## Machine Learning for Cancer Detection: Identifying Residual Tumor DNA from Blood Samples

**Internship subject**

AI is transforming medicine and reshaping the practice of various medical specialties, including oncology. One promising application is the use of machine learning for detecting Minimal Residual Disease (MRD)—traces of cancer DNA that remain in the bloodstream after surgery. Identifying these residual cancer cells is critical for guiding post-operative treatment decisions.

This internship focuses on developing an AI-driven solution that detects tumor DNA residuals using circulating tumor DNA (ctDNA) methylation markers extracted from Next-Generation Sequencing (NGS) data.

The intern will contribute to the development and validation of a machine learning model for detecting residual cancer DNA. Key responsibilities include:

* Data Processing & Feature Engineering: Preprocessing large-scale sequencing datasets (healthy vs. cancer patients).
* Implementing and optimizing supervised learning algorithms: Fine-tuning feature selection and ML techniques (e.g., Random Forest, XGBoost, Neural Networks) to improve detection sensitivity and specificity.
* Deployment & Interpretation: Developing an interpretable AI approach for oncologists and pathologists.

**Supervisors**

Michael Blum (CNRS researcher) and Julien Thévenon (PUPH CHU Grenoble Alpes)

**Required Skills**

* Programming: Python (Pandas, Scikit-learn), R is a plus.
* Data Science: Knowledge of statistical analysis, feature engineering, and model evaluation.

**Level of study**

M2 student

**Lab / Company**

IAB (Institut pour l'Avancée des Biosciences), Université Grenoble Alpes

**Application deadline**

March 31 2025

Please contact michael.blum@univ-grenoble-alpes.fr if interested.