Predicting Physical Activities Using Heartbeat and Accelerometer Data via Decision Classifier Tree

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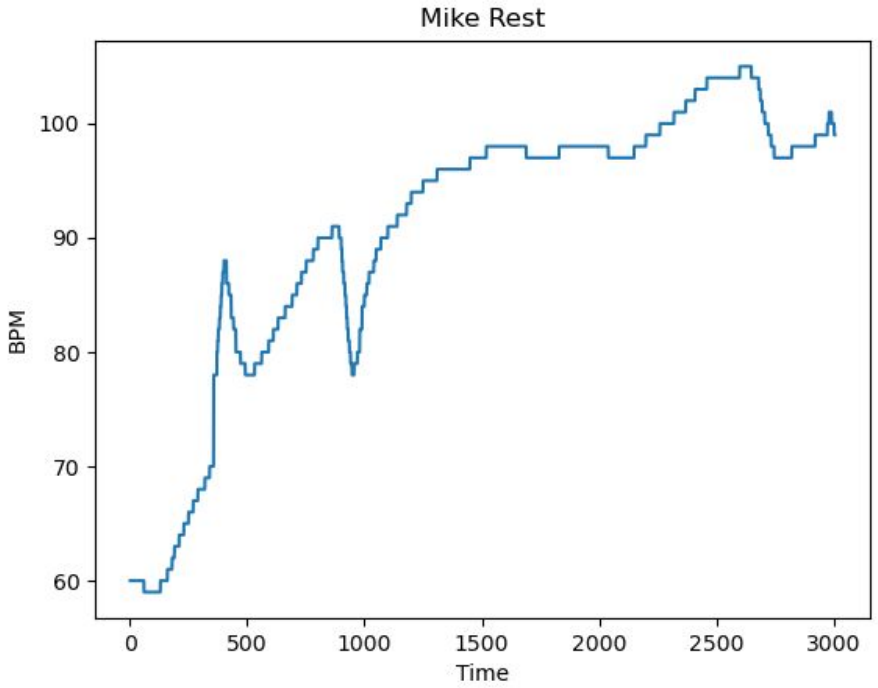
Question and Hypothesis

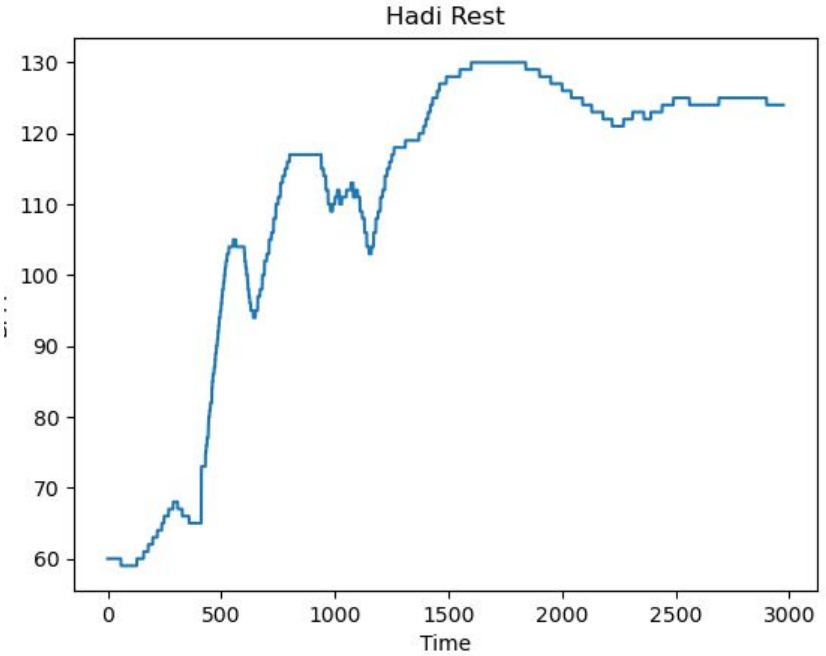
What data will be the most accurate at predicting the activity?

