

# Digital-twin of bioreactor for accelerated design and optimal operations in production of complex biologics

For: PhD Students; 12 months

Program supported: [AI for Design](#)

Academic Collaborator	NRC Principal Investigator	Associated NRC Research Centre
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## **Project Description:**

Combining biosensors and new AI algorithms for the development of digital twin will improve the efficiency and the predictability of bioreactors used in cell production. The development of a digital twin will play a critical role in bio-manufacturing where it will be able to constantly communicate with the bioreactor in order to gather data, predict performance, detect errors as well as take automatically and in real time corrective actions.

In this project, we will combine machine learning and simulation software with mathematical modelling for the development of digital twin of a bioprocess that replicates the process of a real bioreactor. The University of Ottawa and the NRC will explore AI and machine learning for development of bioreactor digital twin. The candidate will be part of research team that apply machine learning along with inputs from internet of things allowing real time data to be fed into models. The models can monitor and determine what's happening in real time and plan the appropriate corrective action.

The student will work on development of new hybrid machine learning algorithms and on Informed Machine Learning to Integrate Knowledge into Learning Systems. These algorithms will be evaluated with the data from our parts of the larger project.

The internship will work on problems relevance to challenge program AI4Design by developing new AI algorithms to support automated design of better bioreactor manufacturing and monitoring systems and establishing algorithms to support automated cell engineering and manufacturing within biodevices for more efficient development of component of cell therapies. Therefore, the outcomes of the internship will directly benefit both the AI4Design as well as cell and gene therapy NRC challenge programs by designing better bioreactor manufacturing and monitoring systems and establishing AI algorithms to support automated cell engineering and manufacturing within biodevices.

## **Student Profile:**

The chosen candidate will develop and implement machine learning algorithms for streaming data of Bioreactor. They will also work with molecular biology models and machine learning for online monitoring and predictions.

## **Qualifications:**

- PhD candidate in computer engineering, computational chemistry/biology and/or AI & machine learning.
- Experience with time series, temporal streaming data analysis and the use of sensor data.
- Experience in reinforcement learning would be an asset.
- Demonstrated ability to apply machine learning and AI techniques to molecular biology models
- Programming experience (Ex. Python, multiflow/River, Kafka, ... , ).

- Experience with bioreactors for cell culture would be an asset.
- Good written and oral English language skills.