



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 6, June 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.512

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6381 907 438

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Evaporation Loss by Using Artificial Neural Networks

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ABSTRACT: The potential of Artificial Neural Networks for determining the evaporation loss of Gaganbawda Dam Was tested. Evaporation Loss prediction is challenging and complex. For this study solar radiation, wind speed, temperature, sunshine hours and variables were used. The Levenberg Marquardt, Newton Back-Propagation and Conjugate Gradient algorithms were used and compared. The best r^2 value of 0.916 was achieved.

KEYWORDS: Artificial Neural Network, Evaporation Loss, Comparison.

I. INTRODUCTION

Evaporation is a process of hydrological cycle in which water is changed from the liquid to the vapour form. Most of the hydrological processes are non-linear processes and evaporation is one of them. Non-linear processes are complex, challenging and inefficient to compute. Many parameters are responsible for evaporation of water such as, temperature, wind speed, solar energy, etc. Forecast of future events are required in many of the activities associated with the planning and operation of the components of a water resource system. Artificial neural network is used in various hydrological projects such as forecasting stream flow, rainfall-runoff, ground water management, water quality simulation, flood prediction, etc. as a model for calculations and prediction. Artificial neural network-based modelling technique has been used to study evaporation from a reservoir by its historical data of meteorological parameters. In this study we investigated efficiency of ANN model on estimating evaporation. For this purpose, Temperature, wind speed, solar energy, humidity, sunshine hours these parameters were used. For achieving the goal observed vs. predicted graph comparison is shown. The performance of the ANN model was evaluated according to the graphs and R^2 values. In comparison with empirical formulae and pan evaporation artificial neural network gives more accurate values by considering different parameters.

II. ARTIFICIAL NEURAL NETWORK

Artificial Neural Network (ANN) is an intelligence processing model specially activated except for biological nervous systems, unusually the brain, development information. The pillar of this model is that the novel structure of the data processing organization. It contains numerous highly linked processing elements (neurons) functioning in union to resolve precise trouble. The familiar sort of artificial neural network construct of three groups, or layers, row of "input" units is joined to a layer of "hidden" units, which is linked to a layer of outputs units. • The activity of the input units describes the raw instruction that's hold within the network. The activity of every hidden unit is forced by the activities of the input units. The weights on the contact between the input and also the hidden units. The attitude of the output units calculates on the activity of the hidden units. The burden among the hidden and output units. Here smooth variety of network is refreshing because of the actual fact the hidden units are liberated to formulate their dominate depiction of the input. The weights mid the input and hidden units determine while each hidden unit is effective, for that deduction adjust these weights, a hidden group can appoint exhibits. The feed forward three-layer Ann has been taken up in frequent hydrological modelling studies as of its suitability to a variation of diverse issues. Feed-forward Three-layered Ann (figure 1) grant sign to proceed once only against input to output. At hand is not any reaction (loops) i.e., the output of any layer doesn't influence that equal layer. Feed-forward ANN's bear to be uncomplicated networks a particular assistant inputs with outputs. They are largely utilized in arrangement perception. This kind of organization is additionally assigned to as bottom-up or top-down.



III. STUDY AREA

The Study Area In this research, the Gaganbavada Dam was selected because the case study area for the proposed prediction model of evaporation rate. Gaganbavada a town placed in reach the region of Kolhapur in Maharashtra, India. It's located 55 km by road from Kolhapur. The most reason for choosing this area was due to the supply of hydrological and meteorological data covering a comparatively while. In general, the foremost climatic characteristics of the Gaganbavada are high humidity, high air temperature, high solar radiation high sunshine hours and wind speed. The meteorological and hydrological data monitored within the study area included rainfall, evaporation, mean air temperature, and ratio, sunshine hours, which were observed and recorded by the Indian Meteorological Department (IMD).

The recorded data utilized in this study were the daily pan evaporation (PE) for the years between 2010 and 2020. Further, processing was dispensed to calculate daily basis required to adequately examine the proposed prediction model.

