C:\Users\whitn\Anaconda2\envs\ml4qs2\python.exe C:/Users/whitn/OneDrive/Documenten/Groupwork\_TommyErik/ML4QS/ML4QS-master/PythonCode/crowdsignals\_ch7\_classification\_gym.py

C:/Users/whitn/OneDrive/Documenten/Groupwork\_TommyErik/ML4QS/ML4QS-master/PythonCode/crowdsignals\_ch7\_classification\_gym.py:45: FutureWarning: to\_datetime is deprecated. Use pd.to\_datetime(...)

dataset.index = dataset.index.to\_datetime()

Training set length is: 368

Test set length is: 158

#basic features: 9

#PCA features: 4

#time features: 26

#frequency features: 189

#cluster features: 3

[0.89945652173913049, 0.99184782608695654, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222, 0.99728260869565222]

['mag\_phone\_x\_freq\_0.0\_Hz\_ws\_33', 'mag\_phone\_z\_temp\_mean\_ws\_100', 'pca\_2\_temp\_mean\_ws\_100', 'mag\_phone\_y\_freq\_0.10101010101\_Hz\_ws\_33', 'mag\_phone\_y\_freq\_1.61616161616\_Hz\_ws\_33', 'gyr\_phone\_z\_freq\_0.909090909091\_Hz\_ws\_33', 'acc\_phone\_z\_freq\_0.808080808081\_Hz\_ws\_33', 'gyr\_phone\_z\_freq\_0.30303030303\_Hz\_ws\_33', 'mag\_phone\_z\_pse', 'mag\_phone\_z\_freq\_1.71717172\_Hz\_ws\_33', 'acc\_phone\_z\_freq\_0.30303030303\_Hz\_ws\_33', 'acc\_phone\_z\_freq\_0.40404040404\_Hz\_ws\_33', 'acc\_phone\_z\_freq\_1.41414141414\_Hz\_ws\_33', 'mag\_phone\_z\_freq\_weighted', 'gyr\_phone\_y\_freq\_0.909090909091\_Hz\_ws\_33', 'mag\_phone\_y\_freq\_0.606060606061\_Hz\_ws\_33', 'gyr\_phone\_y\_freq\_0.707070707071\_Hz\_ws\_33', 'acc\_phone\_z\_freq\_0.10101010101\_Hz\_ws\_33', 'gyr\_phone\_y\_freq\_1.41414141414\_Hz\_ws\_33', 'acc\_phone\_x\_freq\_1.0101010101\_Hz\_ws\_33', 'gyr\_phone\_y\_freq\_0.0\_Hz\_ws\_33', 'gyr\_phone\_y\_freq\_1.51515151515\_Hz\_ws\_33', 'mag\_phone\_x\_freq\_0.20202020202\_Hz\_ws\_33', 'mag\_phone\_x\_freq\_1.31313131313\_Hz\_ws\_33', 'gyr\_phone\_x\_freq\_1.41414141414\_Hz\_ws\_33', 'gyr\_phone\_x\_max\_freq', 'mag\_phone\_x\_max\_freq', 'acc\_phone\_y\_freq\_1.61616161616\_Hz\_ws\_33', 'gyr\_phone\_y\_freq\_1.31313131313\_Hz\_ws\_33', 'mag\_phone\_y\_freq\_1.71717172\_Hz\_ws\_33', 'acc\_phone\_x\_max\_freq', 'gyr\_phone\_x', 'gyr\_phone\_z\_freq\_1.41414141414\_Hz\_ws\_33', 'acc\_phone\_y\_freq\_0.808080808081\_Hz\_ws\_33', 'acc\_phone\_y\_freq\_0.909090909091\_Hz\_ws\_33', 'acc\_phone\_x\_freq\_0.20202020202\_Hz\_ws\_33', 'gyr\_phone\_y\_max\_freq', 'gyr\_phone\_z\_pse', 'gyr\_phone\_x\_pse', 'gyr\_phone\_y\_freq\_1.61616161616\_Hz\_ws\_33', 'gyr\_phone\_y\_freq\_0.808080808081\_Hz\_ws\_33', 'acc\_phone\_x\_freq\_1.71717172\_Hz\_ws\_33', 'acc\_phone\_z\_freq\_1.0101010101\_Hz\_ws\_33', 'mag\_phone\_z\_freq\_0.10101010101\_Hz\_ws\_33', 'mag\_phone\_y\_max\_freq', 'gyr\_phone\_y\_pse', 'gyr\_phone\_z\_freq\_0.707070707071\_Hz\_ws\_33', 'acc\_phone\_z\_freq\_0.20202020202\_Hz\_ws\_33', 'gyr\_phone\_z\_freq\_1.0101010101\_Hz\_ws\_33', 'gyr\_phone\_y\_freq\_1.21212121212\_Hz\_ws\_33']

C:\Users\whitn\Anaconda2\envs\ml4qs2\lib\site-packages\sklearn\neural\_network\multilayer\_perceptron.py:563: ConvergenceWarning: Stochastic Optimizer: Maximum iterations reached and the optimization hasn't converged yet.