Accelerometer, BPM, Signal Magnitude or a combination?

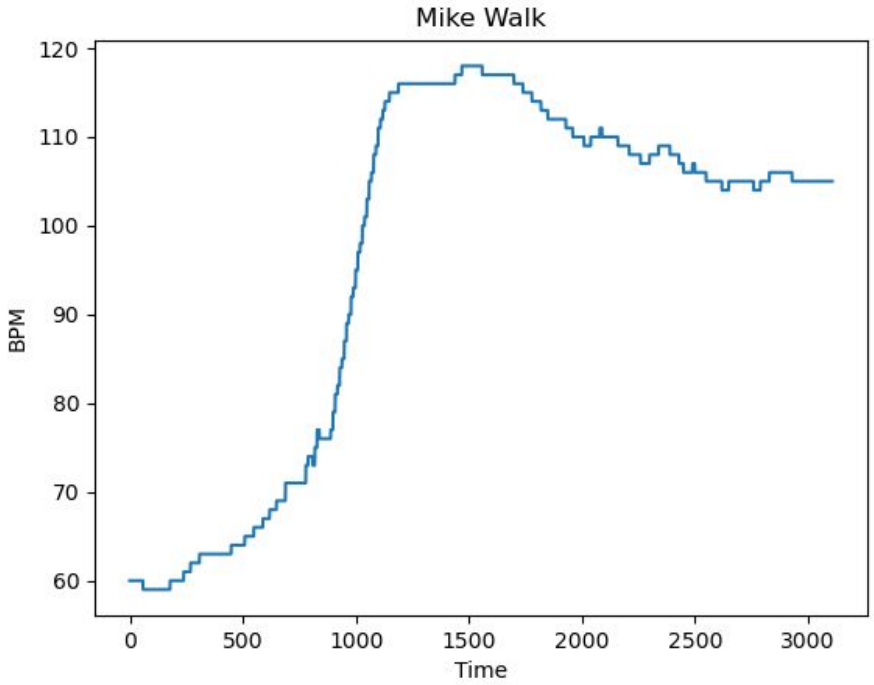
Hypothesis: We believed that BPM signal would be the most accurate in predicting the activity because an individual's BPM can change drastically based on what activity they are doing.

