

```
In [1]: # collect data
import os
import numpy as np
import pandas as pd

root = "./Dog Collar IFT/"
folder = os.listdir(root)
datasets = {}
for fold in folder:
    name = fold
    subfolder = os.listdir(root + fold)
    for subfold in subfolder:
        if "Activity" in subfold:
            activity_data = pd.read_csv(root + fold + "/" + subfold)
            activity_data = pd.DataFrame(np.array(activity_data[['Packet Time', 'Activ
elif "Light" in subfold:
            light_data = pd.read_csv(root + fold + "/" + subfold)
            light_data = pd.DataFrame(np.array(light_data[['Packet Time', ' Light'])))
elif "Audio" in subfold:
            audio_data = pd.read_csv(root + fold + "/" + subfold)
            audio_data = pd.DataFrame(np.array(audio_data[['Packet Time', ' Audio'])))
elif "IMU" in subfold:
            imu_data = pd.read_csv(root + fold + "/" + subfold)
            imu_data['action'] = imu_data[' X']**2 + imu_data[' Y']**2 + imu_data[' Z']
            imu_data = pd.DataFrame(np.array(imu_data[['Packet Time', ' X', ' Y', ' Z',
elif "Pressure" in subfold:
            pressure_data = pd.read_csv(root + fold + "/" + subfold)
            pressure_data = pd.DataFrame(np.array(pressure_data[['Packet Time', ' Press
elif "Temp_" in subfold:
            temp_data = pd.read_csv(root + fold + "/" + subfold)
            temp_data = pd.DataFrame(np.array(temp_data[['Packet Time', ' Temperature']
elif "Humid" in subfold:
            humid_data = pd.read_csv(root + fold + "/" + subfold)
            humid_data = pd.DataFrame(np.array(humid_data[['Packet Time', ' Humidity']])
        dataset = {'act':activity_data, 'light':light_data, 'audio':audio_data, 'imu':imu_d
        datasets.update({name:dataset})
    print(datasets.keys())

dict_keys(['2022-10-05-08_29_20'])
```

Low-Level Fusion (Data Level)

```
In [2]: import DFE_object
```

```
In [3]: # Create DFE object
dfeo = DFE_object.DFE_object()

# Upload data
a_data = datasets['2022-10-05-08_29_20']
dfeo.import_from_pandas(a_data['light'], t = 0)
dfeo.import_from_pandas(a_data['audio'], t = 0)
dfeo.import_from_pandas(a_data['imu'], t = 0)
dfeo.import_from_pandas(a_data['press'], t = 0)
dfeo.import_from_pandas(a_data['temp'], t = 0)
dfeo.import_from_pandas(a_data['humid'], t = 0)
```

```

dfeo.import_from_pandas(a_data['act'], t = 0, y = 1, categorical = 1)

# Temporal Alignment
u_time = pd.DataFrame(a_data['imu'][0]) # we chose to have imu time as the universal ti
dfeo.temporal_alignment(u_time)

# Normalize (Z-score)
dfeo.normalize('Entry_0', ignore = [0]) # Z-score not the time column
dfeo.normalize('Entry_1', ignore = [0])
dfeo.normalize('Entry_2', ignore = [0])
dfeo.normalize('Entry_3', ignore = [0])
dfeo.normalize('Entry_4', ignore = [0])
dfeo.normalize('Entry_5', ignore = [0])

# Low-Level Data Fusion: Concatenation
dfeo.concatenate()

# Classification: Random Forest
dfeo.random_forest()
dfeo.classification_report()

```

C:\Users\dmarti22\Anaconda3\lib\site-packages\sklearn\metrics_classification.py:1245: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.

_warn_prf(average, modifier, msg_start, len(result))

C:\Users\dmarti22\Anaconda3\lib\site-packages\sklearn\metrics_classification.py:1245: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.

