

INTERNSHIP POSITION

IFP Energies Nouvelles
Direction Expérimentation Procédés
BP3 - Rond-point de l'échangeur de Solaize
69360 SOLAIZE, FRANCE

Subject

Robustness study of learning models under data sampling: application to time series/signals prediction on process engineering data

Profile

Being at the interface of two fields, the subject lends itself to master students either in numerical analysis/data science with solid physical sense, or in process engineering with a taste for machine learning, statistics, and programming

Context

Process engineering deals with the application of physical chemistry to industry. Its main goal is to transform materials. It aims at designing and managing the functioning of a process with different chemical or physical transformations. This domain relies on the regular monitoring of different sensors, parameters, and physical quantities (temperature, pressure, concentration, etc.) to optimize operating points and product quality as a function of source materials.

Being able to construct predictive or explicative statistical models, relating acquired or computed data to thought properties, is becoming an important stake for process efficiency. Approaches combining functional knowledge and data science methods have been developed recently, to improve model performance and robustness. Challenges are numerous: data availability, uncertainties, physical model validity, ability of off-line experimental models to work in on-line industrial conditions, etc.

The proposed subject deals with the latter issue. Industrial-type data often only have available measurements acquired at a relatively low frequency rate (typically day or week), with little control of the exact timing. Meanwhile, pilot-unit experimental data may be obtained at higher rates (hour, minute) with precise time control.

Internship mentoring

Julien Gornay (Process Experiments Division)
Laurent Duval (Digital Science and Technology Division)
Denis Guillaume (Digital Science and Technology Division)

Internship objectives

The candidate will be hosted by the Process Experiments Division and will work in close collaboration with the Digital Science and Technology Division. She/he will analyze data related to a given process, in continuity with another internship completed in 2021. She/he will study the impact of different sampling schemes on the reliability and robustness of already developed imputation and prediction models.

The heart of the work will consist in developing a workflow allowing the reduction of the initial sampling rate of pilot-unit data, to better mimic that of industrial measurement. Doing so, we are interested in precisely quantifying the efficiency loss and the resulting uncertainties, and the necessary adaptation of the prediction models. We expect the possibly of providing "best practice/good sampling" recommendations, with respect to temporal dependencies of measures variables.

Duration: 3-4 month **Period:** Spring/Summer 2022

Location: France, IFPEN – LYON (Solaize)

Paid internship

Application : send resume and application letter with your specific interest and skills for this subject to julien.gornay@ifpen.fr