# 80/20 split

# MNB

## Hyper-parameters:

### default

## Emotion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Score for Emotion | 0.437550925 |  |  |  |  |
| Accuracy for Emotion | 0.437550925 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.485135331 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.370297213 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.223413218 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.54 | 0.53 | 0.54 | 2102 |
|  | 1 | 0.63 | 0.37 | 0.46 | 1233 |
|  | 2 | 0.49 | 0.19 | 0.27 | 1011 |
|  | 3 | 0.42 | 0.14 | 0.21 | 1710 |
|  | 4 | 0.44 | 0.17 | 0.24 | 2290 |
|  | 5 | 0.54 | 0.12 | 0.2 | 721 |
|  | 6 | 0.52 | 0.09 | 0.16 | 944 |
|  | 7 | 0.56 | 0.16 | 0.24 | 1174 |
|  | 8 | 0.55 | 0.05 | 0.1 | 387 |
|  | 9 | 0.52 | 0.08 | 0.14 | 928 |
|  | 10 | 0.48 | 0.15 | 0.23 | 1550 |
|  | 11 | 0.56 | 0.1 | 0.17 | 590 |
|  | 12 | 0.5 | 0.02 | 0.04 | 265 |
|  | 13 | 0.45 | 0.05 | 0.08 | 589 |
|  | 14 | 0.74 | 0.08 | 0.14 | 344 |
|  | 15 | 0.79 | 0.72 | 0.75 | 1423 |
|  | 16 | 0 | 0 | 0 | 68 |
|  | 17 | 0.53 | 0.18 | 0.26 | 866 |
|  | 18 | 0.71 | 0.41 | 0.52 | 1001 |
|  | 19 | 0 | 0 | 0 | 185 |
|  | 20 | 0.39 | 0.89 | 0.54 | 11042 |
|  | 21 | 0.58 | 0.18 | 0.28 | 955 |
|  | 22 | 0 | 0 | 0 | 120 |
|  | 23 | 0.54 | 0.07 | 0.12 | 986 |
|  | 24 | 0 | 0 | 0 | 157 |
|  | 25 | 0.53 | 0.08 | 0.13 | 302 |
|  | 26 | 0.56 | 0.13 | 0.22 | 758 |
|  | 27 | 0.49 | 0.12 | 0.19 | 663 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.44 | 34364 |
|  | macro avg | 0.47 | 0.18 | 0.22 | 34364 |
|  | weighted avg | 0.49 | 0.44 | 0.37 | 34364 |

### Confusion Matrix

A screenshot of a computer

Description automatically generated with medium confidence

## Sentiment

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Score for Sentiment | 0.606070306 |  |  |  |  |
| Accuracy for Emotion | 0.606070306 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.600581792 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.599332604 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.563918432 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.53 | 0.32 | 0.4 | 3767 |
|  | 1 | 0.6 | 0.59 | 0.59 | 7711 |
|  | 2 | 0.56 | 0.57 | 0.56 | 11042 |
|  | 3 | 0.66 | 0.75 | 0.7 | 11844 |
|  |  |  |  |  |  |
|  |  |  |  | 0.61 | 34364 |
|  | macro avg | 0.59 | 0.55 | 0.56 | 34364 |
|  | weighted avg | 0.6 | 0.61 | 0.6 | 34364 |

### Confusion Matrix

Chart, treemap chart

Description automatically generated

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# DT

## Hyper-parameters:

### default

## Emotion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Score for Emotion | 0.596438133 |  |  |  |  |
| Accuracy for Emotion | 0.596438133 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.613522205 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.592999113 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.512459252 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.57 | 0.82 | 0.67 | 2102 |
|  | 1 | 0.58 | 0.82 | 0.68 | 1233 |
|  | 2 | 0.44 | 0.7 | 0.54 | 1011 |
|  | 3 | 0.41 | 0.58 | 0.48 | 1710 |
|  | 4 | 0.47 | 0.56 | 0.51 | 2290 |
|  | 5 | 0.48 | 0.55 | 0.51 | 721 |
|  | 6 | 0.48 | 0.58 | 0.52 | 944 |
|  | 7 | 0.59 | 0.63 | 0.61 | 1174 |
|  | 8 | 0.48 | 0.58 | 0.52 | 387 |
|  | 9 | 0.46 | 0.48 | 0.47 | 928 |
|  | 10 | 0.53 | 0.49 | 0.51 | 1550 |
|  | 11 | 0.55 | 0.42 | 0.47 | 590 |
|  | 12 | 0.46 | 0.38 | 0.42 | 265 |
|  | 13 | 0.49 | 0.41 | 0.44 | 589 |
|  | 14 | 0.61 | 0.56 | 0.58 | 344 |
|  | 15 | 0.86 | 0.83 | 0.84 | 1423 |
|  | 16 | 0.4 | 0.28 | 0.33 | 68 |
|  | 17 | 0.6 | 0.45 | 0.51 | 866 |
|  | 18 | 0.76 | 0.7 | 0.73 | 1001 |
|  | 19 | 0.6 | 0.27 | 0.37 | 185 |
|  | 20 | 0.71 | 0.65 | 0.68 | 11042 |
|  | 21 | 0.71 | 0.4 | 0.51 | 955 |
|  | 22 | 0.62 | 0.17 | 0.27 | 120 |
|  | 23 | 0.63 | 0.25 | 0.35 | 986 |
|  | 24 | 0.6 | 0.16 | 0.25 | 157 |
|  | 25 | 0.65 | 0.48 | 0.56 | 302 |
|  | 26 | 0.71 | 0.4 | 0.51 | 758 |
|  | 27 | 0.63 | 0.39 | 0.48 | 663 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.6 | 34364 |
|  | macro avg | 0.57 | 0.5 | 0.51 | 34364 |
|  | weighted avg | 0.61 | 0.6 | 0.59 | 34364 |

### Confusion Matrix

A screenshot of a computer

Description automatically generated with medium confidence

## Sentiment

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Score for Sentiment | 0.720230474 |  |  |  |  |
| Accuracy for Emotion | 0.720230474 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.730819334 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.722443408 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.706697716 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.57 | 0.72 | 0.63 | 3767 |
|  | 1 | 0.68 | 0.78 | 0.72 | 7711 |
|  | 2 | 0.71 | 0.67 | 0.69 | 11042 |
|  | 3 | 0.84 | 0.73 | 0.78 | 11844 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.72 | 34364 |
|  | macro avg | 0.7 | 0.72 | 0.71 | 34364 |
|  | weighted avg | 0.73 | 0.72 | 0.72 | 34364 |

