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# Rainfall- Rain off Modeling Using Artificial Neural Network

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## Abstract

The objective of this work is studying the transformation of the rainfall into rain off in area scale catchment of North East of Algeria by artificial neural networks (ANNs). In this paper, we used simulation and the forecast per ANN and we adopted model conceptual GR2M to validate the results obtained per ANN. In this case, it is necessary to bring a sample of hydro meteorological data to knowing the rains, the evapotranspiration and the flows of the station to be modeled. Results obtained per ANN show superior result compared to the traditional modeling approaches (GR2M). Indeed, the coefficient of correlation is very significant ( $R^2$  exceeds 0.95) and the very weak quadratic error.

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## 1. Introduction

The scientific literature has a very great diversity of models which very little found a use operational. The question of using this models in hydrology to carry out stock management out of water, the regional planning, to dimension structures, to delimit easily flooded zones, arises in particular for the basins slopes for which one has series of measured flows.

ANN models have been widely and largely used by hydrologists particularly in modeling of the rainfall-runoff process (Jain and Srinivasulu 2006; Dechemi et al .2003). This study adopts a type of ANN perception multi-layer is an intelligent technique which provides a structure connexionist in the capacities of training to the systems not flax fields, the systems which have the capacity of training of the neural networks, one gained

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in popularity in the control of the nonlinear systems (Farag et al. 1998; Lin et al. 2002). For validation of the network ANN we applied approach mathematics in hydrology GR2M. The principle of this model articulates around an ascending flow chart of basins of the blade precipitated to the streamed blade passing by the evapotranspiration and the infiltration. We have a data base including the rain, rain off and the evapotranspiration with the step of monthly time. The goal being to adopt a behavior known as intelligent, in order to be able to apprehend complex phenomena and in order to identify the most effective model for modeling.

## 2. Material

### 2.1. Presentation of area study

The area of Souk-Ahras is in the North-East of Algeria, in the south of the wilayas of Annaba and El-Tarf. This zone located in the Telling Atlas represented here by the mounts of Medjerda, consisted two mountainous axes of direction NE-SO. The Northern axis is consisted Djebels Ras El Alia, Arous, and has DJ.Mesid which reaches the altitude of 1406 m. In the south, the second axis parallel with the precedent is consisted Djebels: Zellez (1110 m), Berda (1129 m) between these two assembly lines is located the valley of Medjerda.

### 2.2. Climate

The whole of all stations situated in the area of Souk-Ahras belongs to the natural area which belong themselves to Souk-Ahras power station, zone of hinge between a North of an area telling mountainous cold and rainy and the South of high area hill, a continental climate. Thus, according to the years and the seasons, the steppes are found under the climatic influence of the moderate zone. The climate of our areas depends on this longitudinal swinging of atmospheric circulation, as it in addition undergoes the effect of the altitude of the continentality and relief.

### 2.3. Data

The rain fall data represent a major element in this study of modeling. The data of precipitation is taken from the organizations responsible for network rainfall namely the National Agency of Hydraulic Resources (ANRH). For our need for modeling to the step of monthly time, we have chosen station pluviometric for the size of 1965-1995 and quality with knowing the station of Souk-Ahras which does not comprise gaps. The characterization of this station is showed in the Table 1.

Table 1. Characteristics of the pluviometric stations

Code	Station	River	Latitude (Lambert)	Longitude (Lambert)	Altitude m	Years
120101	Souk - Ahras	Medjerda	967,25	342,25	590	1965-1995

## 3. Material

### 3.1. Neuron Network ANN

The network of neurons used is of type feed-forward (Lin 1997) having the following structure: a layer of

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