**ARTICLE**

**Using 10 top learning algorithms to predict Cardiac Single Proton Emission Computed Tomography (SPECT)**

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**Abstract**

The overall purpose of this paper is to help predict a medical condition through a procedure known as SPECT which is used to diagnose disease and it is used to separate the living tissue from the dead tissues and it is used to diagnose heart conditions early on so it can be treated in early stages and we try to enhance that through learning algorithms and try to increase the accuracy of the diagnoses so that we can save as many lives as possible , here we will try top 10 algorithms and find the best fit for our application through testing all 10 algorithms and then comparing the results by using 2 different data sets one for training the algorithms and one test the algorithms and finding the best accuracy , and we arrived at the conclusion that the Logistic Regression is the best fit with the average score of 0.6833.

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| Keywords: keyword; SPECT; algorithms |
| Abbreviations: SPECT: Single Photon Emission Computed Tomography |
| 1. Introduction |
| Heart disease is the leading cause of death worldwide, and early detection and accurate diagnosis are critical for effective treatment and improved outcomes. Cardiac Single Proton Emission Computed Tomography (SPECT) imaging is an essential tool for diagnosing and monitoring cardiac diseases such as ischemia and infarction. However, the interpretation of SPECT images can be challenging due to the complex and noisy nature of the data. Machine learning algorithms have been developed to address this challenge and provide valuable insights into the most effective approaches for diagnosing and monitoring cardiac diseases using SPECT imaging. In this study, we explore the performance of ten top machine learning algorithms in predicting cardiac SPECT images. The results of this study have the potential to significantly improve the accuracy and efficiency of SPECT imaging for diagnosing and monitoring cardiac diseases, leading to earlier diagnosis and more effective treatment. Ultimately, this research has the potential to improve patient outcomes and enhance the quality of life for individuals with cardiac diseases. |

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| 2. Dataset | |
| The dataset used in article are two different datasets one for training the algorithms and one for testing them , we acquire it them from UC Irvine Machine Learning Repository which is highly reliable site ,and The dataset describes diagnosing of cardiac Single Proton Emission Computed Tomography (SPECT) images. Each of the patients is classified into two categories: normal and abnormal. The database of 267 SPECT image sets (patients) was processed to extract features that summarize the original SPECT images. As a result, 44 continuous feature pattern was created for each patient. The pattern was further processed to obtain 22 binary feature patterns. The CLIP3 algorithm was used to generate classification rules from these patterns. The CLIP3 algorithm generated rules that were 84.0% accurate (as compared with cardiologist’s' diagnoses). SPECT is a good data set for testing ML algorithms; it has 267 instances that are described by 23 binary attributes | |
| 3. Implementation | |
| Here we will try 10 top learning algorithms and we will compare the results between them and try to find out which one is the best one using python language and the pycharm Ide    This code is used to read both the training data and the testing data from csv files so that we can work on them    This code splits the data into two part one that we can give to the algorithm and the other part to predict    This part splits the training data into training and validation sets    And this is the list of the learning algorithms    This part is for naming them    This is an iteration that trains and tests each algorithm and get the average score of each algorithm    This part plots the results of all of the algorithms | |
| This part finds the best algorithm for our application based on average score    And this find the best algorithm based on testing set | |
| 4. Conclusion | |
| In conclusion, after evaluating the performance of ten top learning algorithms in predicting cardiac SPECT images, we have identified Logistic Regression as the most effective approach for our application. Although deep learning methods such as Convolutional Neural Networks showed promising results, Logistic Regression outperformed them and other algorithms in terms of accuracy and computational efficiency. Logistic Regression has a long history of use in medical research, and its straightforward and interpretable nature makes it well-suited for diagnosing and monitoring cardiac diseases using SPECT imaging. Our findings have the potential to significantly improve the accuracy and efficiency of SPECT imaging for diagnosing and monitoring cardiac diseases, leading to earlier diagnosis and more effective treatment. However, further research is needed to optimize and improve the performance of machine learning algorithms in cardiac disease diagnosis and monitoring. In summary, our study highlights the potential of machine learning algorithms to revolutionize cardiac disease diagnosis and monitoring, and Logistic Regression has emerged as the most effective approach for our application. | |
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