A Systematic Evaluation of Medical Multimodal Learning Methods

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Short abstract

Multimodal learning describes the use of multiple modalities, such as video and audio data, to achieve better prediction results in comparison to unimodal learning. Most of the time, deep learning architectures for multimodal learning follow a late fusion architecture. These late fusion architectures in multimodal learning have grown increasingly complex, often incorporating specialized modules, encoder adjustments, and gradient-based methods to address challenges like missing data. This project challenges the prevailing trend towards complexity by hypothesizing that a simple, yet rigorously tuned, baseline can achieve competitive or even state-of-the-art performance. This research is of direct relevance to the Sonderforschungsprojekt (SFB) on Heart Failure with preserved Ejection Fraction (HFpEF). The SFB's central goal is to create a new classification of HFpEF by integrating highly diverse patient data. Our project provides the foundational methodology to analyze these complex, multimodal datasets effectively. By identifying the most robust and efficient learning architectures, our work can significantly accelerate the SFB's ability to discover new patient subgroups and develop the basis for individualized therapies. To validate this claim, we propose a large-scale, comprehensive empirical study benchmarking a simple baseline against approximately 20 established methods across at least ten diverse datasets. The primary computational challenge is the exhaustive hyperparameter optimization required for a fair comparison of each method-dataset pair. This endeavor necessitates substantial parallel GPU resources to be completed in a reasonable timeframe, making access to an HPC facility essential for the project's success.