PROJECT 8 – DEVELOPMENT OF ARTIFICIAL INTELLIGENCE ASSISTANTS FOR SYNCHROTRON BEAMLINE DATA ANALYSIS

Supervisors' name

- <u>Supervisor 1</u>: Jean-Sébastien MICHA

- <u>Supervisor 2</u>: Samuel TARDIF (in case of absence)

GIIP Intake: Summer 2022 (May to July/August)

Institutes: CEA IRIG

Laboratory: Modeling and Exploration of Materials Laboratory (MEM) / Nanostructures and Synchrotron Radiation

Keywords: Machine Learning, Artificial Intelligence, X-ray Image pattern, Data Analysis

Description of the project:

The aim of the internship is to dive into the exciting world of studies and characterization of materials at the European Synchrotron (ESRF) and the related advanced instrumentation for X-ray scattering. Due to the growing amount of data in synchrotron beamlines using rapid 2D detector new approaches to handle collected data from X-ray characterization measurements are needed. Over the last few years, Artificial Intelligence has entered into the synchrotron world with significant and promising results. Several demonstrations of Machine and deep learning algorithms and architectures were made for a higher general beamline throughput and better data interpretation by users. During the internship, we plan to test and implement various learning techniques on the analysis of x-ray 2D pattern recorded by Laue microdiffraction to enable on fly diagnosis & analysis. For instance, several assistants could be trained: to detect and sort data for further analysis, to perform regression for the determination of crystal orientation, to speed up the handling of complex or multicomponents scattering peaks, or deal with 2D (3D) microstructure reconstruction from sample raster scan. Sample or optics alignment procedures could also be implemented. Background on scientific computing is highly recommended. Knowledge on physics, materials science and crystallography would be an asset.

PROJECT 13 – DESIGN, DEVELOPMENT AND REALIZATION OF 3D DYNAMIC ENVIRONMENTS FOR A DRIVING SIMULATOR

Supervisors' name

- <u>Supervisor 1</u>: Christophe PRAT

- <u>Supervisor 2</u>: Viviane CATTIN (in case of absence)

GIIP Intake: Summer 2022 (May to July/August) or Autumn 2022 (September to December)

Institute: CEA LETI

Laboratory: Signal and Sensor Systems Laboratory (LSSC)

Keywords: driving simulator, 3D dynamic environment, driver monitoring

Description of the project:

The trainee will be asked to design, develop and test 3D dynamic environments for a driving simulator in accordance with requirements already defined.

These environments should help immersing drivers into distracting and stressing situations.

3 different environments of 30mn of duration should designed and tested.

The software to be used is UCWinroad (Forum8).

The trainee will be free to use a driving simulator installed in the laboratory.

The trainee would have to find compromise between the realism of the environment (fluidity) and its complexity.

The trainee must be imaginative rigorous and must take initiative. He/she should have a strong interest/background in programming, virtual environment, SCANeR Studio, UCWinroad, Delphi (C++).