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 (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 (https://next-isite.fr/en). 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 digital health and 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 diseases (https://umr1087.univ-nantes.fr). The ITX laboratory, which is jointly hosted by the INSERM (U1087) and the CNRS (U6291), combines basic research and translational approaches to elucidate the molecular bases of these diseases. Our medical ambition is to detect them earlier and prevent reverse clinical outcomes through novel approaches in precision medicine. In this context, we have built longitudinal cohort studies on pathologies such as cardiac arrhythmia, cardiac valve defect, dyslipidaemia and intracranial aneurysm. In parallel, we have implemented the necessary resources to build a multi-scale data warehouse enabling to model and predict disease trajectories. Here we aim at strengthening our analytical capabilities to exploit such resources through international collaborative networks – particularly in the context of the EU framework program Horizon Europe.

Scientific project:

By opening a chair with the INSERM, the ITX laboratory wishes to recruit a scientific leader in computational biology applied to cardiovascular diseases. The chair holder will develop novel numerical approaches aimed at building new predictive models of cardiovascular disease based on multi-scale data integration, disease computational modelling and/or outcome prediction. His/her research will benefit from: (1) established cohorts of subjects/patients with associated clinical, behavioural, biological (molecular) and phenotypic information; (2) well-characterized 3D cell models derived from human subjects; (3) complementary expertise in cardiovascular genomics and pathophysiology at

the ITX laboratory. He/she will also have the opportunity to build on: (1) nationwide clinical networks coordinated by the ITX teams in cardiology, endocrinology and/or neuroradiology; (2) national research infrastructures in which Nantes Université is actively involved, such as the French Institute of Bioinformatics and France Bio-Imaging; (3) international networks led by the ITX and supported by the INSERM, the CNRS and Nantes Université.

Training project:

Supported by the French Government, Nantes Université is currently converting doctoral training into Graduate Programs (GP). In this context, one GP dedicated to 'Cardiovascular & Respiratory Research' and coordinated by the ITX laboratory will open in 2023. Although the chair holder will dedicate most of his/her time to research, he/she may 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 GP. This GP will be built in partnership with computer scientists, 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.

Research Funding: The chair holder will initially get a package of 200k EUR to initiate his/her own research. Based on his/her profile and experience, additional funding may be obtainable on request. The applicants are thus encouraged to contact the ITX laboratory (direction-u1087@univ-nantes.fr) prior to submitting their proposal.

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 research fields, and will participate in the organization and animation of scientific events 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.

Indicators: Beyond scientific production, the evolution of the chair holder will be evaluated according to the following criteria: international networking, grant securing, training by research and supervision, innovation and teaching activities. In addition to this regular follow-up, in-depth annual evaluation will be carried out to ensure that, at the end of the 5-year period, the chair holder will be appointed to a permanent position of Research Director by the INSERM.