

# AI FOR NEUROIMAGING

## -A DIAGNOSTIC TOOL FOR NEURODEGENERATIVE DISEASES

The past decade has seen tremendous efforts in biomarker discovery and validation for neurodegenerative diseases. There is a pressing need for better diagnosis for people affected by neurodegenerative disorders, as well as an improvement of modern techniques in order to characterize the nature of the disorders.

There has been a growing interest in AI techniques in imaging approaches, i.e. fMRI, PET, DTI and particularly sMRI. Classifier models are built by extracting information from imaging modalities through reliable biomarkers such as the changes observed in brain tissue and molecule depositions in specific anatomical regions.

Most AI methods consist of Supervised Learning. In this case, classification is based on the disease status or a related endophenotype and the techniques include mainly SVMs. Unsupervised Learning is implemented to reduce the complexity of datasets or stratify data by feature similarity. Furthermore, advanced Deep Learning methodologies are used for automatic extraction of features and brain region selection.

Integrating AI techniques with neuroimaging and imaging-based biomarkers results in a good overall performance which can improve disease understanding and diagnosis. Studies show a high level of accuracy in terms of classification and multimodal analysis, i.e. the combination of data from multiple imaging modalities, which enables models to train on diverse biomarkers, providing a more detailed insight into underlying disease processes.

However, care should be taken when considering the outcomes of the algorithms, often operating as black boxes. Limiting factors such as a small or poor dataset and the nature of the disease itself represent an open issue.

Among the different research fields, AI methods applied to imaging approaches continue to evolve and are making major contributions to early diagnostic biomarkers. The results are promising, often surpassing current techniques in speed and accuracy. Nevertheless, the limitations reveal the need for further improvements and collaboration between experts in order to incorporate AI techniques in clinical settings.

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