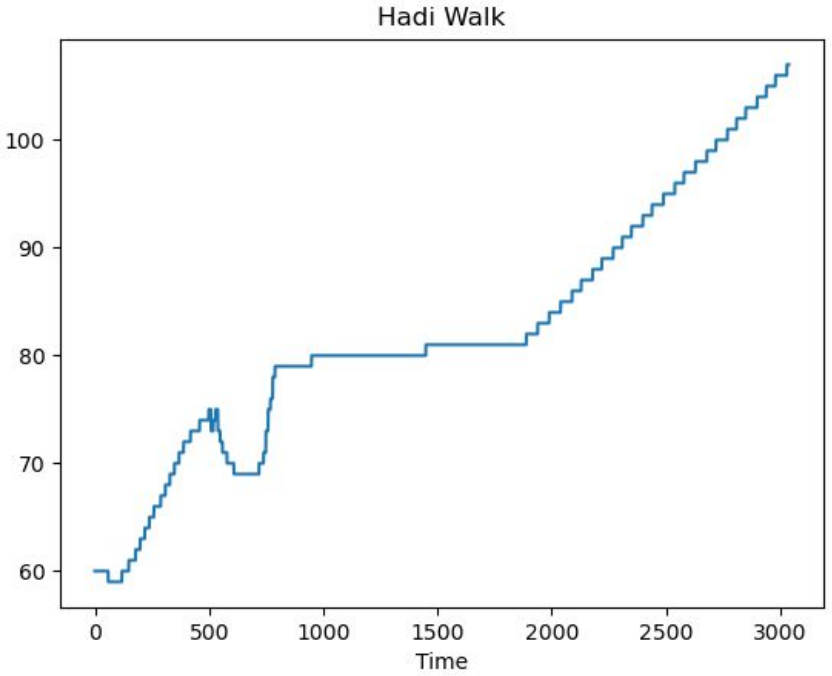
Rest Data

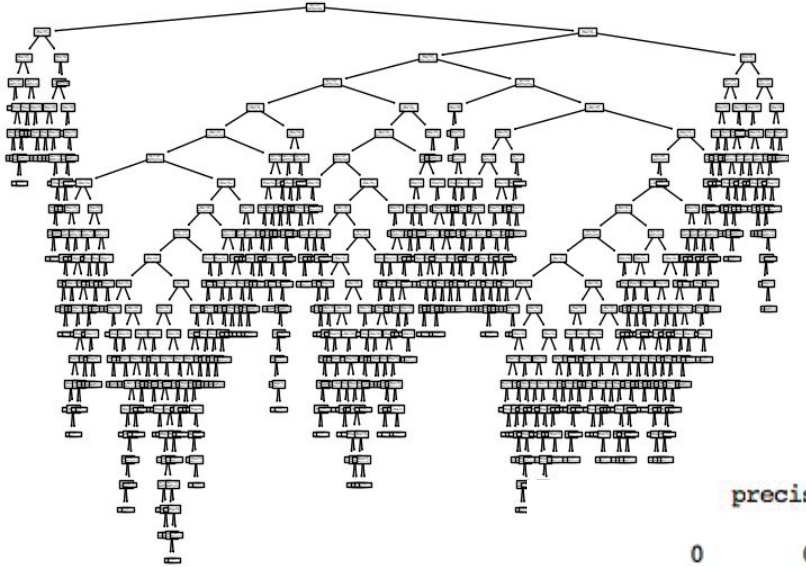

Mike Rest
BPM
100
90
80
70
60
0
500
1000
1500
2000
2500
3000
Time

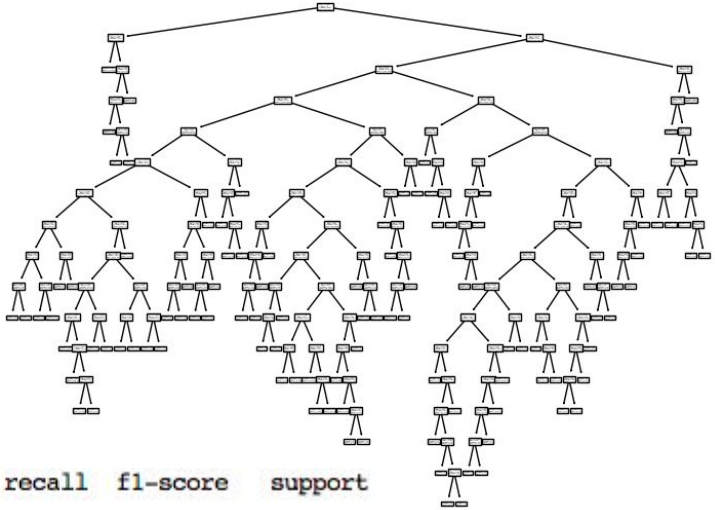

Hadi Rest
130
120
110
100
90
80
70
60
0
500
1000
1500
2000
2500
3000
Time

Walking Data





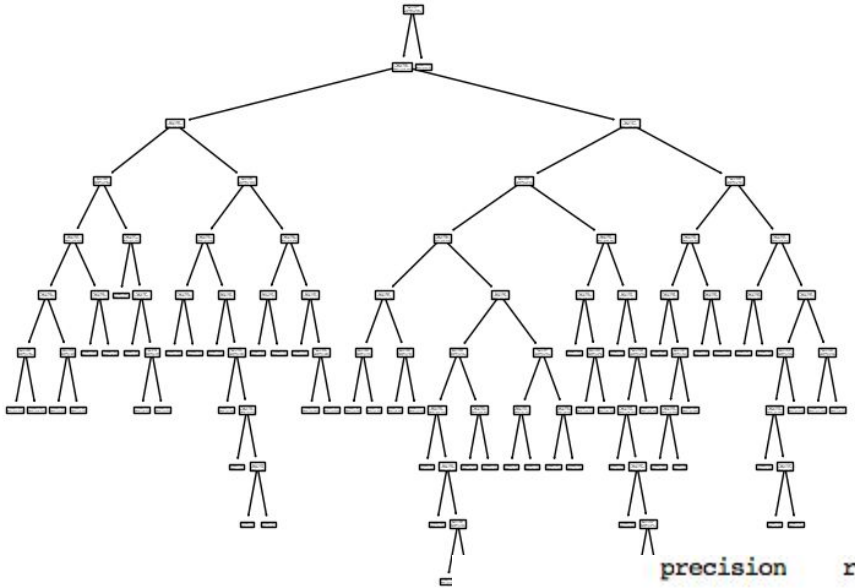


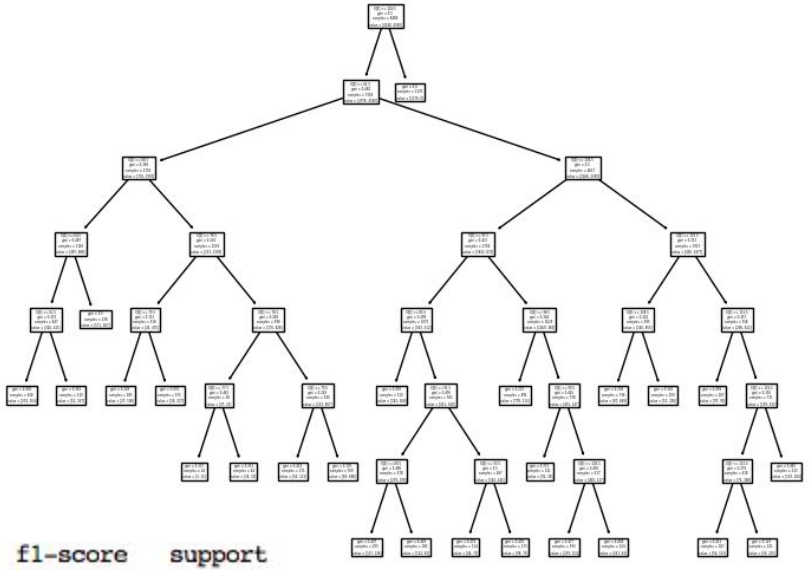


Accelerometer Data

	precision	recall	f1-score	support
0	0.95	0.94	0.94	1833
1	0.94	0.95	0.94	1805
accuracy			0.94	3638
macro avg	0.94	0.94	0.94	3638
weighted avg	0.94	0.94	0.94	3638

	precision	recall	f1-score	support
0	0.95	0.96	0.96	1833
1	0.96	0.95	0.96	1805
accuracy			0.96	3638
macro avg	0.96	0.96	0.96	3638
weighted avg	0.96	0.96	0.96	3638