### Confusion Matrix

Chart, treemap chart

Description automatically generated

# MLP

## Hyper-parameters:

### default

## Emotion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Score for Emotion | 0.577581 |  |  |  |  |
| Accuracy for Emotion | 0.577581 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.570543 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.571757 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.507736 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.62 | 0.67 | 0.65 | 2101 |
|  | 1 | 0.66 | 0.67 | 0.67 | 1255 |
|  | 2 | 0.52 | 0.51 | 0.52 | 1022 |
|  | 3 | 0.45 | 0.37 | 0.41 | 1682 |
|  | 4 | 0.5 | 0.41 | 0.45 | 2208 |
|  | 5 | 0.49 | 0.46 | 0.47 | 691 |
|  | 6 | 0.49 | 0.45 | 0.47 | 986 |
|  | 7 | 0.57 | 0.48 | 0.52 | 1172 |
|  | 8 | 0.48 | 0.61 | 0.54 | 420 |
|  | 9 | 0.44 | 0.36 | 0.4 | 990 |
|  | 10 | 0.47 | 0.47 | 0.47 | 1512 |
|  | 11 | 0.5 | 0.42 | 0.46 | 597 |
|  | 12 | 0.38 | 0.39 | 0.39 | 289 |
|  | 13 | 0.46 | 0.42 | 0.44 | 594 |
|  | 14 | 0.59 | 0.58 | 0.58 | 332 |
|  | 15 | 0.85 | 0.82 | 0.84 | 1386 |
|  | 16 | 0.44 | 0.41 | 0.42 | 76 |
|  | 17 | 0.52 | 0.47 | 0.49 | 857 |
|  | 18 | 0.66 | 0.82 | 0.73 | 1047 |
|  | 19 | 0.48 | 0.4 | 0.44 | 170 |
|  | 20 | 0.63 | 0.7 | 0.67 | 11029 |
|  | 21 | 0.49 | 0.53 | 0.51 | 921 |
|  | 22 | 0.39 | 0.29 | 0.33 | 129 |
|  | 23 | 0.45 | 0.32 | 0.38 | 958 |
|  | 24 | 0.42 | 0.38 | 0.39 | 165 |
|  | 25 | 0.54 | 0.59 | 0.56 | 312 |
|  | 26 | 0.51 | 0.5 | 0.51 | 763 |
|  | 27 | 0.56 | 0.5 | 0.53 | 700 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.58 | 34364 |
|  | macro avg | 0.52 | 0.5 | 0.51 | 34364 |
|  | weighted avg | 0.57 | 0.58 | 0.57 | 34364 |

### Confusion Matrix

A screenshot of a computer

Description automatically generated with medium confidence

## Sentiment

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Score for Sentiment | 0.565155 |  |  |  |  |
| Accuracy for Emotion | 0.565155 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.571357 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.549716 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.490242 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.53 | 0.14 | 0.22 | 3816 |
|  | 1 | 0.57 | 0.46 | 0.51 | 7745 |
|  | 2 | 0.48 | 0.65 | 0.55 | 11029 |
|  | 3 | 0.67 | 0.69 | 0.68 | 11774 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.57 | 34364 |
|  | macro avg | 0.56 | 0.49 | 0.49 | 34364 |
|  | weighted avg | 0.57 | 0.57 | 0.55 | 34364 |

### Confusion Matrix

Chart, treemap chart

Description automatically generated

# MNB (Grid Search CV)

## Hyper-parameters:

### alpha

## Emotion

### alpha\_emotion = 0.36

Best estimator (Emotion): MultinomialNB(alpha=0.36),

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| F1 Score (Macro) for Emotion | 0.36344663 |  |  |  |  |
|  | precision | recall | f1-score | support |  |
|  |  |  |  |  |  |
|  | 0 | 0.54 | 0.62 | 0.58 | 2111 |
|  | 1 | 0.59 | 0.62 | 0.61 | 1213 |
|  | 2 | 0.48 | 0.37 | 0.42 | 1035 |
|  | 3 | 0.41 | 0.27 | 0.32 | 1684 |
|  | 4 | 0.39 | 0.24 | 0.3 | 2158 |
|  | 5 | 0.37 | 0.3 | 0.33 | 681 |
|  | 6 | 0.46 | 0.28 | 0.35 | 1025 |
|  | 7 | 0.46 | 0.31 | 0.37 | 1172 |
|  | 8 | 0.52 | 0.26 | 0.35 | 423 |
|  | 9 | 0.48 | 0.22 | 0.3 | 919 |
|  | 10 | 0.43 | 0.3 | 0.35 | 1576 |
|  | 11 | 0.54 | 0.29 | 0.38 | 588 |
|  | 12 | 0.46 | 0.16 | 0.23 | 276 |
|  | 13 | 0.43 | 0.19 | 0.26 | 583 |
|  | 14 | 0.57 | 0.3 | 0.39 | 338 |
|  | 15 | 0.73 | 0.8 | 0.76 | 1408 |
|  | 16 | 0.2 | 0.01 | 0.02 | 81 |
|  | 17 | 0.5 | 0.36 | 0.42 | 910 |
|  | 18 | 0.65 | 0.62 | 0.63 | 1000 |
|  | 19 | 0.46 | 0.06 | 0.11 | 180 |
|  | 20 | 0.47 | 0.73 | 0.57 | 11089 |
|  | 21 | 0.51 | 0.4 | 0.45 | 903 |
|  | 22 | 0.56 | 0.06 | 0.11 | 141 |
|  | 23 | 0.38 | 0.18 | 0.25 | 981 |
|  | 24 | 0.41 | 0.07 | 0.12 | 154 |
|  | 25 | 0.59 | 0.32 | 0.41 | 299 |
|  | 26 | 0.44 | 0.31 | 0.36 | 743 |
|  | 27 | 0.48 | 0.34 | 0.4 | 693 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.49 | 34364 |
|  | macro | 0.48 | 0.32 | 0.36 | 34364 |
|  | weighted\_avg | 0.48 | 0.49 | 0.46 | 34364 |

### Confusion Matrix

A screenshot of a computer

Description automatically generated with medium confidence

## Sentiment

### alpha\_sentiment=1

Best estimator (Sentiment): MultinomialNB(alpha=1),

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Best Score | 0.53839044 |  |  |  |  |
| Accuracy for Emotion | 0.61247235 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.60704895 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.60548715 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.57227864 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  | 0 | 0.55 | 0.33 | 0.41 | 3871 |
|  | 1 | 0.61 | 0.6 | 0.6 | 7719 |
|  | 2 | 0.57 | 0.56 | 0.57 | 11089 |
|  | 3 | 0.66 | 0.76 | 0.71 | 11685 |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.61 | 34364 |
|  | macro avg | 0.6 | 0.56 | 0.57 | 34364 |
|  | weighted avg | 0.61 | 0.61 | 0.61 | 34364 |

