EE457 - Introduction to Machine Learning and Data Mining

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Speaker Accent Recognition

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Contents

Problem Statement

Recognition of the US accent from 6 different accents

The Input (Dataset)

Total = 330

ES	FR	GE	IT	UK	US
30	30	30	30	45	165

Accent	Gender		
	Female	Male	Total
US	90	75	165
Non-US	90	75	165
Total	180	150	330

Literature Review

2014

A Comparison of Classifiers in Performing Speaker Accent Recognition Using MFCCs

2020

Identification of the English Accent Spoken in Different Countries by the k-Nearest Neighbor Method

2020

Speaker Accent Recognition Using Machine Learning Algorithms

Methods Used

1st Article

MFCC = 12

Average accuracy of classifiers & computation time				
LDA	QDA	SVM(RBF)	SVM(PLY)	k-NN
0.7353	0.8112	0.8208	0.8097	**0.8548**
7.36 s	7.26 s	11.75 s	10.58 s	**0.64 s**

2nd Article

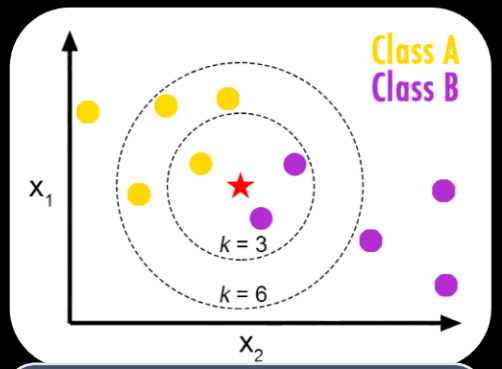
k-NN, # of NN = 5

Accuracy	Error Rate	Recall (r)	Specificity	Precision (p)	F1-Score
87.3%	12.7%	84.1%	83.1%	84.3%	87.7%

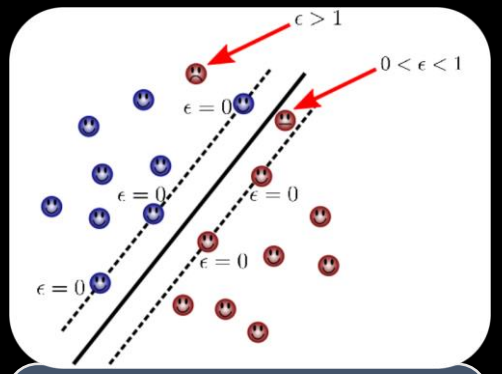
3rd Article

Method	Accuracy	Kappa statistic	Precision	Recall	F1-Score	MAE	RMSE
MLP	76.83%	68.7%	78%	76.8%	76.9%	9.6%	26.2%
RBF	**85.37%**	**79.5%**	**86.3%**	**85.4%**	**85.4%**	**6%**	**21.2%**
DT	69.51%	57.6%	70.8%	69.5%	69.5%	11%	31%
RF	84.15%	77.4%	84.8%	84.1%	84.1%	14%	23.6%
k-NN	*80.49%*	*73.6%*	*81.4%*	*80.5%*	*80.5%*	*7%*	*25%*
LMT	76.85%	69.4%	79.1%	76.8%	76.8%	9%	24%
NB	54.88%	44.4%	66.8%	54.9%	54.9%	16%	35%

