



Application of AI on exploring the relationship between fish community and water quality

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Subject to the geographic environment and climatic conditions of Taiwan, rivers in Taiwan are of steep slopes and flow into oceans very quickly. Due to the severe intensity and short duration of typhoons and storms, sudden rainfall would easily cause huge variations and significant impacts on riverine eco-hydrological environments. To make an effective and comprehensive assessment for sustainable water resources management, this study aims to investigate the relationship between river flow and water quality on fish communities in order to comprehend the situations of the eco-hydrological system in this river basin. We collect a complete set of observational heterogeneity data, which include water quality parameters, stream flow and fish species in the Danshui River of northern Taiwan. This study attempts to improve the understanding of the relationship between water quality parameters, flow regime and fish species by using artificial neural networks (ANNs). The Self-organizing feature map (SOM) is an unsupervised learning algorithm used to cluster, analyze and visualize a large number of data. The results of map size selection for the SOM show that nine clusters (3x3) form the optimum map size based on the local minimum values of both quantization error (QE) and topographic error (TE). The clustering results demonstrate that the SOM is capable of clustering the datasets suitably and can be considered as a powerful tool for further exploration of the relationship between water quality parameters and fish species. It is noted that according to the results of the structure index, the representative indicators of water quality parameters and fish species in the Dahan River, the main tributary of the Danshui River, consist of dissolved oxygen (DO), total phosphorus (TP), water temperature, *Onychostoma barbatulum*, *Rhinogobius candidianus*, Unidentified *Opsariichthys/Zacco* spp., *Formosania lacustre*, *Candidia barbata* and *Hemimyzon formosanus*, respectively. The results of this study can be a guiding reference for sustainable water resources management.