



Figure 2: Overview of the Traditional Machine Learning pipeline. fMRI data and metadata were processed separately using KNN imputation. The fMRI data was scaled to ensure that the distributions of the test and training sets were aligned. The metadata underwent an additional normalization process. Mutual information was then applied, with customized selection of the top K columns or IDA (or no fMRI data concatenated). Given the highly imbalanced data labels, SMOTE was employed to synthesize samples for underrepresented classes. A 5-fold cross-validation (CV) was applied across all model grids, and the model was used to predict both binary and multi-class (four-class) outcomes. The top three parameter settings for each model were selected to make the final prediction.