

# IEEE JOURNAL OF BIOMEDICAL AND HEALTH INFORMATICS

## J-BHI Special Issue on “Multimodal Approaches in Neuroimaging with Explainable and Responsible AI” (MANER-AI)

Alzheimer’s Disease and other forms of dementia cause a deterioration in cognitive functions, such as memory, thinking, behaviour, etc., and therefore affect the ability to perform daily activities. Early detection methods based on Artificial Intelligence (AI, machine learning, and deep learning), in combination with data preprocessing methods (image registration, segmentation, fusion, etc.), are crucial to understand the basis and etiology of these neurological diseases and to assess the effect of new treatments currently under investigation in clinical trials. Nowadays, we know that symptoms appear only after decades of brain degeneration (the so-called preclinical dementia). Thus, the need for early detection is absolutely essential to fight against the disease at its onset and ensure its proper treatment. Novel neuroimaging modalities and biomarkers are widely used in combination with other blood, cerebrospinal fluid and genetic biomarkers to indicate the presence of traces of the disease. While these approaches typically require additional data preprocessing pipelines to provide reliable data for further analysis, neuroimaging is also harnessing existing AI approaches that enable advanced image registration, segmentation, and fusion in this field. Moreover, large international multicenter/multimodal studies are currently providing thousands of samples to test the value of these neurodegeneration biomarkers. The vast amount of available data presents an opportunity for the development of more accurate statistical models of neurodegeneration, enabling early recognition as well as the characterization of the progressive course of dementia. However, it can also pose issues if the most significant aspects of AI are not properly addressed, namely, Explainable AI (XAI) and Responsible AI (RAI).

Within this context, the aim of this Special Issue (SI) is to present the current state of the art in the theory and practice of Computer-Aided Diagnosis (CAD) Systems in Neuroimaging and biomedical applications in general. The issue will follow the organization of the 10<sup>th</sup> International Conference on the Interplay of Natural and Artificial Computation (ICINAC) and MALENE WORKSHOP to be held within the ICINAC conference. The special issue will be comprised of extensions of some of the best works announced in the workshop, along with papers submitted within the open call, taking also into account the target audience of the JBHI journal. Potential fields of research covered in this SI include, but are not limited to:

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

- Statistical learning theory and neuroimaging/biomedical data for RAI
- Bayesian Inference and hypothesis-driven methods of neuroimaging/biomedical data
- Dynamic and time-varying approaches to model connectivity
- Statistical models of neurodegeneration for diagnosis and prognosis (classification and regression tasks)
- XAI techniques (SHAP, LIME, RISE, etc.) in limited sample size neuroimaging
- Algorithms for large-scale data analysis
- Weakly/semi-supervised algorithms for image segmentation and classification
- Generative models for multimodal image synthesis, such as GANs, VAEs, and more.

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### Key Dates

Deadline for Submission: 31 Aug, 2024

First Reviews Due: 05 Oct, 2024

Revised Manuscript Due: 01 Nov, 2024

Final Decision: 01 Dec, 2024