

Age-Incidence of Breast Cancer: Artificial Neural Networks Modeling

Bouharati K., Bouaoud S., Amarane M., Mahnane A., Boucenna N.,
Bouharati S., Hamdi-Cherif M.

Abstract— Background: As age is the major factor on breast cancer incidence. The majority of women presenting with breast cancer it are not possible to identify specific risk factors. In terms of medical safety, the parameters affect breast cancer, are characterized by their complexity. They become less amenable to direct mathematical modeling based on physical laws since they may be distributed, stochastic, non-linear and time-varying, uncertain, etc. The purpose of our study is to develop an analytical model of breast cancer progression of the age of patients in over two decades. Like several factors involved in the process and that are far from circumvented beings, due to their complexity, it becomes necessary to have a suitable methodology for the analysis of these variables. **Methods:** The basic principles of artificial neural networks are perfectly suited to this process. As input variables, we consider we consider the number of registered women on five groups with functions of their ages and this over a period from 1990 to 2007 in Setif region - Algeria. The age of women breast cancer concerned is formulated and applied using MATLAB simulation for the system. **Results:** The result output variable shows that 1998 is representative averaged for entire period in terms of age of the cases analyzed. The superposition of test values and those learning is a proof of the validity and accuracy of the predictive model. **Conclusions:** Based on data from past decades and assuming that the same conditions persist in large proportions; this may be a predictive model. The measures will be taken for limiting it.

Index Terms— Breast cancer, Epidemiology, Incidence factors, Artificial neural networks

I. INTRODUCTION

To investigate whether young age at diagnosis is a negative prognostic factor in primary breast cancer and how stage of disease at diagnosis and treatment influences such an association [1]. Several risk factors for breast cancer have been well documented. However, for the majority of women presenting with breast cancer it is not possible to identify specific risk factors [2][3]. In fact, the aging process is the biggest risk factor for breast cancer. That's because the longer we live, there are more opportunities for genetic damage

Bouharati K., She is from Laboratory of Health and Environment., UFAS, Setif1 university, Algeria

Bouaoud S., She is from Laboratory of Health and Environment., UFAS, Setif1 university, Algeria

Amarane M., She is from Genetic Research and nutritional cardiovascular diseases laboratory, UFAS Setif1 university, Algeria.

Mahnane A., He is from Laboratory of Health and Environment., UFAS, Setif1, Algeria

Boucenna N., He is from department of medicine UFAS, Setif1, Algeria.

Bouharati S., He is from laboratory of intelligent systems. UFAS, Setif1 university, Algeria.

Hamdi-Cherif M., He is from Laboratory of Health and Environment., UFAS, Setif1 university, Algeria

(mutations) in the body. And as we age, our bodies are less capable of repairing genetic damage.

Age specific incidence rates, increase rapidly with age until about 45-50 years of age, after which they continue to increase but at a slower rate. Since data on these variables are characterized by uncertainty, vagueness and complexity, we found it useful to analyze them with an artificial neural network system as a technique of artificial intelligence. Artificial neural networks currently various applications in the field of science and technology. They have the dynamics and the ability to read the experimental data of the real environment and therefore are able to solve complex systems of biophysical processes. Neural networks are systems learning to perform mapping functions between two spaces, space of inputs and output space. We propose in this study reading performance of is representative averaged for entire period in terms of age of the cases analyzed. It is then necessary to link the species parameters, two decades and age of the patients as input space to the study area in terms of actual recorded values. The function associating input parameters to the average ages is then learned by the network from a set of real values measured.

II. METHODS

A. Presentation of the study environment

This study was conducted in the Setif region - Algeria. The plot on which the values were recorded is over a period from 1990 to 2007 (Setif Cancer Registry).

B. Artificial neural networks

Neural networks are designed to mimic the performance of the human brain. There is inputs level, output level, and a variable number of internal (or hidden) layers. The inputs are connected to hidden layer and they are in turn connected to output. As the neural network learns from a data set, the connection weights are adjusted. Data are fed into the input nodes, processed through the hidden layer(s), and the connection weights to the output nodes are adjusted. Neural nets are categorized based on their learning paradigm. The artificial neural network systems are widely used in the prediction of complex processes [4][5]. Neural networks can reveal unexpected and otherwise undetectable patterns in large data sets. The major weakness in neural network solutions is the fact that the methods by which a relationship is discovered are hidden and therefore not readily understood or explained [6]. In the simplest way, a cooperative model [7][8], can be considered as a preprocessor wherein artificial neural network (ANN) learning mechanism determines the training data.

