Drop some files out for test. Shuffle and split the rest data as 75% for training and 25% for validation.

Cost sensitive learning(1:5) for binary classification(0:others)

Feature: [IEMG,SSI,WL,ZC,ku,SSC,skew,Acti,AR,HIST,MDF,MNF,mDWT]

threshold\_ZC = 0.00

threshold\_SSC = 0.001

bins=5

bound = 4

HIST\_range = (-bound,bound)

level = 3

Feature scale: MinMaxScaler((0,1))

## Drop Files[6,30,31,32,33,34,35]:

Class 0 : others

Train (acc 0.991)

|  |  |  |
| --- | --- | --- |
|  | Predicted 0 | Predicted others |
| Actual 0 | 5518 | 44 |
| Actual others | 8 | 517 |

Valid (acc 0.980)

|  |  |  |
| --- | --- | --- |
|  | Predicted 0 | Predicted others |
| Actual 0 | 1814 | 26 |
| Actual others | 11 | 179 |

Test (acc 0.918)

|  |  |  |
| --- | --- | --- |
|  | Predicted 0 | Predicted others |
| Actual 0 | 283 | 43 |
| Actual others | 0 | 201 |

Class 1 : 2 : 6

Train (acc 0.912)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Predicted 1 | Predicted 2 | Predicted 6 |
| Actual 1 | 93 | 5 | 24 |
| Actual 2 | 44 | 239 | 7 |
| Actual 6 | 0 | 0 | 156 |

Valid (acc 0.860)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Predicted 1 | Predicted 2 | Predicted 6 |
| Actual 1 | 20 | 4 | 7 |
| Actual 2 | 4 | 90 | 4 |
| Actual 6 | 4 | 2 | 44 |

Test (acc 0.741)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Predicted 1 | Predicted 2 | Predicted 6 |
| Actual 1 | 38 | 10 | 4 |
| Actual 2 | 18 | 36 | 3 |
| Actual 6 | 15 | 2 | 75 |

Class 2 : 6

Train (acc 0.961)

|  |  |  |
| --- | --- | --- |
|  | Predicted 2 | Predicted 6 |
| Actual 2 | 251 | 8 |
| Actual 6 | 8 | 153 |

Valid (acc 0.950)

|  |  |  |
| --- | --- | --- |
|  | Predicted 2 | Predicted 6 |
| Actual 2 | 92 | 4 |
| Actual 6 | 3 | 42 |

Test (acc 0.919)

|  |  |  |
| --- | --- | --- |
|  | Predicted 2 | Predicted 6 |
| Actual 2 | 55 | 2 |
| Actual 6 | 10 | 82 |

Class 1 : 6

Train (acc 0.962)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 6 |
| Actual 1 | 113 | 9 |
| Actual 6 | 1 | 146 |

Valid (acc 0.911)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 6 |
| Actual 1 | 25 | 6 |
| Actual 6 | 2 | 57 |

Test (acc 0.847)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 6 |
| Actual 1 | 45 | 7 |
| Actual 6 | 15 | 77 |

Class 1 : 2

Train (acc 0.947)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 2 |
| Actual 1 | 110 | 11 |
| Actual 2 | 9 | 251 |

Valid (acc 0.897)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 2 |
| Actual 1 | 26 | 6 |
| Actual 2 | 7 | 88 |

Test (acc 0.779)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 2 |
| Actual 1 | 41 | 11 |
| Actual 2 | 13 | 44 |

## Drop Files[7,30,31,32,33,34,35]:

Class 0 : others

Train (acc 0.980)

|  |  |  |
| --- | --- | --- |
|  | Predicted 0 | Predicted others |
| Actual 0 | 5485 | 114 |
| Actual others | 2 | 435 |

Valid (acc 0.975)

|  |  |  |
| --- | --- | --- |
|  | Predicted 0 | Predicted others |
| Actual 0 | 1810 | 43 |
| Actual others | 6 | 153 |

Test (acc 0.983)

|  |  |  |
| --- | --- | --- |
|  | Predicted 0 | Predicted others |
| Actual 0 | 269 | 7 |
| Actual others | 3 | 317 |

Class 1 : 2 : 6

Train (acc 0.935)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Predicted 1 | Predicted 2 | Predicted 6 |
| Actual 1 | 51 | 12 | 1 |
| Actual 2 | 4 | 226 | 2 |
| Actual 6 | 9 | 1 | 141 |

Valid (acc 0.859)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Predicted 1 | Predicted 2 | Predicted 6 |
| Actual 1 | 7 | 6 | 2 |
| Actual 2 | 6 | 88 | 1 |
| Actual 6 | 5 | 1 | 33 |

Test (acc 0.686)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Predicted 1 | Predicted 2 | Predicted 6 |
| Actual 1 | 67 | 24 | 35 |
| Actual 2 | 21 | 59 | 5 |
| Actual 6 | 11 | 4 | 93 |

Class 2 : 6

Train (acc 0.976)

|  |  |  |
| --- | --- | --- |
|  | Predicted 2 | Predicted 6 |
| Actual 2 | 236 | 8 |
| Actual 6 | 1 | 142 |

