ASSIGNMENT 1- DEEP LEARNING – a1894603

Predict diabetes using Perceptron.

Abstract

Today, people are increasingly turning to fast food and ready-made products, which are high in sugar and fat. This has increased the risk of diabetes for many individuals throughout the world that can worsen other diseases. It is usually in sleep mode, whenever a person suffers from disease, diabetes boosts them. The use of machine learning algorithms, especially Perceptron algorithm has gained significant attention for their potential in early diabetes detection and management. This case study focuses on using the Perceptron model to predict diabetics using a dataset containing patient information and past outcomes. The study encompasses a cohort of 768 patients, using various data processing techniques, data visualization methods and machine learning models.

Introduction

During these days people's diet contains high amounts of sugar and fat, which has led to a global increase in the risk of diabetes among people, especially ladies with pregnancies. As a result, many individuals visit healthcare facilities for diabetes-related blood tests, even though the person has very low-rate to affect. These are all time-taking and financial burden for individuals.

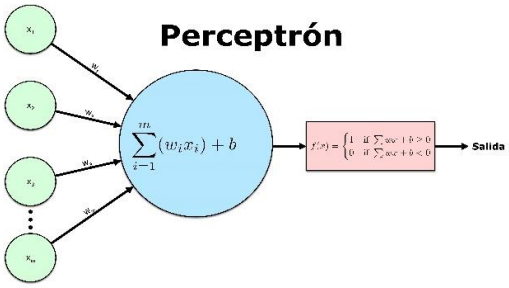
Machine Learning Techniques are frequently used in healthcare treatments for predictions. These algorithms utilize historical patient data to build a model and use this model along with new patient data to predict whether the patient has a particular disease. The Perceptron Algorithm (PA) is a machine learning algorithm employed in diabetes diagnosis.

The provided code addresses the problem of diabetes classification using machine learning techniques. It begins by loading the diabetes dataset and conducting exploratory data analysis to gain insights into the data's characteristics. The primary objective is to develop and evaluate two classification models: A neural network model built using TensorFlow/Keras and a Perception model from Scikit-learn.

Perception Algorithm

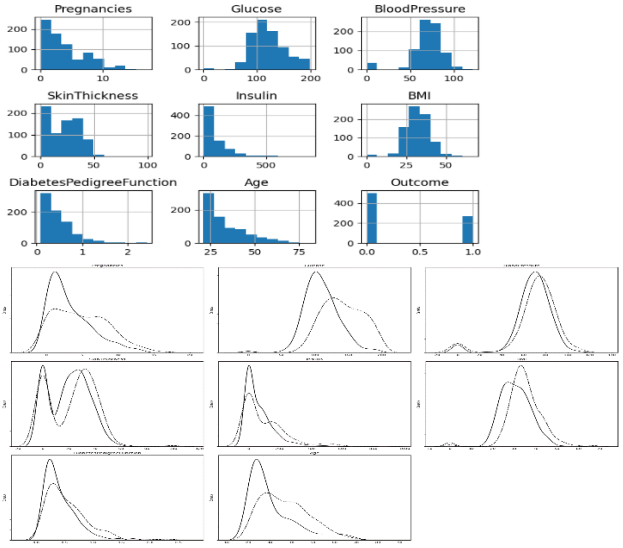
The perception algorithm is a fundamental supervised learning algorithm used for binary classification tasks. The perception is a linear classifier that can separate data points into two classes based on a linear decision boundary. It is particularly suitable for problems where the data is linearly separable. It is a type of online algorithm, meaning it updates its weights after processing each training example, and the learning rate(Ƞ) determines the step size for weight updates. A large learning rate leads to faster convergence but may also cause overshooting and divergence.

The Perceptron is a single layer neural-network, and its decision boundary is a hyperplane in the input future space. Also, it has served as the foundation for more complex neural network architectures, such as multi-layer perceptron's (MLP), which can handle more complex tasks by introducing non-linear activation functions and multi-layers of neurons.



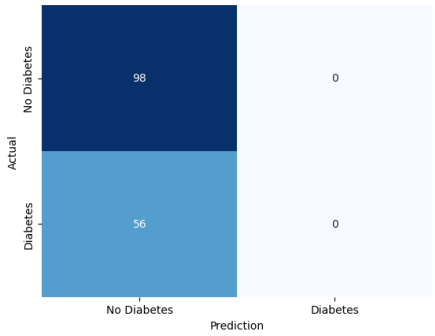
Experimental Results

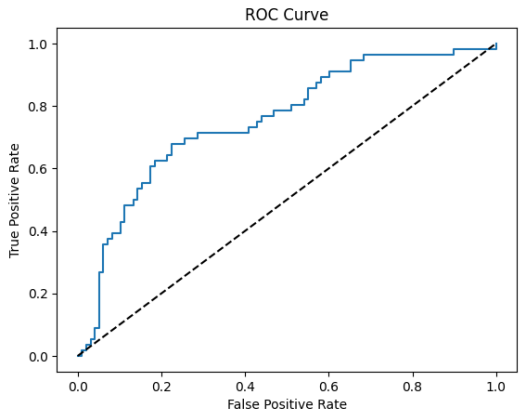
Data processing: The code begins by importing necessary libraries and loading the diabetes dataset. It performs data exploration, including summary statistics, datatype analysis, and data visualization using histograms and density plots.



Neural Network Model Training: A neural network model is constructed using Keras. It consists of an input layer, two hidden layers, and one output layer. The model compiled with binary cross-entropy loss and trained on the training data for 200 epochs.

Model Evaluation: The code calculates and prints the training and testing accuracy of the neural network model. It also generates a confusion matrix to assess the classification performance and plots an ROC curve.





Perceptron Model: Two perceptron models are trained – one on the original data and another on standardized data using StandardScaler. The accuracy of each Perceptron model is computed and displayed.

Conclusion

In conclusion, the code provides a comprhensive analyses of diabetes classification using machine learning techniques. It demonstrates the effectiveness of neural network model for this task and compares its performance with perceptron model. As a result, the neural network model achieves competative accuracy, making it a promising approach for diabetes classification.

References

- Nilashi, M., Ibrahim, O., Dalvi, M., Ahmadi, H. and Shahmoradi, L., 2017. Accuracy improvement for diabetes disease classification: a case on a public medical dataset. *Fuzzy Information and Engineering*, *9*(3), pp.345-357.
- Sarangi, L., Mohanty, M.N. and Pattanayak, S., 2016. Design of MLP based model for analysis of patient suffering from influenza. *Procedia Computer Science*, *92*, pp.396-403.
- Thiyagarajan, C., Kumar, K.A. and Bharathi, A., 2016. A survey on diabetes mellitus prediction using machine learning techniques. *International Journal of Applied Engineering Research*, *11*(3), pp.1810-1814.