Gender Recognition Using Voice Dataset by Machine Learning

Course:CSE498R
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Abstract

In this project, we are offering gender recognition using voice dataset by machine learning algorithm. Here the machine learning predicting models like Logistic Regression, Gradient Boosting Classifier, AdaBoost Classifier, K-Nearest Neighbor and Multi-Layer Perceptron Classifier techniques are used. In this article, we've examined 3168 data from both males and females. Our predicting model such as Logistic Regression, Gradient Boosting Classifier, AdaBoost Classifier, K-Nearest Neighbor and Multi-Layer Perceptron Classifier showed the accuracy 98%, 98%, 98%, 97%, and 97% respectively. It was found that the logistic regression, gradient boosting classifier, and adaboost classifier models had the highest accuracy (98%).

Tools

The software tools we are using in this project—

Libraries we need to execute this model-

Dataset

The dataset which is used in this project is based on CSV file. Our dataset is publicly available. The dataset includes 3168 samples of both male and female voices with voice acoustic properties. Meanfreq, mode, sd, median, q25, q75, skew, iqr, kurt, sp.Ent, meanfun, minfun, centroid, maxfun, mindom, sfm, meandom, maxdom, dfrange, modindex, and label are the acoustic qualities.

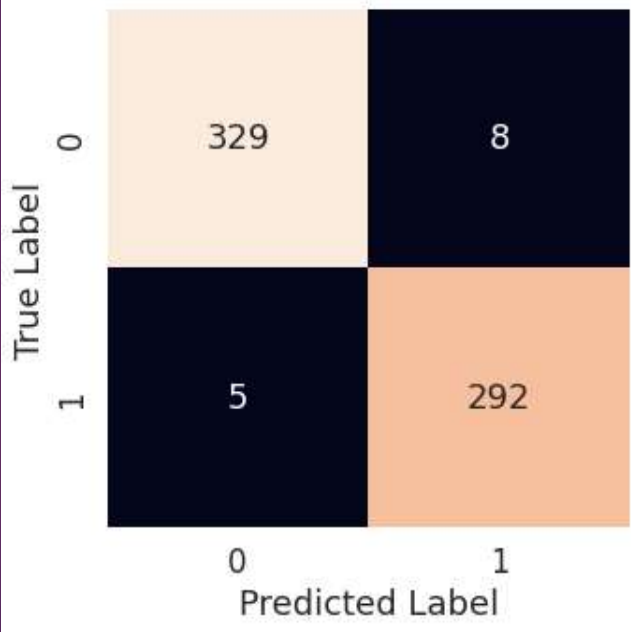|	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	meanfreq	sd	median	Q25	Q75	IQR	skew	kurt	sp.ent	sfm	mode	centroid	meanfun	minfun	maxfun	meandom	mindom	maxdom	dfrange	modindx	label
2	0.059781	0.064241	0.032027	0.015071	0.090193	0.075122	12.86346	274.4029	0.893369	0.491918	0	0.059781	0.084279	0.015702	0.275862	0.007813	0.007813	0.007813	0	0	male
3	0.066009	0.06731	0.040229	0.019414	0.092666	0.073252	22.42329	634.6139	0.892193	0.513724	0	0.066009	0.107937	0.015826	0.25	0.009014	0.007813	0.054688	0.046875	0.052632	male
4	0.077316	0.083829	0.036718	0.008701	0.131908	0.123207	30.75715	1024.928	0.846389	0.478905	0	0.077316	0.098706	0.015656	0.271186	0.00799	0.007813	0.015625	0.007813	0.046512	male
5	0.151228	0.072111	0.158011	0.096582	0.207955	0.111374	1.232831	4.177296	0.963322	0.727232	0.083878	0.151228	0.088965	0.017798	0.25	0.201497	0.007813	0.5625	0.554688	0.247119	male
6	0.13512	0.079146	0.124656	0.07872	0.206045	0.127325	1.101174	4.333713	0.971955	0.783568	0.104261	0.13512	0.106398	0.016931	0.266667	0.712813	0.007813	5.484375	5.476563	0.208274	male
7	0.132786	0.079557	0.11909	0.067958	0.209592	0.141634	1.932562	8.308895	0.963181	0.738307	0.112555	0.132786	0.110132	0.017112	0.253968	0.298222	0.007813	2.726563	2.71875	0.12516	male
8	0.150762	0.074463	0.160106	0.092899	0.205718	0.112819	1.530643	5.987498	0.967573	0.762638	0.086197	0.150762	0.105945	0.02623	0.266667	0.47962	0.007813	5.3125	5.304688	0.123992	male
9	0.160514	0.076767	0.144337	0.110532	0.231962	0.12143	1.397156	4.766611	0.959255	0.719858	0.128324	0.160514	0.093052	0.017758	0.144144	0.301339	0.007813	0.539063	0.53125	0.283937	male
10	0.142239	0.078018	0.138587	0.088206	0.208587	0.120381	1.099746	4.070284	0.970723	0.770992	0.219103	0.142239	0.096729	0.017957	0.25	0.336476	0.007813	2.164063	2.15625	0.148272	male