### Confusion Matrix

Chart, treemap chart

Description automatically generated

# DT (Grid Search CV)

## Hyper-parameters:

### "criterion":("gini","entropy"),"max\_depth":(100,3),"min\_samples\_split":(12,5,30)

## Emotion

### Best estimator (Emotion): DecisionTreeClassifier(max\_depth=100, min\_samples\_split=30)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Score for Emotion | 0.59469212 |  |  |  |  |
| Accuracy for Emotion | 0.59469212 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.61184786 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.59152071 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.51684704 |  |  |  |  |
|  | precision | recall | f1-score | support |  |
|  |  |  |  |  |  |
|  | 0 | 0.56 | 0.82 | 0.66 | 2101 |
|  | 1 | 0.6 | 0.84 | 0.7 | 1255 |
|  | 2 | 0.44 | 0.72 | 0.55 | 1022 |
|  | 3 | 0.4 | 0.57 | 0.47 | 1682 |
|  | 4 | 0.45 | 0.57 | 0.5 | 2208 |
|  | 5 | 0.46 | 0.55 | 0.5 | 691 |
|  | 6 | 0.48 | 0.56 | 0.52 | 986 |
|  | 7 | 0.55 | 0.58 | 0.57 | 1172 |
|  | 8 | 0.5 | 0.56 | 0.53 | 420 |
|  | 9 | 0.46 | 0.45 | 0.46 | 990 |
|  | 10 | 0.53 | 0.47 | 0.5 | 1512 |
|  | 11 | 0.55 | 0.38 | 0.45 | 597 |
|  | 12 | 0.53 | 0.41 | 0.46 | 289 |
|  | 13 | 0.52 | 0.42 | 0.47 | 594 |
|  | 14 | 0.66 | 0.61 | 0.63 | 332 |
|  | 15 | 0.86 | 0.83 | 0.84 | 1386 |
|  | 16 | 0.48 | 0.36 | 0.41 | 76 |
|  | 17 | 0.61 | 0.47 | 0.53 | 857 |
|  | 18 | 0.77 | 0.7 | 0.73 | 1047 |
|  | 19 | 0.49 | 0.26 | 0.34 | 170 |
|  | 20 | 0.71 | 0.65 | 0.68 | 11029 |
|  | 21 | 0.67 | 0.39 | 0.49 | 921 |
|  | 22 | 0.53 | 0.18 | 0.27 | 129 |
|  | 23 | 0.58 | 0.23 | 0.33 | 958 |
|  | 24 | 0.72 | 0.21 | 0.32 | 165 |
|  | 25 | 0.67 | 0.46 | 0.55 | 312 |
|  | 26 | 0.68 | 0.41 | 0.51 | 763 |
|  | 27 | 0.67 | 0.4 | 0.5 | 700 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.59 | 34364 |
|  | macro | 0.58 | 0.5 | 0.52 | 34364 |
|  | weighted\_avg | 0.61 | 0.59 | 0.59 | 34364 |

### Confusion Matrix

A screenshot of a computer

Description automatically generated with medium confidence

## Sentiment

### Best estimator (Sentiment): DecisionTreeClassifier(max\_depth=100, min\_samples\_split=5

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Best Score | 0.72081248 |  |  |  |  |
| Accuracy for Emotion | 0.72081248 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.73241701 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.72335867 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.70629159 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.56 | 0.72 | 0.63 | 3816 |
|  | 1 | 0.67 | 0.77 | 0.72 | 7745 |
|  | 2 | 0.71 | 0.66 | 0.69 | 11029 |
|  | 3 | 0.84 | 0.74 | 0.79 | 11774 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.72 | 34364 |
|  | macro avg | 0.7 | 0.72 | 0.71 | 34364 |
|  | weighted avg | 0.73 | 0.72 | 0.72 | 34364 |

### Confusion Matrix

Chart, treemap chart

Description automatically generated

# MLP (Grid Search CV)

## Hyper-parameters:

### "activation":("identity", "logistic", "tanh", "relu"),"hidden\_layer\_sizes":((5,5),(5,10)), "solver":("adam","sgd")

## Emotion

### Best estimator (Emotion): MLPClassifier(activation='identity', early\_stopping=True, hidden\_layer\_sizes=(5, 10), max\_iter=5, verbose=True)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Best Score | 0.421342 |  |  |  |  |
| Accuracy for Emotion | 0.421342 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.367309 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.340128 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.201855 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.48 | 0.5 | 0.49 | 2120 |
|  | 1 | 0.49 | 0.59 | 0.54 | 1226 |
|  | 2 | 0.36 | 0.2 | 0.26 | 1075 |
|  | 3 | 0.14 | 0.04 | 0.06 | 1586 |
|  | 4 | 0.27 | 0.07 | 0.11 | 2277 |
|  | 5 | 0.25 | 0 | 0 | 735 |
|  | 6 | 0.33 | 0.07 | 0.11 | 953 |
|  | 7 | 0.32 | 0.12 | 0.17 | 1162 |
|  | 8 | 0.44 | 0.06 | 0.11 | 428 |
|  | 9 | 0 | 0 | 0 | 949 |
|  | 10 | 0.17 | 0.06 | 0.09 | 1576 |
|  | 11 | 0.51 | 0.03 | 0.06 | 620 |
|  | 12 | 1 | 0 | 0.01 | 292 |
|  | 13 | 0.52 | 0.05 | 0.09 | 590 |
|  | 14 | 0.44 | 0.29 | 0.35 | 358 |
|  | 15 | 0.73 | 0.8 | 0.76 | 1435 |
|  | 16 | 0 | 0 | 0 | 76 |
|  | 17 | 0.31 | 0.18 | 0.23 | 844 |
|  | 18 | 0.57 | 0.6 | 0.58 | 1027 |
|  | 19 | 0 | 0 | 0 | 138 |
|  | 20 | 0.41 | 0.84 | 0.55 | 11027 |
|  | 21 | 0.48 | 0.22 | 0.3 | 924 |
|  | 22 | 0 | 0 | 0 | 132 |
|  | 23 | 0 | 0 | 0 | 946 |
|  | 24 | 0 | 0 | 0 | 161 |
|  | 25 | 0.33 | 0.36 | 0.35 | 280 |
|  | 26 | 0.27 | 0.23 | 0.25 | 753 |
|  | 27 | 0.36 | 0.12 | 0.18 | 674 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.42 | 34364 |
|  | Macro avg | 0.33 | 0.19 | 0.2 | 34364 |
|  | weighted\_avg | 0.37 | 0.42 | 0.34 | 34364 |

### Confusion Matrix A screenshot of a computer Description automatically generated with medium confidence

## Sentiment

### Best estimator (Sentiment): MLPClassifier(activation='tanh', early\_stopping=True, hidden\_layer\_sizes=(5, 5), max\_iter=5, verbose=True)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Best Score | 0.554266 |  |  |  |  |
| Accuracy for Emotion | 0.554266 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.551942 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.549862 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.506429 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.41 | 0.25 | 0.31 | 9405 |
|  | 1 | 0.54 | 0.52 | 0.53 | 19335 |
|  | 2 | 0.48 | 0.56 | 0.52 | 27658 |
|  | 3 | 0.67 | 0.67 | 0.67 | 29512 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.55 | 85910 |
|  | macro avg | 0.53 | 0.5 | 0.51 | 85910 |
|  | weighted avg | 0.55 | 0.55 | 0.55 | 85910 |

