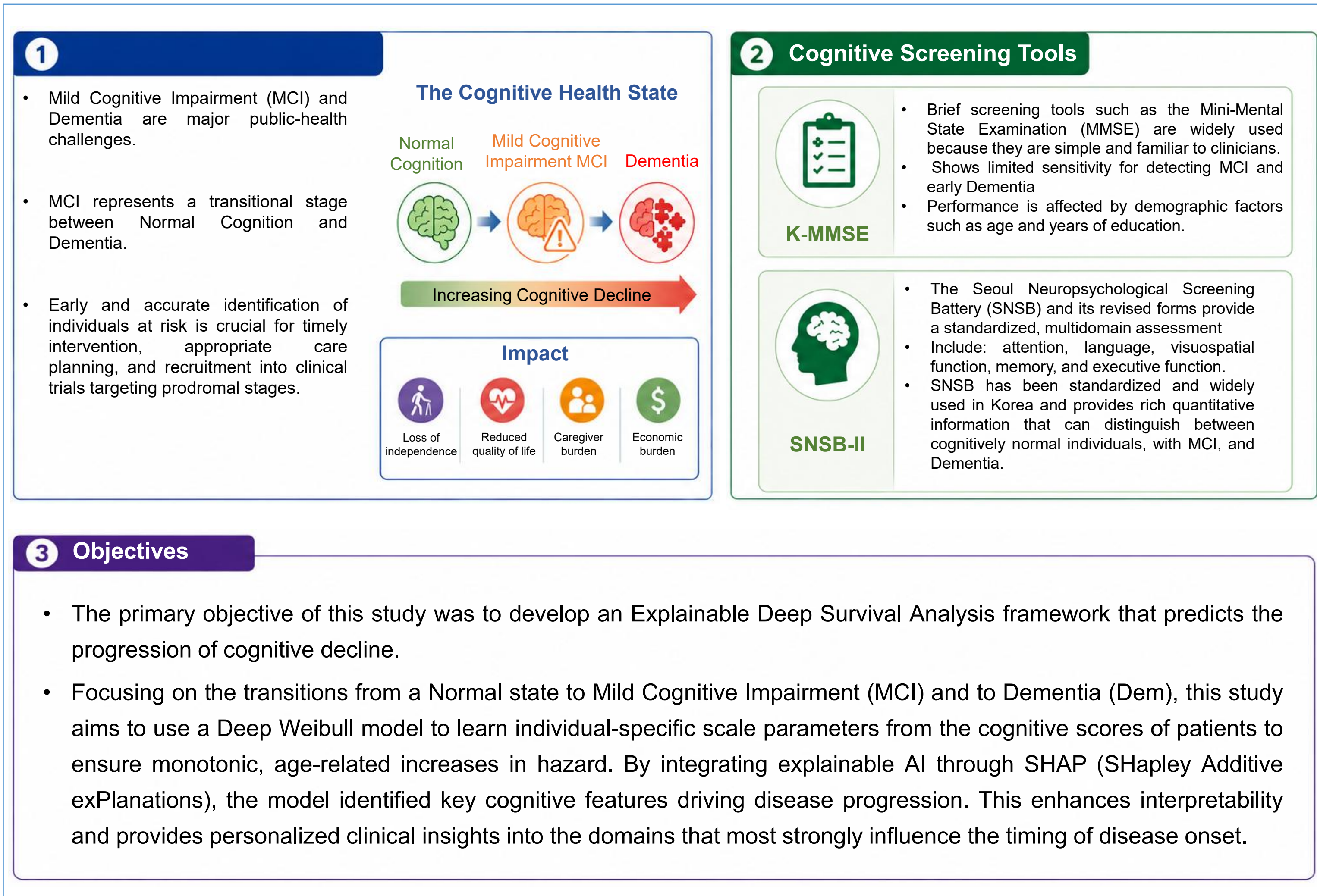




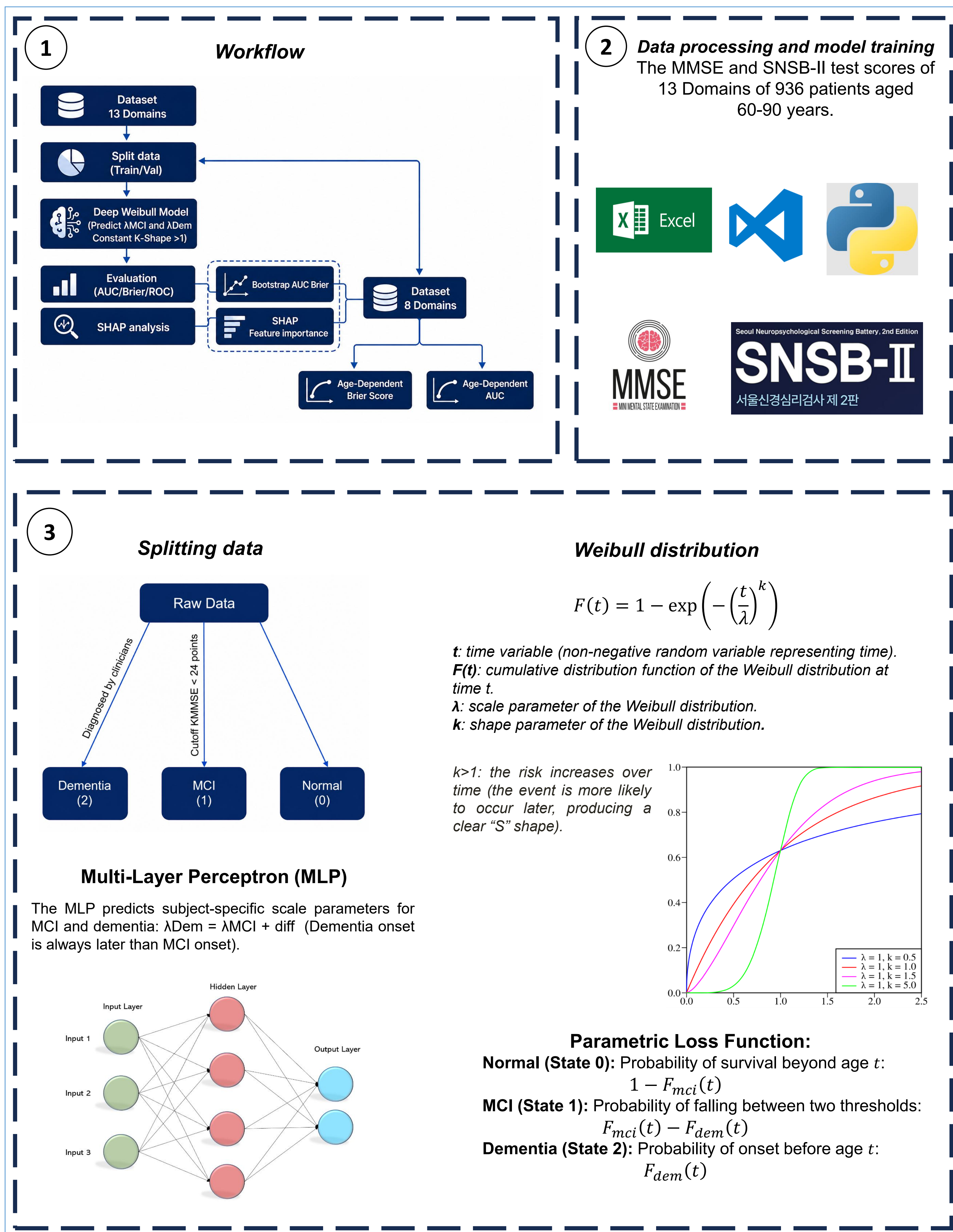
Explainable deep Weibull survival modeling for predicting time to cognitive impairment in older adults