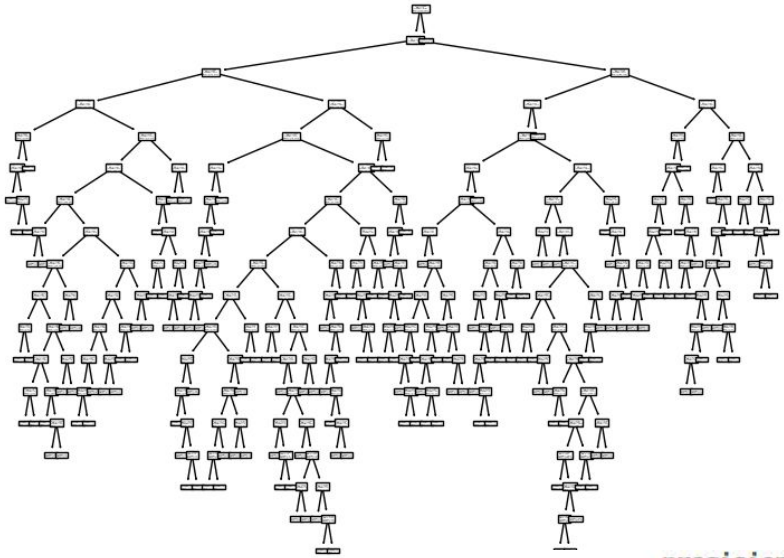


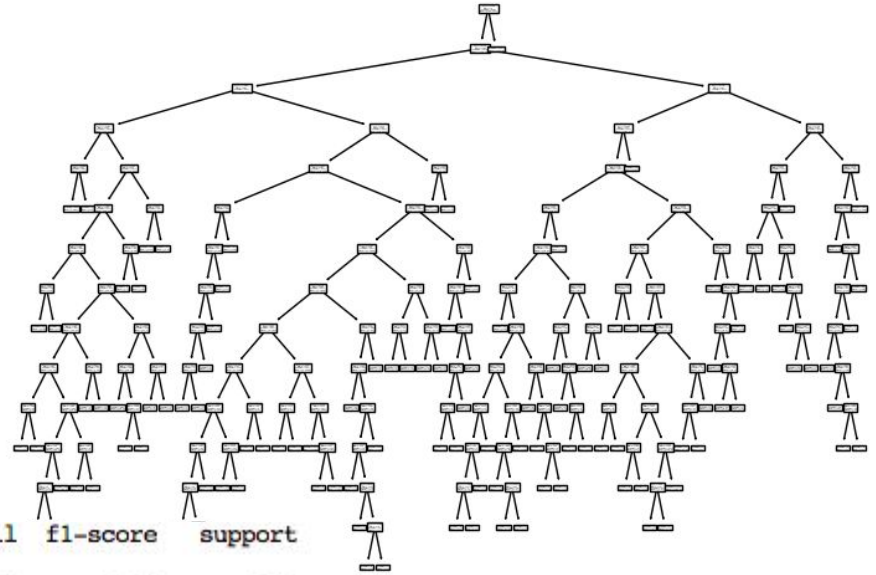


BPM Data

	precision	recall	f1-score	support
0	0.81	0.72	0.76	1833
1	0.74	0.83	0.78	1805
accuracy			0.77	3638
macro avg	0.78	0.77	0.77	3638
weighted avg	0.78	0.77	0.77	3638

	precision	recall	f1-score	support
0	0.78	0.76	0.77	1833
1	0.76	0.78	0.77	1805
accuracy			0.77	3638
macro avg	0.77	0.77	0.77	3638
weighted avg	0.77	0.77	0.77	3638

