Performance Analysis of Machine Learning Algorithms for Gender Classification

Rahul Kulkarni[1], Priyanka Patil[2], Poornima Kulkarni[3], Preeti Phabba[4]

[1]*Professor, Guru Nanak Dev Engineering College, Bidar*

[2,3,4] *Student , Guru Nanak Dev Engineering College, Bidar*

Abstract- **We have various machine algorithms for gender classification but choosing best one is important task. For selecting best algorithm we conducted experimental study on machine learning algorithms for gender classification. In this experimental study of machine learning algorithms, we analyzed performance of various algorithms for gender classification using voice dataset. From this study we concluded that SVM and ANN are giving best results. After tuning parameters ANN outperforms SVM giving accuracy 99.87% on test data.**

Index terms- **Machine learning; Deep learning; SVM; Artificial Neural Networks**

INTRODUCTION

Gender prediction is important in applications like targeted advertisements, interactive systems and mobile based health care systems. Based on the gender of a person interactive systems respond accordingly. If marketing firms know the the gender of the person then they can target respective people who potentially buy the products. Classifying the gender of a person accurately based on their voice is a challenging problem in machine learning. Deep learning models are more suitable for unstructured data like audio, video and images. Deep learning models perform better results when the data is large. In this paper we used the voice dataset consists of 3168 male and female voice acoustic features to train different machine learning algorithms. From this research we compared the accuracy of different algorithms.

1.1 Purpose of the project: We have various machine algorithms for gender classification but choosing best one is important task. For selecting best algorithm we conducted experimental study on machine learning algorithms for gender classification. In this experimental study of machine learning algorithms, we analyzed performance of various algorithms for gender classification using voice dataset.

1.3 Problem statement: Classifying the gender of a person accurately based on their voice is a challenging problem in machine learning

1.4 Solution for the problem statement: Parameter tuning is used to find the best hyper parameters. Grid Search technique is used to find best hyper parameters. Grid Search will test several combinations of hyper parameters and returns the best selection that gives best accuracy. We created dictionary with hyper parameters and applied on Grid Search CV of keras library. Grid Seach CV will train. Artificial Neural Networks using k-fold cross validation to get relevant accuracy with different combinations of the dictionary of hyper parameters and returns best accuracy with best selection of these values

Use Case Diagram:
Sequence diagram:
Sequence Diagrams Represent the objects participating the interaction horizontally and time vertically. A Use Case is a kind of behavioral classifier that represents a declaration of an offered behavior. Each use case specifies some behavior, possibly including variants that the subject can perform in collaboration with one or more actors. Use cases define the offered behavior of the subject without reference to its internal structure. These behaviors, involving interactions between the actor and the subject, may result in changes to the state of the subject and communications with its environment. A use case can include possible

variations of its basic behavior, including exceptional behavior and error handling.
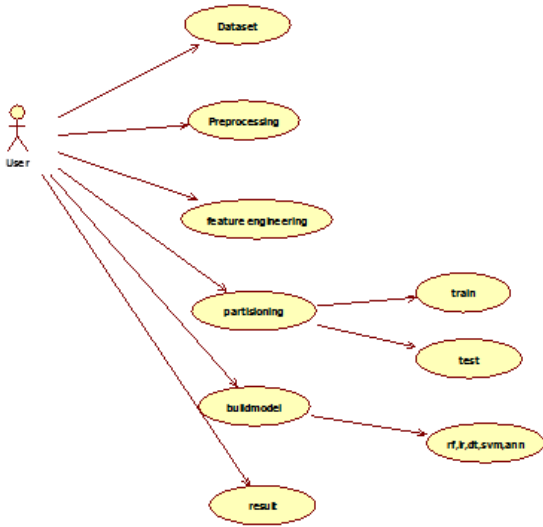

Activity diagram:

Activity diagrams are graphical representations of Workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.
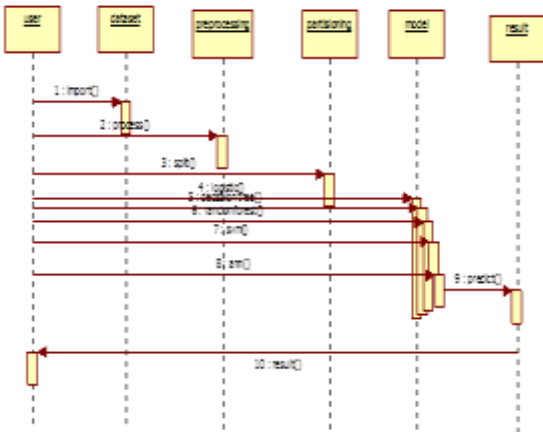
Collaboration Diagram:

A collaboration diagram resembles a flowchart that portrays the roles, functionality and behavior of individual objects as well as the overall operation of the system in real time. Objects are shown as rectangles with naming labels inside. These labels are preceded by colons and may be underlined. The

relationships between the objects are shown as lines connecting the rectangles. The messages between objects are shown as arrows connecting the relevant rectangles along with labels that define the message sequencing.
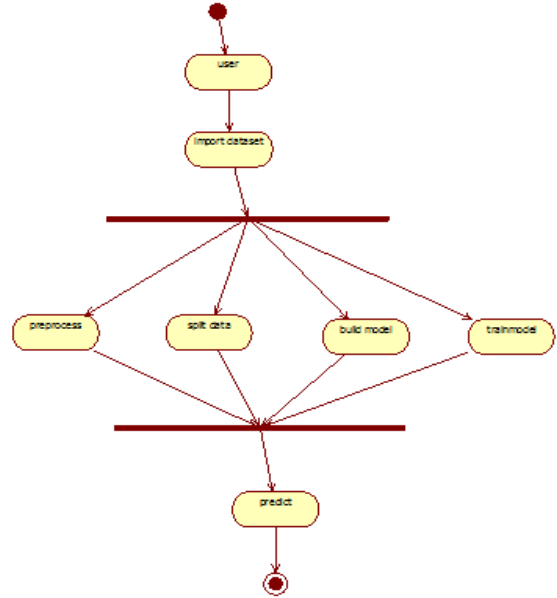
IMPLEMENTATION

