

Self Supervised Gesture Classification

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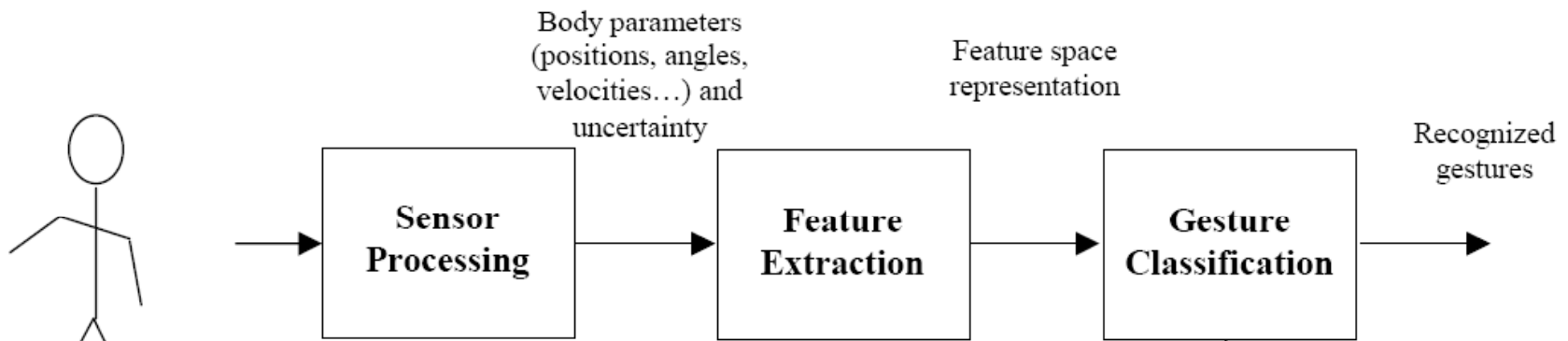
6.xxx Presentation

Vision

- Intelligent Environments
- Step - Recognizing gestures .

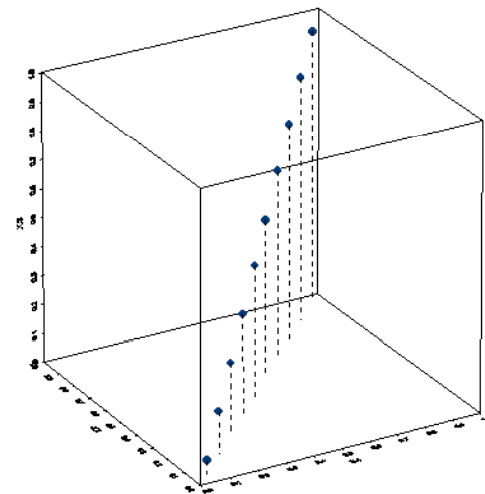
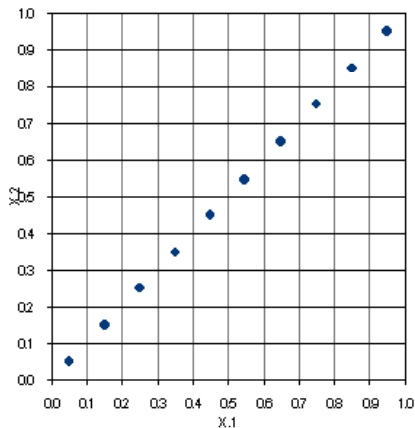


