AUTISM SPECTRUM DISORDER CLASSIFICATION MODEL

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Introduction

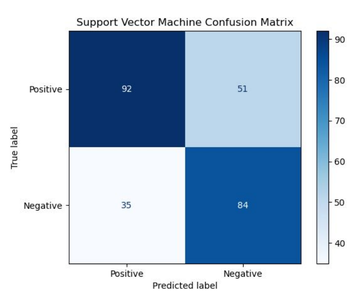
The growing prevalence of autism spectrum disorder (ASD) imposes significant challenges on individuals and their caregivers, affecting various aspects of their lives. Autism Spectrum Disorder is a range of neurodevelopmental conditions characterized by repetitive behavioural patterns and difficulties in social interactions. With 1 in 100 children diagnosed with autism, the absence of a definitive biomarker further complicates the diagnostic process. Currently, diagnosis primarily relies on subjective clinical history and behavioural assessments, which are susceptible to misdiagnosis and inconclusive results due to comorbidity. To address these limitations, this research proposes a machine-learning model for autism classification based on functional brain networks derived from resting-state functional magnetic resonance imaging (fMRI) scans.

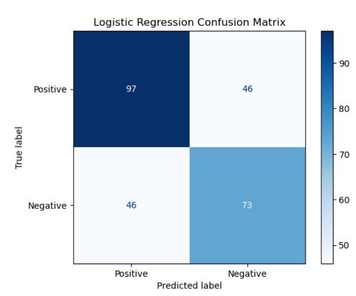
Methodology

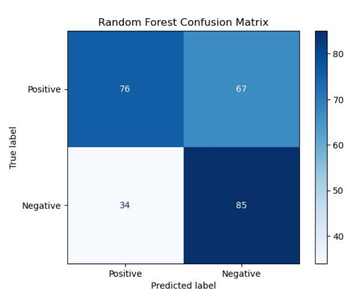
- Data Acquisition: We utilized the Autism Imaging Data Exchange (ABIDE-1) preprocessed dataset, comprising 871 subjects with ASD and healthy controls.
- Preprocessing: Standard preprocessing techniques are applied, including motion correction and normalization to ensure data quality.
- Feature Extraction: Functional connectivity matrices are constructed from the Craddock 200 (CC200) brain atlas, capturing relationships between 200 regions of interest (ROIs).
- Classification: Support Vector Machines (SVM), Logistic Regression, and Random Forests algorithms were used to train the classification model.
- Model Evaluation: Accuracy, sensitivity, and specificity metrics are used to assess model performance.

Results

Algorithm	Accuracy	Sensitivity	Specificity
Support Vector Machine (SVM)	67.17%	70.58%	64.33%
Logistic Regression	64.88%	61.34%	67.83%
Random Forest	61.45%	71.42%	53.14%







Conclusion

- This work classified autistic subjects from typical control subjects using machine learning algorithms leveraging the preprocessed ABIDE-1 dataset.
- Future work will incorporate multiple modalities, such as structural imaging data and phenotypic information for ASD detection.
- In addition, we aim to investigate the interpretability of the machine learning model, enabling the identification of specific biomarkers associated with autism.

References

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