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CPE 019 - CPE32S9

In this assignment, you are tasked to search for two (2) scientific papers or journals in IEEEXplore about the application of perceptron. You can also search from other sources provided they are Scopus indexed.

Title of the research:
Human Presence Detection with Thermal Sensor using Multilayer Perceptron Algorithm

Author:
Lassi Puurunen; Jatin Chaudhary; Rajeev Kanth; Jukka Heikkonen

Date of publication or conference:
Date of Conference: 14 June 2021 - 31 July 2021

Title of publication or conference proceeding:
Published in: 2021 IEEE 7th World Forum on Internet of Things (WF-IoT)

Answer the following:

What is the problem being solved in the research?

- The need for a cheaper and more cost-effective Human Presence Detection device that uses thermal sensors.

What is the proposed solution of the author/s?

- The authors proposed a cost-effective method of detecting human presence by using an OMRON D6T-44L06 MEMS thermal sensor, ATmega328P microcontroller-based board, and an Arduino nano.

How did the author/s solve the problem/s? Provide a summary of the methodology

- They used a temperature sensor that has the detection range of +5°C to +50°C, and the operating temperature range is from 0°C to +50°C. Their methods consisted of two major phases, first is the processing of data and the second phase was focused on the embedding of arduino nano with an optimized MPL model built for python using Tensorflow. The processing of data first needed to normalize the temperatures of those who are detected that fall beyond the human body temperature. The data collected in the first phase of the experimentation was used to train an MLP over Tensorflow library in python. A five-layer highly optimized MLP was built with the first four layers having the activation function as ReLU, whereas the fifth layer uses the Sigmoid activation function to get a binary classification output.

Provide a summary of the results.

- The model was trained for 1100 epochs with a batch size of 88 and their model training accuracy was noted as 99.11% with a loss of 0.031%.

What is the conclusion of the author/s and provide your own recommendations on the paper.

- Their conclusion was that they believe that their research makes a useful contribution in the detection of a human's presence by using and analyzing temperature data. They used a realized model that includes a mathematical function for the binary classification and the model has been embedded in the Arduino Nano. They have achieved an efficiency rating of 99.6% after the termination of the 1100 epoch learning process.

Title of the research:
Real-time Heart Disease Prediction System using Multilayer Perceptron

Author:
Sakshi Bhoyar; Nikki Wagholikar; Kshitij Bakshi; Sheetal Chaudhari

Date of publication or conference:
Date of Conference: 21-23 May 2021

Title of publication or conference proceeding:
Published in: 2021 2nd International Conference for Emerging Technology (INCET)

Answer the following:

What is the problem being solved in the research?

- Cardiovascular diseases or heart related diseases are the leading cause of high mortality in the world and because of this, the researchers aim to make a system that can predict whether a patient has a heart condition or not without the help of any certified medical professional.

What is the proposed solution of the author/s?

- They proposed a system that can credit whether a patient has a heart condition or not. The medical professionals that handle heart related diseases are also able to use or access the system for a quick and early diagnosis of the heart condition.

How did the author/s solve the problem/s? Provide a summary of the methodology

- The main goal was to develop a system that predicts heart diseases in a patient and generate a report that considers the outcome.
- The study consisted and revolves around two datasets that have varying data to be used in predicting patients with heart disease.
- In their data collection, they used the UCI Heart Disease dataset which consisted of 13 features that are relevant to the system which has a final attribute target that reveals whether the patients have a severe heart condition or not. They also used another dataset from Kaggle which is the Cardiovascular Disease Dataset that had 70,000 patient records along with 12 attributes of defining the different risk factors for the disease.
- They used a multi-layer perceptron that consists of 2 hidden-layers with 8 unit neurons each for the 2 datasets that were used.
- The researchers used python code in Jupyter Notebook and VScode or Visual Studio Code where they used the Sci-kit Learn library.

Provide a summary of the results.

- Their output prediction model is just a simple yes or no and it is displayed as healthy or unhealthy.
- The highest accuracy for classification from the 2nd dataset that they used is 73% which is achieved by the decision tree algorithm.
- It shows that Multilayer Perceptron achieves an accuracy which is greater than the Decision Tree model by approximately 12-13% for both datasets.

What is the conclusion of the author/s and provide your own recommendations on the paper.

- Their proposed Multilayer Perceptron model delivered a better accuracy for the UCI heart disease dataset which resulted in having the accuracy of 85.71% and the Cardiovascular disease dataset from Kaggle with 87.30%. The proposed model with two hidden layers that consist of 8 unit neurons each resulted in a better solution for the development of a real-time heart disease prediction system.