Recognizing Gestures



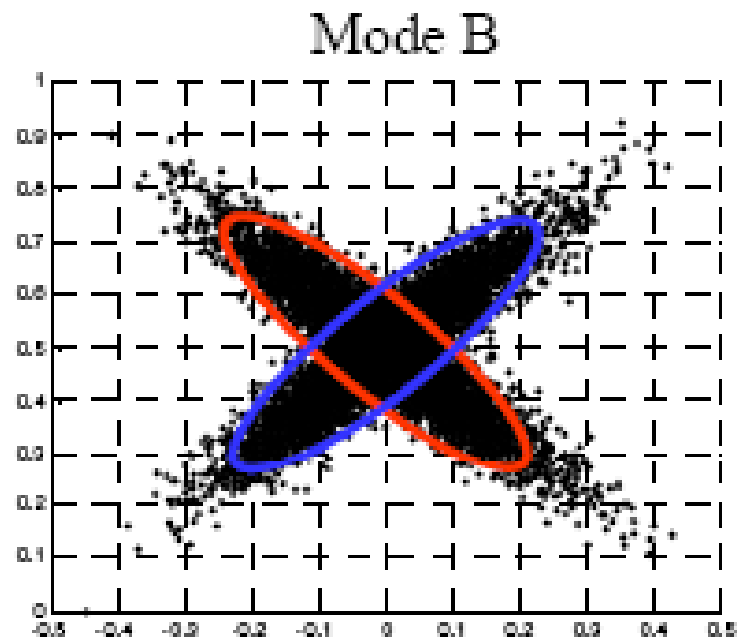
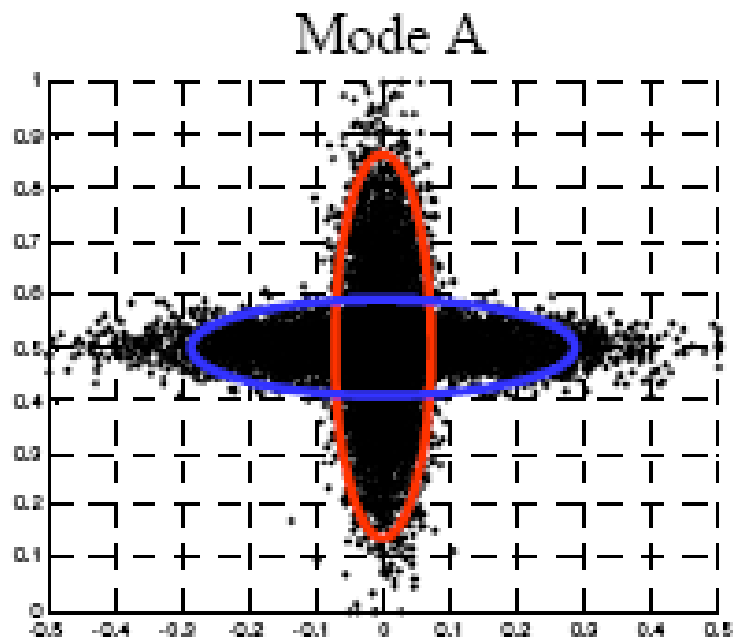
Challenges

- Unique Style of Gestures.
- Combining Sensor Information is hard.
(Curse of Dimensionality).



