

# Recovery the Missing Streamflow Data on River Basin Based on the Deep Neural Network Model

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## Abstract

In this study, a gated recurrent unit (GRU) network is constructed based on a deep neural network (DNN) with the aim of restoring the missing daily flow data in river basins. Lai Chau hydrological station is located upstream of the Da river basin (Vietnam) is selected as the target station for this study.

Input data of the model are data on observed daily flow for 24 years from 1961 to 1984 (before Hoa Binh dam was built) at 5 hydrological stations, in which 4 gauge stations in the basin downstream and restoring - target station (Lai Chau). The total available data is divided into sections for different purposes. The data set of 23 years (1961-1983) was employed for training and validation purposes, with corresponding rates of 80% for training and 20% for validation respectively. Another data set of one year (1984) was used for the testing purpose to objectively verify the performance and accuracy of the model. Though only a modest amount of input data is required and furthermore the Lai Chau hydrological station is located upstream of the Da River, the calculated results based on the suggested model are in satisfactory agreement with observed data, the Nash - Sutcliffe efficiency (NSE) is higher than 95%.

The finding of this study illustrated the outstanding performance of the GRU network model in recovering the missing flow data at Lai Chau station. As a result, DNN models, as well as GRU network models, have great potential for application within the field of hydrology and hydraulics.

**Keywords: deep neural network, GRU, recovery data, missing data, Da river.**

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