On the same Audio dataset (which contains 90 audio files with three classes for interference 3,4,5 till now I have only worked in interference class. 54 samples belong to class 5, 24 to class 3, and 12 to class 4).

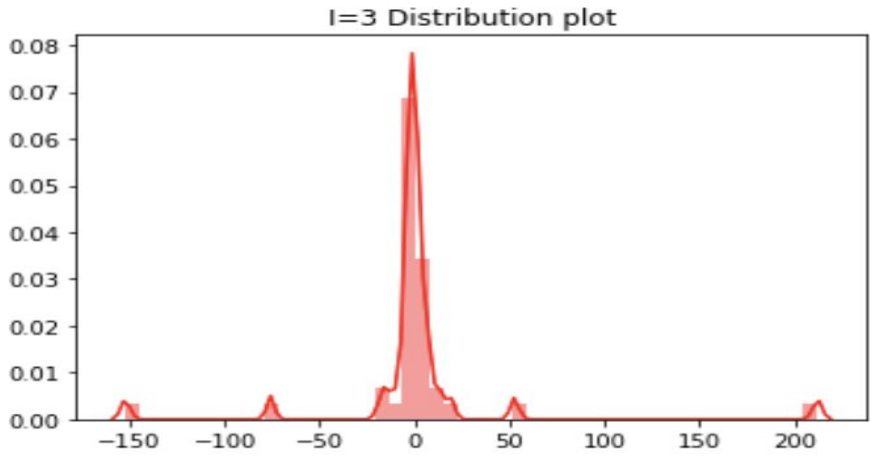
The first thing I did the feature extraction, I extracted the following features:

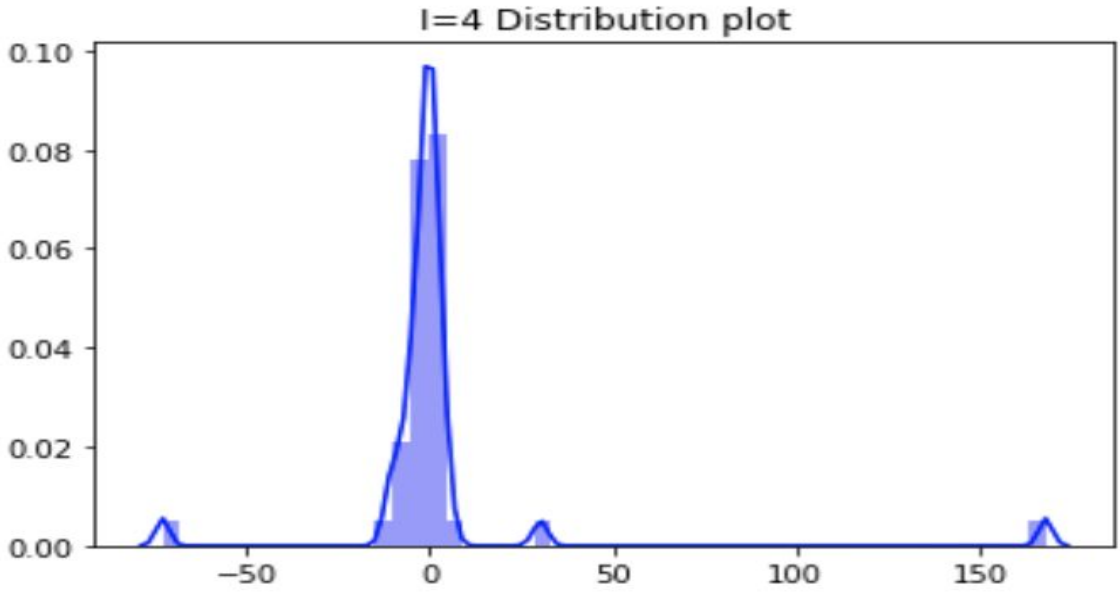
1. MFCC
2. ZCR
3. RMS
4. SC
5. Mel-spectrogram

