Master Project (30 ECTS)/Semester Project (10 ECTS)

Administrative

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Location: Sion or remotely (travel allowance offered)

Project description:

Anion exchange membrane water electrolyzers are known for producing hydrogen at high efficiency using cheaper materials and are a promising alternative for green hydrogen production. A surrogate model has been built for a single cell AEMWE using a simplified model which only considers the membrane electrode assembly (MEA). The surrogate model was validated using a physics-based model. The goal of the project is to upgrade the current surrogate model to validate the newly built AEMWE stack (figure 1). The model will use experimental data generated by the AEMWE stack as operation data (polarization curves and EIS) as well as long-term degradation data. The goal is to train the model by optimizing the deep neural network (DNN) previously used by including more parameters that might affect the stack operation and durability.

Figure 1: 1 KW experimental AEMWE stack

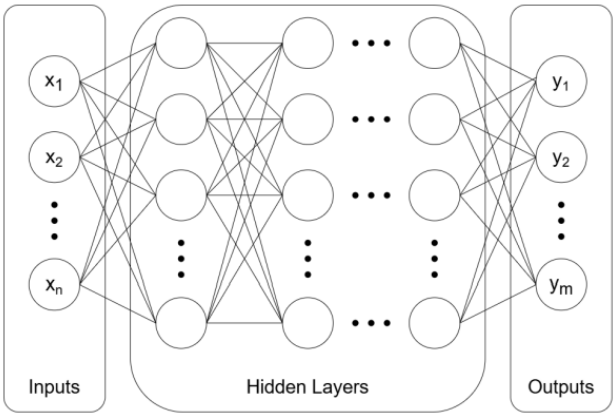

Figure 2: Deep neural network (DNN) structure

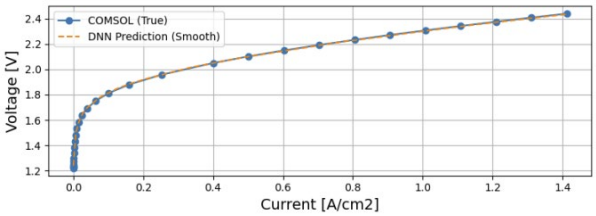

Figure 3: Surrogate (orange) vs multi-physics simulation (blue)

Once the surrogate model is validated with experimental data, the effort will be directed towards building a digital twin for the real stack for diagnosis, monitoring, maintenance and control. The general structure of the digital twin was built, and it will be used and applied in the project.

Your tasks:

1. Upgrade the current surrogate model from 1 cm^2 single-cell MEA model to 100 cm^2 5-cell experimental stack by considering additional parameters
2. Connect the model to the experimental setup to allow diagnosis, monitoring, maintenance and control of the AEMWE 1 kW stack