% (), ConvergenceWarning)

These are the selected **features ['mag\_phone\_x\_freq\_0.0\_Hz\_ws\_33', 'mag\_phone\_z\_temp\_mean\_ws\_100', 'pca\_2\_temp\_mean\_ws\_100', 'mag\_phone\_y\_freq\_0.10101010101\_Hz\_ws\_33', 'mag\_phone\_y\_freq\_1.61616161616\_Hz\_ws\_33', 'gyr\_phone\_z\_freq\_0.909090909091\_Hz\_ws\_33', 'acc\_phone\_z\_freq\_0.808080808081\_Hz\_ws\_33', 'gyr\_phone\_z\_freq\_0.30303030303\_Hz\_ws\_33', 'mag\_phone\_z\_pse', 'mag\_phone\_z\_freq\_1.71717172\_Hz\_ws\_33', 'acc\_phone\_z\_freq\_0.30303030303\_Hz\_ws\_33', 'acc\_phone\_z\_freq\_0.40404040404\_Hz\_ws\_33', 'acc\_phone\_z\_freq\_1.41414141414\_Hz\_ws\_33', 'mag\_phone\_z\_freq\_weighted', 'gyr\_phone\_y\_freq\_0.909090909091\_Hz\_ws\_33', 'mag\_phone\_y\_freq\_0.606060606061\_Hz\_ws\_33', 'gyr\_phone\_y\_freq\_0.707070707071\_Hz\_ws\_33', 'acc\_phone\_z\_freq\_0.10101010101\_Hz\_ws\_33', 'gyr\_phone\_y\_freq\_1.41414141414\_Hz\_ws\_33', 'acc\_phone\_x\_freq\_1.0101010101\_Hz\_ws\_33']**

initial set & 0.9908 \emph{( 0.9808 - 1.0007 )} & 0.9291 \emph{( 0.8883 - 0.9699 )} & 0.9989 \emph{( 0.9955 - 1.0023 )} & 0.9481 \emph{( 0.9128 - 0.9834 )} & 0.9973 \emph{( 0.9919 - 1.0027 )} & 0.9747 \emph{( 0.9497 - 0.9997 )} & 1.0000 \emph{( 1.0000 - 1.0000 )} & 0.9557 \emph{( 0.9230 - 0.9884 )} & 0.9837 \emph{( 0.9705 - 0.9969 )} & 0.9241 \emph{( 0.8819 - 0.9662 )} & 0.9049 \emph{( 0.8743 - 0.9355 )} & 0.8987 \emph{( 0.8507 - 0.9467 )} \\\hline

Chapter 3 & 0.9804 \emph{( 0.9660 - 0.9949 )} & 0.9316 \emph{( 0.8915 - 0.9718 )} & 0.9995 \emph{( 0.9970 - 1.0019 )} & 0.9443 \emph{( 0.9078 - 0.9808 )} & 0.9973 \emph{( 0.9919 - 1.0027 )} & 0.9747 \emph{( 0.9497 - 0.9997 )} & 1.0000 \emph{( 1.0000 - 1.0000 )} & 0.9557 \emph{( 0.9230 - 0.9884 )} & 0.9810 \emph{( 0.9667 - 0.9952 )} & 0.9051 \emph{( 0.8584 - 0.9517 )} & 0.8995 \emph{( 0.8681 - 0.9308 )} & 0.8861 \emph{( 0.8355 - 0.9366 )} \\\hline

Chapter 4 & 1.0000 \emph{( 1.0000 - 1.0000 )} & 0.9481 \emph{( 0.9128 - 0.9834 )} & 1.0000 \emph{( 1.0000 - 1.0000 )} & 0.9937 \emph{( 0.9811 - 1.0063 )} & 1.0000 \emph{( 1.0000 - 1.0000 )} & 0.9684 \emph{( 0.9405 - 0.9962 )} & 0.9891 \emph{( 0.9783 - 0.9999 )} & 0.9747 \emph{( 0.9497 - 0.9997 )} & 0.9973 \emph{( 0.9919 - 1.0027 )} & 0.9747 \emph{( 0.9497 - 0.9997 )} & 0.9918 \emph{( 0.9825 - 1.0012 )} & 0.9684 \emph{( 0.9405 - 0.9962 )} \\\hline

Chapter 5 & 0.9989 \emph{( 0.9955 - 1.0023 )} & 0.9570 \emph{( 0.9247 - 0.9893 )} & 1.0000 \emph{( 1.0000 - 1.0000 )} & 0.9975 \emph{( 0.9895 - 1.0055 )} & 1.0000 \emph{( 1.0000 - 1.0000 )} & 0.9684 \emph{( 0.9405 - 0.9962 )} & 0.9891 \emph{( 0.9783 - 0.9999 )} & 0.9747 \emph{( 0.9497 - 0.9997 )} & 0.9973 \emph{( 0.9919 - 1.0027 )} & 0.9557 \emph{( 0.9230 - 0.9884 )} & 0.9918 \emph{( 0.9825 - 1.0012 )} & 0.9557 \emph{( 0.9230 - 0.9884 )} \\\hline