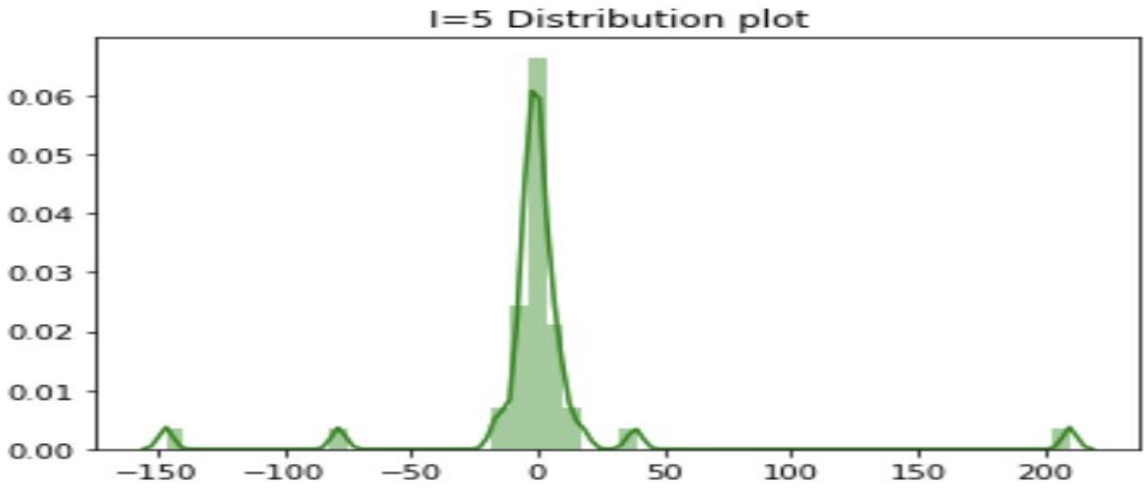
All the above features return an array of different sizes.

These are the plot of different classes.