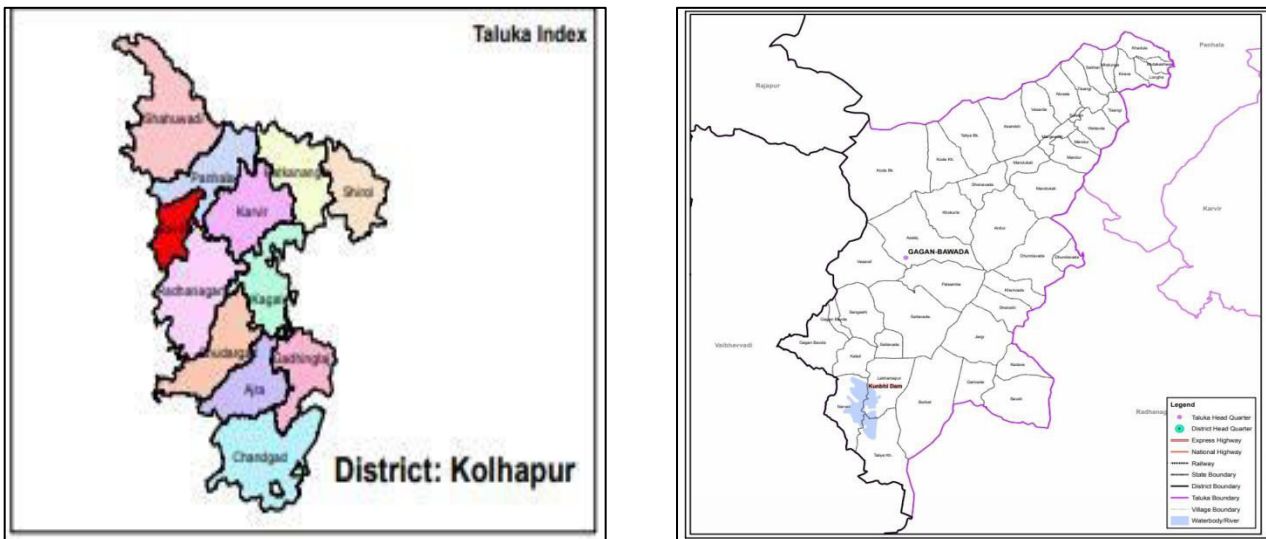


Figure 1: Gaganbavada Dam, Kolhapur, Maharashtra, India.
(Source: <https://mrsac.gov.in>)

IV. MODEL APPLICATION

MATLAB software was used for ANN model. The ANN models were trained using Conjugate Gradient Descent (CGF), Newton Back Propagation (BFG) and Levenberg–Marquardt (LM) algorithms. This algorithm was implemented during this study using the Neural Network Toolbox of MATLAB. Software.

For the ANN models the number of neurons within hidden layer was found by a trial-and-error procedure. The activation functions recycled for the hidden and output layers prevail the ‘logsig’ and ‘purelin’ functions, commonly.

V. RESULT

The ANN model was developed and tested for predicting the evaporation loss. The parameters or variables of Gaganbavada dam were used for the development of the model were sunshine hours, relative humidity, wind speed, solar radiation and temperature. For this model, 70% of data were used for training and 30% for testing. When accuracy was achieved the training was stopped. The data of Gaganbavada dam were tested in different algorithms. It was observed the epoch did not remain the same for same data. Also, the there was a slight difference in the r² value obtained. But the values were good with other algorithms. The best result, r² value obtained was 0.916 by LM method.