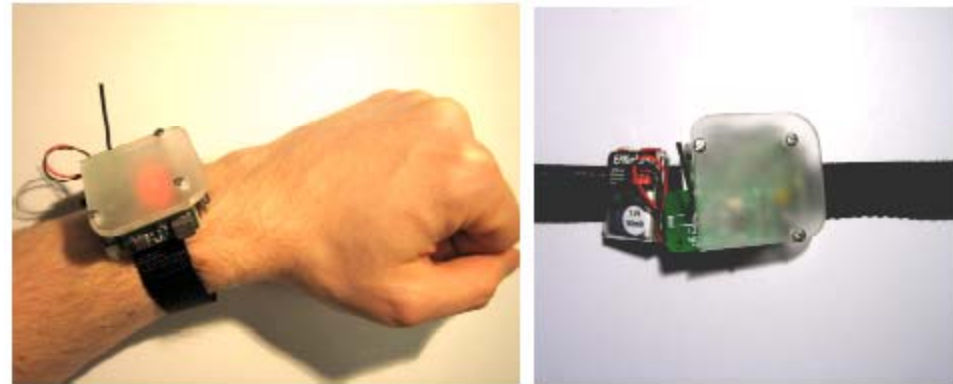
Coen's Algorithm

- (x_1, y_1, x_2, y_2) , Multi-Modal Clustering



Data Collection

Node[1]: Wireless,
3 Axis Axl,
3 Axis Gyro
100 Hz



2 Nodes (Wrist/Ankle):
5 Gestures*6000 Pts
Used 3

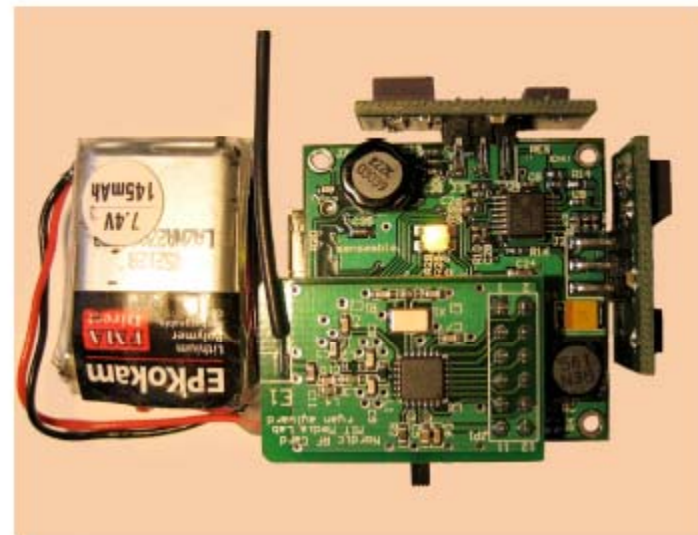
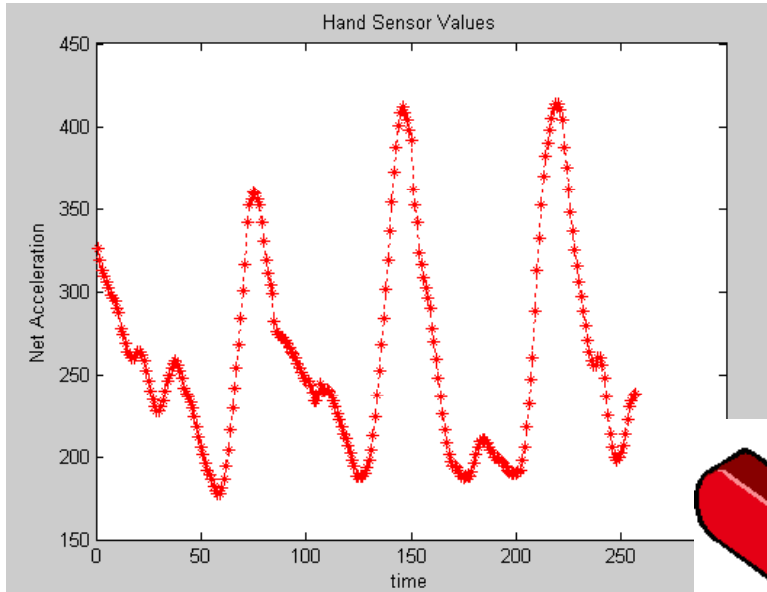


Figure 1. Sensor node on wrist (upper left), removed (upper right), and exposed circuit board (bottom).