Results and Analysis

➤Model Accuracy:

In this study, we have compared several machine learning models using voice dataset. We took 80% random data for training and 20% random data for testing. Logistic regression, gradient boosting classifier, adaboost classifier, k-nearest neighbor and multi-layer perceptron classifier (MLPclassifier) algorithms were used to identify the gender, and their respective accuracies were 98%, 98%, 98%, 97%, and 97%.

Results and Analysis

➢Confusion Matrix:

In the confusion matrix, the genders are represented by 1 for the female and 0 for the male.

In Logistic Regression algorithm, total correct predicted result is 621 data. The correct male voice recognition result is 329 data and the correct female voice recognition result is 292 data.

Figure 1: Confusion Matrix (Logistic Regression)

Results and Analysis

➤Confusion Matrix:

In Gradient Boosting Classifier algorithm, total correct predicted result is 623 data. The correct male voice recognition result is 329 data and the correct female voice recognition result is 294 data.
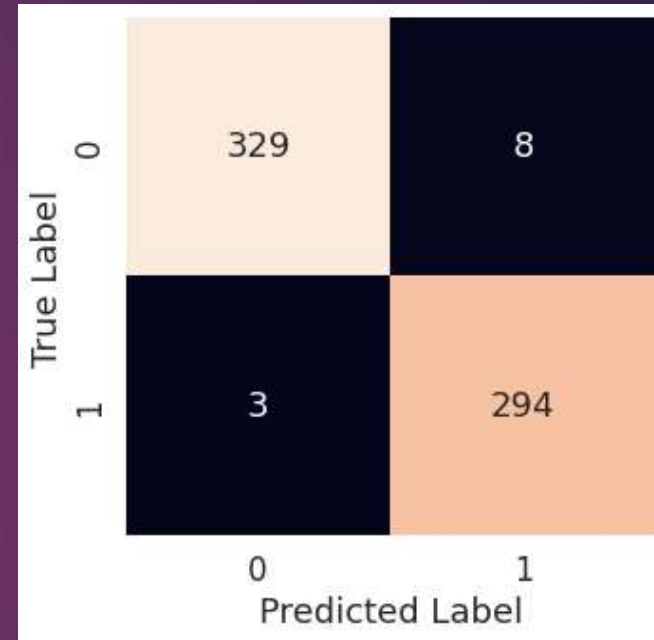

Figure 2: Confusion Matrix (Gradient Boosting Classifier)

Results and Analysis

➢Confusion Matrix:

