Supplementary Material for Paper: "Body Movements as Biomarkers: Machine Learning-based Prediction of HPA Axis Reactivity to Stress"

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Table A.1.1: Overview of generic features computed per body part (group) from the *Xsens* system.

Body Part (Group)	Channels				Axes		Generic Features
	`acc`	`vel`	`ang_vel`	`rot`	x, y, z	L2-norm	
Head	✓	✓	✓	✓	✓	✓	*all*
Chest (T8)	✓	✓	✓	✗	✓	✓	
{Left/Right} Hand	✓	✓	✓	✓	✓	✓	
{Left/Right} ForeArm	✓	✓	✓	✓	✗	✓	`mean`, `std`, `cov`, `max_val`
{Left/Right} Leg	✓	✓	✓	✓	✗	✓	
Trunk	✓	✓	✓	✗	✗	✓	*all*, except `z_cross` and `m_cross`
Upper Extremities	✓	✓	✓	✗	✗	✓	
Lower Extremities	✓	✓	✓	✗	✗	✓	
Total Body	✓	✓	✓	✗	✗	✓	

Table A.1.2: Overview of expert features computed per body part (group) from the *Xsens* system.

Body Part (Group)	Channels		Expert Features
	`vel`	`ang_vel`	
Chest (T8)	✓	✓	`Static Periods`
Left Hand & Right Hand	✓	✓	
Head	✓	✓	`Absolute Movement`, `Static Periods`
Trunk	✓	✓	
Upper Extremities	✓	✓	
Lower Extremities	✓	✓	

Table A.2: Hyperparameter search space for the individual feature selection and classification/regression algorithms.

Type	Algorithm	Parameter	Values
Feature Selection	SkB	`k`	$\{2, 4, ..., 18\}$
	RFE	`n_features`	$\{2, 4, ..., 18\}$
Classifier/Regressor	kNN	`n_neighbors`	$\{1, 3, ..., 19\}$
		`weights`	["uniform", "distance"]
	DT	`criterion`	["gini", "entropy"]
		`max_depth`	$\{1, 3, ..., 19\}$
		`min_samples_leaf`	$\{0.1, 0.2, 0.3, 0.4\}$
		`min_samples_split`	$\{0.1, 0.2, ..., 0.7\}$
		`max_features`	$\{0.1, 0.2, 0.3, 0.4, 0.5,$ "auto", "log2", None$\}$
	SVM-lin	`C`	$\{10^{-2}, 10^{-1}, ..., 10^{4}\}$
	SVM-rbf	`C`	$\{10^{-2}, 10^{-1}, ..., 10^{4}\}$
		`gamma`	$\{10^{-4}, 10^{-3}, ..., 10^{3}\}$
	MLP	`hidden_layer_sizes`	$[(1), (1, 1), (1, 1, 1), (2), (2, 2), (2, 2, 2), (5), (5, 5), (5, 5, 5)]$
		`activation`	["identitiy", "tanh", "relu"]
		`solver`	["lbfgs", "adam"]
		`alpha`	$\{10^{-2}, 10^{-1}, ..., 10^{2}\}$
	Ada	`base_estimator`	SVC
		`n_estimators`	$\{10, 20, ..., 500\}$
		`learning_rate`	$\{0.01, 0.02, ..., 0.1, 0.2, ..., 1.5\}$
	RF	`criterion`	["entropy"]
		`max_depth`	$\{4, 8, 12, ..., 48,$ None$\}$
		`max_features`	$\{0.1, 0.2, 0.3, 0.4,$ "sqrt"$\}$
		`min_samples_leaf`	$\{0.05, 0.1, 0.15, 0.20\}$
		`min_samples_split`	$\{0.1, 0.2, 0.3, 0.4\}$
		`min_weight_fraction_leaf`	$\{0.1, 0.2, 0.3, 0.4\}$
		`max_leaf_nodes`	$\{2, 4, ..., 18\}$
		`min_impurity_decrease`	$\{0, 0.01, ..., 0.09\}$
		`n_estimators`	$\{10, 20, ..., 390\}$
		`ccp_alpha`	$\{0, 0.01, ..., 0.09\}$

Table A.3: Mean ± standard deviation of classification performance metrics over the 5-fold model evaluation CV. For each evaluated classifier, the classification pipeline combination with the highest mean accuracy is shown. The classification pipelines scoring the highest metrics are highlighted in **bold**. SkB: SelectKBest.

Scaler	Feature Selection	Regressor	Accuracy (%)	F1-score (%)
Min-Max	SkB	RF	**65.2 ± 7.3**	**62.8 ± 11.0**
Standard	SkB	MLP	64.8 ± 5.0	62.1 ± 8.5
Min-Max	RFE	Ada	62.9 ± 11.2	62.5 ± 11.7
Standard	SkB	kNN	62.5 ± 9.4	54.6 ± 21.8
Min-Max	SkB	SVM	58.8 ± 13.7	53.7 ± 22.8
Standard	RFE	DT	56.4 ± 8.2	50.3 ± 16.3

Table A.4: Mean ± standard deviation of regression performance metrics over the 5-fold model evaluation CV, trained on features extracted over the complete (f-)TSST, respectively. For each evaluated regressor, the pipeline combination with the lowest mean absolute error is shown.

Scaler	Feature Selection	Classifier	Mean Absolute Error
Min-Max	SkB	MLP	**0.71 ± 0.09**
Min-Max	SkB	RF	0.71 ± 0.16
Standard	SkB	DT	0.72 ± 0.08
Min-Max	SkB	SVM	0.73 ± 0.15
Standard	SkB	kNN	0.73 ± 0.11
Standard	RFE	Ada	0.74 ± 0.12