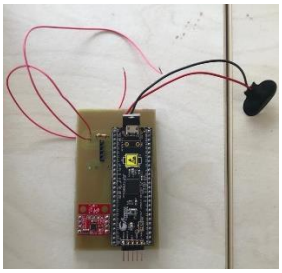
ACQUISITION PROTOCOL

code used for this purpose: `acquisitions_training_classifier.ipynb`

Prerequisites

- Right-handed players only.
- Position of the PCB within the case for acquisitions as shown in the picture below (IMU facing the game net in the forehand grip).



Training phase

Number of subjects: 4

Duration of each acquisition: about 5 seconds

Gestures acquired and related labels set:

- Forehand : ‘0’
- Backhand: ‘1’
- Serve: ‘2’
- No shot: ‘3’

Number of acquisitions for each shot (‘forehand’, ‘backhand’, ‘serve’) → 10 for each subject.
Number of acquisitions for the ‘no shot’ gesture → 20 acquisitions for 1 subject only.

The files thus obtained are in the `acquisitions_for_TRAINING` folder of the GitHub repository.

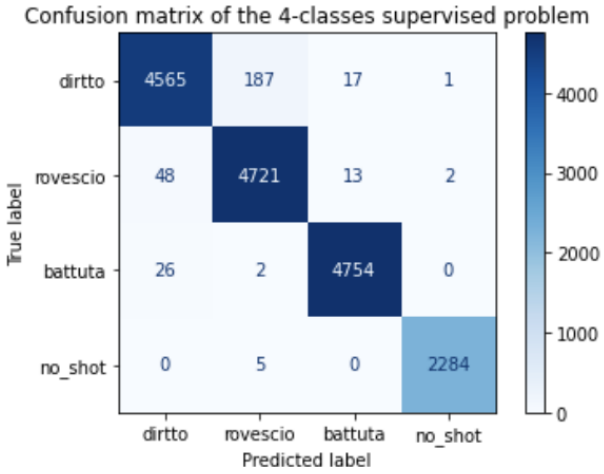
Since each `acquisition_file.csv` contains 400 values (rows), there are 4000 values for each of the 3 shots of each subject and 800 values for the gesture 'no shot'.

Dimensions of the dataset thus obtained (`training_dataset.csv`) → (56000, 7)
Dimensions of the training dataset after cleaning (removing `NaN` and infinite values) → (55415, 7)

Trained classifiers

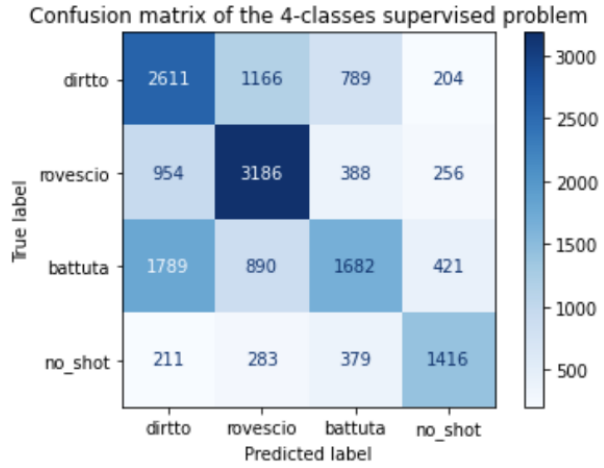
- Decision Tree:
  `{'criterion': 'entropy', 'max_depth': 20, 'min_samples_leaf': 8, 'min_samples_split': 15}`

f1_train: 0.974684
f1_test: 0.982015



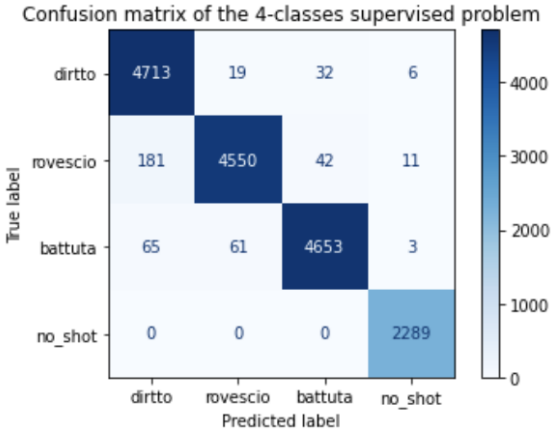
- Logistic Regression:
  `{'C': 10, 'max_iter': 1000}`

f1_train: 0.538928
f1_test: 0.535037



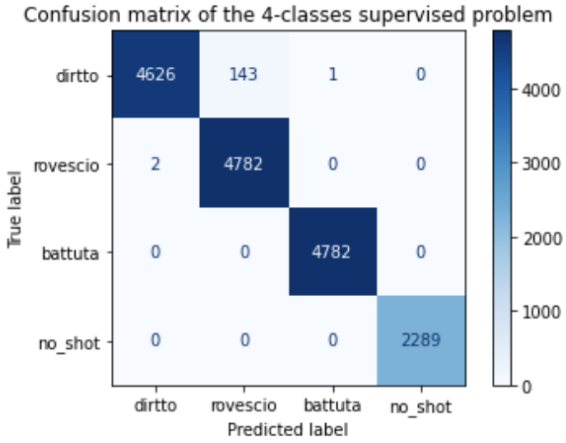
- KNN:
  `{'n_neighbors': 10}`

f1_train: 0.940111
f1_test: 0.974736



- Random Forest:
  `{'criterion': 'entropy', 'max_depth': 15, 'min_samples_leaf': 2, 'min_samples_split': 3, 'n_estimators': 30}`

f1_train: 0.991338
f1_test: 0.991278



We chose *Random Forest*.

Criteria used for the choice:

✓ High F1 score for both training set and test set.
✓ Similar F1 scores for training sets and test sets, meaning no overfitting problems.
✓ Interpretability of the classifier.