C. Expression of the Problem

Mapping of the space of parameters involved in the inputs are [the number of women with breast cancer recorded in age groups over a period of two decades. Fig. 1 describes the topology with inputs extensible, hidden layer, and an output (5-3-1) in the terminology of models of artificial neural networks. W_{ij} and W_{jk} are weights, which represents the connection between the inputs and the output of the system. Weights contain all the information about the network. The objective is the training of the network to reach the minimum value of the reading error at the output observed [9]. (In particular non-linear) this justifies the use of a multilayer network.

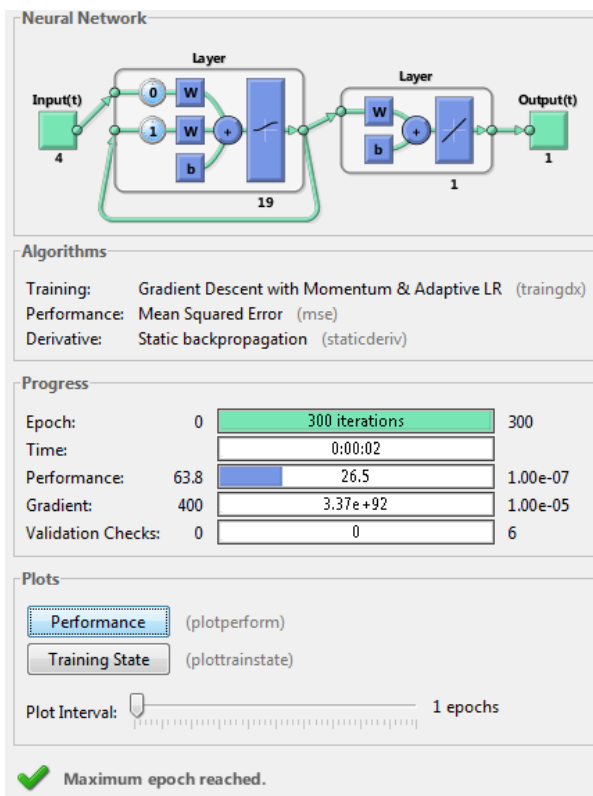


Fig.1. System architecture.

D. Learning of the Neural Network

This phase consists in the introduction of the input variables corresponding to the result at the output in order to enable the network to establish the mapping function.

To achieve this, the method is a kind of imitation of the brain: if the answer is correct, it is, but if there is an error, we must modify the network so as not to repeat the mistake. Is repeated several hundred times the operation, until the system has the smallest error value as possible.

Note: To change the system, just work on the weights [W] which are in the form of real numbers linking neurons. As these weights involved in the sum made by each neuron (the sum is weighted), it is possible to modify the network by changing their values without changing the network itself. That said it is not clear how much weight we need to modify these. The goal is to achieve convergence towards a minimum error (fig. 2). The goal is learning network to reach the minimum value of the read error observed at the output [10]. In our case, after 300 iterations, the error is 10^{-7} .

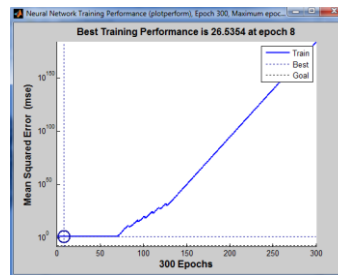


Fig. 2. The minimum of error reached at 8 epocs.

E. Model

Using examples consists of 90 measurements on all input parameters. We chose to keep 45 tests (50 %) while 45 other measures (50%) are used for learning. In principal, the relationship between these two areas is complex (in particular non-linear), which involves the use of a multi-layer structure (fig. 3).

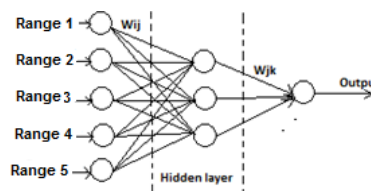


Fig. 3. The average corresponding to year's inputs (8) corresponding to year 1998 in our case.

III. RESULTS AND DISCUSSION

The input and output parameters are presented in an Excel file. The program uses this file as a data source. The result after training presented in Fig. 4, demonstrates the direct reading of the rate of return from other input variables. The system refers to the function that connects the inputs to the output established during the operation of learning. Automatic forecasting artificial neural networks average breast cancer women number shows its ability to respond to treatment data on parameters recorded. The average number curve and allows us to visualize the synthesis of the corresponding year. The result shows that the measurement error is negligible intermittently (1to1) from 0 to 90 and the remaining 45 or 50% are taken to test. The superposition of test values and those learning is a proof of the validity and accuracy of the predictive model.

IV. CONCLUSION

The identification average year corresponding to total variables as the recorded values are spread over a long period and relate to women with breast cancer at different ages, this tool is very accurate in determining the corresponding average year throughout the study period.

We try through the use of neural complete analysis already made networks using a fuzzy logic system to arrive at a neuro-fuzzy hybrid system to establish a key to identify and evaluate the performance of measures in a breast cancer registry.

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