利用因子分析和人工神經網路建立台灣河川水質測站汙染熱點預測模型

報告者：張睿宇

指導教授：陳瑞昇 老師

梁菁萍 老師

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摘要

　　河川水質易受到工業、農業、畜牧業及生活廢水等多重因素的影響，不同來源的污染物質交互作用，使河川水體呈現複雜且動態多變的特性。因此，準確地預測河川水質的變化，不僅對環境監測工作至關重要，更是影響污染治理策略成效的關鍵因素之一。本研究旨在透過建立高準確性的河川水質預測模型，協助環境管理單位更有效地辨識污染熱點，進而協助管理單位針對潛在污染風險做出精準的決策與資源配置，以達成水質保護及污染防治之目標。為實現此研究目標，本研究首先蒐集並整合由台灣環境部提供之全面性河川水質監測數據，並結合內政部所提供的土地利用及開發狀況資料。透過 SPSS 軟體進行因子分析，篩選並識別出對河川水質影響的主要因子，進而建立機器學習模型，深入探討水質參數與土地利用之間的內在關聯性。

關鍵字: 河川水質、土地利用、因子分析、機器學習。

Establishing a pollution hotspot prediction model for Taiwan's river water quality monitoring stations using factor analysis and artificial neural networks

Presenter: Rui-Yu Zhang
Advisor: Prof. Jui-Sheng Chen
Prof. Ching-Ping Liang
Date: 2025/03/21

Abstract

River water quality is susceptible to various factors, including industrial, agricultural, animal farming, and domestic wastewater. These pollutants from different sources interact, causing complex and dynamically changing characteristics in river systems. Therefore, accurately predicting changes in river water quality is crucial not only for environmental monitoring but also for the effectiveness of pollution control strategies. This study aims to establish a high-accuracy river water quality prediction model to help environmental management authorities effectively identify pollution hotspots, thereby supporting precise decision-making and resource allocation for potential pollution risks, ultimately achieving water quality protection and pollution prevention goals. To achieve these objectives, this research first collects and integrates comprehensive river water quality monitoring data provided by the Ministry of Environment in Taiwan, combined with land use and development data from the Ministry of the Interior. Using SPSS software for factor analysis, the study identifies the primary factors affecting river water quality. Subsequently, a machine learning model is developed to deeply explore the intrinsic relationships between water quality parameters and land use patterns.

Keywords: River water quality, land use, Factor analysis, Machine learning.