In AdaBoost Classifier, total correct predicted result is 621 data. The correct male voice recognition result is 331 data and the correct female voice recognition result is 290 data.
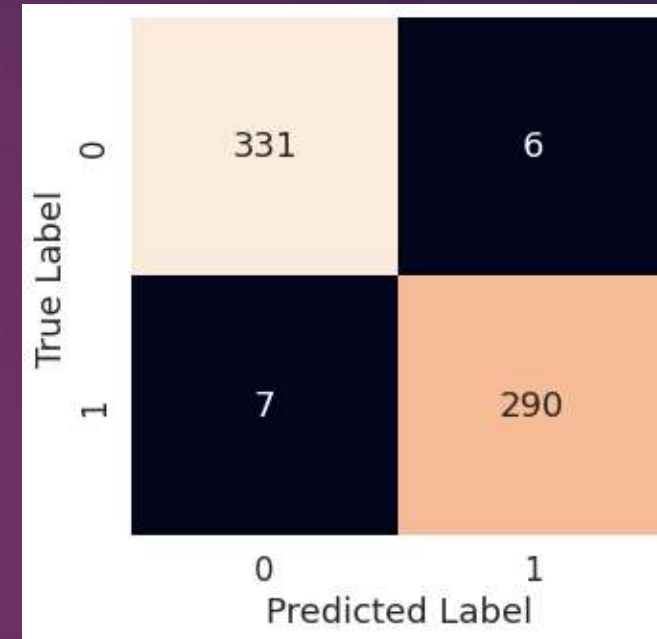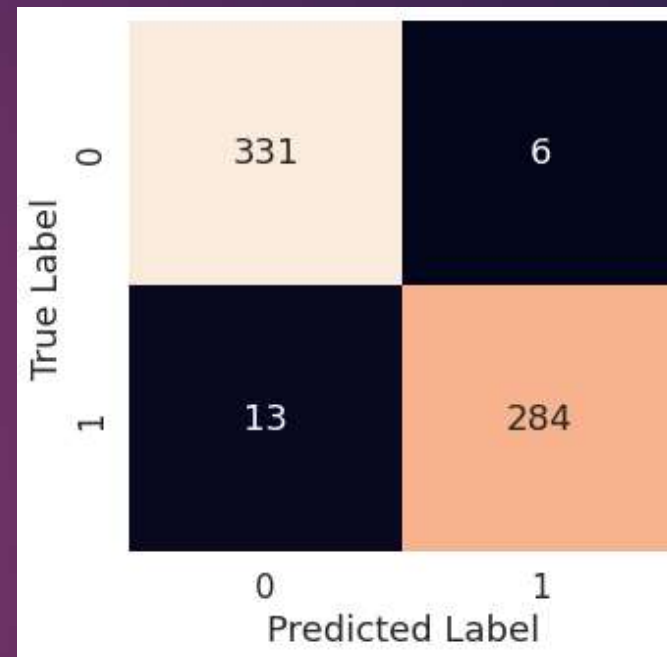

Figure 3: Confusion Matrix (AdaBoost Classifier)

Results and Analysis

➤Confusion Matrix:

In K-Nearest Neighbor, total correct predicted result is 615 data. The correct male voice recognition result is 331 data and the correct female voice recognition result is 284 data.
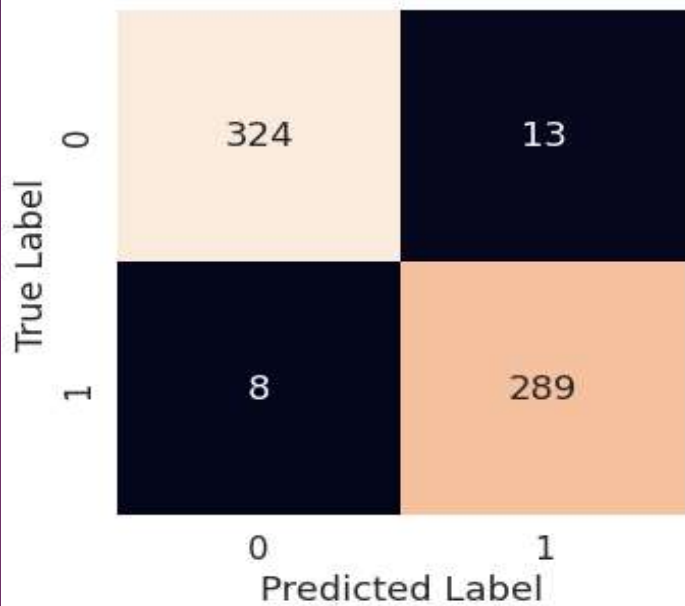
Figure 4: Confusion Matrix (K-Nearest Neighbor)