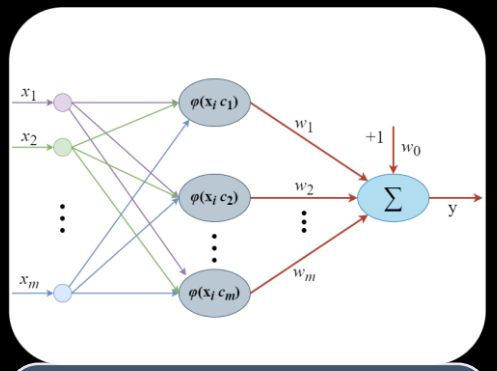
Methods Used



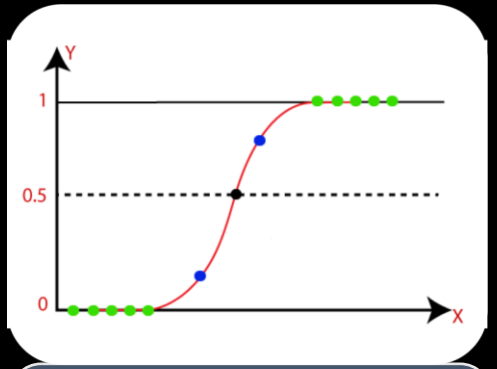
k-Nearest Neighbor



Support Vector Machine



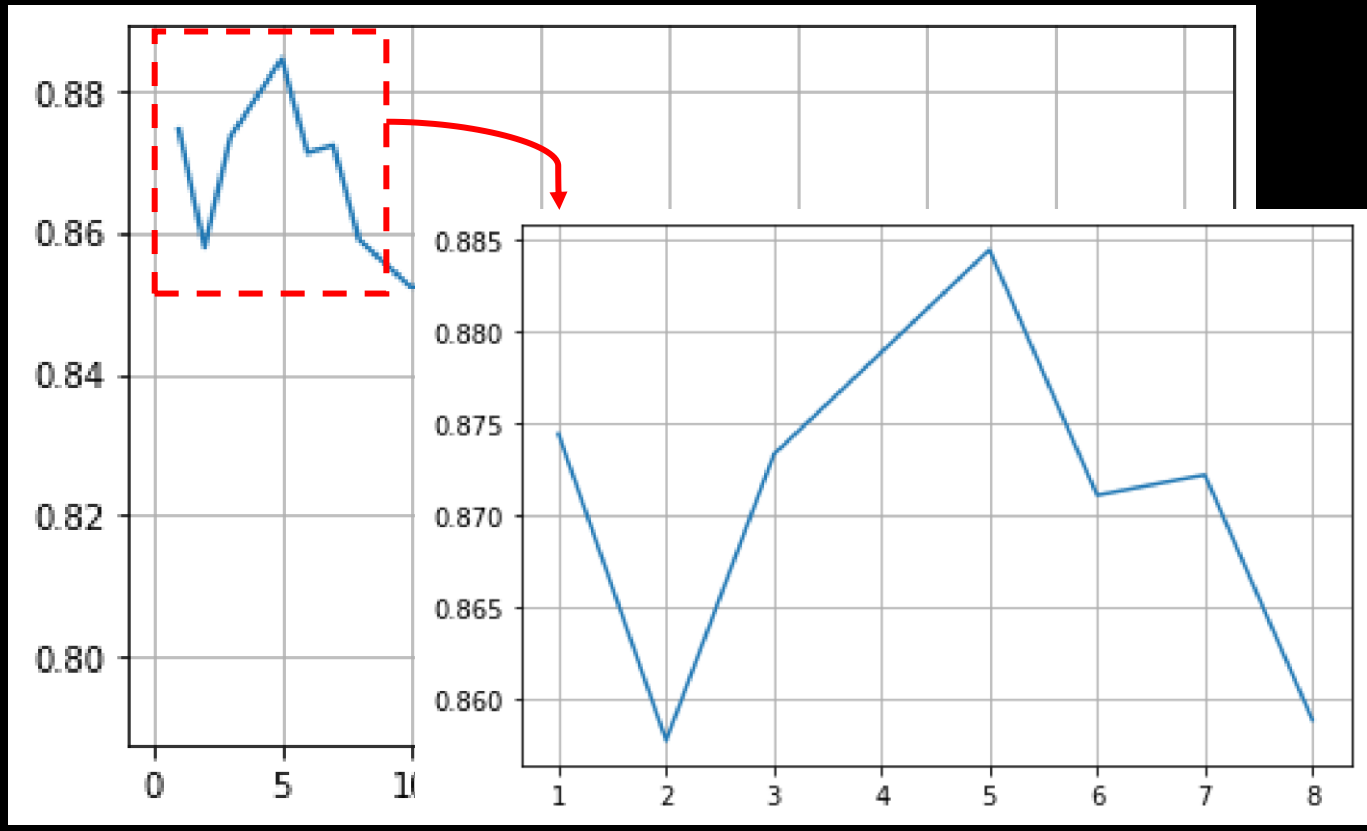
Radial Basis Function



Logistic Regression

Experimental Results

Finding the best NN number



Experimental Results

Method Used	Parameters	Accuracy	Time	Precision	Recall	f1 score
k-NN	k = 5, k = 16	0.881	0.104s	0.916	0.853	0.877
RBF	sigma = 1, k = 10	0.882	*7.13s*	0.893	0.867	0.877
LR	C = 0.04, k = 5	0.781	2.29s	0.810	0.739	0.772
SVM (Linear)	C = 2, k = 4	*0.775*	0.096s	0.818	0.719	0.760
SVM (RBF)	C=6, gamma=0.03, k=4	**0.894**	0.048s	0.901	0.887	0.892
SVM (PLY)	C = 17, degree = 5, k = 4	0.881	**0.034s**	0.925	0.8305	0.875

Comparison Table

Accuracy

Method	This Study	1st Article	2nd Article	3rd Article
K-NN	**88.1%**	85.48%	87.3%	80.49%
SVM (RBF)	**89.4%**	82.08%	---	---
SVM (PLY)	**88.1%**	80.97%	---	---
RBF	**88.2%**	---	---	85.37%

Computation Time

	k-NN	SVM (RBF)	SVM (PLY)
1st Article	0.64 s	11.75 s	10.58 s
This Study	**0.104 s**	**0.048 s**	**0.034 s**

Conclusion & Future Works

- ✓ Parameter optimization for a predefined range
- ✓ High-accuracy results were obtained with respect to the literature
- ➢ Natural Language Processing

Thank you for your time 😊