Valid (acc 0.938)

|  |  |  |
| --- | --- | --- |
|  | Predicted 2 | Predicted 6 |
| Actual 2 | 78 | 5 |
| Actual 6 | 3 | 44 |

Test (acc 0.683)

|  |  |  |
| --- | --- | --- |
|  | Predicted 2 | Predicted 6 |
| Actual 2 | 24 | 61 |
| Actual 6 | 0 | 108 |

Class 1 : 6

Train (acc 0.955)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 6 |
| Actual 1 | 58 | 1 |
| Actual 6 | 8 | 134 |

Valid (acc 0.970)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 6 |
| Actual 1 | 18 | 2 |
| Actual 6 | 0 | 48 |

Test (acc 0.739)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 6 |
| Actual 1 | 113 | 13 |
| Actual 6 | 48 | 60 |

Class 1 : 2

Train (acc 0.911)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 2 |
| Actual 1 | 47 | 11 |
| Actual 2 | 16 | 230 |

Valid (acc 0.901)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 2 |
| Actual 1 | 14 | 7 |
| Actual 2 | 3 | 78 |

Test (acc 0.748)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 2 |
| Actual 1 | 109 | 17 |
| Actual 2 | 36 | 49 |

## Drop Files[5,30,31,32,33,34,35]:

Class 0 : others

Train (acc 0.975)

|  |  |  |
| --- | --- | --- |
|  | Predicted 0 | Predicted others |
| Actual 0 | 5426 | 145 |
| Actual others | 8 | 583 |

Valid (acc 0.968)

|  |  |  |
| --- | --- | --- |
|  | Predicted 0 | Predicted others |
| Actual 0 | 1787 | 59 |
| Actual others | 6 | 203 |

Test (acc 0.927)

|  |  |  |
| --- | --- | --- |
|  | Predicted 0 | Predicted others |
| Actual 0 | 292 | 19 |
| Actual others | 12 | 104 |

Class 1 : 2 : 6

Train (acc 0.879)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Predicted 1 | Predicted 2 | Predicted 6 |
| Actual 1 | 111 | 24 | 11 |
| Actual 2 | 16 | 281 | 0 |
| Actual 6 | 14 | 7 | 135 |

Valid (acc 0.835)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Predicted 1 | Predicted 2 | Predicted 6 |
| Actual 1 | 31 | 13 | 2 |
| Actual 2 | 9 | 96 | 1 |
| Actual 6 | 8 | 0 | 40 |

Test (acc 0.112)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Predicted 1 | Predicted 2 | Predicted 6 |
| Actual 1 | 4 | 9 | 0 |
| Actual 2 | 2 | 7 | 0 |
| Actual 6 | 55 | 27 | 2 |

Class 2 : 6

Train (acc 0.942)

|  |  |  |
| --- | --- | --- |
|  | Predicted 2 | Predicted 6 |
| Actual 2 | 272 | 20 |
| Actual 6 | 6 | 157 |

Valid (acc 0.953)

|  |  |  |
| --- | --- | --- |
|  | Predicted 2 | Predicted 6 |
| Actual 2 | 106 | 5 |
| Actual 6 | 2 | 39 |

Test (acc 0.689)

|  |  |  |
| --- | --- | --- |
|  | Predicted 2 | Predicted 6 |
| Actual 2 | 7 | 2 |
| Actual 6 | 30 | 64 |

Class 1 : 6

Train (acc 0.929)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 6 |
| Actual 1 | 133 | 12 |
| Actual 6 | 9 | 143 |

Valid (acc 0.868)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 6 |
| Actual 1 | 41 | 6 |
| Actual 6 | 7 | 45 |

Test (acc 0.130)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 6 |
| Actual 1 | 13 | 0 |
| Actual 6 | 93 | 1 |

Class 1 : 2

Train (acc 0.946)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 2 |
| Actual 1 | 141 | 11 |
| Actual 2 | 13 | 281 |

Valid (acc 0.879)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 2 |
| Actual 1 | 29 | 11 |
| Actual 2 | 7 | 102 |

Test (acc 0.454)

|  |  |  |
| --- | --- | --- |
|  | Predicted 1 | Predicted 2 |
| Actual 1 | 1 | 12 |
| Actual 2 | 0 | 9 |

## Model:

acti = 'relu'

drop = 0.2

init = 'glorot\_normal'

model = models.Sequential()

model.add(layers.Dense(128, kernel\_initializer=init))

model.add(layers.Activation(acti))

model.add(layers.Dropout(drop))

model.add(layers.Dense(64, kernel\_initializer=init ))

model.add(layers.Activation(acti))

model.add(layers.Dropout(drop))

model.add(layers.Dense(32, kernel\_initializer=init))

model.add(layers.Activation(acti))

model.add(layers.Dropout(drop))

model.add(layers.Dense(16, kernel\_initializer=init))

model.add(layers.Activation(acti))

model.add(layers.Dropout(drop))

model.add(layers.Dense(2,activation='softmax'))