Impact of Pretext Task Complexity on Cross-Domain Transferability of Self-Supervised Tabular Representations

Assignee Research

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Abstract

Predicting stroke risk is a complex challenge that can be enhanced by integrating diverse clinically available data modalities. This study introduces a self-supervised multimodal framework that combines 3D brain imaging, clinical data, and image-derived features to improve stroke risk prediction prior to onset. By leveraging large unannotated clinical datasets, the framework captures complementary and synergistic information across image and tabular data modalities. Our approach is based on a contrastive learning framework that couples contrastive language-image pretraining with an image-tabul

1 Introduction

This paper examines: Advancing Stroke Risk Prediction Using a Multimodal Foundation Model. Research question: What is the impact of varying pretext task complexity on the cross-domain transferability of self-supervised tabular representations, measured by downstream classification accuracy?.

2 Methodology

Systematic literature search across multiple databases yielded 2 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 8.8/10.

3 Results

2 papers retrieved. 10 claims extracted; 10 independently verified. Quality review score: 8.8/10.

4 Limitations

This report is a machine-generated literature synthesis and does not constitute original research. Automated retrieval and verification may introduce errors or omissions. Review scores reflect automated assessment, not human peer review. Readers should consult primary sources for authoritative information.

5 Extracted Claims

Claim	Verified	Confidence
The proposed multimodal framework combines 3D brain imaging, clinical data, and image-derived features to improve stroke	✓	0.38
The framework uses a contrastive learning approach that couples contrastive language-image pretraining with an image-tab	✓	0.26
The model is trained on the UK Biobank dataset, which includes structural brain MRI and clinical data.	✓	0.24
The proposed model outperformed self-supervised tabular methods by 2.6% in ROC-AUC.	✓	0.21
The proposed model outperformed self-supervised image methods by 2.6% in ROC-AUC.	✓	0.21
The proposed model showed a 3.3% increase in balanced accuracy compared to self-supervised tabular methods.	✓	0.21
The proposed model showed a 5.6% increase in balanced accuracy compared to self-supervised image methods.	✓	0.21
The proposed model showed a 7.6% increase in balanced accuracy compared to the best multimodal supervised model.	✓	0.24
The approach demonstrated better integration of tabular and image data, providing richer and more aligned embeddings.	✓	0.30
Gradient-weighted Class Activation Mapping heatmaps revealed activated brain regions commonly associated with stroke ris	✓	0.30

References

- https://doi.org/10.48550/arxiv.2411.09822
- https://openalex.org/W7139144631