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Predicting inflow in hydraulic dams using different artificial intelligence techniques

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In this paper, Artificial Intelligence techniques such as different types of Artificial Neural Network architectures and other regression models have been used to predict the inflow of water into a hydroelectric dam from rainfall records from different areas of the basin, a physical phenomenon known as "Rainfall-Runoff transformation".

The environment of this research work includes the Portodemouros dam, in northwestern Spain, and among the rainfall records used to predict the inflow to the dam, rainfall in different regions of influence have been processed. The training set contains samples of more than 3800 days from 2009 to 2020 and the validation and test sets contain more than 300 samples with data from 2021 and 2022 respectively.

Having predictions of the flow of water entering the dam at least one day in advance makes it possible to manage the dam's operation with greater security, as well as to prevent possible floods and flooding. In this research, real rainfall data from different areas of the basin are combined with meteorological estimates of rainfall predictions (using radar) as input to the Artificial Neural Network (ANN) that will produce as output the flow of water entering the dam. The ANN is adapted to work with real time series. The results are compared with other machine learning techniques such as SVM, etc.

The models created have obtained, in the test set, a correlation coefficient of the predicted output with the real output of 90%, which allows to provide a reliable prediction model to improve the operation of the hydraulic dam.

Biography:

Full Professor at University of A Coruña since 2000. In 2002 he obtained his PhD degree in Computer Science and in 2008 PhD in Civil Engineering. His Research lines are focused on the field of Artificial Intelligence and its applicability in Civil Engineering. He is the Director since 2006 of the research Center of Technological Innovation in Building and Civil Engineering (CITEEC <https://www.udc.es/citeec/>). The research activity in the last 15 years is: 77 publications in web of Science, where 41 publications are concentrated in JCR articles. Leadership participation leading projects and research contracts (IP in 20 research projects and Scientific-Technological Infrastructure Projects and more than 10 research contracts).

Dr. Alejandro C. Pazos Sierra is a full professor in Computer Science and Artificial Intelligence in Biomedicine in the department of Computer Science and Information Technologies at University of A Coruña (Spain). He holds a Master in Artificial Intelligence (1987 Polytechnic University of Madrid), a Ph.D. in Computer Science (1990 Polytechnic University of Madrid) and a second Ph.D. in Medicine (1996 Complutense University of Madrid). His research lines are Artificial Intelligence techniques as Artificial Neural Networks, Evolutionary Computation and Artificial Vision, and the application of these techniques in different areas of Medicine and e-health. In his 35 years of research career, he has published more than 300 scientific papers in conferences and high impact JCR journals and has directed 20 doctoral theses, obtaining the highest grade in all of them. He has been the principal investigator of more than 100 R+D+i and technology transfer projects and contracts, financed by both public administrations and companies. His areas of expertise in higher education includes Artificial Intelligence in medical and biomedical area.