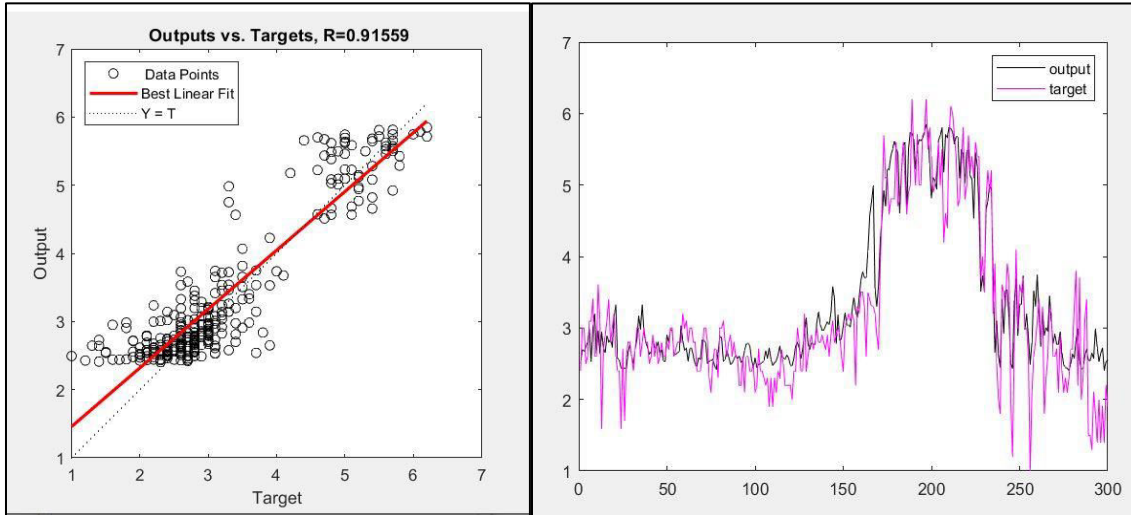


Figure 2: $R^2 = 0.916$ by LM method and Observed Vs Predicted by LM Method

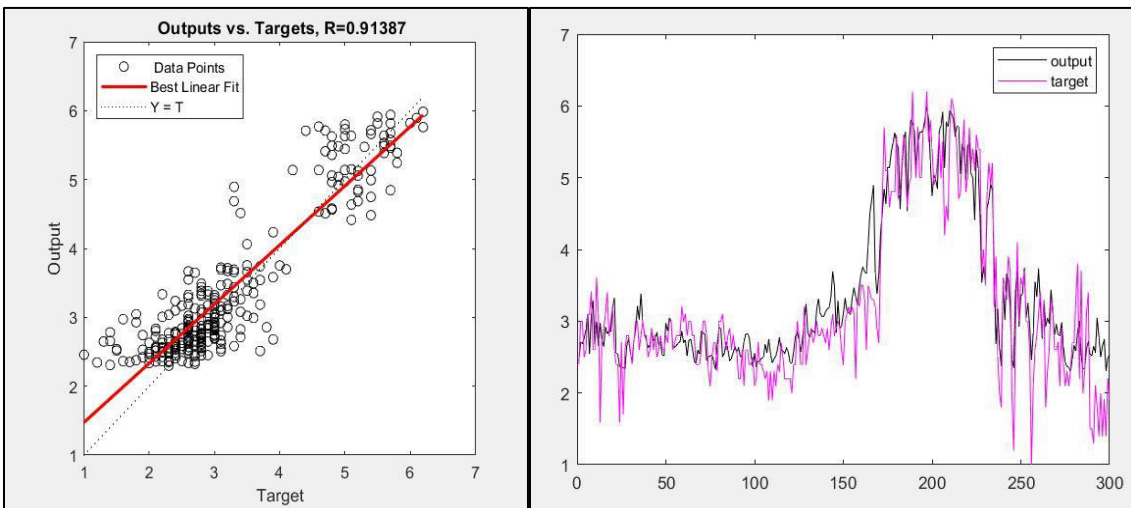


Figure 3: $R^2 = 0.914$ by CGF method and Observed Vs Predicted by CGF method

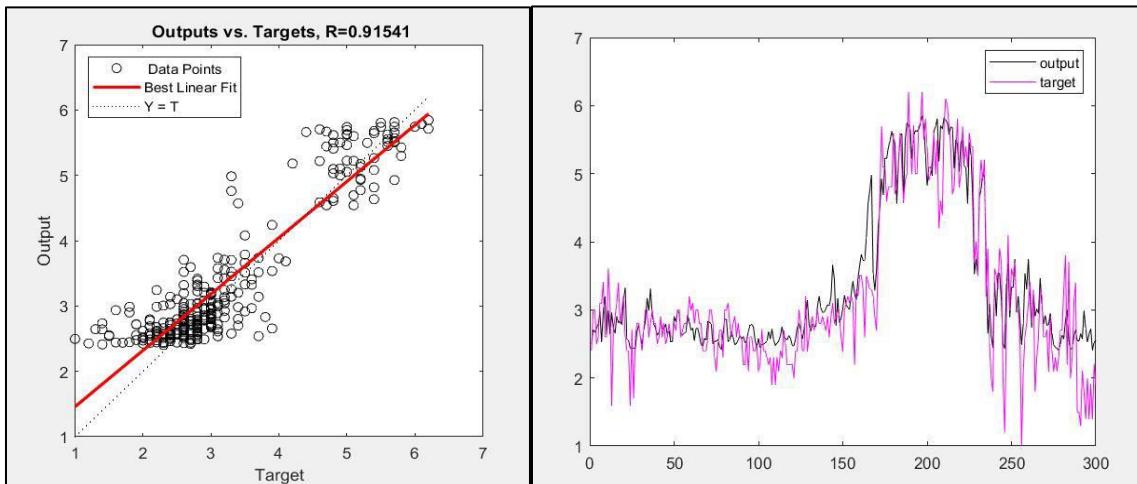


Figure 4: $R^2 = 0.915$ by BFG method and Observed Vs Predicted by BFG Method



VI. CONCLUSION

Hydrological processes are mostly not linear, ANN can be developed and used for prediction of evaporation loss with relation of input parameters. Evaporation prediction the graph observed graph was studied at Gaganbavada Dam, Kolhapur, Maharashtra, India. Data from Gaganbavada dam was studied, observed and helped to train and mature ANN model. The developed model was tested in different algorithms and compared. While the LM algorithm gave the best results, CGF and BFG algorithms were close to it. A good value of $r^2 = 0.916$ was achieved by LM algorithm. This value showed that Artificial Neural Networks are more suitable and efficient in predicting evaporation loss. Also, a good relation between Observed vs Predicted was found. Artificial Neural Networks application will not be limited in the hydrological process, it can be aged and used.

REFERENCES

- [1.] Dogan and Demir (2006) carried out work on Evaporation Estimation Using ANN.
- [2.] Deswal and Mahesh Pal (2008) studied on “ANN MODELLING FOR PREDICTION OF EVAPORATION IN RESERVOIRS”.
- [3.] Goel (2009) ANN Based Modelling for Prediction of Evaporation in Reservoir.
- [4.] Shirgure et al. (2011) “ANN MODELLING FOR PREDICTION OF EVAPORATION IN RESERVOIRS”.
- [5.] Pankaj Kumar and Ajai Kumar Tiwari (2012) carried out work on Evaporation Estimation Using Artificial Neural Network.
- [6.] The Author YARAR (2018) studied the topic Pan Evaporation Estimation Using Artificial Neural Network.
- [7.] <https://mrsac.gov.in> › MRSACPDF, Village Map - Maharashtra Remote Sensing Application Centre



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