IRC TransForMed 2020 – internship grants

Data mining on the Arronax accelerator for anomaly detection

Authors: F.Poirier (Arronax), D.Mateus (LS2N)

Abstract:
Providing precise irradiation for radioisotopes relies heavily and in part on the knowledge of the impact of the most effective settings of the accelerator. This is essential to secure irradiation within some time and specifications.
To support this latter consideration, the accelerator environment has been strengthened with an additional control and acquisition system as well as new diagnostics, both bringing new data within a large data framework called EPICS (Experimental Physics and Industrial Control System).
It is proposed here to perform data mining using the extended new data, and to apply multiple algorithm studies based on machine learning in order to better monitor the accelerator settings and thus improve secure irradiation. This project propose to join together two fields of specialty within a collaboration between the LS2N and ARRONAX: Accelerator data from ARRONAX and machine learning from LS2N.
The primary goals are the application of the algorithms to the accelerator operation, to explore:

- significant events and detect anomalies,
- alarm handling and prognostics.

For these, sets of accelerator and environmental data have been gathered and several algorithms have been applied. In particular, one algorithm, the Density Based Spatial Clustering of Applications with Noise (DBSCAN), has been investigated. This unsupervised application has shown its capacity to identify outliers. Thus, several technics also have been determined to perform selection and check robustness of the outliers. Their relevance in terms of accelerator significant events has to be further investigated and consideration on each individual anomalies has to be tackled possibly in view of future supervised treatments.