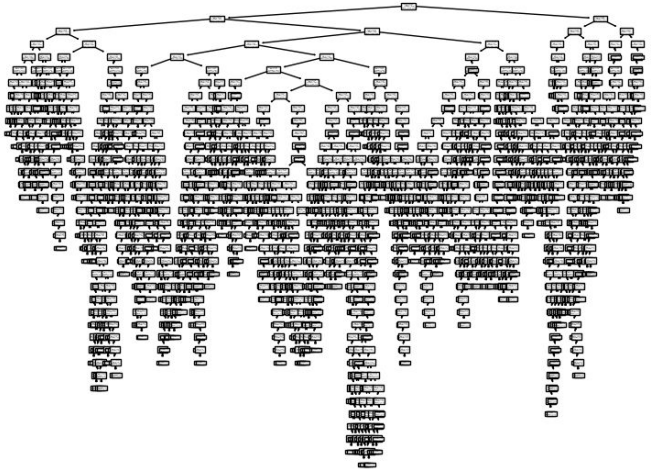




Accelerometer + BPM Data

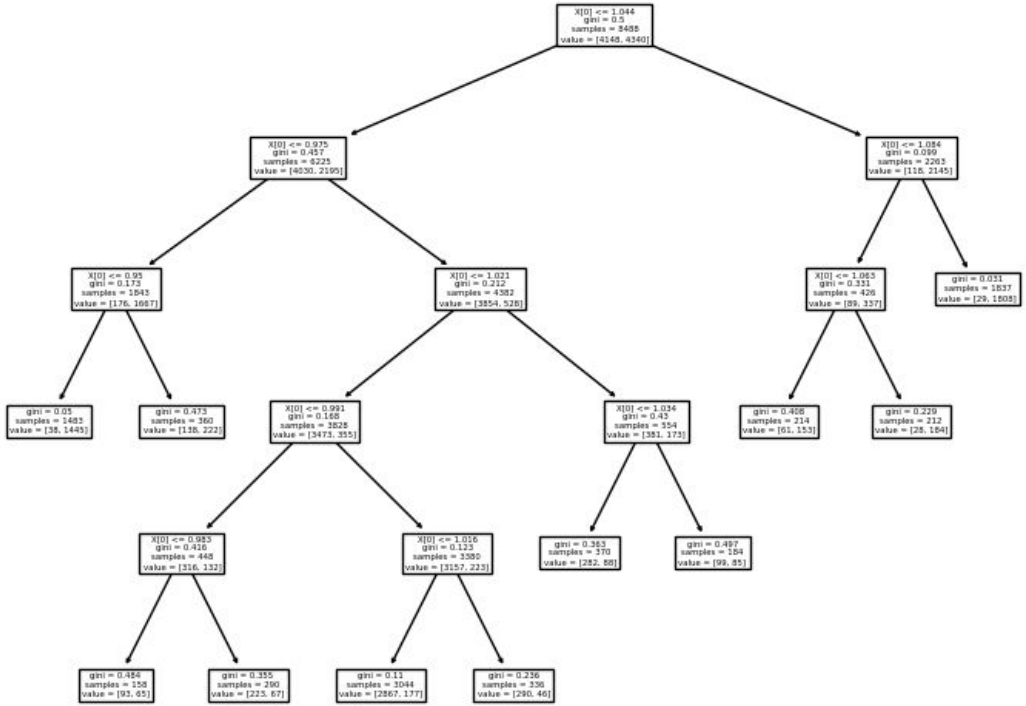
	precision	recall	f1-score	support
0	0.98	0.99	0.99	1833
1	0.99	0.98	0.99	1805
accuracy			0.99	3638
macro avg	0.99	0.99	0.99	3638
weighted avg	0.99	0.99	0.99	3638

	precision	recall	f1-score	support
0	0.98	0.99	0.99	1833
1	0.99	0.98	0.99	1805
accuracy			0.99	3638
macro avg	0.99	0.99	0.99	3638
weighted avg	0.99	0.99	0.99	3638

