characteristics but they are specifically designed to analyze and interpret medical images.

This special issue aims to explore and showcase cutting-edge research in the development and application of foundation models for medical imaging within the field of healthcare. Foundation models, such as GPT-4V, rooted in large multimodal language and vision models, have emerged as transformative tools in medical image analysis, offering unprecedented capabilities in image recognition, segmentation, and diagnostic assistance. This special issue will feature contributions that address key challenges in the design, training, and deployment of foundation models tailored specifically for medical imaging tasks. Researchers and practitioners are invited to submit manuscripts that delve into novel architectures, pretraining and fine-tuning strategies, interpretability, and ethical considerations related to foundation models and their integration into clinical practice. The goal is to foster a deeper understanding of the potential benefits and limitations of these models, paving the way for their responsible and effective use in enhancing diagnostic accuracy and improving patient care in the field of medical imaging.

This special issue calls for original and innovative methodological contributions which address the key challenges in developing, validating and applying foundation models for medical imaging. This is an open call for papers. Authors of papers related to foundation models that have been accepted to conferences like the IEEE International Symposium on Biomedical Imaging (ISBI) 2024 are encouraged to extend their works to meet IEEE TMI standard and submit them to this special issue. Submissions should focus on advanced development of the technical aspects of new foundation models, and all the developed new methods should meet the TMI's standard of technical novelty and should also be evaluated or validated on real and large-scale medical imaging data. Review articles or position papers on this topic are considered out of the scope of this special issue.

Topics of interest include but are not limited to:

- Developments and validations of large language models for medical imaging
- Developments and validations of large vision models for medical imaging
- Developments and validations of large multimodal language/vision models for medical imaging
- Developments and validations of foundation models for image reconstruction
- Bottom-up and/or top-down approaches to developing, validating and applying foundation models for medical imaging
- Curating and integrating large-scale, high-quality expert annotations/descriptions of medical imaging data for the development and validation of foundation models

- Developing new methods for better pretraining and fine-tuning of foundation models for medical imaging
- Adaptation, fine-tuning and optimization of foundation models to specific medical imaging tasks and model distillation
- Developing new methods for reinforcement learning from human feedback in foundation models of medical imaging
- Developing new methods that promote the explainability, generalizability, trustworthiness, and fairness of foundation models
- Novel integration and application of foundation models of medical imaging in clinical deployment
- Trustworthy and ethical considerations of foundation models in medical imaging

Authors must submit papers on [ScholarOne](#) according to the instructions [here](#). Please choose “Special Issue on Advancements in Foundation Models for Medical Imaging” as the manuscript type in the submission process. Four reviewers will be typically recruited according to the standard TMI review protocol. Authors are encouraged to discuss with one of the guest editors to determine the suitability for this special issue.

Guest Editors:

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Schedule:

Submission of manuscripts: due on July 1st, 2024

Initial decision: August 15th, 2024

Revised manuscripts: due on October 1st, 2024

Final acceptance: November 15th, 2024

Publication: To be determined