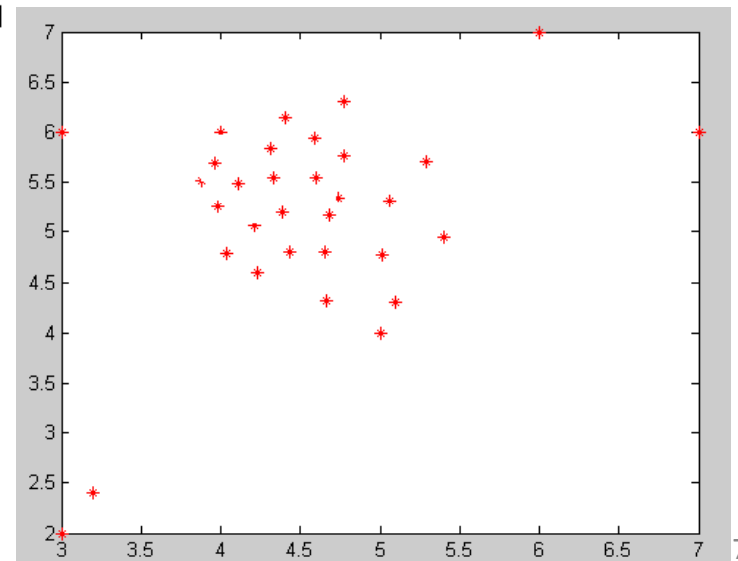
Feature Extraction



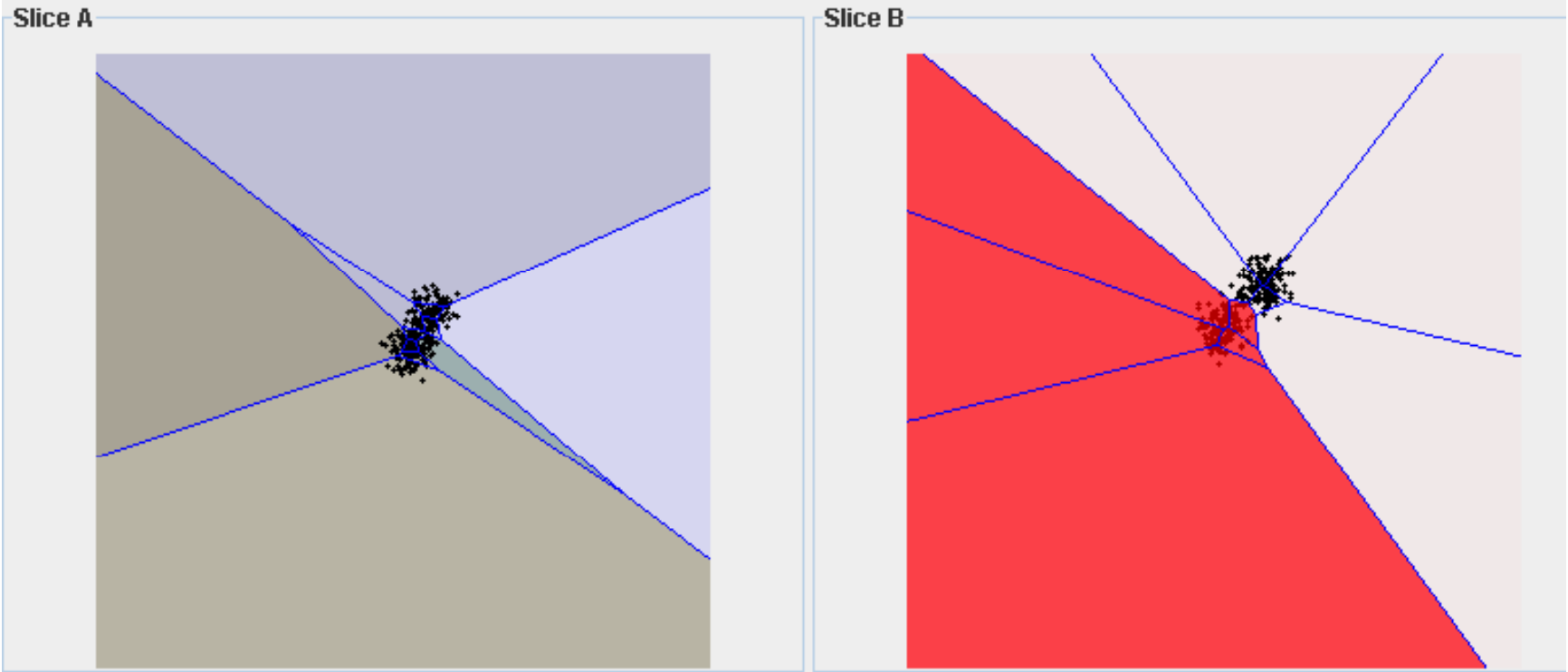
- Window – 256 Sample, 128 Overlap [2]



- Variance
- Mean
- **FFT**
- **Energy**



[2] L. Bao and S. S. Intille, "Activity recognition from user-annotated acceleration data," in *Proceedings of PERVASIVE 2004*, vol. LNCS 3001, A. Ferscha and F. Mattern, Eds. Berlin Heidelberg: Springer-Verlag, 2004, pp. 1-17.