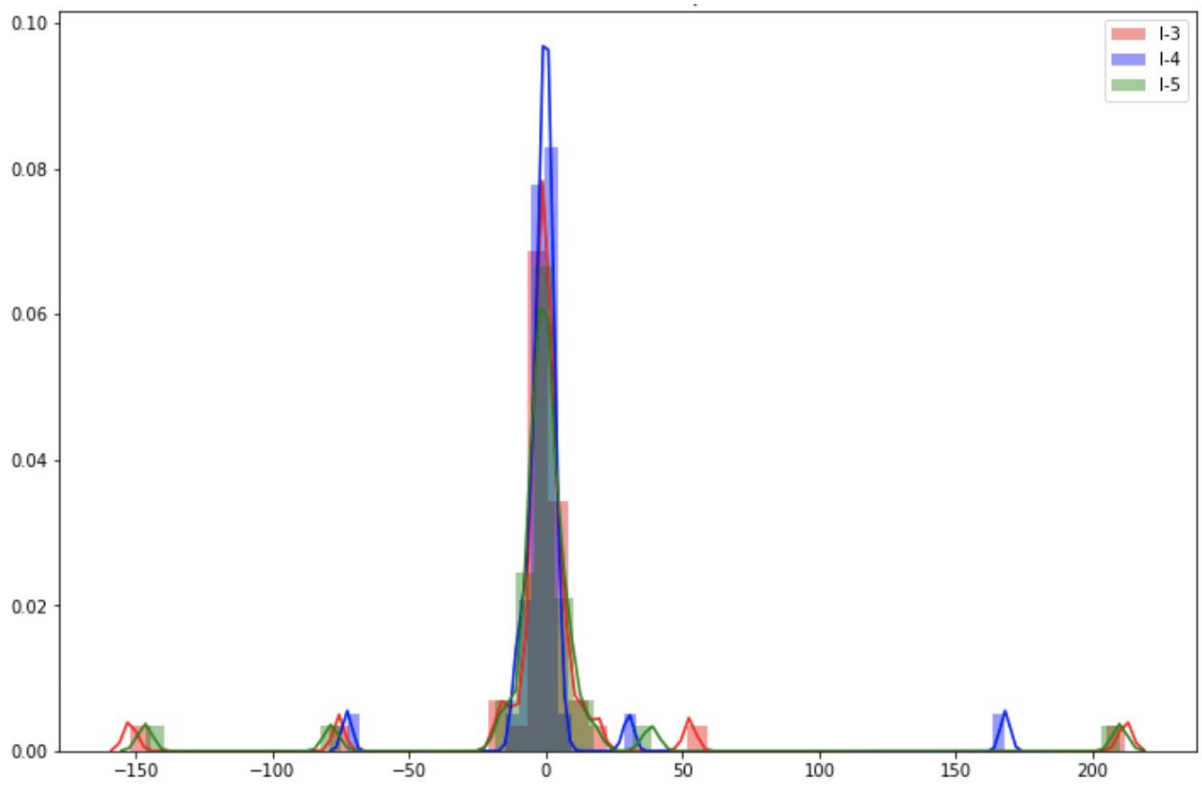
For MFCC only







In these three plots for mfcc, there is almost the same plot for I=3 and I=5. which can be seen in the following overlapping graph.



By only using **MFCC** as a feature for classification and using the **Decision Tree** as a classifier. Classification report is as follows.

```
from sklearn.metrics import classification_report,confusion_matrix
```

```
print(confusion_matrix(y_test,predict))
```

```
[[ 2  0  1]
 [ 1  5  0]
 [ 1  0 17]]
```

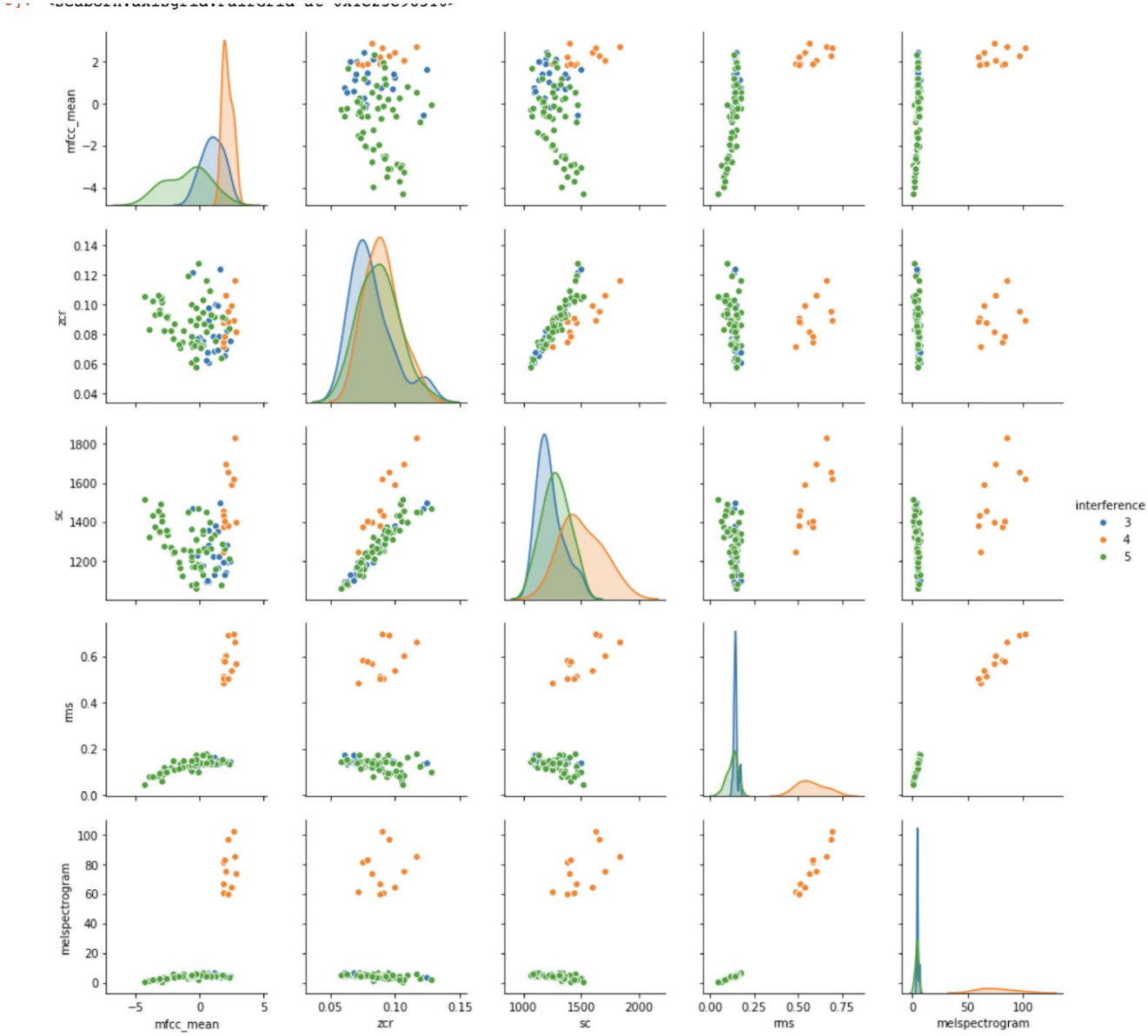
```
print(classification_report(y_test,predict))
```

```
              precision    recall  f1-score   support

           3       0.50      0.67      0.57         3
           4       1.00      0.83      0.91         6
           5       0.94      0.94      0.94        18

    accuracy                           0.89        27
   macro avg       0.81      0.81      0.81        27
weighted avg       0.91      0.89      0.90        27
```