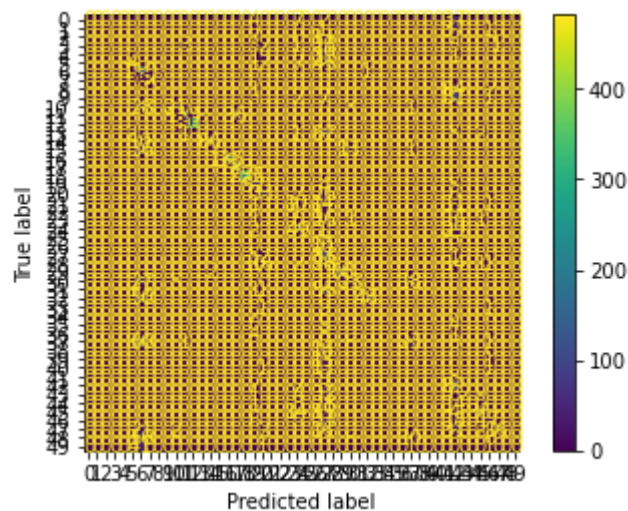
_warn_prf(average, modifier, msg_start, len(result))

C:\Users\dmarti22\Anaconda3\lib\site-packages\sklearn\metrics_classification.py:1245: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.

_warn_prf(average, modifier, msg_start, len(result))

	precision	recall	f1-score	support
0.0	0.00	0.00	0.00	50
1.0	0.00	0.00	0.00	39
2.0	0.00	0.00	0.00	22
3.0	0.00	0.00	0.00	41
4.0	0.00	0.00	0.00	50
5.0	0.67	0.07	0.12	59
6.0	0.25	0.99	0.40	111
7.0	1.00	1.00	1.00	482
8.0	0.00	0.00	0.00	67
9.0	0.00	0.00	0.00	94
10.0	0.58	0.40	0.47	53
11.0	0.96	0.77	0.85	149
12.0	1.00	1.00	1.00	310
13.0	0.00	0.00	0.00	73
14.0	0.97	0.87	0.92	76
15.0	0.00	0.00	0.00	50
16.0	1.00	1.00	1.00	136
17.0	0.78	1.00	0.88	123
18.0	1.00	1.00	1.00	236
19.0	0.48	0.85	0.62	61
20.0	0.46	0.49	0.47	67
21.0	0.00	0.00	0.00	37
22.0	0.00	0.00	0.00	27
23.0	0.00	0.00	0.00	45
24.0	0.43	0.60	0.50	81
25.0	0.00	0.00	0.00	14
26.0	0.00	0.00	0.00	10
27.0	0.12	0.91	0.21	91

28.0	0.00	0.00	0.00	72
29.0	1.00	0.97	0.99	70
30.0	0.44	0.32	0.37	73
31.0	0.00	0.00	0.00	57
32.0	0.98	0.49	0.65	98
33.0	0.00	0.00	0.00	11
34.0	0.00	0.00	0.00	8
35.0	0.00	0.00	0.00	13
36.0	0.00	0.00	0.00	13
37.0	0.43	0.25	0.32	91
38.0	0.00	0.00	0.00	26
39.0	0.00	0.00	0.00	16
40.0	0.00	0.00	0.00	15
41.0	0.00	0.00	0.00	17
42.0	0.16	0.92	0.28	89
43.0	1.00	0.04	0.07	54
44.0	0.00	0.00	0.00	51
45.0	0.65	0.51	0.57	68
46.0	0.61	0.20	0.31	83
47.0	0.94	0.18	0.30	90
48.0	0.00	0.00	0.00	76
49.0	0.00	0.00	0.00	44
accuracy				0.56 3789
macro avg				0.32 0.30 0.27 3789
weighted avg				0.57 0.56 0.52 3789



```
Out[3]: (array([[ 0,  0,  0, ...,  0,  0,  0],
                [ 0,  0,  0, ...,  0,  0,  0],
                [ 0,  0,  0, ...,  0,  0,  0],
                ...,
                [ 0,  0,  0, ..., 16,  0,  0],
                [ 0,  0,  0, ...,  0,  0,  0],
                [ 0,  0,  0, ...,  0,  0,  0]], dtype=int64),
         <sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x2627e35cca0>)
```

