Gender Detection

Selen Akkaya s289332

January 2023

Abstract

In this paper, 'synthetic speaker embeddings that represent the acoustic characteristics of a spoken utterance' is analyzed and a gender classification task is applied by building commonly used machine learning algorithms. Moreover, the performances of applied machine learning models and the comparison of models are analyzed.

1 Introduction

1.1 Problem Overview

The data-set contains synthetic speaker embeddings which represent the acoustic characteristics of a spoken utterance. Each row corresponds to a different speaker and contains **12 features** followed by the gender label:
1: female,
0: male
The features do not have any particular interpretation. Speakers belong to four different age groups. The age information, however, is not available.
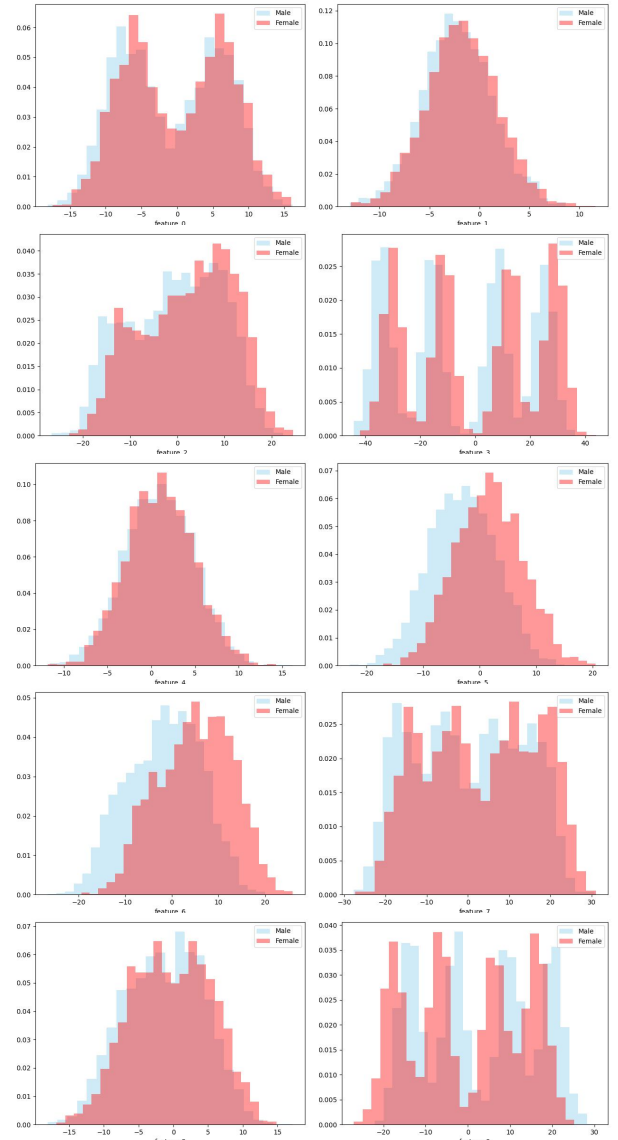The **training set** consists of **3000** samples for each class, whereas the **test set** contains **2000** samples for each class.

1.2 Exploratory Data Analysis

The 12 features are in a scale that have considerably similar means and variances, so it does not worth to apply Z-normalization which is basically centering every feature to its mean and scaling to unit variance $x_i = (x_i - \mu) / \sigma$

μ : [-0.40439904, -1.98045219, 0.84747715, -2.37863374, 0.97348671, -0.72096827, 1.684338, 1.49200716, -0.8046595, 1.31572434, -0.07712583, 1.00468738]

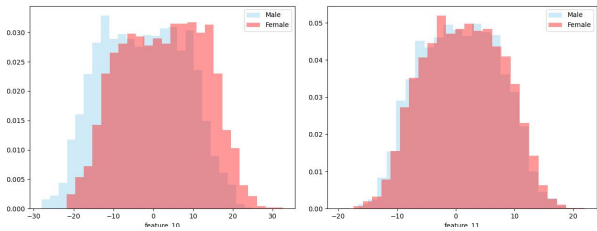σ : [7.09209235, 3.52880203, 9.8027367, 23.02600239, 3.85825232, 6.35299195, 8.5832784, 13.35106596,

5.71561775, 13.29758557, 10.69372272, 6.69376688]

Histograms of each 12 features (raw data) are shown below as Figure 1. It is obvious that raw features have approximated Gaussian distribution.

Figure 1: Raw Features

Figure 2: Gaussianized Features

lalallalalalaaaaaaaaaaa lalallalalalaaaaaaaaaaa lalal-lalalalaaaaaaaaaaa lalallalalalaaaaaaaaaaa lalal-lalalalaaaaaaaaaaa lalallalalalaaaaaaaaaaa lalal-lalalalaaaaaaaaaaa lalallalalalaaaaaaaaaaa
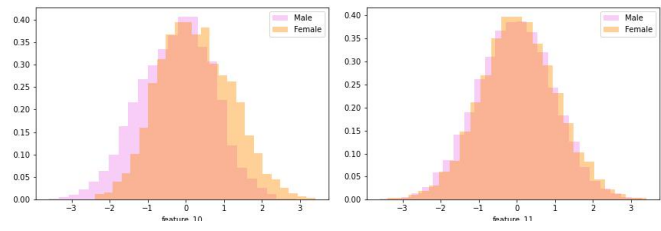
However, to approve this idea, histograms of Gaussianized features are plotted to demonstrate. Every 12 features with Gaussianization as it is shown in Figure 2.