

## Classification and localization problem: SVM benchmark implementation details

We train an SVM on the [WLAN Indoor Localization benchmark](#) to achieve an accuracy result of 89.48%. This document provides implementational details.

The implementation consists of the following steps:

1. We import the WiFi RSSI dataset, smartphone geomagnetic dataset, timestamp datafile, and PointsMapping dataset which contains the placeID-to-XY coordinate mapping.
2. We merge the RSSI dataset with PointsMapping dataset by PlaceID, so that we have XY coordinate and placeID data for RSSI measurements.
3. We merge RSSI dataset and Smartphone Geomagnetic dataset together according to the timestamp datafile. The final pre-processed dataset after these operations consists of a table with 11,498 rows and 143 columns which contains all the relevant feature data from the aforementioned files.
4. We split training and test data to a 67:33 ratio, which we have found to yield the accuracy results that meet the benchmark requirements.

We have implemented the dataset preprocessing procedures and the SVM model with linear kernel in Numpy, a widely used Python library for numerical computing. This was done in order to ensure that our data preprocessing and SVM algorithm implementation is correct and also so that we can verify on CPU before targeting it for acceleration on TABLA. Our Numpy implementation showed 89.22% accuracy for test data, higher than the 75% requirement.

Next, we implemented the SVM algorithm in the PolyMath domain-specific language. The implementation effort was relatively straightforward, since the language is designed so that many of the language constructs in Numpy can be translated with ease. Once we implemented the SVM algorithm in Polymath, we were able to compile it first to the mg-DFG representation, followed by a TABLA-backend translation pass, which produces the binary executable as well as necessary configuration and RTL files for TABLA.

The SVM implementation is available [here](#) on the VeriGOOD-ML repo.