Results and Analysis

➢Confusion Matrix:

In Multi-Layer Perceptron Classifier, total correct predicted result is 613 data. The correct male voice recognition result is 324 data and the correct female voice recognition result is 289 data.

Figure 5: Confusion Matrix (Multi-Layer Perceptron Classifier)

Result and Analysis

➢Model Evaluation:

In Logistic Regression algorithm, precision, recall, f1-score respective results were 0.99, 0.98, 0.98 for male and 0.97, 0.98, 0.98 for female.

	precision	recall	f1-score	support
0	0.99	0.98	0.98	337
1	0.97	0.98	0.98	297
accuracy			0.98	634
macro avg	0.98	0.98	0.98	634
weighted avg	0.98	0.98	0.98	634

Figure 6: Classification Report (Logistic Regression)

Result and Analysis

➢Model Evaluation:

In Gradient Boosting Classifier algorithm, precision, recall, f1-score respective results were 0.99, 0.98, 0.98 for male and 0.97, 0.99, 0.98 for female.

	precision	recall	f1-score	support
0	0.99	0.98	0.98	337
1	0.97	0.99	0.98	297
accuracy			0.98	634
macro avg	0.98	0.98	0.98	634
weighted avg	0.98	0.98	0.98	634

Figure 7: Classification Report (Gradient Boosting Classifier)

Result and Analysis

➢Model Evaluation:

In AdaBoost Classifier algorithm, precision, recall, f1-score respective results were 0.98, 0.98, 0.98 for male and 0.98, 0.98, 0.98 for female.

	precision	recall	f1-score	support
0	0.98	0.98	0.98	337
1	0.98	0.98	0.98	297
accuracy			0.98	634
macro avg	0.98	0.98	0.98	634
weighted avg	0.98	0.98	0.98	634

Figure 8: Classification Report (AdaBoost Classifier)

Result and Analysis

➤Model Evaluation:

In K-Nearest Neighbor algorithm, precision, recall, f1-score respective results were 0.96, 0.98, 0.97 for male and 0.98, 0.96, 0.97 for female.

	precision	recall	f1-score	support
0	0.96	0.98	0.97	337
1	0.98	0.96	0.97	297
accuracy			0.97	634
macro avg	0.97	0.97	0.97	634
weighted avg	0.97	0.97	0.97	634

Figure 9: Classification Report (K-Nearest Neighbor)

Result and Analysis

➢Model Evaluation:

In Multi-Layer Perceptron Classifier algorithm, precision, recall, f1-score respective results were 0.98, 0.96, 0.97 for male and 0.96, 0.97, 0.96 for female.

	precision	recall	f1-score	support
0	0.98	0.96	0.97	337
1	0.96	0.97	0.96	297
accuracy			0.97	634
macro avg	0.97	0.97	0.97	634
weighted avg	0.97	0.97	0.97	634

Figure 10: Classification Report (Multi-Layer Perceptron Classifier)

Conclusion

The primary goal of this research was to create a speech signal-based gender recognition system. The dataset for this project was collected from kaggle. We evaluated at 3168 records from both males and females. To improve the accuracy of the experiment, we compare five different algorithms. In this study, gender recognition from audio data is presented using logistic regression, gradient boosting classifier, adaboost classifier, k-nearest neighbor (KNN), and multi-layer perceptron classifier (mlpclassifier), with respective accuracies of 98%, 98%, 98%, 97%, and 97% and compare them in terms of F1 score, recall, and precision. In this model, logistic regression, adaboost classifier, and gradient boosting classifier produced the best results.