Implementation is the process of converting a new or revised system design into operational one. There are three types of Implementation:

- Implementation of a computer system to replace a manual system. The problems encountered are converting files, training users, and verifying printouts for integrity.
- Implementation of a new computer system to replace an existing one. This is usually a difficult conversion. If not properly planned there can be many problems.
- Implementation of a modified application to replace an existing one using the same computer. This type of conversion is relatively easy to handle, provided there are no major changes in the files.

Implementation in Generic tool project is done in all modules. In the first module User level identification is done. In this module every user is identified whether they are genuine one or not to access the database and also generates the session for the user. Illegal use of any form is strictly avoided.

In the Table creation module, the tables are created with user specified fields and user can create many table at a time. They may specify conditions, constraints and calculations in creation of tables. The Generic code maintains the user requirements throughout the project.

In Updating module user can update or delete or Insert the new record into the database. This is very important module in Generic code project. User has to specify the filed value in the form then the Generic tool automatically gives whole filed values for that particular record.

In Reporting module user can get the reports from the database in 2Dimentional or 3Dimensional view. User has to select the table and specify the condition then the report will be generated for the user.

SYSTEM SECURITY

The protection of computer based resources that includes hardware, software, data, procedures and people against unauthorized use or natural
Disaster is known as System Security.
System Security can be divided into four related issues:

- Security
- Integrity
- Privacy
- Confidentiality

SYSTEM SECURITY refers to the technical innovations and procedures applied to the hardware and operation systems to protect against deliberate or accidental damage from a defined threat.

DATA SECURITY is the protection of data from loss, disclosure, modification and destruction.

SYSTEM INTEGRITY refers to the power functioning of hardware and programs, appropriate physical security and safety against external threats such as eavesdropping and wiretapping.

PRIVACY defines the rights of the user or organizations to determine what information they are willing to share with or accept from others and how the organization can be protected against unwelcome,

unfair or excessive dissemination of information about it.

CONFIDENTIALITY is a special status given to sensitive information in a database to minimize the possible invasion of privacy. It is an attribute of information that characterizes its need for protection.

SECURITY IN SOFTWARE

System security refers to various validations on data in form of checks and controls to avoid the system from failing. It is always important to ensure that only valid data is entered and only valid operations are performed on the system

CONCLUSION

Support-vector machines and Deep neural networks are performing better on voice dataset. Parameter Tuning is giving the 98.6% accuracy with SVM and 99.87% with ANN. From the above results we can conclude that deep neural networks are performing better compared with all machine learning algorithms to classify gender of a person using acoustic properties of voice.

REFERENCES

[1] S. Gaikwad, B. Gawali, and S. C. Mehrotra, "Gender identification using SVM with combination of MFCC," Advances in Computational Research, vol. 4, no. 1, pp. 69–73, 2012.

[2] S. M. R. Azghadi, M. R. Bonyadi, and H. Sliahhosseini, "Gender classification based on feedforward backpropagation neural network," in Artificial Intelligence and Innovations 2007: From Theory to Applications: Proceedings of the 4th IFIP International Conference on Artificial Intelligence Applications and Innovations (AIAI 2007), C. Boukis, L. Pnevmatikakis, and L. Polymenakos, Eds., vol. 247 of IFIP The International Federation for Information Processing, pp. 299–304, Springer, Berlin, Germany, 2007.

[3] Cortes, Corinna & Vapnik, VN. (1995). Support Vector Networks. Machine Learning. 20. 273-297. 10.1023/A:1022627411411

[4] L. Breiman, J.H. Friedman, R.A. Olshen, C.J. Stone, Classification and Regression Trees, CRC Press, 1984.

[5] K.-H. Lee, S.-I. Kang, D.-H. Kim et al., "A Support Vector Machine- Based Gender Identification Using Speech Signal," IEICE Transactions on Communications, pp. 3326-3329, 2008.

[6] J. Silovsky, and J. Nouza, "Speech, Speaker and Speaker's Gender Identification in Automatically Processed Broadcast Stream,"

[7] Büyükyılmaz, Mücahit & Çıbıkdiken, Ali. (2016). Voice Gender Recognition Using Deep Learning. 10.2991/msota-16.2016.90.

[8] https://github.com/primaryobjects/voice-gender

[9] M. Araya-Salas, G. Smith-Vidaurre, warbleR: an R package to streamline analysis of animal acoustic signals. Methods Ecol Evolution, 2016, doi:10.1111/2041-210X.12624.

[10] dataset, https://github.com/primaryobjects/voice-gender/blob/master/voice.csv

[11] http://neupy.com/2016/12/17/hyperparameter_optimization_for_neural_ networks.html

[12] G. S. Archana and M. Malleswari, "Gender identification and performance analysis of speech signals," 2015 Global Conference on Communication Technologies (GCCT), Thuckalay, 2015, pp. 483-489.