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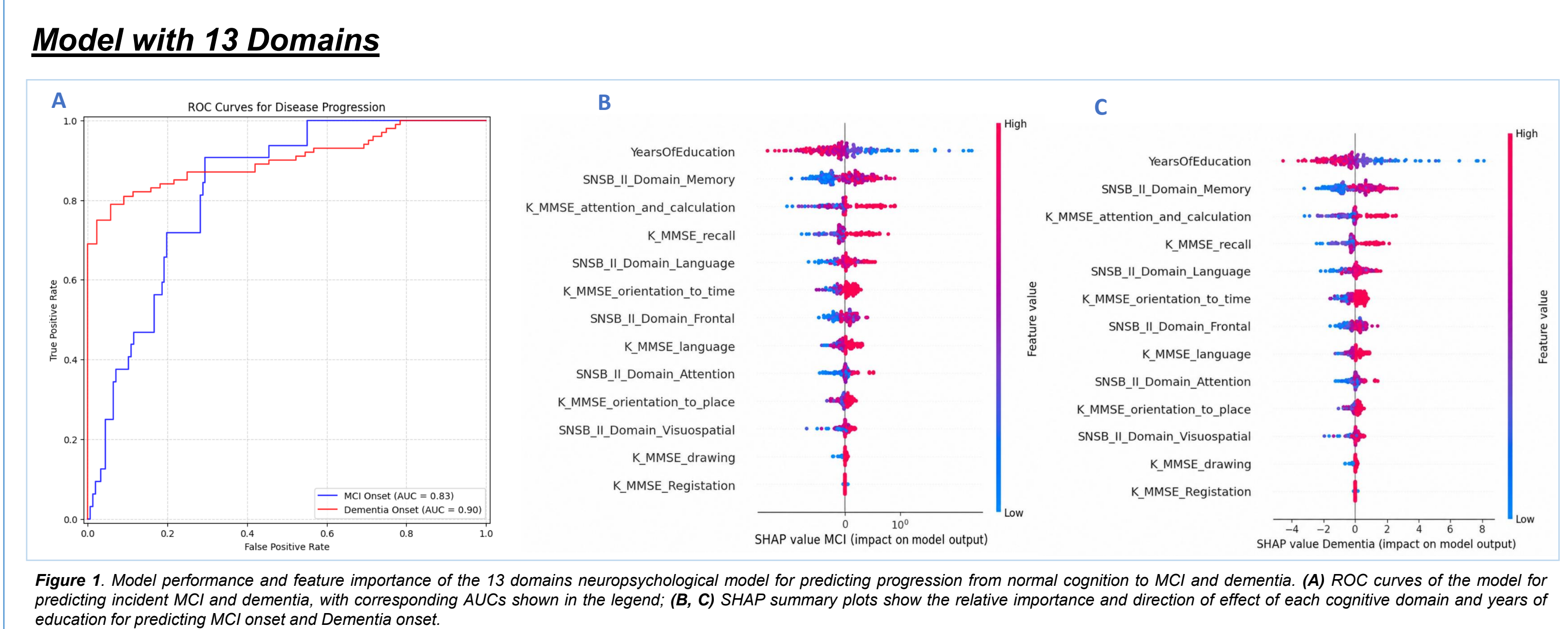
BACKGROUND AND OBJECTIVES