Mid-Level Fusion (Feature Level)

```
In [4]: # Feature Extraction

dfeo.set_window_scheme(length = 30000, overlap = 5000) # set windowing scheme

dfeo.fe_average("Entry_0")
dfeo.fe_average("Entry_1")
```

```

dfeo.fe_average("Entry_2")
dfeo.fe_average("Entry_3")
dfeo.fe_average("Entry_4")
dfeo.fe_average("Entry_5")

dfeo.fe_variance("Entry_0")
dfeo.fe_variance("Entry_1")
dfeo.fe_variance("Entry_2")
dfeo.fe_variance("Entry_3")
dfeo.fe_variance("Entry_4")
dfeo.fe_variance("Entry_5")

dfeo.fe_skewness("Entry_0")
dfeo.fe_skewness("Entry_1")
dfeo.fe_skewness("Entry_2")
dfeo.fe_skewness("Entry_3")
dfeo.fe_skewness("Entry_4")
dfeo.fe_skewness("Entry_5")

dfeo.fe_kurtosis("Entry_0")
dfeo.fe_kurtosis("Entry_1")
dfeo.fe_kurtosis("Entry_2")
dfeo.fe_kurtosis("Entry_3")
dfeo.fe_kurtosis("Entry_4")
dfeo.fe_kurtosis("Entry_5")

dfeo.fe_peak_count("Entry_0")
dfeo.fe_peak_count("Entry_1")
dfeo.fe_peak_count("Entry_2")
dfeo.fe_peak_count("Entry_3")
dfeo.fe_peak_count("Entry_4")
dfeo.fe_peak_count("Entry_5")

dfeo.fe_RMS("Entry_0")
dfeo.fe_RMS("Entry_1")
dfeo.fe_RMS("Entry_2")
dfeo.fe_RMS("Entry_3")
dfeo.fe_RMS("Entry_4")
dfeo.fe_RMS("Entry_5")

dfeo.classification_windowing("Entry_6")

# Mid-Level Fusion: Concatenation
dfeo.concatenate() # should be able to specify that we're concatenating features for a
                    # defaults to current window scheme if unspecified

# Dimensional Reduction: PCA
dfeo.my_PCA("active")

# Classification: Random Forest
dfeo.random_forest()
dfeo.classification_report()

```

Calculated average on dataset Entry_0 at 2023-05-19 09:54:53.494914.
 Calculated average on dataset Entry_1 at 2023-05-19 09:54:53.513347.
 Calculated average on dataset Entry_2 at 2023-05-19 09:54:53.533341.
 Calculated average on dataset Entry_3 at 2023-05-19 09:54:53.540405.
 Calculated average on dataset Entry_4 at 2023-05-19 09:54:53.556066.
 Calculated average on dataset Entry_5 at 2023-05-19 09:54:53.556066.
 Calculated variance on dataset Entry_0 at 2023-05-19 09:54:53.571690.

