MONASH
ENGINEERING

MONASH University

Faculty of Engineering

Summer Research Program 2023-2024

Project Title: AI/ML and digital twin development for the Monash water treatment pilot plant

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Objective

Monash Department of Chemical and Biological Engineering has recently invested in the Monash Student Pilot Plant - a water treatment pilot plant based on industrial membrane technology. This semi-industrial scale facility enables students, researchers and industry partners to gain authentic experience and solve real world problems. The physical system also represents a unique opportunity for Monash Engineering to develop and demonstrate industry-applicable digitalisation and digital technologies such as AI, ML, and digital twins for teaching, research and industry training.

To meet this aim, an international collaboration between Monash University and the University of Cambridge has been initiated to develop a cloud-based, fully integrated digital twin of the Monash Student Pilot Plant that uses ontology and knowledge graphs to manage plant data and optimise the performance of the physical system. The eventual integrated physical and digital systems will provide students, researchers and industry with access to an authentic industry-scale physical system integrated with cutting-edge digitalisation tools, providing opportunities for student and industry training and demonstrations.

Project Details

This summer research project (SRP) is a continuation of a current final year project (FYP) that is progressing the digital twin development via two parallel and related research pathways. The first pathway focusses on understanding and developing AI/ML algorithms that take physical data measurements from the pilot plant and infer or calculate complex parameters related to the product (water) quality. The second pathway focusses on developing a cloud-based data cleaning and collection system to complement the ML algorithm and supply it with data for processing – generating a ‘digital twin’. The FYP project will deliver a functional digital twin which optimises one or more product quality parameters by taking live data from the pilot plant and manipulating the available on-plant independent variables. The SRP will continue this project, progressively optimising and adding more data and more aspects of the pilot plant to the digital twin.

Prerequisites

This project will involve: coding, statistical machine learning tools, knowledge graphs, ontological data structures, digital twins and the Monash Pilot Plant. Experience in any of these aspects will be highly regarded and beneficial to the applicant.