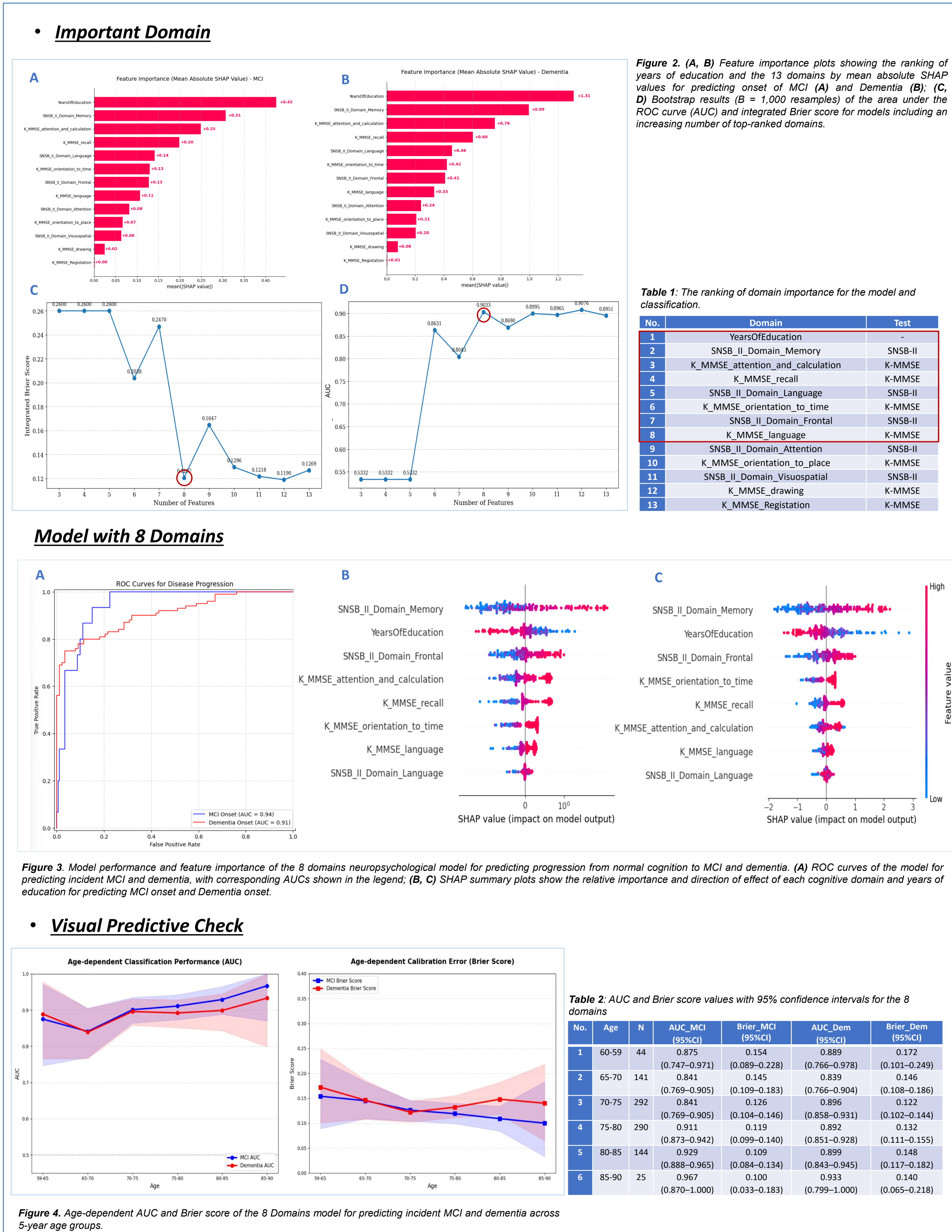
METHODS



RESULTS



RESULTS



CONCLUSION & DISCUSSION

- This research demonstrates that combining deep learning with parametric survival analysis provides a robust and interpretable framework for predicting cognitive decline over time. The Deep Weibull model effectively captures the continuous nature of neurodegeneration, preserves the temporal ordering of risk, and adheres to the logical medical progression from Normal cognition to Mild Cognitive Impairment and Dementia.
- By incorporating SHAP explainability, the framework offers interpretability at both the global and individual levels, enabling clinicians to identify personalized risk factors and specific cognitive deficits that accelerate disease onset. The results indicate that discrimination power is particularly high for predicting Dementia and that probability estimates for MCI are well calibrated, providing reliable risk stratification. These properties suggest that the proposed model can serve as a comprehensive tool to support early intervention strategies, guide personalized patient management, and improve decision-making in aging populations at risk for cognitive decline.

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