

From Waveforms to Bits

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MESTRADO EM ENGENHARIA INFORMÁTICA

10th of December, 2025

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Brief summary

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- Identify faults in a physical system.

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- 20 000 samples for each class.

Brief summary

- Identify faults in a physical system.
- Classification problem.
- 7 classes.
- 140 000 samples total.
- 20 000 samples for each class.
- data is mostly abstract to humans (sound waves).

- Shuffling.

Processing and Feature Extraction

- Shuffling.
- Labels extracted from one_hot encoding.

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- Shuffling.
- Labels extracted from one_hot encoding.
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- PCA with variance of 95% (no analysis could be done).

Classifier Model

Random Forest

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- 200 decision trees.

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- a node must have at least 5 samples to be considered for splitting.
- each leaf node must have at least 2 samples.

Gradient Boost

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- 200 iterations max.

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- 200 iterations max.
- learning rate of 0.1.

Gradient Boost

- 200 iterations max.
- learning rate of 0.1.
- regularization at 0.1.

Gradient Boost

- 200 iterations max.
- learning rate of 0.1.
- regularization at 0.1.
- early stopping.

One Vs Rest

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- neural network.

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- neural network.
- 256-128 topology.

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- neural network.
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- relu activation function.

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- 100 iterations max.

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Single Neural Network

Single Neural Network

- 512-256 topology.

Single Neural Network

- 512-256 topology.
- relu activation function.

Single Neural Network

- 512-256 topology.
- relu activation function.
- daptative learning rate.

Single Neural Network

- 512-256 topology.
- relu activation function.
- adaptive learning rate.
- regularization of 0.0001.

Single Neural Network

- 512-256 topology.
- relu activation function.
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- 100 iterations max.

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- 512-256 topology.
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- early stopping.

Stacking Ensembler

Stacking Ensembler

- logistic regression.

Stacking Ensembler

- logistic regression.
- inputs of previous models.

All training was done multi-threaded on 16 CPU cores.

Classifier model	Time (s)
Random Forest	126
Gradient Boost	26
One Vs Rest	33
Neural Network	38
Stacking Ensembler	1

Table 1: Model training time.

Model	Accuracy	Precision	Recall	f1-score
Random Forest	0.82	0.82	0.82	0.81
Gradient Boost	0.87	0.87	0.87	0.87
One Vs Rest	0.91	0.91	0.91	0.91
Neural Network	0.90	0.90	0.90	0.90
Stacking Ensembler	0.94	0.94	0.94	0.94

Table 2: Model testing metrics.

Confusion Matrix

