



How Can Data Science Be Used in Groundwater Flow and Transport Modelling?

Louis-Charles Boutin, P.Eng.

Don Haley, M.Sc.

Matrix Solutions Inc.

Gaelen Merritt, B.A.Sc.

Aqua Insight Inc.

Summary

The field of data science can be characterized as extracting knowledge from datasets. The general workflow consists of 1) collecting data, 2) data compilation and cleaning, 3) exploring and visualizing the data, and 4) developing inferences and making predictions. Application of data science is omnipresent in our daily lives. For example, since March 2020 the public has been provided with a host of interactive tools exploring COVID infection, hospitalization, and mortality rates as well as data on the vaccine rollout across the country and simulation results from epidemiological models that predict the potential for the virus to spread throughout the population. The onus now lies on groundwater modelling to catch up and our experience suggests clients would find similar interactive data exploration tools extremely beneficial. This leads to the following question: how can data science be used in groundwater flow and transport modelling?

Numerical groundwater flow and transport modelling software allow for 2D/3D visualizations of hydrogeological information with time. These are useful tool to understand simulation results, but usually lacks in the ability to create comprehensive comparison of the simulated results to measured information, and/or allow interactivity with several predicted model results specific to the problem at hand. With increased computational resources available through cloud computing, and the latest development in optimization algorithms such as the Iterative Ensemble Smoother, data science will be instrumental in extracting insights from simulation results. With such a workflow in place, the information from simulations can be extracted and presented in a timely manner, and with interactive functionality, which can greatly improve and facilitate the decision-making process.

This presentation will focus on the data science workflow applied to some groundwater modelling projects and will present a case study where interactive plots were developed to support the stakeholder decision-making process.