Calculated variance on dataset Entry_1 at 2023-05-19 09:54:53.587283.
 Calculated variance on dataset Entry_2 at 2023-05-19 09:54:53.618533.
 Calculated variance on dataset Entry_3 at 2023-05-19 09:54:53.645025.
 Calculated variance on dataset Entry_4 at 2023-05-19 09:54:53.656547.
 Calculated variance on dataset Entry_5 at 2023-05-19 09:54:53.672173.
 Calculated skewness on dataset Entry_0 at 2023-05-19 09:54:53.772856.
 Calculated skewness on dataset Entry_1 at 2023-05-19 09:54:53.871834.
 Calculated skewness on dataset Entry_2 at 2023-05-19 09:54:54.213746.
 Calculated skewness on dataset Entry_3 at 2023-05-19 09:54:54.292548.
 Calculated skewness on dataset Entry_4 at 2023-05-19 09:54:54.393002.
 Calculated skewness on dataset Entry_5 at 2023-05-19 09:54:54.476616.
 Calculated kurtosis on dataset Entry_0 at 2023-05-19 09:54:54.593334.
 Calculated kurtosis on dataset Entry_1 at 2023-05-19 09:54:54.720945.
 Calculated kurtosis on dataset Entry_2 at 2023-05-19 09:54:55.093792.
 Calculated kurtosis on dataset Entry_3 at 2023-05-19 09:54:55.193919.
 Calculated kurtosis on dataset Entry_4 at 2023-05-19 09:54:55.293835.
 Calculated kurtosis on dataset Entry_5 at 2023-05-19 09:54:55.396357.
 Calculated peak_count on dataset Entry_0 at 2023-05-19 09:54:55.456080.
 Calculated peak_count on dataset Entry_1 at 2023-05-19 09:54:55.511138.
 Calculated peak_count on dataset Entry_2 at 2023-05-19 09:54:55.729975.
 Calculated peak_count on dataset Entry_3 at 2023-05-19 09:54:55.805342.
 Calculated peak_count on dataset Entry_4 at 2023-05-19 09:54:55.873442.
 Calculated peak_count on dataset Entry_5 at 2023-05-19 09:54:55.920318.
 Calculated RMS on dataset Entry_0 at 2023-05-19 09:54:55.943787.
 Calculated RMS on dataset Entry_1 at 2023-05-19 09:54:55.965563.
 Calculated RMS on dataset Entry_2 at 2023-05-19 09:54:55.985561.
 Calculated RMS on dataset Entry_3 at 2023-05-19 09:54:55.992622.
 Calculated RMS on dataset Entry_4 at 2023-05-19 09:54:56.008249.
 Calculated RMS on dataset Entry_5 at 2023-05-19 09:54:56.008249.
 Calculated classification on dataset Entry_6 at 2023-05-19 09:54:56.086376.

C:\Users\dmarti22\Anaconda3\lib\site-packages\sklearn\metrics_classification.py:1245: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.

_warn_prf(average, modifier, msg_start, len(result))

C:\Users\dmarti22\Anaconda3\lib\site-packages\sklearn\metrics_classification.py:1245: UndefinedMetricWarning: Recall and F-score are ill-defined and being set to 0.0 in labels with no true samples. Use `zero_division` parameter to control this behavior.

_warn_prf(average, modifier, msg_start, len(result))

C:\Users\dmarti22\Anaconda3\lib\site-packages\sklearn\metrics_classification.py:1245: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.

_warn_prf(average, modifier, msg_start, len(result))

C:\Users\dmarti22\Anaconda3\lib\site-packages\sklearn\metrics_classification.py:1245: UndefinedMetricWarning: Recall and F-score are ill-defined and being set to 0.0 in labels with no true samples. Use `zero_division` parameter to control this behavior.

_warn_prf(average, modifier, msg_start, len(result))

C:\Users\dmarti22\Anaconda3\lib\site-packages\sklearn\metrics_classification.py:1245: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.

_warn_prf(average, modifier, msg_start, len(result))

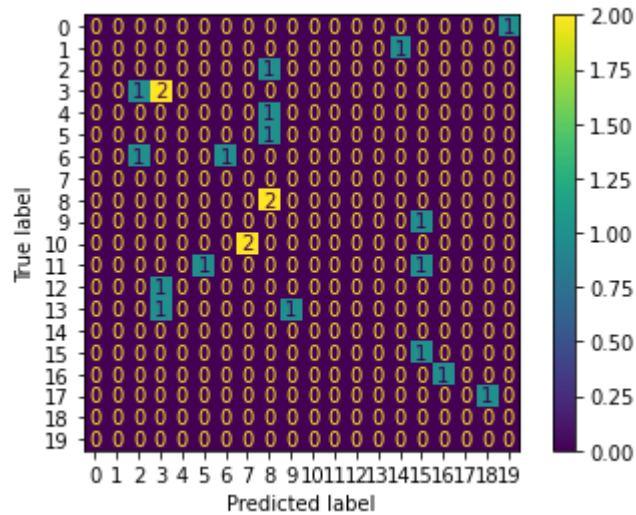
C:\Users\dmarti22\Anaconda3\lib\site-packages\sklearn\metrics_classification.py:1245: UndefinedMetricWarning: Recall and F-score are ill-defined and being set to 0.0 in labels with no true samples. Use `zero_division` parameter to control this behavior.

