# 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

Unable to converge to a final model

## Sentiment

Unable to converge to a final model

# New 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

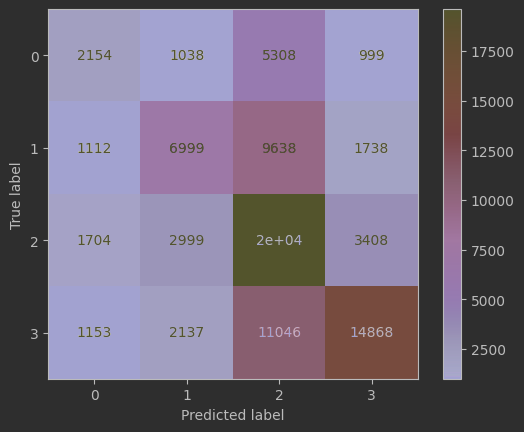
Graphical user interface

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

Unable to converge to a final model

## Sentiment

Unable to converge to a final model