Environmental Engineering and Management Journal *June 2022, Vol. 21, No.6, 927-937*
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

RECURRENT NEURAL NETWORKS FOR PEAK FLOW ESTIMATION

Serhat Yılmaz[1], Önder Ekinci[2], Erman Şentürk[3], Arzu Morkoyunlu Yüce[4*]

[1]Kocaeli University, Engineering Faculty, Department of Electronics and Telecommunication Engineering,
[2]Kocaeli University, Hereke Asım Kocabıyık Vocational School, Department of Construction Technology,
[3]Kocaeli University, Engineering Faculty, Department of Geomatics Engineering,
[4]Kocaeli University, Hereke Asım Kocabıyık Vocational School, Department of Environment and Cleaning,
41000 Kocaeli, Turkey

Abstract

Since hydraulic processes are nonlinear, vary over time and may involve spatially distributed systems, estimations of peak flows are essential problems in the projection, management, and safety of any aquatic constructions. In this study, an index flood and overflow quantiles estimation model was designed using analysis by recurrent Artificial Neural Networks (ANNs) architecture. The proposed model was enhanced by training the estimation capabilities via Multi-Layer Perceptron (MLP) type ANNs. Then the model was applied to the problem of estimating peak flows for hydrological processes. For this purpose, an acceptable estimation pattern for the peak of probable maximum floods for a returning period from 25 to 200 years was extracted using annual maximum flow data from the Kayırlı streamflow gauging station. The station is located on the Çine River in the Büyük Menderes basin, Turkey and data from 1938 to 2016 was available. The results from the proposed model were compared with some probability distribution functions, such as Gumbel, Lognormal, or Pearson Type III statistics-based frequency analysis. Comparison demonstrated that the proposed model may be a viable alternative for estimating peak flows.

Key words: artificial neural networks, cascade correlation, flood frequency analysis, recursive training methods

Received: September, 2021; Revised final: February, 2022; Accepted: March, 2022; Published in final edited form: June, 2022

[*] Author to whom all correspondence should be addressed: e-mail: arzu.yuce@kocaeli.edu.tr Phone: +902625113715; Fax: +902625113705