Node 1

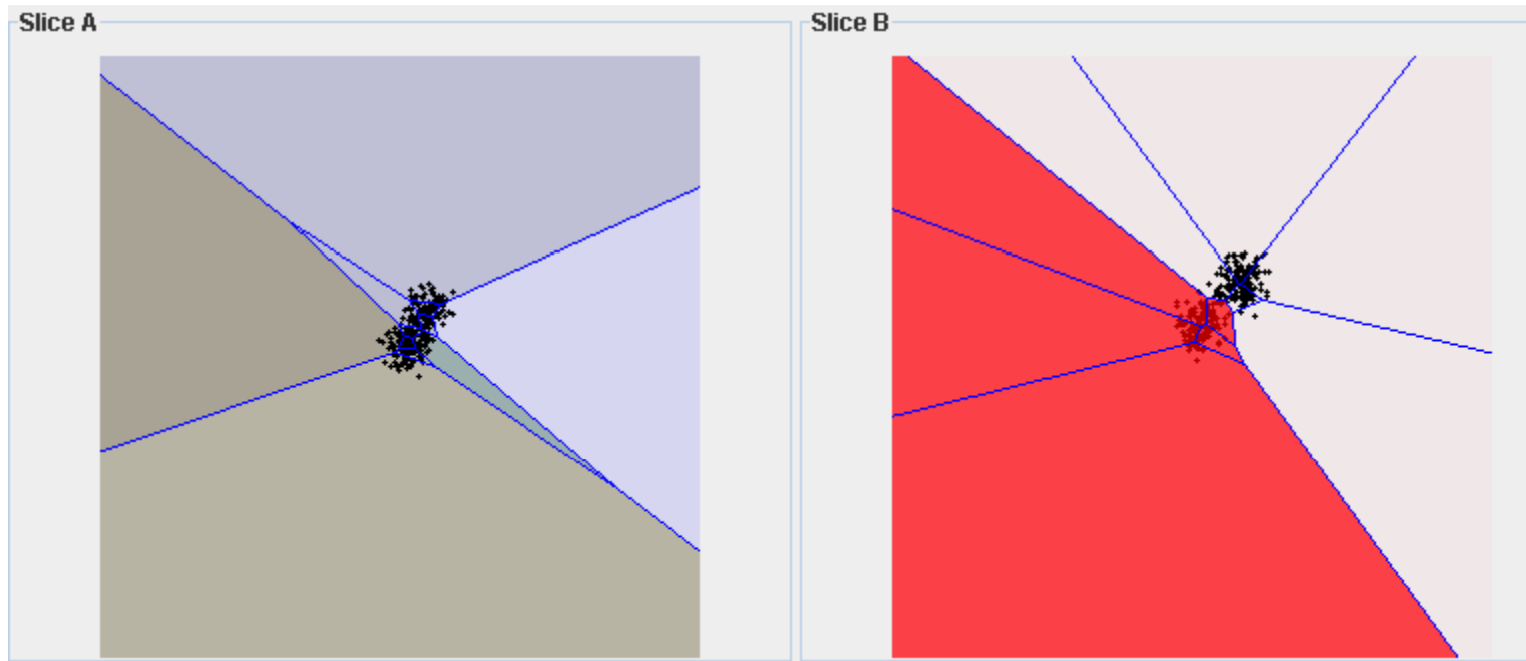
Node 2

Sum(FFT(Angular Velocity))

Sum(FFT(Acceleration))

