Republic of the Philippines
CAVITE STATE UNIVERSITY
Don Severino de las Alas Campus
Indang, Cavite

ANALYSIS AND CLASSIFICATION OF ACCENT IN INDANG, CAVITE USING MACHINE LEARNING ALGORITHMS

Rationale

Human speech has evolved through the time and accents may differ from person-to-person according to their background. Accents are different in terms of tones, vowels, consonants, rhymes, first and last sounds (Do & Duong, 2021). The term dialect refers to the difference in pronunciation, vocabulary, and grammar among varieties of the same language that form a particular speech pattern whereas the term accent refers to the distinct pattern of pronunciation ‘‘Accent’’ of a language reflects the people of a geographical region and/or a socio-economic class to which they belong (Kibria *et al*., 2020). A local study in 2017 by Danao *et al*. was conducted to classify Tagalog accents from Region IV-A of the Philippines. In their study, the researchers utilized WEKA- a data mining tool and used the model they created to classify accents from different provinces. However, the result of their study with the four used classifiers, the highest percentage of correctly classified instances only yielded around 56%.

To address the aforementioned gap, the researchers propose using TensorFlow, a deep learning framework. TensorFlow supports a variety of applications, but it particularly targets training and inference with deep neural networks. It serves as a platform for research and for deploying machine learning systems across many areas, e.g. speech recognition, computer vision, robotics, information retrieval, and natural language processing (Abadi, 2016). According to Monica Ramchandani *et al.* (2022), when compared to other deep learning frameworks available, TensorFlow provides them with an interactive multiplatform programming interface that is scalable and significantly more robust. TensorFlow's ability to build complex models allows us to potentially capture more nuanced features within the speech data of Indang residents compared to simpler machine learning algorithms. A study conducted by Habbash *et al.* (2024) accurately classify Arabic accents speaking an English

paragraph with a deep learning approach successfully achieved an accuracy rate of up to 79% with their proposed deep learning model. Compared to the study conducted by Danao *et al*. in the Philippines using machine learning algorithms, which only yielded 56.19% at best, the results of both studies had significant differences.

Moreover, the project aims to shed light on the subtle differences in speech patterns among people of Indang, Cavite, as well as improve accent classification accuracy. Through exploring the intricate structure of linguistic variation within this society, the researchers aim to identify precise distinctions between accents that could indicate social and cultural effects in addition to geographic origins. These findings may have far-reaching effects, from advancing speech recognition technology to encouraging a better awareness and respect of language diversity in both local and global contexts. Additionally, by demonstrating the potential of deep learning frameworks such as TensorFlow in accent classification, the work may open the door to more advanced and successful methods in language-related applications and research.

In order to overcome the shortcomings of earlier studies on accent classification, TensorFlow, a deep learning framework, is suggested to be used in the analysis of speech samples from Indang, Cavite, Philippines. Previous study using WEKA produced unsatisfactory findings, which led to the investigation of more sophisticated methods. The goal of the research is to improve classification accuracy by utilizing TensorFlow's capacity to collect subtle information. In addition to attempting to identify tiny differences in speech patterns among the locals, the study hopes to make a contribution to the field of automated accent recognition. Beyond linguistic studies, the work is useful to computer science because it demonstrates how deep learning frameworks can improve language-related applications, like speech recognition software, pushing the boundaries of computational linguistics and artificial intelligence.

Significance of the Study

In enhancing accent analysis techniques in the local context, the study addresses the need for accurate and culturally sensitive communication. Understanding the origins and backgrounds of different accents within the community not only promotes linguistic appreciation but also promotes inclusivity and respect for cultural diversity.

Moreover, the development of an accent analysis system can mitigate the risk of mistakenly associating individuals with specific regions solely based on their accent. This is particularly relevant in contexts where accent stereotypes may lead to biases or discrimination. Additionally, such a system can enhance the accuracy of speech recognition technologies that will improve user experiences. Through conducting nuanced and accurate communication, the proposed study promotes empathy, understanding, and cultural sensitivity.

Furthermore, the alignment of this research with CVSU's thematic area of Smart Engineering, ICT, and Industrial Competitiveness show its relevance to advancing technological innovation while addressing real-world challenges in communication and cultural recognition. Additionally, this study aligns well with SDG 9: Industry, Innovation, and Infrastructure by promoting innovation in speech processing technologies, particularly within the context of accent analysis.

All in all, this study not only addresses the need for accurate accent analysis within small geographical settings and contributes to academic knowledge but also fosters social cohesion, respect for diversity, and ethical communication practices.

Scope and Limitations

This study focuses on the analysis and classification of accents in Indang, Cavite, using machine learning algorithms. It examines the distinct phonetic patterns and speech variations among residents to develop an automated system for accent identification. The research involves collecting and preprocessing speech samples, extracting relevant linguistic features,

and training machine learning models to differentiate between accent variations. The study aims to evaluate the accuracy and performance of these models using predefined metrics, ensuring a systematic approach to accent classification.

However, the study has certain limitations. The dataset is restricted to recorded speech samples from Indang, Cavite, which may limit the model's generalizability to accents outside this region. Variations in recording quality and background noise could also affect the accuracy of classification. Additionally, the research primarily focuses on phonetic and acoustic features, without considering sociolinguistic factors that may influence accent development. The effectiveness of the machine learning model depends on the quality and quantity of training data, which may pose challenges in achieving high classification accuracy. Furthermore, the classification process may not capture subtle accent variations due to the limitations of the feature extraction methods used.

Objectives of the Study

The study aims to contribute to the improvement of accent analysis by identifying the most accurate and precise machine learning algorithm for accent classification in Indang, Cavite.

Specifically, it aims to:

1. develop an accent analysis system capable of accurately classifying and characterizing an audio sample that determines if the accent is from Indang, Cavite.
2. train and test the accent analysis system using a dataset of speech samples collected from local residents.
3. evaluate the performance of the developed accent analysis system in terms of accuracy, precision, recall, and F1-score using confusion matrix.
4. compare the performance of different accent classification algorithms including kNearest Neighbor (KNN), Support Vector Machine (SVM), Multi-Layer Perceptron (MLP), and Random Forest.

Expected Output

The expected output of this study is to identify the distinct characteristics of the accent of local residents from Indang, Cavite, providing a comprehensive understanding of regional linguistic variations. It will also determine the most effective machine learning algorithm for accent classification within the small geographical setting. Through this knowledge, the researchers will develop a software made to accurately classify whether an accent is from Indang, Cavite or not.

Furthermore, the software developed using TensorFlow will be able to analyze and classify the accent of an audio sample provided by the user, specifically people in Indang Cavite. The software will be able to accept an audio file and in the next panel there will be a confirmation if the file received is correct and is audible, an error will show otherwise. After the confirmation, it will now process the given data, the software will check frequency levels of the audio with the help of the accent classification model that the researchers trained. After some time, a new window will pop-up that will show the result. The result consists of percent accuracy, and if the accuracy is correct then it will show that the audio sample come from Indang, Cavite. The accuracy will be the basis to classify what is the accent and it will show where the accent comes from. This software goal is to give enhancement to the recent study created using the WEKA platform giving better accuracy to classify where the accent comes from.

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