

Chair of Junior Professor

Institution: INSERM

Head of the institution: Gilles BLOCH

Host university: Nantes Université

Location: Nantes

Partner institutions: Nantes Université, CNRS

Project title: Risk prediction models for cardiovascular diseases

Keywords: multi-scale data, AI models, cardiovascular system, disease trajectories

Expected duration: 60 months

Scientific field: Digital Health / Data Science / Cardiovascular Diseases

Institutional strategy:

Nantes Université involves one university, one national research organization (INSERM), one university hospital (CHU Nantes), one technological research institute (IRT Jules Verne) and three major high schools (Ecole Centrale Nantes, EBANSN, ENSA Nantes). These partners have unified their forces to consolidate their areas of research excellence, particularly in health and engineering within the framework of the I-SITE NEXt.

Nantes Université aims to open new crossways for multiple cultures and practices. This philosophy is particularly relevant in the field of digital health, which requires bringing together clinicians, biologists, mathematicians and computer scientists around global issues. Through its structure and its willingness to promote transdisciplinarity, Nantes Université is a privileged ecosystem for ambitious research programs aiming to develop innovative approaches in precision medicine.

Strategy of the host laboratory:

Within Nantes Université, l'institut du thorax (ITX) integrates research, training and care against cardiovascular, metabolic and respiratory pathologies, aiming to "place the patient at the heart of our research". The ITX laboratory (UMR INSERM 1087 / CNRS 6291) combines basic research and translational approaches to understand the pathophysiology of these diseases and to prevent, detect and treat them better. Our ambition is to improve patient care through novel approaches in precision medicine.

With the digital revolution, we are accelerating the development of extensive databases from national cohorts of patients with pathologies such as cardiac arrhythmia, cardiac valve defect, dyslipidaemia and intracranial aneurysm. In parallel, we are implementing all the necessary resources and skills for the systematic exploitation of this massive data, through strategies based in particular on artificial intelligence. Further strengthening our analytical capabilities will allow us to reinforce our leadership and implement these systemic approaches within international collaborative networks – particularly in the context of the EU framework program Horizon Europe.

Scientific project:

By opening an INSERM chair, the ITX laboratory wishes to recruit an emerging leader in data science applied to cardiovascular diseases. The chair holder will focus on the development of new numerical approaches for the multi-scale analysis of biomedical data, aimed at building new predictive models of cardiovascular risk. The research program will be based

on: (1) cohorts of subjects/patients for whom clinical, behavioural, biological (molecular) and phenotypic (e.g. from medical imaging or digital electrocardiograms) data will have been collected longitudinally; (2) preclinical cellular or organoid models directly derived from patients, and on which multi-omics approaches have been carried out.

The candidate will benefit from: (1) nationwide clinical networks coordinated by the ITX teams in cardiology, endocrinology and/or neuroradiology; (2) national research infrastructures, such as the French Institute of Bioinformatics and France Bio-Imaging, in which Nantes Université is actively involved; (3) international collaborative networks led by the ITX and supported by the INSERM, the CNRS and Nantes Université.

Training project:

With strong support from the French Government (through the SFRI program TRITON), Nantes Université aims to transform doctoral training through the development of Graduate Programs (GP). In this context, the GP 'Cardiovascular Research' will open in 2023 as one component of the novel Graduate School in Future Health.

In this context, the chair holder will deliver advanced training on multi-scale approaches and on prediction modelling based on artificial intelligence. He/she will also tutor postgraduate and doctoral study projects, supervise internship or thesis work, and contribute to the scientific animation of the Graduate School.

In parallel, the on-going development of a GP dedicated to 'Smart Computing' will provide additional teaching and/or coaching opportunities, relating to the development of systems, applications and services by engineering based on advanced computer technologies. This GP will be built in close interaction with the laboratories in biomedical research, in order to train future experts in digital health by promoting dual training in engineering and biology. The chair holder will therefore play an important role at the interface between data science and biomedicine.

Dissemination:

The chair holder will aim to publish regularly in the best international scientific journals. He/she will communicate on the results of his/her research during international congresses dealing with his/her fields of specialty, and will participate in the organization and animation of scientific events in Nantes, in France and abroad. To do this, he/she will rely on the partnerships already in place between the ITX and prestigious centres in cardiovascular research across Europe and North America. He/she will also develop new international partnerships in the field of data science.

Open Science:

Nantes University defines itself as a sustainable organisation, committed to accompany societal evolution. It has adopted a global and proactive policy in favour of open science, open education and open innovation, and has recently implemented rules for systematic publication to the open archive Hal.univ-nantes. This approach marks an important step towards generalizing open resources in research and education.

Science & society:

Thanks to the close links between the ITX members and the communication services at Nantes University, the INSERM, the CNRS and the Nantes University-Hospital, our main scientific discoveries and medical advances are regularly taken up by the local and national media. Dissemination to the general public is continuous, through both actions of communication and participations in local or national events.

Financial summary: using the attached financial form, describe the financial needs and their distribution to carry out the scientific project (doctoral student, post-doctoral student, IT, equipment, etc.)

ANR funding package	200 000 €
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