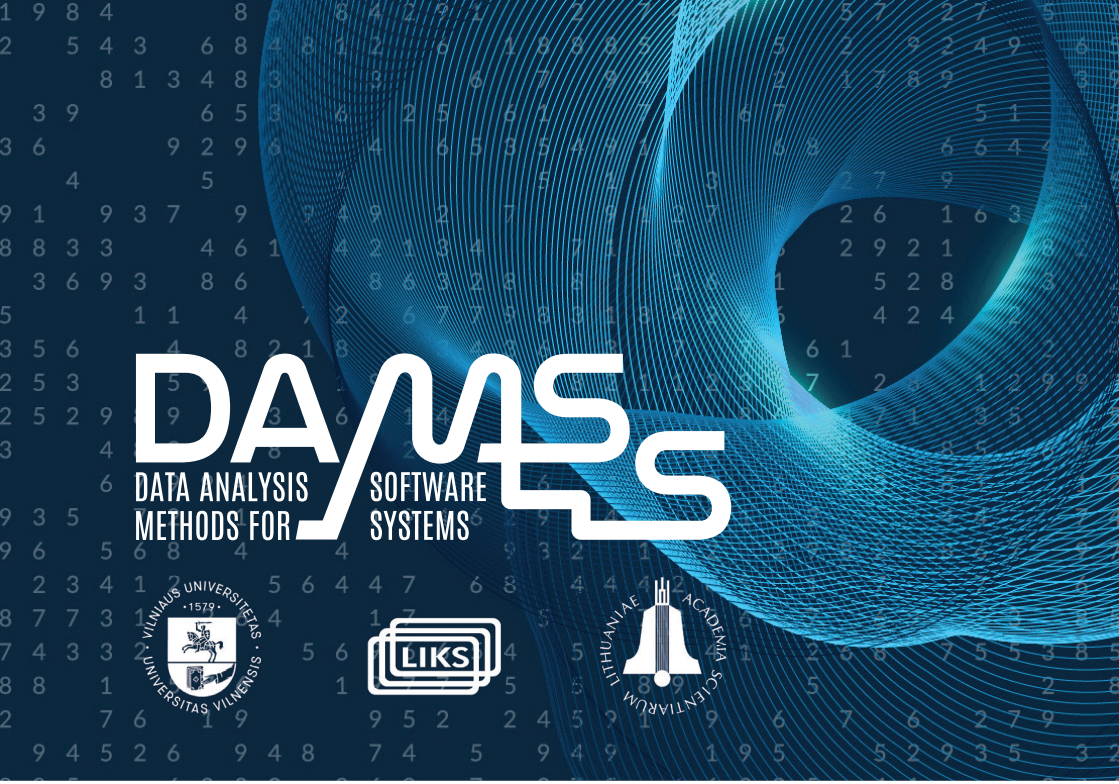

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Comparative Evaluation of Adjacency Matrix Applications for EEG Signal Classification Tasks

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Major depressive disorder (MDD) can be defined by distinct abnormal resting-state functional brain connectivity. EEG-based functional brain connectivity can enhance the diagnostics of MDD, especially when combined with machine learning methods. Functional brain connectivity, measured as the correlation between EEG electrodes, is represented as a graph in the form of an adjacency matrix. Different metrics capture unique aspects of this connectivity, making comparative analysis essential for effective classification. In this study, we compare several functional connectivity metrics – Pearson's correlation, phase-locked value (PLV), phase lag index (PLI), and the imaginary part of coherence (iCoherence). These metrics are used to classify two resting-state conditions. The analysis is conducted on two datasets: the EEG Motor Movement/Imagery Dataset, which contains 100 subjects with eyes closed and eyes open recorded with 64 electrodes, and the Republican Vilnius Psychiatric Hospital dataset, featuring 100 control subjects and 100 patients diagnosed with major depressive disorder, recorded with 20 electrodes. Machine learning methods, combined with LASSO for feature selection, produced strong results on the EEG Motor Movement/Imagery Dataset. Bootstrapped mean accuracies using binarized adjacency matrices were: 84.15% (CI: [77.50%, 91.31%]) for support vector machines, 83.40% (CI: [75.00%, 90.00%]) for random forests, and 81.70% (CI: [73.69%, 90.00%]) for XGBoost. Additionally, results will be presented on the Republican Vilnius Psychiatric Hospital dataset.

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