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ANN-based surrogate models for flood inundation modeling

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ANN-Based Meta Models for Flood Inundation Modelling

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Abstract: Flood inundation models are important tools for flood risk estimation, flood protection infrastructure design and river system management. Very often, one-dimensional (1D) or two-dimensional (2D) hydrodynamic models are used to simulate key variables, such as velocity, water depth or water surface elevation. However, hydrodynamic models are computational expensive, which prevents their application in uncertainty and probability related analyses, where a large number of model runs are required. To significantly improve the efficiency of flood inundation modelling process, artificial neural network (ANN) based surrogate models can be used. This study investigates the suitability of ANN models as surrogate models for modelling flood inundation via a real-world case study in Australia. Data from ten historical and design flood events were used for model development, where most flood data are available at one-hour interval. For data with longer intervals (e.g. two-hour intervals), linear interpolation was used to fill in the gaps, which maximizes the utilization of useful information for model development. Key issues in developing ANN-based inundation models, including lead-time determination, input selection, sampling location and method selection and their impact on derived flood information in a flood plain, are also discussed. This study provides insights into the best practice in developing ANN-based surrogate models for flood inundation modelling.

***Keywords**:* Flood inundation modelling; artificial neural network; meta model; surrogate model