PhD in Artificial Intelligence Models for Precision Oncology  
(CEA, Grenoble, France)

Context:
Drug treatments for metastatic renal cell carcinoma (RCC) have evolved considerably over the past twenty years with the availability of an increasing number of targeted therapies based on protein kinase inhibitors and immunotherapies. At the same time, molecular profiling technologies (next-generation sequencing, LC-MS/MS) have made it possible to obtain multi-omic characterizations of large cohorts of renal tumors. One of the main challenges in precision medicine is to optimize the choice of treatments for patients by combining clinical, histological and genomic information about their tumors. In this context, the KATY project (https://katy-project.eu/), funded by the European Union’s Horizon 2020 Framework Programme, has set out to build a precise personalized medicine system empowered by Artificial Intelligence (AI). The novel AI tool aims to predict the response of kidney cancer to targeted therapies and identify the molecular evidence to support these predictions. Most importantly, the KATY system will offer human-interpretable knowledge that clinicians and clinical researchers can trust, adequately evaluate and effectively use in their everyday working routine.

Project:
This PhD project aims to develop predictive models of the response to targeted therapies of patients with RCC. This work will be based on a whole body of public data collected, organized and shared within the KATY consortium such as: (i) multi-omic molecular profiling generated from tumor and normal tissues, and ex vivo cell models; (ii) patient pathological, clinical and demographic data; (iii) response and adverse effects associated with patient therapies and (iv) existing knowledge regarding biological pathways, molecular interactions and drug targets. In addition to these public data, the project will also benefit from molecular profiling of cohorts of patients with follow up for targeted therapies against RCC, generated by the clinical partners of the KATY consortium. Special attention will be devoted to the explainability and interpretability of AI models in order to identify the molecular and cellular signatures supporting the predictions.

Working environment:
The research project will take place in the Biology and Biotechnology for Health (BioHealth) Lab (UMR1292, INSERM-CEA-UGA, https://biosante-lab.fr/en) at the Interdisciplinary Research Institute of Grenoble (IRIG), CEA Grenoble. CEA, the French Atomic and Alternative Energy Commission is a public research and technology organization active in four main areas: defense and security, low-carbon energies, information technologies and health technologies. It has been ranked the most innovative

The PhD project will be hosted in a multi-disciplinary research environment made of cancer biologists, clinicians, experts in “omics” data and bioinformaticians. This research project will be carried out in close collaboration with an engineer in bioinformatics and a post-doctoral researcher in AI also recruited by the CEA to work on the KATY project. Furthermore, the PhD student will be integrated into the KATY research network, made up of clinicians, biologists, lawyers, bioinformaticians, developers, and AI experts from 11 countries.

This thesis project will be supervised by Dr. Christophe Battail and Dr. Delphine Pflieger, both researchers at the BioHealth Lab, and carried out in collaboration with Dr. Pedro Ballester (team leader at the Cancer Research Center of Marseille).

**Expected qualifications, skills and experience:**

**Essential selection criteria**
- Master degree with a focus on computational analysis of large-scale biological data.
- Experience in Python and/or R programming languages, and Unix command line.
- Prior use of machine learning and biostatistics methods.
- Prior knowledge of molecular biology, oncology or “omics” data.
- Ability to speak and write in English.

**Desirable selection criteria**
- Prior experience in processing and exploration of “omics” data.
- Prior knowledge in network / systems biology.

**Job contract:**
The successful candidate will be recruited on a 3-year PhD contract funded by the European Union’s Horizon 2020 research and innovation programme under the grant agreement No 101017453.

**How to apply:**
The candidate must send its application file to christophe.battail@cea.fr. It consists of a CV, grades obtained for each university degree and the names and emails of two scientists involved in assessing the academic performance. The application must also be accompanied by a cover letter describing in particular how the candidate meets the essential and desirable selection criteria, and how this thesis project contributes to its future career. The position starts in October 2021.