Postdoc position in "Mathematical modeling for *in silico* design of bio-inspired molecules for Lyme disease diagnosis"

Workplace: Applied Mathematics Laboratory of Compiègne (LMAC - UTC), CNRS EA 2222, Compiègne and ISCD (Sorbonne Université), Paris

Starting date: May-June 2023

Application Deadline: April 5th, 2023

Keywords: Bioinformatics, Life and Health Sciences, Mathematical modeling, data mining, *in silico* modeling, diagnosis, Lyme disease

Context

The proposed postdoctoral position is part of the 3-years multidisciplinary project «Num4Lyme», funded by the Institute of Computing and Data Sciences (ISCD) and aimed at developing a new holistic approach for the diagnosis of Lyme disease.

Description of the project

Lyme borreliosis is a tick-borne disease caused by bacteria of the *Borrelia* genus; all over the world, the Lyme disease is the most frequent arthropods-transmitted disease, with ~ 30 000 reported cases per year in the USA, though considered as highly underestimated according to the Center of Disease Control and Prevention (CDC).

Patients affected by this disease show different symptoms, among which some of them are specific to the disease, whilst others consist in blurred clinical signs that are traditionally linked to a persisting or chronic form of Lyme disease. The heterogeneity of its symptoms makes the detection of the Lyme disease more difficult and might lead to wrong diagnosis and hence wrong treatment of the patients.

The proposed postdoctoral project will contribute to a better detection of Lyme disease; the main goal is indeed to develop a new approach for the Lyme disease diagnosis in exploring innovative biotechnological tools designed by combining machine learning, stochastic and molecular modeling.

Research team

Num4Lyme is a research team at ISCD composed of five members split into three sub-teams with different expertise, ranging from mathematical and molecular modeling, bioinformatics and biotechnology *in vitro*, to high-performance computing and data mining.

The successful candidate will be working directly with Dr Miraine Davila-Felipe and Pr Ghislaine Gayraud, who are responsible for the mathematical modeling aspect of the project. Both of them are members of the Applied Mathematics Laboratory of Compiègne and have a strong experience in stochastic modeling with applications to biological systems and dependent data.

Due to the need of a tight collaboration between the three sub-teams of the Num4Lyme project, the postholder will also interact with all the members of this interdisciplinary project.

Missions

The successful candidate will be involved in the mathematical design of the bio-inspired molecules, with the ability to detect the pathogen agent of Lyme disease. The postholder will be in charge of the implementation and adjustment of the models, that will be selected by the entire research team. He or she will be expected to interpret model findings using expert insight in both statistical validation and the biological context. The candidate will be required to manipulate mathematical models such as Markov chains, and machine learning methods.

The postholder will present his/her work through participation in national and international conferences/seminars and the publication in international open access peer-reviewed journals.

Description of the host laboratory

The Laboratory of Applied Mathematics of Compiègne (LMAC) at UTC conducts high-level research into deterministic and stochastic problems in applied mathematics. The research activities developed in LMAC are related to applications and to the development of effective tools for scientific computation. The aim of these activities is to ensure complementarity and coherence within partnerships involving other UTC laboratories and research groups from other institutions.

Profile of the candidate

- PhD in one of the following areas: Computational Biology, Bioinformatics, Biostatistics Applied Mathematics or any other related field
- Experience in mathematical modeling of biological systems and development of bioinformatics tools
- Proficiency in at least one data-analysis or scripting language (e.g. Python or R)
- Published articles in peer-reviewed scientific journals
- Ability to work independently but also as part of an interdisciplinary research team
- Excellent verbal and written communication skills (at least in English)

Details

- Full time one-year appointment with possibility of one-year extension
- Salary according to experience
- Starting date: from May/June 2023
- Location: Compiègne, 80 km far from Paris; easily accessible by public transport TER from Paris-Gare du Nord

How to apply

Interested applicants should submit the following documents to

miraine.davila-felipe@utc.fr, ghislaine.gayraud@utc.fr

- Cover letter, including your prior research experience and your motivation
- CV with publications
- Names and contact details of at least two references

Deadline: April 5th, 2023; applications will be evaluated on a rolling basis