

# CSE / ECE 343: Machine Learning Project Proposal

## Title: Gender Classification by Voice

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### 1. Motivation

Recently, gender recognition has become an important area of research. Gender research can be used in various fields like security purposes and speaker identification. Implementing such a model improves the efficiency of many algorithms like Face Recognition, Smart Devices for human-computer interaction, visual surveillance systems, and intelligent surface. Improvement in fields like Machine Learning and visualization tools can help us produce a model of such capability.

### 2. Related Work

Various works that are still going on in the field of Gender Recognition are as follows:

#### 2.1. A New Gender Detection Algorithm Considering the Non-Stationarity of Speech Signal

A Pitch based algorithm has been developed for gender detection using analysis of the non-stationary behavior of the voice signal. The Concept of peak detection is used to get the dominant pitch, the frequencies, and the fundamental frequency in the sound signal.

#### 2.2. An Efficient Algorithm for Gender Detection Using Voice Samples

This paper proposed an efficient gender detection algorithm based on the time domain. Authors have proposed to use pitch-based gender detection. For pitch detection, Autocorrelation (ACF) and K-Means as a classifier is used.

#### 2.3. Automatic Recognition of Gender by Voice

Two algorithms have been developed to automatically detect the gender of the speaker using audio features. The audio features acoustic parameters for vowels and fricatives for rapid gender classification.

### 3. Timeline

A Tentative 12-week timeline:

Week 1-2: Data Collection.

Week 3-4: Pre-processing and Data Visualization.

Week 5: Feature Extraction.

Week 6: Feature Analysis, Selection, Correlation, Heatmaps.

Week 7: Logistic Regression, Naïve Bayes

Week 8: Decision Trees, Random Forest.

Week 9: Support Vector Machine (SVM).

Week 10: Analysis and performance of models.

Week 11: Hyperparameter Tuning, Check for model Overfitting and Underfitting.

Week 12: Report Writing.

### 4. Individual Task

Tasks	Team Member /s
Data Collection	Arjun and Dheeraj
Pre-processing and Data Visualization	Aryman and Khushdev
Feature Extraction	Dheeraj
Logistic Regression, Naïve Bayes,	Khushdev, Arjun
Decision Trees, Random Forest, Support Vector Machine (SVM)	Aryman and Khushdev
Analysis and performance of models	Dheeraj and Aryman
Hyperparameter Tuning, Check for model Overfitting and Underfitting	Dheeraj and Arjun
Report Writing	Aryman, Dheeraj, Arjun, and Khushdev

### 5. Final Outcome

The objective is to develop various Machine Learning models that can classify gender using Binary Classification and other Machine Learning algorithms. We will identify specific audio features that have the highest correlation to our training dataset and develop a decision-making model that can identify the gender of the speaker. The tuning of the model to get the best output is based on metrics like Accuracy, Precision, and NMI for our classification problem. The project will help us identify important voice features which will simulate our decision-making process, granting the working of our model to be highly efficient.

### References

- [1] A new gender detection algorithm considering the non-stationarity of the speech signal by Mamta Kumari, Nilakshi Talukdar, Israj Ali. [\[Link\]](#)
- [2] An efficient algorithm for Gender Detection using voice samples by Mamta Kumari, Israj Ali. [\[Link\]](#)
- [3] Automatic recognition of gender by voice by D.G. Childers, Ke Wu, K.S. Bae, D.M. Hicks. [\[Link\]](#)