After doing this, for the next four features, I selected the mean value of the output array. And our final data frame looks like this

	interference	path	mfcc	mfcc_mean	zcr	sc	rms	melspectrogram
0	3	/Users/sanjeevkumar/Desktop/TWR/DATA Samples/I...	[-131.37686, 227.78185, -96.030304, 54.124985,...	2.112172	0.082634	1191.677533	0.145938	4.630924
1	3	/Users/sanjeevkumar/Desktop/TWR/DATA Samples/I...	[-152.18541, 212.1246, -75.82145, 52.74044, 18...	0.729980	0.060887	1092.225866	0.173567	6.968941
2	3	/Users/sanjeevkumar/Desktop/TWR/DATA Samples/I...	[-154.4152, 207.58583, -83.73171, 49.88308, 11...	1.869403	0.071624	1190.340956	0.145403	4.837517
3	3	/Users/sanjeevkumar/Desktop/TWR/DATA Samples/I...	[-165.0797, 206.83765, -102.65477, 52.450253, ...	-0.568734	0.121395	1467.007764	0.133121	3.483984
4	3	/Users/sanjeevkumar/Desktop/TWR/DATA Samples/I...	[-146.89711, 219.33466, -90.32005, 52.043674, ...	2.014244	0.070289	1141.962910	0.144590	4.700539

I drew a pair plot to see the relationship between variables.



In this plot also there is very much correlation between I=3 & I=5 and many features aren't able to differentiate between them.

By using all the above features for classification and using the **Decision Tree** as a classifier. This is the classification report.

```
print(confusion_matrix(y1_test,dtc_pred))
```

```
[[ 7  0  2]
 [ 0  4  0]
 [ 2  0 15]]
```

```
print(classification_report(y1_test,dtc_pred))
```

```
              precision    recall  f1-score   support

           3       0.78      0.78      0.78         9
           4       1.00      1.00      1.00         4
           5       0.88      0.88      0.88        17

    accuracy                           0.87        30
   macro avg       0.89      0.89      0.89        30
weighted avg       0.87      0.87      0.87        30
```