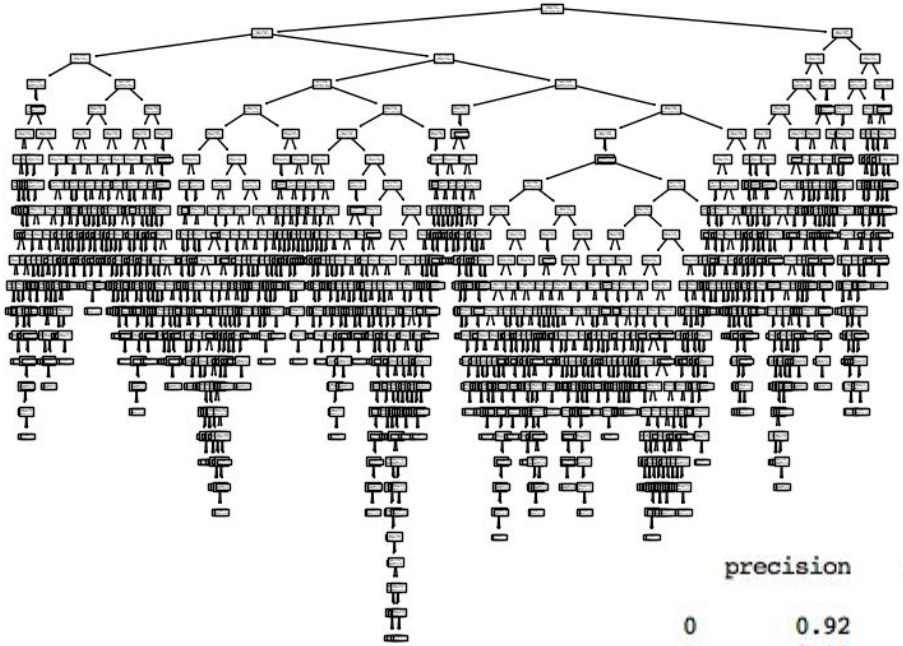


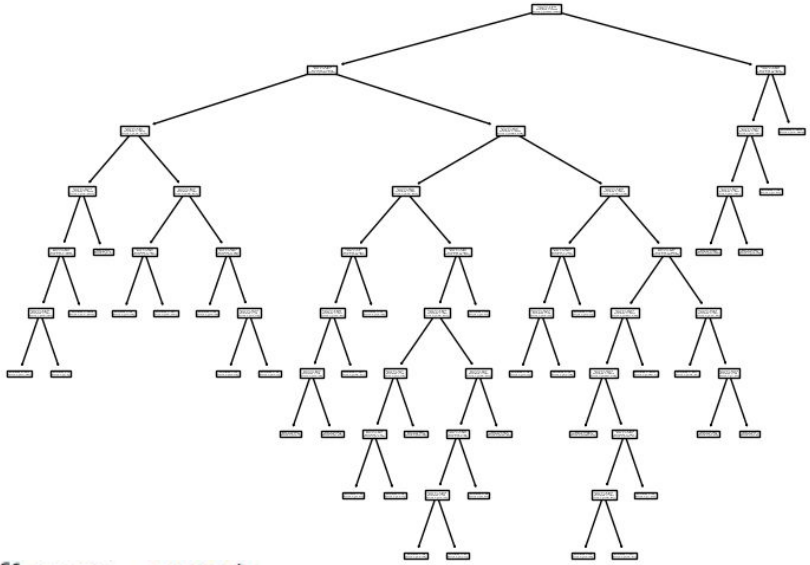
	precision	recall	f1-score	support
0	0.86	0.85	0.86	1833
1	0.85	0.86	0.86	1805
accuracy			0.86	3638
macro avg	0.86	0.86	0.86	3638
weighted avg	0.86	0.86	0.86	3638

	precision	recall	f1-score	support
0	0.89	0.93	0.91	1833
1	0.92	0.88	0.90	1805
accuracy			0.91	3638
macro avg	0.91	0.91	0.91	3638
weighted avg	0.91	0.91	0.91	3638



Signal Magnitude Data





Magnitude + BPM Data

	precision	recall	f1-score	support
0	0.92	0.90	0.91	1833
1	0.90	0.92	0.91	1805
accuracy			0.91	3638
macro avg	0.91	0.91	0.91	3638
weighted avg	0.91	0.91	0.91	3638

	precision	recall	f1-score	support
0	0.92	0.94	0.93	1833
1	0.94	0.91	0.93	1805
accuracy			0.93	3638
macro avg	0.93	0.93	0.93	3638
weighted avg	0.93	0.93	0.93	3638

Conclusion

Decision Trees can easily be subject to overfitting.

Pruning may not always work in your favor.

A combination of signal Magnitude and BPM appear to be the most accurate, but not by much compared to just signal Magnitude.