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AN APPROACH AND EVALUATION TO MENTAL PERFORMANCE CLASSIFICATION BASED ON EYE MOVEMENT MONITORING

Batol Hamoud (ИТМО)

Scientific supervisor - Associate professor Alexey Kashevnik (ИТМО)

Introduction. In the field of human cognition, the relationship between mental performance and various physiological factors continues to captivate researchers and scientists [1,2]. This correlation sheds light on the remarkable interplay between our visual system and mental abilities. In this experiment, the main objective was to categorize mental performance using eye data. We focused on eye movement tracking data, including x and y coordinates, triggered eye characteristics, blinkings, and fixations

Main part. The aim of this study was to classify mental performance using eye data, specifically eye movement tracking data including x and y coordinates, triggered eye characteristics, blink occurrences, and fixations. We conducted an initial data processing phase, analyzing the provided data for each session stage and extracting 57 features, which were categorized into three groups. These features were used as input for six different classifiers with varying parameters, and the models' performance was evaluated. Feature selection methods and Principal Component Analysis (PCA) techniques were employed to enhance the models' performance. We employed experiments to examine each group of features independently and in combination with others to determine the most effective combination. Multiple test set strategies, including randomly selected and balanced sets, were used to evaluate the models. Group k cross-validation was also performed based on the type of activity and the ID of the subject.

Conclusions. The findings derived from the conducted experiments consistently demonstrated that employing a Multi-layer Perceptron (MLP) classifier with the inclusion of all features from the three groups, without applying any feature exclusion, yielded the most favorable results. This particular approach exhibited the highest F1-scores and exhibited the most superior average accuracies, thereby indicating the overall robustness and dependability of the model.

List of sources used

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Author _____ Batol Hamoud

Scientific supervisor _____ Alexey Kashevnik