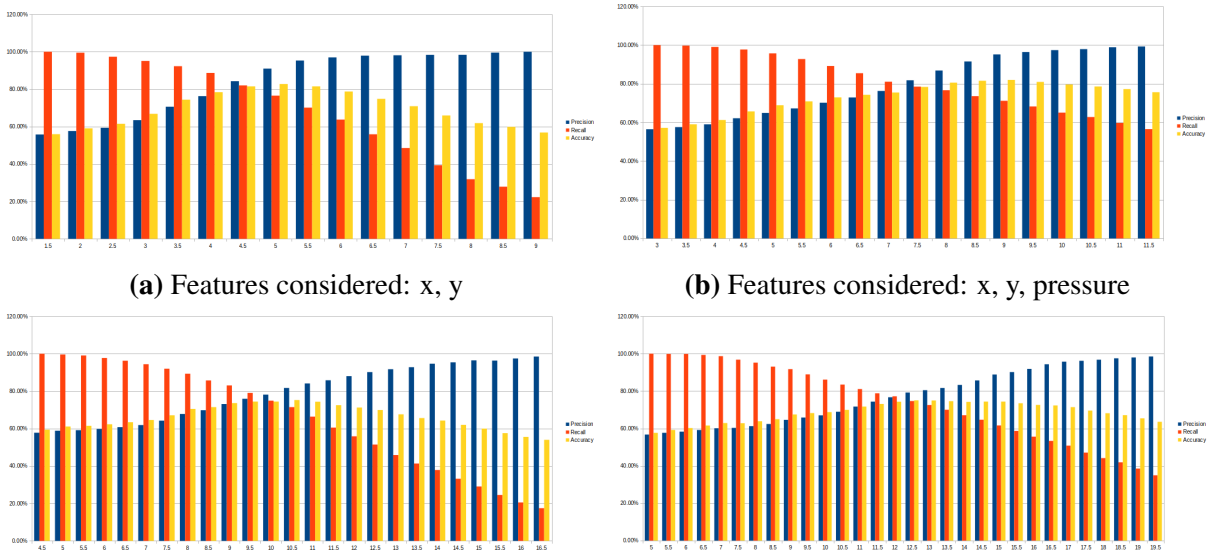
Evaluation of Signature Verification

4.1 Impact of different feature selections



(a) Features considered: x, y

(b) Features considered: x, y, pressure

(c) Features considered: x, y, azimuth

(d) Features considered: x, y, pressure, azimuth

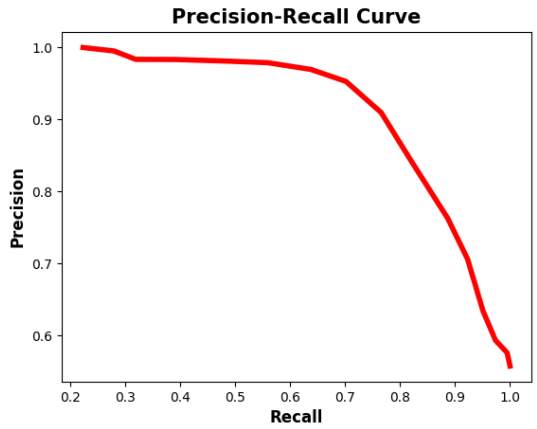
Figure 1. Precision, recall and accuracy for different sets of features

In figure 1, we see that by setting the threshold low or high enough, we can achieve 100% precision or recall, but never both at the same time. If the threshold is low enough, all signatures are classified as fake, so no false negatives are possible and recall is 100%. Of course, this also leads to very poor precision and accuracy. On the other hand, if the threshold is set high enough, all signatures are classified as genuine and there are no false positives, so precision is 100%. The optimal value is somewhere in between those extremes. The maximal accuracies are $82.74\%, 82.00\%, 75.26\%$ and 75.04% for thresholds of 5, 9, 10.5 and 12.5 for the evaluation considering only x and y; x, y and pressure; x, y and azimuth and x, y, pressure and azimuth, respectively.

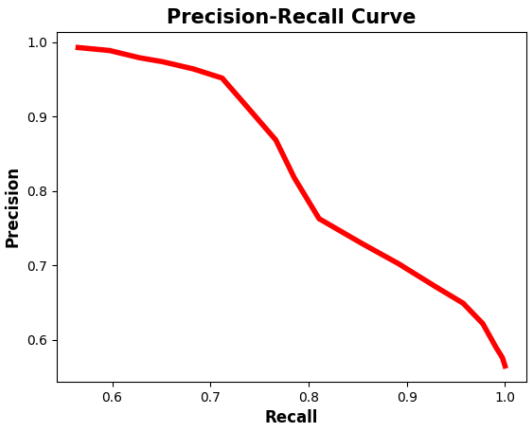
So, the best accuracy over all settings is, somewhat surprisingly, achieved by only considering the x and y values as features. Especially also considering the azimuth seems to lead to much poorer results.

As in the previous figure, we can see in figure 2, that the best results are achievable by only considering x and y as features. With a threshold of 4.5, the precision is 84.25% and the recall is 82.0%. In the other settings, precision and recall don't achieve 80% or more at the same time anywhere.

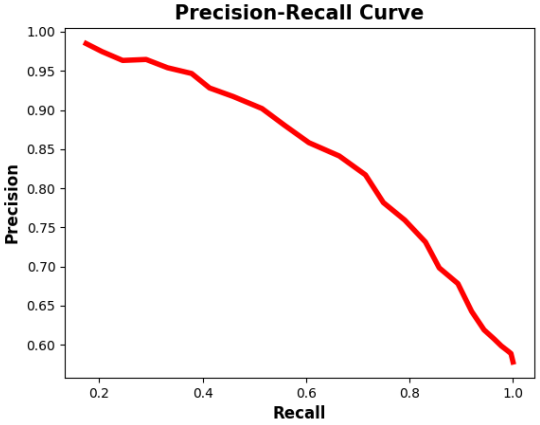
We can conclude, that, from all settings we have tried, considering only x and y as features with a threshold of 4.5 or 5 leads to the best results. The achieved precision, recall and accuracy with these settings of around 80% is acceptable.



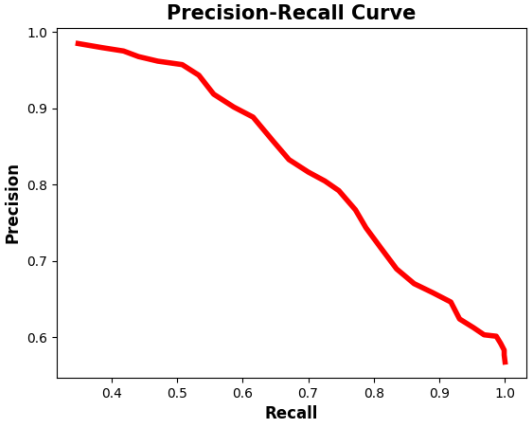
(a) Features considered: x, y



(b) Features considered: x, y, pressure



(c) Features considered: x, y, azimuth



(d) Features considered: x, y, pressure, azimuth

Figure 2. Precision-recall curve for different sets of features