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J-BHI Special Issue on "Advancing Medical Image Analysis through Self-Supervised Learning: Innovations, Applications, and Future Directions"

In modern medical diagnostics, medical image analysis, particularly the interpretation of medical imaging data such as MRI, CT scans, X-rays, Ultrasound, and PET scans, is a primary area of importance. Medical image analysis is mainly concerned with processing and analyzing medical images to extract useful information that helps in making precise diagnoses. However, a significant challenge in advancing this field is the availability of labelled data. To address this critical concern and to advance the area of medical image analysis, this special issue focuses on exploring Self-Supervised Learning (SSL), which is extremely helpful in cases where the available data is unlabeled and holds the potential to transform the field of medical image analysis. Traditional SSL techniques cannot be directly applied to medical images as they are different from ordinary images. There are certain significant concerns related to the applicability and effectiveness of SSL for medical data that need the attention of researchers. Moreover, it is extremely important to explore which type of SSL technique works best from predictive, generative, and contrastive learning perspectives.

This special issue, in this regard, invites cutting-edge research and novel contributions in the field of SSL for medical image analysis. In addition to original research articles, this SI welcomes systematic literature reviews (SLRs) and critical evaluation studies that review existing SSL techniques and evaluate them for their applicability in practical medical settings. The evaluation studies should address the problems of using SSL in healthcare, such as trust and privacy of user data, the utilization of explainable AI to assist medical practitioners in making quick and accurate diagnoses.

Topics of interest include, but are not limited to, the following:

- Novel algorithms and architectures for SSL in medical imaging.
- SSL applications in disease diagnosis, patient monitoring, medical response, patient care management, etc.
- Integration of SSL with clinical metadata, i.e., methodologies to incorporate clinical metadata into SSL frameworks.
- The SSL contrastive pre-training methods in medical imaging, such as Multi-Instance Contrastive Learning (MICLe) for enhancing model robustness and accuracy in medical diagnostics.
- 3D SSL applications, e.g., investigating the extension of self-supervised algorithms to 3D medical imaging.
- Knowledge-guided self-supervised Vision Transformers for improving interpretability and performance on tasks like lung and heart segmentation and disease classification from chest X-rays, etc.
- Cross-modal learning in medical image analysis
- Ethical considerations and bias mitigation in self-supervised learning.

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Key Dates

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