

Supplementary Material 2. Machine-Learning Algorithms

A variety of machine-learning algorithms exist for classification. One consideration for selecting an algorithm was its ability to provide a relative measure of importance of the predictor variables, i.e., the voxels of the Voiding Initiation Network. Four algorithms, which use inherently different techniques, were selected from the caret package of the R-project, random forests (RF), neural networks (NNET), generalized linear model (GLM), and partial least squares (PLS).

Each model used 14 samples and 227 predictors for 2 classes (voider and nonvoider). A 10-fold cross validation with 5 repeats was used to minimize the effect of overfitting. Tuning parameters were determined by random search and yielded the following results (final denotes the value of the tuning parameter to obtain the results):

Random forests:

| Tuning parameter <i>mtry</i> | ROC | Sensitivity | Specificity |
|------------------------------|-------------|-------------|-------------|
| 2 (final) | 0.90 | 0.67 | 0.83 |
| 114 | 0.88 | 0.60 | 0.80 |
| 227 | 0.88 | 0.60 | 0.78 |

Neural networks:

| Tuning parameter: <i>size</i> | Tuning parameter <i>decay</i> | ROC | Sensitivity | Specificity |
|-------------------------------|-------------------------------|-------------|-------------|-------------|
| 1 | 0 | 0.57 | 0.2 | 0.83 |
| 1 | 1e-4 | 0.81 | 0.7 | 0.75 |
| 1 (final) | 0.1 | 0.89 | 0.83 | 0.65 |
| 3 | 0 | 0.55 | 0.43 | 0.7 |
| 3 | 1e-4 | 0.85 | 0.7 | 0.7 |

| | | | | |
|---|-----|------|------|------|
| 3 | 0.1 | 0.89 | 0.83 | 0.65 |
|---|-----|------|------|------|

Generalized Linear Model: no tuning parameter

Partial least squares:

| Tuning parameter ncomp | ROC | Sensitivity | Specificity |
|------------------------|------------|-------------|-------------|
| 1 (final) | 1.0 | 0.67 | 0.75 |
| 2 | 1.0 | 0.67 | 0.75 |
| 3 | 0.92 | 0.73 | 0.85 |

ROC, receiver-operating characteristic curve.