### Confusion Matrix

Chart, treemap chart

Description automatically generated

# New Training/Test Split

80/20 split becomes 50/50 training test split

# MNB

## Hyper-parameters:

### default

## Emotion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Score for Emotion | 0.449225934 |  |  |  |  |
| Accuracy for Emotion | 0.449225934 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.490750903 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.3901304 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.249161233 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.53 | 0.53 | 0.53 | 5242 |
|  | 1 | 0.61 | 0.42 | 0.49 | 3057 |
|  | 2 | 0.55 | 0.23 | 0.32 | 2661 |
|  | 3 | 0.43 | 0.17 | 0.25 | 4173 |
|  | 4 | 0.45 | 0.18 | 0.26 | 5731 |
|  | 5 | 0.45 | 0.13 | 0.21 | 1762 |
|  | 6 | 0.56 | 0.13 | 0.22 | 2493 |
|  | 7 | 0.55 | 0.18 | 0.27 | 2985 |
|  | 8 | 0.55 | 0.07 | 0.13 | 1065 |
|  | 9 | 0.51 | 0.1 | 0.16 | 2366 |
|  | 10 | 0.46 | 0.18 | 0.25 | 3717 |
|  | 11 | 0.55 | 0.14 | 0.22 | 1437 |
|  | 12 | 0.61 | 0.03 | 0.05 | 699 |
|  | 13 | 0.52 | 0.08 | 0.14 | 1512 |
|  | 14 | 0.71 | 0.09 | 0.17 | 896 |
|  | 15 | 0.77 | 0.74 | 0.76 | 3551 |
|  | 16 | 0 | 0 | 0 | 183 |
|  | 17 | 0.5 | 0.19 | 0.28 | 2152 |
|  | 18 | 0.69 | 0.47 | 0.56 | 2501 |
|  | 19 | 0.5 | 0 | 0.01 | 392 |
|  | 20 | 0.4 | 0.87 | 0.55 | 27584 |
|  | 21 | 0.58 | 0.22 | 0.32 | 2294 |
|  | 22 | 0 | 0 | 0 | 323 |
|  | 23 | 0.46 | 0.09 | 0.15 | 2320 |
|  | 24 | 0.17 | 0 | 0.01 | 383 |
|  | 25 | 0.63 | 0.1 | 0.18 | 773 |
|  | 26 | 0.55 | 0.16 | 0.25 | 1911 |
|  | 27 | 0.55 | 0.16 | 0.25 | 1747 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.45 | 85910 |
|  | macro avg | 0.49 | 0.2 | 0.25 | 85910 |
|  | weighted avg | 0.49 | 0.45 | 0.39 | 85910 |

### Confusion Matrix

A screenshot of a computer

Description automatically generated with medium confidence

## Sentiment

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Score for Sentiment | 0.614759632 |  |  |  |  |
| Accuracy for Emotion | 0.614759632 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.609513349 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.608632921 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.575957613 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.54 | 0.34 | 0.42 | 9545 |
|  | 1 | 0.61 | 0.61 | 0.61 | 19208 |
|  | 2 | 0.57 | 0.57 | 0.57 | 27584 |
|  | 3 | 0.66 | 0.75 | 0.7 | 29573 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.61 | 85910 |
|  | macro avg | 0.6 | 0.57 | 0.58 | 85910 |
|  | weighted avg | 0.61 | 0.61 | 0.61 | 85910 |

### Confusion Matrix

Graphical user interface, chart, treemap chart

Description automatically generated

# DT

## Hyper-parameters:

### default

## Emotion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Score for Emotion | 0.621534164 |  |  |  |  |
| Accuracy for Emotion | 0.621534164 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.632473884 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.616308677 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.539113605 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.58 | 0.82 | 0.68 | 5242 |
|  | 1 | 0.59 | 0.83 | 0.69 | 3057 |
|  | 2 | 0.48 | 0.71 | 0.57 | 2661 |
|  | 3 | 0.43 | 0.58 | 0.5 | 4173 |
|  | 4 | 0.49 | 0.54 | 0.52 | 5731 |
|  | 5 | 0.49 | 0.58 | 0.53 | 1762 |
|  | 6 | 0.52 | 0.56 | 0.54 | 2493 |
|  | 7 | 0.61 | 0.61 | 0.61 | 2985 |
|  | 8 | 0.54 | 0.55 | 0.54 | 1065 |
|  | 9 | 0.49 | 0.45 | 0.47 | 2366 |
|  | 10 | 0.56 | 0.49 | 0.53 | 3717 |
|  | 11 | 0.6 | 0.43 | 0.5 | 1437 |
|  | 12 | 0.58 | 0.4 | 0.47 | 699 |
|  | 13 | 0.57 | 0.41 | 0.48 | 1512 |
|  | 14 | 0.67 | 0.58 | 0.62 | 896 |
|  | 15 | 0.88 | 0.83 | 0.85 | 3551 |
|  | 16 | 0.48 | 0.36 | 0.41 | 183 |
|  | 17 | 0.65 | 0.45 | 0.53 | 2152 |
|  | 18 | 0.76 | 0.74 | 0.75 | 2501 |
|  | 19 | 0.64 | 0.3 | 0.41 | 392 |
|  | 20 | 0.71 | 0.72 | 0.71 | 27584 |
|  | 21 | 0.72 | 0.42 | 0.53 | 2294 |
|  | 22 | 0.63 | 0.18 | 0.28 | 323 |
|  | 23 | 0.64 | 0.25 | 0.36 | 2320 |
|  | 24 | 0.66 | 0.25 | 0.36 | 383 |
|  | 25 | 0.7 | 0.55 | 0.62 | 773 |
|  | 26 | 0.7 | 0.4 | 0.51 | 1911 |
|  | 27 | 0.69 | 0.44 | 0.54 | 1747 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.62 | 85910 |
|  | macro avg | 0.61 | 0.52 | 0.54 | 85910 |
|  | weighted avg | 0.63 | 0.62 | 0.62 | 85910 |

### Confusion Matrix

A screenshot of a computer

Description automatically generated with medium confidence

## Sentiment

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Score for Sentiment | 0.73947154 |  |  |  |  |
| Accuracy for Emotion | 0.73947154 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.746933632 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.741232869 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.725295616 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.6 | 0.71 | 0.65 | 9545 |
|  | 1 | 0.7 | 0.79 | 0.74 | 19208 |
|  | 2 | 0.73 | 0.7 | 0.71 | 27584 |
|  | 3 | 0.84 | 0.76 | 0.8 | 29573 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.74 | 85910 |
|  | macro avg | 0.72 | 0.74 | 0.73 | 85910 |
|  | weighted avg | 0.75 | 0.74 | 0.74 | 85910 |

### Confusion Matrix

Chart, treemap chart

Description automatically generated

# MLP

## Hyper-parameters:

### default

## Emotion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Score for Emotion | | 0.469293 |  |  |  |
| Accuracy for Emotion | | 0.469293 |  |  |  |
| Precision (Weighted) for Emotion | | 0.459024 |  |  |  |
| F1 Score (Weighted) for Emotion | | 0.423664 |  |  |  |
| F1 Score (Macro) for Emotion | | 0.318377 |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.55 | 0.52 | 0.53 | 5228 |
|  | 1 | 0.57 | 0.58 | 0.57 | 3080 |
|  | 2 | 0.44 | 0.26 | 0.33 | 2565 |
|  | 3 | 0.28 | 0.15 | 0.2 | 4157 |
|  | 4 | 0.34 | 0.15 | 0.21 | 5589 |
|  | 5 | 0.34 | 0.15 | 0.21 | 1702 |
|  | 6 | 0.41 | 0.2 | 0.27 | 2483 |
|  | 7 | 0.44 | 0.22 | 0.3 | 2893 |
|  | 8 | 0.47 | 0.26 | 0.34 | 1077 |
|  | 9 | 0.36 | 0.14 | 0.2 | 2358 |
|  | 10 | 0.33 | 0.15 | 0.21 | 3771 |
|  | 11 | 0.43 | 0.21 | 0.28 | 1485 |
|  | 12 | 0.49 | 0.12 | 0.2 | 729 |
|  | 13 | 0.37 | 0.19 | 0.25 | 1499 |
|  | 14 | 0.52 | 0.28 | 0.36 | 899 |
|  | 15 | 0.83 | 0.76 | 0.79 | 3559 |
|  | 16 | 0.31 | 0.05 | 0.08 | 174 |
|  | 17 | 0.48 | 0.3 | 0.37 | 2172 |
|  | 18 | 0.66 | 0.62 | 0.64 | 2442 |
|  | 19 | 0.54 | 0.07 | 0.13 | 420 |
|  | 20 | 0.45 | 0.83 | 0.58 | 27769 |
|  | 21 | 0.56 | 0.3 | 0.39 | 2297 |
|  | 22 | 0.42 | 0.06 | 0.11 | 358 |
|  | 23 | 0.39 | 0.07 | 0.12 | 2366 |
|  | 24 | 0.4 | 0.09 | 0.15 | 419 |
|  | 25 | 0.52 | 0.4 | 0.45 | 752 |
|  | 26 | 0.51 | 0.21 | 0.3 | 1921 |
|  | 27 | 0.52 | 0.26 | 0.35 | 1746 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.47 | 85910 |
|  | macro\_avg | 0.46 | 0.27 | 0.32 | 85910 |
|  | weighted\_avg | 0.46 | 0.47 | 0.42 | 85910 |

