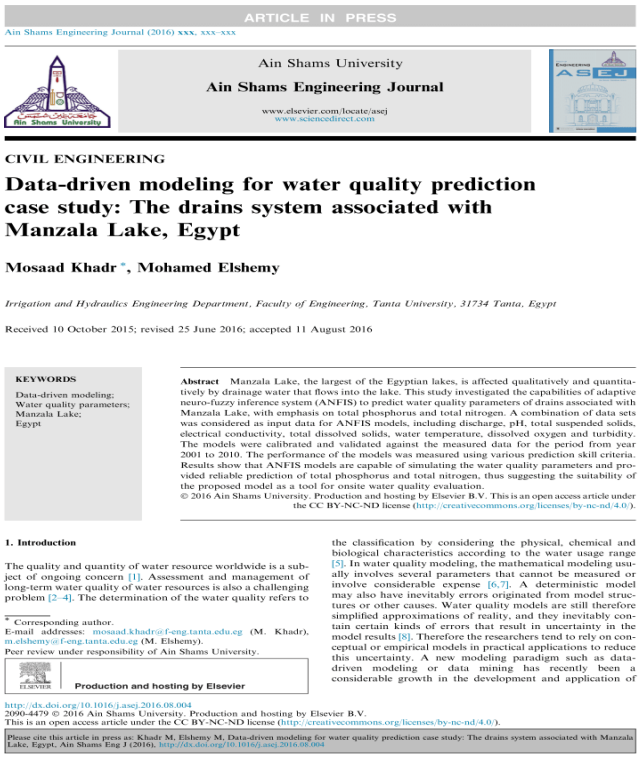
Freshwater Quality: Defining the Indefinable?



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Data-driven modeling for water quality prediction case study: The drains system associated with Manzala Lake, Egypt

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Abstract Manzala Lake, the largest of the Egyptian lakes, is affected qualitatively and quantitatively by drainage water that flows into the lake. This study investigated the capabilities of adaptive neuro-fuzzy inference system (ANFIS) to predict water quality parameters of drains associated with Manzala Lake, with emphasis on total phosphorus and total nitrogen. A combination of data sets was considered as input data for ANFIS models, including discharge, pH, total suspended solids, electrical conductivity, total dissolved solids, water temperature, dissolved oxygen and turbidity. The models were calibrated and validated against the measured data for the period from year 2001 to 2010. The performance of the models was measured using various prediction skill criteria. Results show that ANFIS models are capable of simulating the water quality parameters and provided reliable prediction of total phosphorus and total nitrogen, thus suggesting the suitability of the proposed model as a tool for onsite water quality evaluation.

1. Introduction

The quality and quantity of water resource worldwide is a subject of ongoing concern [1]. Assessment and management of long-term water quality of water resources is also a challenging problem [2–4]. The determination of the water quality refers to the classification by considering the physical, chemical and biological characteristics according to the water usage range [5]. In water quality modeling, the mathematical modeling usually involves several parameters that cannot be measured or involve considerable expense [6,7]. A deterministic model may also have inevitably errors originated from model structures or other causes. Water quality models are still therefore simplified approximations of reality, and they inevitably contain certain kinds of errors that result in uncertainty in the model results [8]. Therefore the researchers tend to rely on conceptual or empirical models in practical applications to reduce this uncertainty. A new modeling paradigm such as data-driven modeling or data mining has recently been a considerable growth in the development and application of

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