_warn_prf(average, modifier, msg_start, len(result))

precision recall f1-score support

5.0	0.00	0.00	0.00	1
6.0	0.00	0.00	0.00	1
7.0	0.00	0.00	0.00	1
12.0	0.50	0.67	0.57	3
13.0	0.00	0.00	0.00	1
14.0	0.00	0.00	0.00	1
16.0	1.00	0.50	0.67	2
17.0	0.00	0.00	0.00	0
18.0	0.40	1.00	0.57	2

20.0	0.00	0.00	0.00	1
24.0	0.00	0.00	0.00	2
27.0	0.00	0.00	0.00	2
28.0	0.00	0.00	0.00	1
31.0	0.00	0.00	0.00	2
32.0	0.00	0.00	0.00	0
37.0	0.33	1.00	0.50	1
42.0	1.00	1.00	1.00	1
45.0	0.00	0.00	0.00	1
46.0	0.00	0.00	0.00	0
47.0	0.00	0.00	0.00	0
accuracy			0.30	23
macro avg	0.16	0.21	0.17	23
weighted avg	0.24	0.30	0.25	23



```
Out[4]: (array([[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1],
 [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0],
 [0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
 [0, 0, 1, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
 [0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
 [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0],
 [0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
 [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
 [0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
 [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0],
 [0, 0, 0, 0, 0, 0, 0, 0, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
 [0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0],
 [0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
 [0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
 [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
 [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0],
 [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0],
 [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0],
 [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
 [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]]),
dtype=int64),
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x2627fa424c0>)
```

Mid-Level Fusion (LDA instead of PCA and Random Forest)

In [5]:

```
# Feature Extraction

dfeo.set_window_scheme(length = 30000, overlap = 5000) # set windowing scheme

dfeo.fe_average("Entry_0")
dfeo.fe_average("Entry_1")
dfeo.fe_average("Entry_2")
dfeo.fe_average("Entry_3")
dfeo.fe_average("Entry_4")
dfeo.fe_average("Entry_5")

dfeo.fe_variance("Entry_0")
dfeo.fe_variance("Entry_1")
dfeo.fe_variance("Entry_2")
dfeo.fe_variance("Entry_3")
dfeo.fe_variance("Entry_4")
dfeo.fe_variance("Entry_5")

dfeo.fe_skewness("Entry_0")
dfeo.fe_skewness("Entry_1")
dfeo.fe_skewness("Entry_2")
dfeo.fe_skewness("Entry_3")
dfeo.fe_skewness("Entry_4")
dfeo.fe_skewness("Entry_5")

dfeo.fe_kurtosis("Entry_0")
dfeo.fe_kurtosis("Entry_1")
dfeo.fe_kurtosis("Entry_2")
dfeo.fe_kurtosis("Entry_3")
dfeo.fe_kurtosis("Entry_4")
dfeo.fe_kurtosis("Entry_5")

dfeo.fe_peak_count("Entry_0")
dfeo.fe_peak_count("Entry_1")
dfeo.fe_peak_count("Entry_2")
dfeo.fe_peak_count("Entry_3")
dfeo.fe_peak_count("Entry_4")
dfeo.fe_peak_count("Entry_5")

dfeo.fe_RMS("Entry_0")
dfeo.fe_RMS("Entry_1")
dfeo.fe_RMS("Entry_2")
dfeo.fe_RMS("Entry_3")
dfeo.fe_RMS("Entry_4")
dfeo.fe_RMS("Entry_5")

dfeo.classification_windowing("Entry_6")

# Mid-Level Fusion: Concatenation
dfeo.concatenate() # should be able to specify that we're concatenating features for a
                  # defaults to current window scheme if unspecified

# Dimensional Reduction and Classification: LDA
dfeo.my_LDA(5)
dfeo.classification_report()
```