### Confusion Matrix

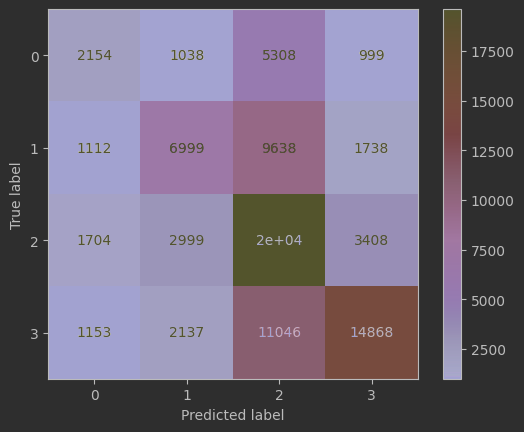
Graphical user interface

Description automatically generated with medium confidence

## Sentiment

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Score for Sentiment | 0.725410313 |  |  |  |  |
| Accuracy for Emotion | 0.725410313 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.724313449 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.724585208 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.704508824 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.65 | 0.58 | 0.61 | 9488 |
|  | 1 | 0.71 | 0.73 | 0.72 | 19231 |
|  | 2 | 0.7 | 0.7 | 0.7 | 27769 |
|  | 3 | 0.79 | 0.8 | 0.79 | 29422 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.73 | 85910 |
|  | macro avg | 0.71 | 0.7 | 0.7 | 85910 |
|  | weighted avg | 0.72 | 0.73 | 0.72 | 85910 |

### Confusion Matrix



# MNB (Grid Search CV)

## Hyper-parameters:

### “alpha”: (0.5, 0, 0.36, 1)

## Emotion

### alpha\_emotion = 0.5

Best estimator (Emotion): MultinomialNB(alpha=0.5),

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Best Score | 0.390598 |  |  |  |  |
| Accuracy for Emotion | 0.484751 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.48579 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.453676 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.34276 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.54 | 0.61 | 0.57 | 5237 |
|  | 1 | 0.58 | 0.59 | 0.59 | 3015 |
|  | 2 | 0.5 | 0.34 | 0.4 | 2615 |
|  | 3 | 0.41 | 0.25 | 0.31 | 4202 |
|  | 4 | 0.43 | 0.23 | 0.3 | 5652 |
|  | 5 | 0.41 | 0.29 | 0.34 | 1781 |
|  | 6 | 0.47 | 0.24 | 0.32 | 2490 |
|  | 7 | 0.49 | 0.3 | 0.37 | 2907 |
|  | 8 | 0.55 | 0.21 | 0.3 | 1049 |
|  | 9 | 0.44 | 0.18 | 0.26 | 2369 |
|  | 10 | 0.42 | 0.27 | 0.33 | 3918 |
|  | 11 | 0.54 | 0.27 | 0.36 | 1484 |
|  | 12 | 0.58 | 0.12 | 0.19 | 725 |
|  | 13 | 0.46 | 0.19 | 0.26 | 1458 |
|  | 14 | 0.58 | 0.28 | 0.38 | 902 |
|  | 15 | 0.74 | 0.8 | 0.77 | 3520 |
|  | 16 | 0.2 | 0.01 | 0.01 | 178 |
|  | 17 | 0.47 | 0.31 | 0.37 | 2113 |
|  | 18 | 0.64 | 0.63 | 0.63 | 2428 |
|  | 19 | 0.52 | 0.03 | 0.05 | 406 |
|  | 20 | 0.45 | 0.76 | 0.57 | 27720 |
|  | 21 | 0.5 | 0.35 | 0.41 | 2217 |
|  | 22 | 0.39 | 0.03 | 0.05 | 354 |
|  | 23 | 0.43 | 0.17 | 0.24 | 2398 |
|  | 24 | 0.52 | 0.03 | 0.06 | 380 |
|  | 25 | 0.58 | 0.27 | 0.37 | 768 |
|  | 26 | 0.49 | 0.3 | 0.37 | 1920 |
|  | 27 | 0.51 | 0.33 | 0.4 | 1704 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.48 | 85910 |
|  | macro\_avg | 0.49 | 0.3 | 0.34 | 85910 |
|  | weighted\_avg | 0.49 | 0.48 | 0.45 | 85910 |

### Confusion Matrix

Graphical user interface

Description automatically generated with low confidence

## Sentiment

### alpha\_sentiment=1

Best estimator (Sentiment): MultinomialNB(alpha=1),

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Best estimator (Sentiment) | 0.543696 |  |  |  |  |
| Accuracy for Emotion | 0.617332 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.612228 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.611357 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.57956 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.55 | 0.35 | 0.42 | 9499 |
|  | 1 | 0.62 | 0.61 | 0.61 | 19487 |
|  | 2 | 0.58 | 0.57 | 0.57 | 27720 |
|  | 3 | 0.66 | 0.75 | 0.71 | 29204 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.62 | 85910 |
|  | macro\_avg | 0.6 | 0.57 | 0.58 | 85910 |
|  | weighted\_avg | 0.61 | 0.62 | 0.61 | 85910 |

### Confusion Matrix

Chart, treemap chart

Description automatically generated

# DT (Grid Search CV)

## Hyper-parameters:

### "criterion":("gini","entropy"),"max\_depth":(100,3),"min\_samples\_split":(12,5,30)

## Emotion

Best estimator (Emotion):