Selected features & 0.9967 \emph{( 0.9908 - 1.0027 )} & 0.9152 \emph{( 0.8709 - 0.9595 )} & 1.0000 \emph{( 1.0000 - 1.0000 )} & 0.9835 \emph{( 0.9633 - 1.0038 )} & 0.9918 \emph{( 0.9825 - 1.0012 )} & 0.9494 \emph{( 0.9145 - 0.9843 )} & 0.9130 \emph{( 0.8837 - 0.9424 )} & 0.9114 \emph{( 0.8662 - 0.9566 )} & 0.9891 \emph{( 0.9783 - 0.9999 )} & 0.9367 \emph{( 0.8980 - 0.9755 )} & 0.9620 \emph{( 0.9420 - 0.9819 )} & 0.9494 \emph{( 0.9145 - 0.9843 )} \\\hline

{'criterion': 'gini', 'min\_samples\_leaf': 2}

Feature importance decision tree:

mag\_phone\_z\_temp\_mean\_ws\_100 & 0.387648094342

mag\_phone\_x\_freq\_0.0\_Hz\_ws\_33 & 0.360040675074

pca\_2\_temp\_mean\_ws\_100 & 0.221721634777

acc\_phone\_z\_freq\_0.808080808081\_Hz\_ws\_33 & 0.0116126356536

acc\_phone\_z\_freq\_0.40404040404\_Hz\_ws\_33 & 0.00989224518636

mag\_phone\_z\_pse & 0.00908471496707

mag\_phone\_y\_freq\_0.10101010101\_Hz\_ws\_33 & 0.0

mag\_phone\_y\_freq\_1.61616161616\_Hz\_ws\_33 & 0.0

gyr\_phone\_z\_freq\_0.909090909091\_Hz\_ws\_33 & 0.0

gyr\_phone\_z\_freq\_0.30303030303\_Hz\_ws\_33 & 0.0

mag\_phone\_z\_freq\_1.71717172\_Hz\_ws\_33 & 0.0

acc\_phone\_z\_freq\_0.30303030303\_Hz\_ws\_33 & 0.0

acc\_phone\_z\_freq\_1.41414141414\_Hz\_ws\_33 & 0.0

mag\_phone\_z\_freq\_weighted & 0.0

gyr\_phone\_y\_freq\_0.909090909091\_Hz\_ws\_33 & 0.0

mag\_phone\_y\_freq\_0.606060606061\_Hz\_ws\_33 & 0.0

gyr\_phone\_y\_freq\_0.707070707071\_Hz\_ws\_33 & 0.0

acc\_phone\_z\_freq\_0.10101010101\_Hz\_ws\_33 & 0.0

gyr\_phone\_y\_freq\_1.41414141414\_Hz\_ws\_33 & 0.0

acc\_phone\_x\_freq\_1.0101010101\_Hz\_ws\_33 & 0.0

{'n\_estimators': 50, 'criterion': 'gini', 'min\_samples\_leaf': 2}

Feature importance random forest:

mag\_phone\_z\_temp\_mean\_ws\_100 & 0.220553126428

mag\_phone\_x\_freq\_0.0\_Hz\_ws\_33 & 0.211141597297

pca\_2\_temp\_mean\_ws\_100 & 0.175580825925

mag\_phone\_z\_pse & 0.12185982338

gyr\_phone\_z\_freq\_0.909090909091\_Hz\_ws\_33 & 0.044323967311

mag\_phone\_y\_freq\_1.61616161616\_Hz\_ws\_33 & 0.0329843882662

mag\_phone\_z\_freq\_1.71717172\_Hz\_ws\_33 & 0.025708383236

gyr\_phone\_y\_freq\_0.909090909091\_Hz\_ws\_33 & 0.0212230717861

acc\_phone\_x\_freq\_1.0101010101\_Hz\_ws\_33 & 0.0207110298613

mag\_phone\_y\_freq\_0.606060606061\_Hz\_ws\_33 & 0.0202288986844

gyr\_phone\_y\_freq\_0.707070707071\_Hz\_ws\_33 & 0.0164829341155

acc\_phone\_z\_freq\_0.808080808081\_Hz\_ws\_33 & 0.0140557766198

acc\_phone\_z\_freq\_0.10101010101\_Hz\_ws\_33 & 0.0123536945745

acc\_phone\_z\_freq\_0.40404040404\_Hz\_ws\_33 & 0.0119225558095

mag\_phone\_y\_freq\_0.10101010101\_Hz\_ws\_33 & 0.0112494123585

mag\_phone\_z\_freq\_weighted & 0.00920172515368

gyr\_phone\_z\_freq\_0.30303030303\_Hz\_ws\_33 & 0.00908729938281

acc\_phone\_z\_freq\_0.30303030303\_Hz\_ws\_33 & 0.00802101313154

acc\_phone\_z\_freq\_1.41414141414\_Hz\_ws\_33 & 0.00665902695118

gyr\_phone\_y\_freq\_1.41414141414\_Hz\_ws\_33 & 0.00665144972732

Process finished with exit code 0