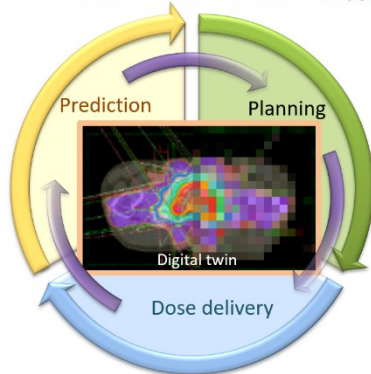


Projet PEPR Santé Numérique : Digital Twin for Personalized Radiotherapy in Prostate Cancer

PhD Position: Integrative modeling of tumor growth and RT response

TwinCaRT

Digital Twin for Personalized Care and Planning in
 Prostate CAncer RadioTherapy



Context / Objectives

Prostate cancer treatment remains a challenge due to inter-patient variability in tumor biology and response to irradiation. The **TwinCaRT project, funded by the PEPR Santé Numérique**, aims to shift from "one-size-fits-all" radiotherapy to a personalized, **in-silico-driven** approach. By creating a **Digital Twin (DT)**, we can simulate treatment outcomes before they occur, optimizing the therapeutic ratio for each individual.

This PhD will specifically address the following objectives :

- i) **Mechanistic Modeling:** Enhancing a 3D multiscale model to simulate tumor growth and the "5 R's of Radiobiology" (Repair, Reoxygenation, etc.) at a cellular level.
- ii) **Virtual-Real Synchronization:** Developing algorithms to identify patient-specific biological parameters (e.g., cell density, hypoxia) using longitudinal quantitative MRI (qMRI) data and
- iii) **Clinical Integration:** Utilizing real-time data from MR-Linac platforms to update the Digital Twin during the course of treatment.

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Required Profile

- **Education:** Master's degree (or equivalent) in Biomedical Engineering, Applied Mathematics, Computational Physics, or Computer Science.
- **Technical Skills:** Strong programming skills (C++, Python).
 - Experience in mechanistic/mathematical modeling or stochastic simulations (Monte Carlo).
 - Knowledge of optimization algorithms and data fusion.
 - Familiarity with Medical Imaging (specifically MRI/qMRI) and image processing workflows.
 - Knowledge on Radiobiology, Medical Physics, Oncology, or Radiotherapy principles will be highly appreciated.
- **Soft Skills:** High autonomy, scientific curiosity, and the ability to work in a multidisciplinary, international environment.
- **Language:** Fluency in English (written and spoken); French is a plus but not mandatory.

Why Join TwinCaRT?

The **Digital Health Research Program (PEPR SantéNum)** is the major research initiative of the French National Strategy. You will be at the forefront of Digital Twin technology in oncology, working with unique datasets from the first MR-Linac platforms in France. Within the PEPR Digital health This project offers a high-impact research environment where your work directly contributes to improving the quality of life and survival rates for cancer patients. **Consortium:** LaTIM, EURECOM, CREATIS, ICO Nantes, HCL Lyon, Centre Eugène Marquis. **Main Industrial Partner:** Dassault Systèmes.

Location: LTSI (Laboratory of Signal and Image Processing), Inserm U1099, Rennes, France

Duration: 36 Months

How to Apply : Interested candidates should send their CV, a motivation letter, and academic transcripts to **Oscar Acosta** (oscar.acosta@univ-rennes.fr).

Reference

- Sosa Marrero C., de Crevoisier, A. Hernandez, R.d. Fontaine, Rioux-Leclerc, Mathieu, Fautrel, Paris and O. Acosta. « *Towards a reduced in silico model predicting biochemical recurrence after radiotherapy in prostate cancer* », **IEEE Trans Biomedical Engineering**, 2021 68 (9), 2718-2729, 2021 DOI: 10.1109/TBME.2021.3052345