### DecisionTreeClassifier(max\_depth=100, min\_samples\_split=30),

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Best Score | 0.404464 |  |  |  |  |
| Accuracy for Emotion | 0.505529 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.510401 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.464475 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.371004 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.58 | 0.55 | 0.57 | 2101 |
|  | 1 | 0.63 | 0.66 | 0.65 | 1255 |
|  | 2 | 0.48 | 0.33 | 0.39 | 1022 |
|  | 3 | 0.35 | 0.19 | 0.24 | 1682 |
|  | 4 | 0.42 | 0.2 | 0.27 | 2208 |
|  | 5 | 0.4 | 0.2 | 0.26 | 691 |
|  | 6 | 0.45 | 0.23 | 0.31 | 986 |
|  | 7 | 0.5 | 0.24 | 0.32 | 1172 |
|  | 8 | 0.49 | 0.28 | 0.36 | 420 |
|  | 9 | 0.44 | 0.16 | 0.23 | 990 |
|  | 10 | 0.43 | 0.22 | 0.29 | 1512 |
|  | 11 | 0.54 | 0.23 | 0.33 | 597 |
|  | 12 | 0.56 | 0.21 | 0.3 | 289 |
|  | 13 | 0.55 | 0.2 | 0.3 | 594 |
|  | 14 | 0.64 | 0.38 | 0.48 | 332 |
|  | 15 | 0.85 | 0.8 | 0.82 | 1386 |
|  | 16 | 0.38 | 0.11 | 0.16 | 76 |
|  | 17 | 0.55 | 0.34 | 0.42 | 857 |
|  | 18 | 0.73 | 0.67 | 0.7 | 1047 |
|  | 19 | 0.65 | 0.15 | 0.25 | 170 |
|  | 20 | 0.47 | 0.86 | 0.61 | 11029 |
|  | 21 | 0.61 | 0.3 | 0.4 | 921 |
|  | 22 | 0.67 | 0.06 | 0.11 | 129 |
|  | 23 | 0.47 | 0.1 | 0.16 | 958 |
|  | 24 | 0.48 | 0.1 | 0.16 | 165 |
|  | 25 | 0.59 | 0.48 | 0.53 | 312 |
|  | 26 | 0.6 | 0.26 | 0.37 | 763 |
|  | 27 | 0.52 | 0.32 | 0.4 | 700 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.51 | 34364 |
|  | macro\_avg | 0.54 | 0.32 | 0.37 | 34364 |
|  | weighted\_avg | 0.51 | 0.51 | 0.46 | 34364 |

### Confusion Matrix

A screenshot of a computer

Description automatically generated with medium confidence

## Sentiment

Best estimator (Sentiment):

### DecisionTreeClassifier(max\_depth=100, min\_samples\_split=5),

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Best estimator (Sentiment) | 0.515219 |  |  |  |  |
| Accuracy for Emotion | 0.627197 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.673676 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.629506 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.603656 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.55 | 0.46 | 0.5 | 3816 |
|  | 1 | 0.69 | 0.5 | 0.58 | 7745 |
|  | 2 | 0.51 | 0.79 | 0.62 | 11029 |
|  | 3 | 0.86 | 0.61 | 0.71 | 11774 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.63 | 34364 |
|  | Macro avg | 0.65 | 0.59 | 0.6 | 34364 |
|  | weighted\_avg | 0.67 | 0.63 | 0.63 | 34364 |

### Confusion Matrix

Chart, treemap chart

Description automatically generated

# MLP (Grid Search CV)

## Hyper-parameters:

### "activation":("identity", "logistic", "tanh", "relu"),"hidden\_layer\_sizes":((5,5),(5,10)), "solver":("adam","sgd")

## Emotion

### Best estimator (Emotion): MLPClassifier(activation='identity', early\_stopping=True, hidden\_layer\_sizes=(5, 10), max\_iter=5, verbose=True)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Best Score | 0.41029 |  |  |  |  |
| Accuracy for Emotion | 0.41029 |  |  |  |  |
| Precision (Weighted) for Emotion | 0.332184 |  |  |  |  |
| F1 Score (Weighted) for Emotion | 0.316989 |  |  |  |  |
| F1 Score (Macro) for Emotion | 0.177569 |  |  |  |  |
|  |  | precision | recall | f1-score | support |
|  |  |  |  |  |  |
|  | 0 | 0.41 | 0.48 | 0.44 | 5187 |
|  | 1 | 0.51 | 0.56 | 0.53 | 3083 |
|  | 2 | 0.33 | 0.07 | 0.12 | 2664 |
|  | 3 | 0.18 | 0.01 | 0.02 | 4114 |
|  | 4 | 0.3 | 0.04 | 0.07 | 5673 |
|  | 5 | 0.16 | 0.03 | 0.05 | 1744 |
|  | 6 | 0.23 | 0.07 | 0.1 | 2430 |
|  | 7 | 0.19 | 0.09 | 0.13 | 2941 |
|  | 8 | 0.37 | 0.12 | 0.18 | 1028 |
|  | 9 | 0 | 0 | 0 | 2312 |
|  | 10 | 0.14 | 0.01 | 0.01 | 3863 |
|  | 11 | 0.51 | 0.09 | 0.15 | 1443 |
|  | 12 | 0 | 0 | 0 | 754 |
|  | 13 | 0.27 | 0.01 | 0.03 | 1519 |
|  | 14 | 0 | 0 | 0 | 885 |
|  | 15 | 0.77 | 0.75 | 0.76 | 3546 |
|  | 16 | 0 | 0 | 0 | 183 |
|  | 17 | 0.27 | 0.16 | 0.2 | 2161 |
|  | 18 | 0.57 | 0.6 | 0.58 | 2505 |
|  | 19 | 0 | 0 | 0 | 407 |
|  | 20 | 0.4 | 0.87 | 0.55 | 27658 |
|  | 21 | 0.48 | 0.18 | 0.27 | 2316 |
|  | 22 | 0 | 0 | 0 | 350 |
|  | 23 | 0 | 0 | 0 | 2328 |
|  | 24 | 0 | 0 | 0 | 400 |
|  | 25 | 0.38 | 0.41 | 0.4 | 769 |
|  | 26 | 0.25 | 0.15 | 0.19 | 1941 |
|  | 27 | 0.26 | 0.16 | 0.2 | 1706 |
|  |  |  |  |  |  |
|  | accuracy |  |  | 0.41 | 85910 |
|  | Macro\_avg | 0.25 | 0.17 | 0.18 | 85910 |
|  | weighted\_avg | 0.33 | 0.41 | 0.32 | 85910 |

### Confusion Matrix

A screenshot of a computer

Description automatically generated with medium confidence

## Sentiment

### Best estimator (Sentiment): MLPClassifier(activation='tanh', early\_stopping=True, hidden\_layer\_sizes=(5, 5), max\_iter=5, verbose=True)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Best estimator (Sentiment) | 0.554266 |  |  |  |
| Accuracy for Emotion | 0.554266 |  |  |  |
| Precision (Weighted) for Emotion | 0.551942 |  |  |  |
| F1 Score (Weighted) for Emotion | 0.549862 |  |  |  |
| F1 Score (Macro) for Emotion | 0.506429 |  |  |  |
|  | precision | recall | f1-score | support |
|  |  |  |  |  |
| 0 | 0.41 | 0.25 | 0.31 | 9405 |
| 1 | 0.54 | 0.52 | 0.53 | 19335 |
| 2 | 0.48 | 0.56 | 0.52 | 27658 |
| 3 | 0.67 | 0.67 | 0.67 | 29512 |
|  |  |  |  |  |
| accuracy |  |  | 0.55 | 85910 |
| macro avg | 0.53 | 0.5 | 0.51 | 85910 |
| weighted avg | 0.55 | 0.55 | 0.55 | 85910 |

