

# Forecasting stream discharge of Lor River by mean of artificial neural network\*

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## Introduction

In this research we used transit data analysis and artificial neural networks for modelling and predict the hydrological discharges of Lor River (NW Spain). We developed three different models to predict the Lor River discharge; i) one (ANN<sub>1</sub>), ii) two (ANN<sub>2</sub>), and iii) three days ahead (ANN<sub>3</sub>). Input variables, used in all models, are based on atmospheric parameters and on previous records discharge. Data base used in this research was collected from different sources; i) Discharge data were obtained from Saltos del Sil (Iberdrola) and Ministerio de Agricultura, Alimentación y Medio Ambiente (Lor Station in Parada), ii) Precipitation were obtained from Conselleria de Medio Ambiente Territorio e Infraestructura, and Temperature was collected from Agencia Estatal de Meteorología. Database between October 1984 and December 1992 were used as training phase, and January 1993 to September 1994 were used for internal validation phase. Furthermore, we had tested the predictive models chosen with another database (external validation), in this case, years 2008 to 2011.

Transit data analyses showed a coefficient of correlation of 0.53 between precipitation and discharge. A lag time of one day was determined. Furthermore, temperature and discharge showed a correlation coefficient of -0.43, In this case, the lag time was 19 days.-All ANN models developed in this research, ANN<sub>1</sub>, ANN<sub>2</sub>, and ANN<sub>3</sub>, provide a good result for training phase with a coefficient of determination ( $R^2$ ) between 0.91 (ANN<sub>1</sub>) and 0.72 (ANN<sub>3</sub>). In internal validation phase, models developed present a  $R^2$  between 0.92 and 0.80. The adjustments for external validation show a good correlation with a high  $R^2$  included on the range 0.91-0.64.

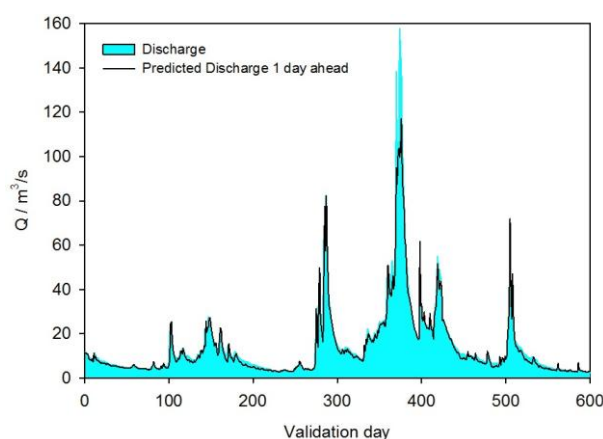


Figure 1. Temporal distribution between observed and predicted data for ANN<sub>1</sub> in internal validation phase.

## Conclusion

ANNs chosen in this research show a great prediction power to determinate the Lor River discharge one, two and three days ahead. All models developed used such as input variables; i) precipitation, ii) temperature, and iii) previous River discharge.

Taking into account the different adjustments obtained, we can say that ANNs coupled with transient data analysis have proved to be a valid tool to modelling and predict the hydrological discharges of Lor River

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