Calculated average on dataset Entry_0 at 2023-05-19 09:55:00.013356.
Calculated average on dataset Entry_1 at 2023-05-19 09:55:00.029919.
Calculated average on dataset Entry_2 at 2023-05-19 09:55:00.046860.

Calculated average on dataset Entry_3 at 2023-05-19 09:55:00.057857.
 Calculated average on dataset Entry_4 at 2023-05-19 09:55:00.068856.
 Calculated average on dataset Entry_5 at 2023-05-19 09:55:00.079950.
 Calculated variance on dataset Entry_0 at 2023-05-19 09:55:00.079950.
 Calculated variance on dataset Entry_1 at 2023-05-19 09:55:00.095575.
 Calculated variance on dataset Entry_2 at 2023-05-19 09:55:00.126827.
 Calculated variance on dataset Entry_3 at 2023-05-19 09:55:00.142486.
 Calculated variance on dataset Entry_4 at 2023-05-19 09:55:00.158110.
 Calculated variance on dataset Entry_5 at 2023-05-19 09:55:00.173735.
 Calculated skewness on dataset Entry_0 at 2023-05-19 09:55:00.257658.
 Calculated skewness on dataset Entry_1 at 2023-05-19 09:55:00.351410.
 Calculated skewness on dataset Entry_2 at 2023-05-19 09:55:00.638355.
 Calculated skewness on dataset Entry_3 at 2023-05-19 09:55:00.724150.
 Calculated skewness on dataset Entry_4 at 2023-05-19 09:55:00.823439.
 Calculated skewness on dataset Entry_5 at 2023-05-19 09:55:00.911318.
 Calculated kurtosis on dataset Entry_0 at 2023-05-19 09:55:00.989483.
 Calculated kurtosis on dataset Entry_1 at 2023-05-19 09:55:01.062749.
 Calculated kurtosis on dataset Entry_2 at 2023-05-19 09:55:01.359391.
 Calculated kurtosis on dataset Entry_3 at 2023-05-19 09:55:01.439668.
 Calculated kurtosis on dataset Entry_4 at 2023-05-19 09:55:01.517792.
 Calculated kurtosis on dataset Entry_5 at 2023-05-19 09:55:01.605709.
 Calculated peak_count on dataset Entry_0 at 2023-05-19 09:55:01.676926.
 Calculated peak_count on dataset Entry_1 at 2023-05-19 09:55:01.739427.
 Calculated peak_count on dataset Entry_2 at 2023-05-19 09:55:01.941345.
 Calculated peak_count on dataset Entry_3 at 2023-05-19 09:55:02.003880.
 Calculated peak_count on dataset Entry_4 at 2023-05-19 09:55:02.066380.
 Calculated peak_count on dataset Entry_5 at 2023-05-19 09:55:02.113218.
 Calculated RMS on dataset Entry_0 at 2023-05-19 09:55:02.128879.
 Calculated RMS on dataset Entry_1 at 2023-05-19 09:55:02.140536.
 Calculated RMS on dataset Entry_2 at 2023-05-19 09:55:02.165893.
 Calculated RMS on dataset Entry_3 at 2023-05-19 09:55:02.179853.
 Calculated RMS on dataset Entry_4 at 2023-05-19 09:55:02.181671.
 Calculated RMS on dataset Entry_5 at 2023-05-19 09:55:02.197326.
 Calculated classification on dataset Entry_6 at 2023-05-19 09:55:02.212956.