### Confusion Matrix

Chart, treemap chart

Description automatically generated

# Embeddings

# MLP (Embeddings)

### MLPClassifier(max\_iter=100)

## Emotion

Score for Emotion: 0.3132840141524606

Accuracy: 0.3132840141524606

Precision (Weighted): 0.10991460495201474

F1 Score (Weighted): 0.15242757960216918

F1 Score (Macro): 0.0178362445341089

precision recall f1-score support

0 0.00 0.00 0.00 2089

1 0.00 0.00 0.00 1240

2 0.00 0.00 0.00 1025

3 0.00 0.00 0.00 1699

4 0.04 0.00 0.00 2211

5 0.00 0.00 0.00 705

6 0.03 0.00 0.00 1009

7 0.05 0.00 0.01 1229

8 0.00 0.00 0.00 464

9 0.00 0.00 0.00 920

10 0.00 0.00 0.00 1514

11 0.00 0.00 0.00 574

12 0.00 0.00 0.00 292

13 0.00 0.00 0.00 614

14 0.00 0.00 0.00 353

15 0.07 0.00 0.01 1404

16 0.00 0.00 0.00 69

17 0.00 0.00 0.00 881

18 0.03 0.00 0.00 1020

19 0.00 0.00 0.00 143

20 0.32 0.99 0.48 10836

21 0.00 0.00 0.00 924

22 0.00 0.00 0.00 138

23 0.00 0.00 0.00 964

24 0.00 0.00 0.00 164

25 0.00 0.00 0.00 302

26 0.03 0.00 0.00 760

27 0.00 0.00 0.00 656

accuracy 0.31 34199

macro avg 0.02 0.04 0.02 34199

weighted avg 0.11 0.31 0.15 34199

Graphical user interface

Description automatically generated with medium confidence

## Sentiment

Score for Sentiments: 0.5372122129405944

Accuracy: 0.5372122129405944

Precision (Weighted): 0.5374237299734715

F1 Score (Weighted): 0.5219671309658458

F1 Score (Macro): 0.46449184791008546

precision recall f1-score support

0 0.49 0.13 0.21 3780

1 0.53 0.44 0.48 7739

2 0.46 0.60 0.52 10920

3 0.63 0.67 0.65 11918

accuracy 0.54 34357

macro avg 0.53 0.46 0.46 34357

weighted avg 0.54 0.54 0.52 34357

A picture containing chart

Description automatically generated

# MLP Grid Search CV (Embeddings)

### MLPClassifier(max\_iter=100)

## Emotion

Accuracy: 0.3878359099775817

Precision (Weighted): 0.25383071639530835

F1 Score (Weighted): 0.27016455551657853

F1 Score (Macro): 0.1220581025419878

precision recall f1-score support

0 0.44 0.43 0.44 2092

1 0.37 0.38 0.37 1221

2 0.29 0.10 0.15 1041

3 0.00 0.00 0.00 1679

4 0.00 0.00 0.00 2221

5 0.33 0.00 0.01 704

6 0.00 0.00 0.00 985

7 0.20 0.00 0.00 1174

8 0.00 0.00 0.00 420

9 0.00 0.00 0.00 964

10 0.00 0.00 0.00 1519

11 0.36 0.05 0.08 564

12 0.00 0.00 0.00 283

13 0.00 0.00 0.00 585

14 0.00 0.00 0.00 334

15 0.63 0.74 0.68 1402

16 0.00 0.00 0.00 72

17 0.28 0.10 0.14 889

18 0.51 0.49 0.50 967

19 0.00 0.00 0.00 162

20 0.37 0.90 0.53 11160

21 0.33 0.04 0.07 951

22 0.00 0.00 0.00 136

23 0.00 0.00 0.00 879

24 0.00 0.00 0.00 152

25 0.36 0.23 0.28 290

26 0.24 0.13 0.17 769

27 0.00 0.00 0.00 732

accuracy 0.39 34347

macro avg 0.17 0.13 0.12 34347

weighted avg 0.25 0.39 0.27 34347

Best estimator (Emotion): MLPClassifier(activation='tanh', early\_stopping=True,

hidden\_layer\_sizes=(5, 10), max\_iter=100, verbose=True), Best Score: 0.3841097685252584

Accuracy: 0.3878359099775817

Precision (Weighted): 0.25383071639530835

F1 Score (Weighted): 0.27016455551657853

F1 Score (Macro): 0.1220581025419878

Graphical user interface

Description automatically generated with medium confidence

## Sentiment

Accuracy: 0.528954493842257

Precision (Weighted): 0.5286138750581487

F1 Score (Weighted): 0.5194281396686699

F1 Score (Macro): 0.4679402991192396

precision recall f1-score support

0 0.45 0.16 0.23 3770

1 0.48 0.49 0.49 7677

2 0.47 0.57 0.51 11160

3 0.64 0.63 0.64 11740

accuracy 0.53 34347

macro avg 0.51 0.46 0.47 34347

weighted avg 0.53 0.53 0.52 34347

Best estimator (Sentiment): MLPClassifier(activation='tanh', early\_stopping=True,

hidden\_layer\_sizes=(5, 10), max\_iter=100, verbose=True), Best Score: 0.5237589168729073

