Perceptron multilayer.

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***Abstract*—The work presented below is a perceptron that determines whether a patient has any of the 2 kidney-related diseases or not. The dataset used for the work was taken from the UCI Machine Learning Repository and donated by a health specialist.**

This dataset consists of 6 variables that have different weights each. The variables used are the following:

- **a1 Temperature of patient [35°C - 42°C]**
- **a2 Occurrence of nausea [yes , no]**
- **a3 Lumbar pain [yes , no]**
- **a4 Urine pushing (continuous need for urination) [yes , no]**
- **a5 Micturition pains [yes , no]**
- **a6 Burning of urethra, itch, swelling of urethra outlet [yes , no]**
- **d1 decision: Inflammation of urinary bladder [yes , no]**
- **d2 decision: Nephritis of renal pelvis origin [yes , no]**

***Index Terms*—perceptron, machine learning, dataset.**

I. Introduction.

A multilayer perceptron ("MLP" from now) is a feedforward artificial neural network that generates a set of outputs from a set of inputs. An MLP is characterized by several layers of input nodes connected as a directed graph between the input and output layers. MLP uses backpropogation for training the network. MLP is a deep learning method.
Then, using the perceptron learning methods *multivariable or not*, it is intended, through previous training, to determine whether a patient suffers from any of the 2 conditions described in the dataset.
To do this, the perceptron uses the weights of the variables to determine which are those symptoms that are most present, and therefore, can give a clue whether you have the disease x or the disease y.

II. Motivation(s).

Reasons for specifically choosing this topic include:

- To understand the machine learning and neural network basics: Given that, according to the sources consulted, perceptron (especially the simple one) is one of the most primitive forms of machine learning, the team thought it was a good idea to choose it, as it gives us an early perception of what to expect in subsequent courses.
- To apply some of the topics seen in previous probability classes: Topics such as linear regression, probabilities and error were addressed in the course of probability and statistics for the current quarter. In choosing this topic, we also decided to do so because we could see real applications of the operations taught.
- To understand the relations between statistics and data science in their applications in the real-world problem solutions.
- To learn how the databases can be applied for prediction-algorithms: This point is related to the previous two. The project also contributed to a better perception of how data is handled for forecasting processes. This is, a previous analysis, to know how to handle variables and their cleanliness.

III. Objective(s).

Our main objective was to generate an algorithm that, based on the 6 parameters/indicators (read abstract), gives us as a result the probability of suffering from the two diseases related to these parameters.

A. Other objectives

Learn to interpret the result, for a better understanding of the problem.

IV. Problem description.

In many cases, doctors do not have extra tools when diagnosing diseases, which could cause them to make a mistake in their conclusion (diagnosis). In this case, the problem that is solved is to provide doctors and health specialists with programs such as this one, since they would be of great help to them if we consider that 6 symptoms are perhaps little information to corroborate that a patient has a certain disease or not.

V. Proposed solution.

Generate a multilayer perceptron for the generation of probability of suffering from one of two diseases of the urinary tract, given the symptoms. With the tool generated, doctors could reach more accurate conclusions, given that the sample size for the data set is a representative number of patients with these diseases.

VI. Results.

Regardless of the fact that the program can only model once, it can generate the desired probability. The results are clearly not the same, since for perceptron random numbers other than 0 are generated from the beginning so that the products are not different from 0. The result shown to the user can take the values 1 and 0. Where 1 represents positive and 0 a negative result. Each of the results is shown for each symptom, which in turn is found in the dataset.

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