



Table 1. The corresponding model parameters

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| --- | --- | --- |
| **Algorithm** | **model parameters** | **value** |
| Random Forest | class\_weight | balanced |
| max\_depth | 20 |
| n\_estimators | 20 |
| random\_state | 2018 |
| AdaBoost | class\_weight | balanced |
| base\_estimator | Logistic Regression |
| algorithm | SAMME |
| n\_estimators | 10 |
| random\_state | 2018 |
| LogitBoost | Classifier-maxDepth | RandomForest-5 |
| Multilayer Perceptron | hidden\_layer\_sizes | 3 |
| random\_state | 2018 |

Table 2. Overall performance of the diagnostic model in all classification models. Results were obtained using the features selection.

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| --- | --- | --- | --- | --- | --- |
| Algorithm | Feature selection | Accuracy | Precision | Recall | F-measure |
| Random Forest | Relief | 0.781 | 0.8 | 0.78 | 0.78 |
| Information Gain | 0.783 | 0.79 | 0.78 | 0.78 |
| Random Forest | 0.757 | 0.77 | 0.76 | 0.76 |
| AdaBoost | Relief | 0.774 | 0.78 | 0.77 | 0.77 |
| Information Gain | 0.774 | 0.78 | 0.77 | 0.77 |
| Random Forest | 0.761 | 0.76 | 0.76 | 0.76 |
| LogitBoost | Relief | 0.798 | 0.75 | 0.80 | 0.76 |
| Information Gain | 0.783 | 0.73 | 0.78 | 0.74 |
| Random Forest | 0.787 | 0.78 | 0.79 | 0.78 |
| Multilayer Perceptron | Relief | 0.805 | 0.75 | 0.80 | 0.76 |
| Information Gain | 0.789 | 0.73 | 0.79 | 0.75 |
| Random Forest | 0.776 | 0.76 | 0.78 | 0.76 |
| Naïve Bayes | Relief | 0.786 | 0.74 | 0.79 | 0.75 |
| Information Gain | 0.810 | 0.82 | 0.81 | 0.81 |
| Random Forest | 0.810 | 0.82 | 0.81 | 0.81 |
| SVM | Relief | 0.797 | 0.74 | 0.80 | 0.76 |
| Information Gain | 0.791 | 0.73 | 0.79 | 0.75 |
| Random Forest | 0.763 | 0.74 | 0.76 | 0.75 |

Table 3. Performance of the diagnostic models in the classification of normal, MCI, VMD, and dementia. The results of Random Forest and AdaBoost were obtained using the Information Gain feature selection; the results of LogitBoost, Multilayer Perceptron, and Naïve Bayes were obtained using the Random Forest feature selection; the results of SVM were obtained using the Relief feature selection.

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| --- | --- | --- | --- | --- | --- |
| **Algorithm** | **Class** | **Precision** | **Sensitivity** | **Specificity** | **F-measure** |
| Random Forest | Normal | 0.56 | 0.88 | 0.93 | 0.69 |
| MCI | 0.70 | 0.57 | 0.93 | 0.62 |
| VMD | 0.68 | 0.54 | 0.94 | 0.60 |
| Dementia | 0.91 | 0.95 | 0.90 | 0.93 |
| AdaBoost | Normal | 0.55 | 0.84 | 0.93 | 0.67 |
| MCI | 0.74 | 0.54 | 0.95 | 0.63 |
| VMD | 0.63 | 0.55 | 0.93 | 0.59 |
| Dementia | 0.89 | 0.94 | 0.88 | 0.92 |
| LogitBoost | Normal | 0.77 | 0.84 | 0.97 | 0.80 |
| MCI | 0.66 | 0.74 | 0.90 | 0.70 |
| VMD | 0.60 | 0.40 | 0.94 | 0.48 |
| Dementia | 0.89 | 0.94 | 0.89 | 0.92 |
| Multilayer Perceptron | Normal | 0.77 | 0.84 | 0.74 | 0.80 |
| MCI | 0.65 | 0.74 | 0.89 | 0.69 |
| VMD | 0.57 | 0.37 | 0.94 | 0.45 |
| Dementia | 0.88 | 0.93 | 0.87 | 0.90 |
| Naïve Bayes | Normal | 0.56 | 0.84 | 0.94 | 0.67 |
| MCI | 0.75 | 0.62 | 0.93 | 0.68 |
| VMD | 0.70 | 0.72 | 0.93 | 0.71 |
| Dementia | 0.95 | 0.92 | 0.95 | 0.93 |
| SVM | Normal | 0 | 0 | 1 | 0 |
| MCI | 0.60 | 0.96 | 0.83 | 0.74 |
| VMD | 0.85 | 0.56 | 0.98 | 0.67 |
| Dementia | 0.91 | 0.97 | 0.90 | 0.94 |