Chart, treemap chart

Description automatically generated

# MLP Twitter (Embeddings)

### MLPClassifier(max\_iter=100)

## Emotion

Score for Emotions: 0.37331772966647164

Accuracy: 0.37331772966647164

Precision (Weighted): 0.3636351303597701

F1 Score (Weighted): 0.26656652963011374

F1 Score (Macro): 0.12171919880877288

precision recall f1-score support

0 0.44 0.32 0.37 2122

1 0.52 0.15 0.24 1218

2 0.31 0.07 0.11 1037

3 0.20 0.03 0.05 1638

4 0.51 0.01 0.02 2285

5 0.29 0.02 0.04 674

6 0.26 0.01 0.02 903

7 0.37 0.19 0.25 1173

8 0.48 0.03 0.06 417

9 0.36 0.01 0.01 972

10 0.22 0.01 0.02 1444

11 0.40 0.07 0.12 555

12 0.00 0.00 0.00 266

13 0.32 0.03 0.06 576

14 0.40 0.07 0.12 359

15 0.55 0.40 0.46 1478

16 0.00 0.00 0.00 67

17 0.31 0.08 0.12 878

18 0.51 0.36 0.42 988

19 0.67 0.01 0.02 161

20 0.36 0.92 0.52 11149

21 0.30 0.07 0.12 884

22 0.00 0.00 0.00 126

23 0.00 0.00 0.00 911

24 0.00 0.00 0.00 159

25 0.48 0.06 0.10 289

26 0.39 0.07 0.13 776

27 0.50 0.01 0.01 675

accuracy 0.37 34180

macro avg 0.33 0.11 0.12 34180

weighted avg 0.36 0.37 0.27 34180

Graphical user interface

Description automatically generated with medium confidence

## Sentiment

Score for Sentiments: 0.49637214745465186

Accuracy: 0.49637214745465186

Precision (Weighted): 0.5065184711799884

F1 Score (Weighted): 0.4872978336397582

F1 Score (Macro): 0.4402642610201702

precision recall f1-score support

0 0.52 0.15 0.24 3662

1 0.46 0.43 0.44 7564

2 0.43 0.57 0.49 11149

3 0.61 0.57 0.59 11805

accuracy 0.50 34180

macro avg 0.50 0.43 0.44 34180

weighted avg 0.51 0.50 0.49 34180

A picture containing graphical user interface

Description automatically generated

# MLP Grid Search CV Twitter (Embeddings)

### MLPClassifier(max\_iter=100)

## Emotion

Accuracy: 0.34339446053054895

Precision (Weighted): 0.1899110131432744

F1 Score (Weighted): 0.20833619664976433

F1 Score (Macro): 0.058257258816966244

precision recall f1-score support

0 0.36 0.28 0.32 2095

1 0.00 0.00 0.00 1204

2 0.22 0.02 0.04 1003

3 0.00 0.00 0.00 1694

4 0.00 0.00 0.00 2255

5 0.67 0.00 0.01 672

6 0.00 0.00 0.00 1011

7 0.33 0.08 0.13 1146

8 0.00 0.00 0.00 416

9 0.00 0.00 0.00 948

10 0.00 0.00 0.00 1588

11 0.00 0.00 0.00 563

12 0.00 0.00 0.00 307

13 0.00 0.00 0.00 580

14 0.00 0.00 0.00 371

15 0.39 0.37 0.38 1463

16 0.00 0.00 0.00 68

17 0.00 0.00 0.00 878

18 0.42 0.18 0.25 985

19 0.00 0.00 0.00 146

20 0.34 0.94 0.50 10915

21 0.00 0.00 0.00 897

22 0.00 0.00 0.00 134

23 0.00 0.00 0.00 923

24 0.00 0.00 0.00 176

25 0.00 0.00 0.00 315

26 0.00 0.00 0.00 781

27 0.00 0.00 0.00 657

accuracy 0.34 34191

macro avg 0.10 0.07 0.06 34191

weighted avg 0.19 0.34 0.21 34191

Best estimator (Emotion): MLPClassifier(early\_stopping=True, hidden\_layer\_sizes=(5, 5), max\_iter=100,

verbose=True), Best Score: 0.34758446021266376

Accuracy: 0.34339446053054895

Precision (Weighted): 0.1899110131432744

F1 Score (Weighted): 0.20833619664976433

F1 Score (Macro): 0.058257258816966244

Graphical user interface

Description automatically generated with low confidence

## Sentiment

Accuracy: 0.4918253341522623

Precision (Weighted): 0.48763441602206437

F1 Score (Weighted): 0.4864398036763785

F1 Score (Macro): 0.45372270840256124

precision recall f1-score support

0 0.43 0.25 0.31 3737

1 0.45 0.46 0.46 7784

2 0.44 0.46 0.45 10915

3 0.57 0.62 0.60 11755

accuracy 0.49 34191

macro avg 0.47 0.45 0.45 34191

weighted avg 0.49 0.49 0.49 34191

Best estimator (Sentiment): MLPClassifier(activation='tanh', early\_stopping=True,

hidden\_layer\_sizes=(5, 10), max\_iter=100, verbose=True), Best Score: 0.48648512567740354

Chart, treemap chart

Description automatically generated

# MLP Wiki (Embeddings)

### MLPClassifier(max\_iter=100)

## Emotion

Score for Emotions: 0.38717506359835085

Accuracy: 0.38717506359835085

Precision (Weighted): 0.3662660225736137

F1 Score (Weighted): 0.3054314369601219

F1 Score (Macro): 0.19573170590377284

precision recall f1-score support

0 0.52 0.35 0.42 2089

1 0.47 0.36 0.41 1240

2 0.33 0.12 0.18 1025

3 0.20 0.02 0.04 1699

4 0.33 0.03 0.06 2211

5 0.30 0.05 0.09 705

6 0.33 0.03 0.06 1009

7 0.38 0.22 0.27 1229

8 0.47 0.09 0.16 464

9 0.23 0.03 0.05 920

10 0.22 0.06 0.09 1514

11 0.28 0.15 0.19 574

12 0.35 0.10 0.15 292

13 0.31 0.06 0.11 614

14 0.48 0.29 0.36 353

15 0.59 0.50 0.54 1404

16 0.19 0.07 0.11 69

17 0.33 0.14 0.20 881

18 0.55 0.51 0.53 1020

19 0.32 0.05 0.08 143

20 0.37 0.87 0.52 10836

21 0.43 0.12 0.19 924

22 0.46 0.04 0.08 138

23 0.25 0.00 0.01 964

24 0.10 0.01 0.01 164

25 0.41 0.19 0.26 302

26 0.34 0.19 0.24 760

27 0.30 0.04 0.07 656

accuracy 0.39 34199

macro avg 0.35 0.17 0.20 34199

weighted avg 0.37 0.39 0.31 34199

Graphical user interface

Description automatically generated

## Sentiment

Score for Sentiments: 0.5165063305944618

Accuracy: 0.5165063305944618

Precision (Weighted): 0.5291221780220821

F1 Score (Weighted): 0.5129582214203394

F1 Score (Macro): 0.47357183479205495

precision recall f1-score support

0 0.47 0.21 0.29 3858

1 0.49 0.50 0.50 7651

2 0.43 0.58 0.49 10836

3 0.66 0.57 0.61 11854

accuracy 0.52 34199

macro avg 0.51 0.46 0.47 34199

weighted avg 0.53 0.52 0.51 34199

A picture containing chart

Description automatically generated

# MLP Grid Search CV Wiki (Embeddings)

### MLPClassifier(max\_iter=100)

## Emotion

Accuracy: 0.35626133239749663

Precision (Weighted): 0.23083496323163072

F1 Score (Weighted): 0.23566305836078766

F1 Score (Macro): 0.08782347405468795

precision recall f1-score support

0 0.41 0.31 0.35 2101

1 0.39 0.20 0.26 1240

2 0.31 0.05 0.09 1024

3 0.00 0.00 0.00 1678

4 0.00 0.00 0.00 2229

5 0.00 0.00 0.00 638

6 0.00 0.00 0.00 992

7 0.32 0.13 0.19 1164

8 0.00 0.00 0.00 423

9 0.00 0.00 0.00 940

10 0.00 0.00 0.00 1483

11 0.00 0.00 0.00 602

12 0.00 0.00 0.00 313

13 0.00 0.00 0.00 592

14 0.26 0.01 0.03 336

15 0.54 0.30 0.39 1387

16 0.00 0.00 0.00 62

17 0.21 0.02 0.03 902

18 0.50 0.41 0.45 1002

19 0.00 0.00 0.00 151

20 0.35 0.92 0.50 10986

21 0.31 0.04 0.06 873

22 0.00 0.00 0.00 156

23 0.00 0.00 0.00 995

24 0.00 0.00 0.00 177

25 0.00 0.00 0.00 303

26 0.34 0.06 0.10 751

27 0.00 0.00 0.00 694

accuracy 0.36 34194

macro avg 0.14 0.09 0.09 34194

weighted avg 0.23 0.36 0.24 34194

Best estimator (Emotion): MLPClassifier(activation='logistic', early\_stopping=True,

hidden\_layer\_sizes=(5, 10), max\_iter=100, verbose=True), Best Score: 0.35492432550998027

Accuracy: 0.35626133239749663

Precision (Weighted): 0.23083496323163072

F1 Score (Weighted): 0.23566305836078766

F1 Score (Macro): 0.08782347405468795

Graphical user interface

Description automatically generated

## Sentiment

Accuracy: 0.49707551032344854

Precision (Weighted): 0.4972254287168954

F1 Score (Weighted): 0.49385696006537

F1 Score (Macro): 0.4610463748652832

precision recall f1-score support

0 0.41 0.26 0.32 3845

1 0.48 0.43 0.46 7643

2 0.43 0.52 0.47 10986

3 0.59 0.59 0.59 11720

accuracy 0.50 34194

macro avg 0.48 0.45 0.46 34194

weighted avg 0.50 0.50 0.49 34194

Best estimator (Sentiment): MLPClassifier(activation='tanh', early\_stopping=True,

hidden\_layer\_sizes=(5, 10), max\_iter=100, verbose=True), Best Score: 0.49279812824449803

Chart, treemap chart

Description automatically generated