C:\Users\dmarti22\Anaconda3\lib\site-packages\sklearn\metrics_classification.py:1245: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.
 _warn_prf(average, modifier, msg_start, len(result))

C:\Users\dmarti22\Anaconda3\lib\site-packages\sklearn\metrics_classification.py:1245: UndefinedMetricWarning: Recall and F-score are ill-defined and being set to 0.0 in labels with no true samples. Use `zero_division` parameter to control this behavior.
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C:\Users\dmarti22\Anaconda3\lib\site-packages\sklearn\metrics_classification.py:1245: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.
 _warn_prf(average, modifier, msg_start, len(result))

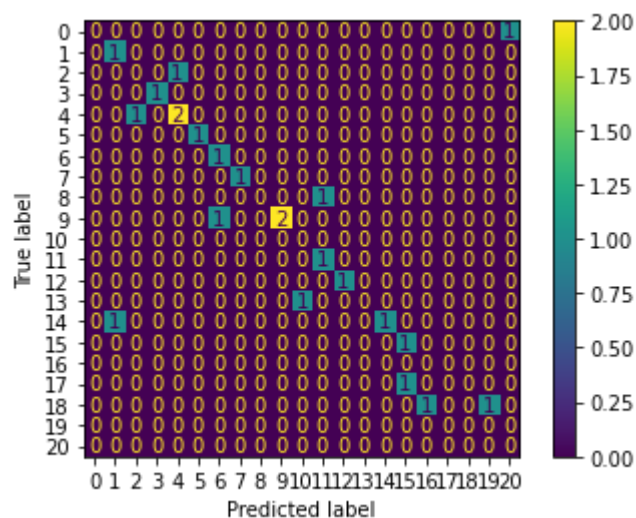
C:\Users\dmarti22\Anaconda3\lib\site-packages\sklearn\metrics_classification.py:1245: UndefinedMetricWarning: Recall and F-score are ill-defined and being set to 0.0 in labels with no true samples. Use `zero_division` parameter to control this behavior.
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C:\Users\dmarti22\Anaconda3\lib\site-packages\sklearn\metrics_classification.py:1245: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.
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C:\Users\dmarti22\Anaconda3\lib\site-packages\sklearn\metrics_classification.py:1245: UndefinedMetricWarning: Recall and F-score are ill-defined and being set to 0.0 in labels with no true samples. Use `zero_division` parameter to control this behavior.
 _warn_prf(average, modifier, msg_start, len(result))

	precision	recall	f1-score	support
5.0	0.00	0.00	0.00	1
6.0	0.50	1.00	0.67	1
7.0	0.00	0.00	0.00	1
11.0	1.00	1.00	1.00	1
12.0	0.67	0.67	0.67	3

13.0	1.00	1.00	1.00	1
14.0	0.50	1.00	0.67	1
16.0	1.00	1.00	1.00	1
17.0	0.00	0.00	0.00	1
18.0	1.00	0.67	0.80	3
20.0	0.00	0.00	0.00	0
24.0	0.50	1.00	0.67	1
27.0	1.00	1.00	1.00	1
28.0	0.00	0.00	0.00	1
32.0	1.00	0.50	0.67	2
42.0	0.50	1.00	0.67	1
43.0	0.00	0.00	0.00	0
44.0	0.00	0.00	0.00	1
45.0	0.00	0.00	0.00	2
46.0	0.00	0.00	0.00	0
47.0	0.00	0.00	0.00	0
accuracy			0.57	23
macro avg	0.41	0.47	0.42	23
weighted avg	0.57	0.57	0.54	23



```
Out[5]: (array([[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1],
                [0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
                [0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
                [0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
                [0, 0, 1, 0, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
                [0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
                [0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
                [0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
                [0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
                [0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
                [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0],
                [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0],
                [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0],
                [0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0],
                [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0],
                [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0],
                [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0],
                [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0],
                [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0],
                [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]],
        dtype=int64),
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x2627fa2c5e0>)
```