Results

Walking vs Running



Slice 1: Arm Sensor

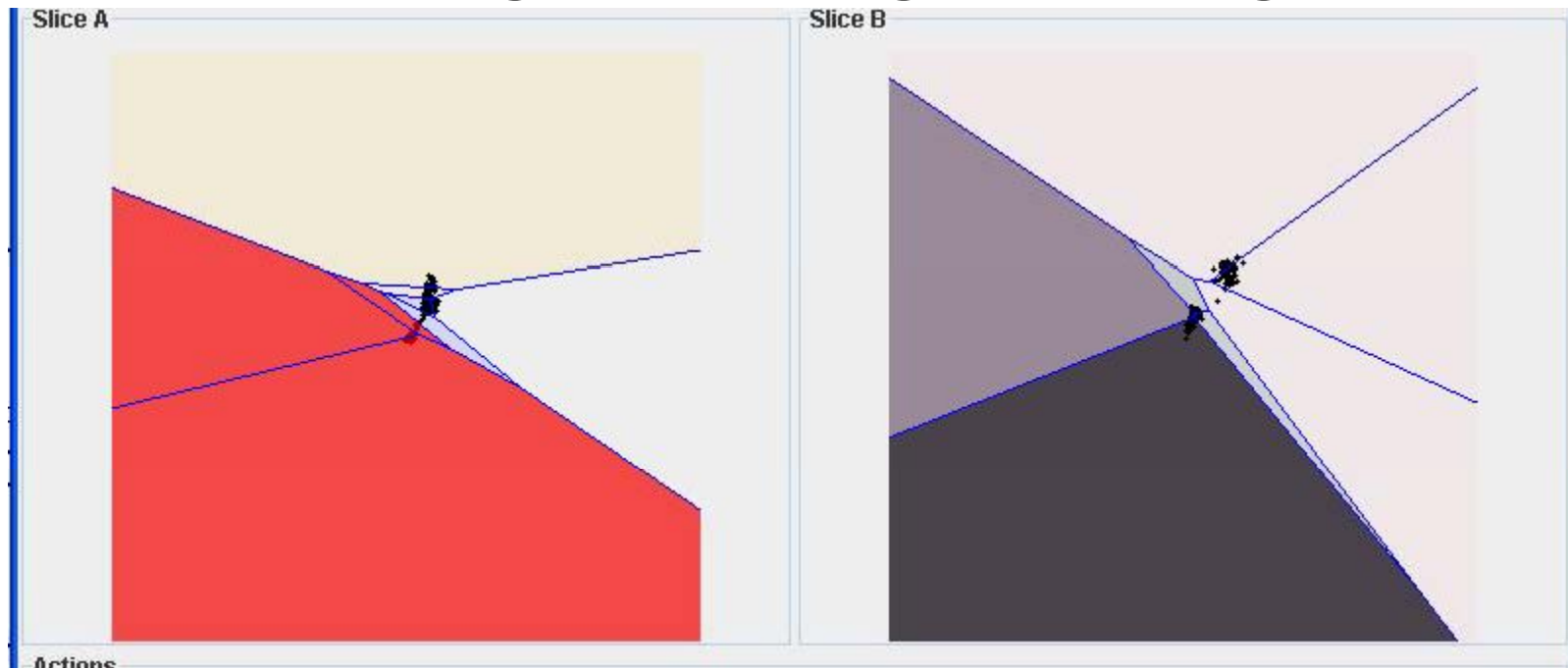
Cluster 1 – (6 W, 124 R)
Cluster 2 – (102 W, 1 R)
Cluster 3 – (32 W, 15 R)
W – 74%, R – 90%

Slice2: Foot Sensor

Cluster 1 – (140 W, 7 R)
Cluster 2 – (33 W, 133 R)
W – 81%, R – 95%

Results

Walking vs Running vs Waving



Slice 1: Arm Sensor

Cluster 1 – (29 Run, 0 Wav,12 Walk)
 Cluster 2 – (28 Run, 0 Wave, 0 Walk)
 Cluster 3 – (1 Run, 0 Wave, 44 Walk)
 Cluster 4 – (0 Run, 58 Wave, 0 Walk)

Slice2: Foot Sensor / Elbow

Cluster 1 – (0 Run, 1 Wave, 32 Walk)
 Cluster 2 – (0 Run, 10 Wave, 20 Walk)
 Cluster 3 – (0Run, 6 Wave, 44 Walk)
 Cluster 4 – (58 Run, 3 Wave 7 Walk)

Analysis of Results

- Results Comparable to Reported [2]:
2 Actions:
[Walking: 89%[2] vs 81%]
[Running: 89%[2] vs 90%]
One extra Cluster
- More Dimensions → Much Better

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Contributions

- Unsupervised Gesture Recognition
- Matlab Toolchain.
- Future Work: More modalities looks promising