

**Reference Scores:** **F-scores: [0.9742, 0.9709, 0.9820, 0.9220, 0.9358, 1.0]**

1) SVM → Labels → [1 to 6] → RBF (SVC Function)

**F-scores: [0.966, 0.947, 0.940, 0.884, 0.889, 1.0] → Bad than reference**

2) SVM → Labels → [1 to 6] → Linear (LinearSVC Function)

**F-scores: [0.980, 0.973, 0.991, 0.922, 0.938, 0.998] → Very close to reference**

3) SVM → Labels → [Dyn, NonDyn] → RBF (SVC Function)

**F-scores: [0.9993, 0.9992]**

4) SVM → Labels → [Dyn, NonDyn] → Linear (LinearSVC Function)

**F-scores: [1.0, 1.0] → Coarse classifier**

**By now we figured out Linear is good and worked with mostly linear SVM**

5) SVM → Labels → [1,2,3] → Linear (LinearSVC Function)

**F-scores: [0.972, 0.968, 0.981] → Same as reference**

6) SVM → Labels → [4,5,6] → Linear (LinearSVC Function)

**F-scores: [0.917, 0.933, 0.998] → Bad than reference**

**We then tried varying class weights within [4,5,6] fine classifier and saw some improvements but decided that's not the right way as it included parameter tuning with test data.**

7) SVM → Labels → [1 to 6] → Blown Up degree → [1,2] → Linear (LinearSVC Function)

**F-scores: [0.9811, 0.9764, 0.9818, 0.922, 0.9374, 0.9907] → Same as reference**

8) SVM → Labels → [1,2,3] → Blown Up degree → [1,2] → Linear (LinearSVC Function)

**F-scores: [0.9772, 0.9687, 0.9831] → Same or slightly less than reference**

9) SVM → Labels → [4,5,6] → Blown Up degree → [1,2] → Linear (LinearSVC Function)

**F-scores: [0.9373, 0.9579, 0.988] → Little Improvement on 4,5 but reduced 6**

Because of 9, we used another classifier to split 4,5 and 6 into two groups:

10) SVM → Labels → [(4,5 as 1) and (6 as 0)] → Linear (LinearSVC Function)

**F-scores: [1.0, 1.0] → Second level classifier, works perfect**

11) SVM → Labels → [4,5] → Blown Up degree → [1,2] → Linear (LinearSVC Function)

**F-scores: [0.9494, 0.9562] → Final classifier, 2.5% more than reference.**

**Now we started doing sample weights method**

12) SVM → Labels → [4,5,6] → Blown Up degree → [1,2] → Sample weights → Linear (SVC Function with kernel='linear')

**F-scores: [0.9495, 0.9561, 1.0] → Combined classifier works when using sample weights. However, as shown in 9, it doesn't work without sample weights.**

13) SVM → Labels → [1,2,3] → Blown Up degree → [1,2] → Sample weights → Linear (SVC Function with kernel='linear')

**F-scores: [0.9812, 0.9711, 0.9806]] → Little improvement in 1,2. But, pretty much same as reference.**

**So, looks like sample weights method is helping us to have just one classifier for [4,5,6]. If we don't use sample weights, then we have to split 4,5 and 6 first into two groups and then classify 4 and 5. Both ways, results are same.**

**However, [1,2,3] classifier is not improving much with any methods. Its staying same as reference.**

ACCELEROMETER VS GYROSCOPE

STEP1:

Linear SVM → Labels → [1,2,3,4,5,6]

NOT BLOWN UP

**Reference Scores:** **F-scores: [0.9742, 0.9709, 0.9820, 0.9220, 0.9358, 1.0]**

**Just accelerometer data: F-scores: [0.93,0.92,0.96,0.82,0.85,1.0] Dynamic decent (decrease is less) , Non-dynamic bad**

**Just Gyroscope data: F-scores: [0.86,0.95,0.84,0.91,0.92,1.0] Dynamic bad (1 and 3 especially), Non-dynamic decent (decrease is less)**

**Conclusion**-

**Intuition is -**

* **ACCELEOMETER is good for DYNAMIC**
* **GYROSCOPE is good for NON-DYNAMIC**

STEP 2:

Linear SVM → Labels → [1,2,3]

NOT BLOWN UP

**Reference Scores:** **F-scores: [0.9742, 0.9709, 0.9820]**

**Just accelerometer data: F-scores: [0.93,0.92,0.96]**

**Just Gyroscope data: F-scores: [0.86,0.96,0.84]**

**Conclusion-**

This further cements our finding in the previous step.

STEP 3:

Linear SVM → Labels → [1,2,3]

BLOWN UP

**Reference Scores:** **F-scores: [0.9742, 0.9709, 0.9820]**

**Just accelerometer data: F-scores: [0.93,0.92,0.96]**

**Just Gyroscope data: F-scores: [0.86,0.96,0.84]**

**Conclusion-**

Blowing Up the Feature Space does not seem to improve accuracy for [1,2,3]

STEP 4:

Linear SVM → Labels → [4,5,6]

NOT BLOWN UP

**Reference Scores:** **F-scores:** **[0.9220, 0.9358, 1.0]**

**Just accelerometer data: F-scores: [0.82,0.85,1.0]**

**Just Gyroscope data: F-scores: [0.91,0.92,1.0]**

**Conclusion-**

This further cements our finding in Step-1 that Gyroscope is good for Non-dynamic

STEP 5:

Linear SVM → Labels → [4,5,6]

BLOWN UP

**Reference Scores:** **F-scores: [0.9220, 0.9358, 1.0]**

**Just accelerometer data: F-scores: [0.81,0.84,1.0]**

**Just Gyroscope data: F-scores: [0.93,0.94,1.0]**

**Conclusion-**

Blowing Up the Feature Space SEEMS to improve accuracy for [4,5,6]

STEP 6:

Linear SVM → Labels → [4,5,6]

BLOWN UP

SAMPLE WEIGHTS INCLUDED

**Reference Scores:** **F-scores: [0.9220, 0.9358, 1.0]**

**Just Gyroscope data: F-scores: [0.93,0.94,1.0]**

**Conclusion-**

Sample Weights do not seem to improve accuracy on 4,5,6 in the Blown Up Space

.