2018-00505 - Development, characterization and control of E. coli communities on an automated experimental platform IBIS - PHD Campaign - Campagne Doctorants Grenoble Rhône-Alpes - IPL

Contract type: Public service fixed-term contract
Level of qualifications required: Graduate degree or equivalent
Fonction: PhD Position

About the research centre or Inria department

Inria, the French national institute for research in computer science and control, is dedicated to fundamental and applied research in information and communication science and technology (ICST). Inria has a workforce of 3,800 people working throughout its eight research centers established in seven regions of France.

Grenoble is the capital city of the French Alps. Combining the urban life-style of southern France with a unique mountain setting, it is ideally situated for outdoor activities. The Grenoble area is today an important centre of industry and science (second largest in France). Dedicated to an ambitious policy in the arts, the city is host to numerous cultural institutions. With 60,000 students (including 6,000 foreign students), Grenoble is the third largest student area in France.

Context

A PhD position funded by the Inria Project Lab CoSy (https://project.inria.fr/plcosy/) is open in project-team IBIS, which includes members of the Laboratoire Interdisciplinaire de Physique (LIPhy) of the University Grenoble-Alpes. The project includes data analysis and modelling tasks to be carried out at Inria, as well as experimental biology tasks carried out at LIPhy. Our interdisciplinary group, composed of biologists, computer scientists, mathematicians and physicists, studies bacteria, in particular Escherichia coli, at the level of the population and at the single-cell level. Our main focus is fundamental research, but we also aim at applications in biotechnology and synthetic biology.

Assignment

Different species in natural bacterial communities generally communicate in complicated ways. Here, we construct precisely defined bacterial communities consisting of engineered strains of E. coli. Using this synthetic system, we can analyze and control the interactions between different subpopulations. In particular, we engineer bacteria that communicate by metabolites that are released in the medium and control the temporal expression profile of particular genes in the two populations by optogenetics.

Main activities

The PhD project consists in constructing some of the strains, analyzing their behavior by measuring gene expression and growth parameters, and controlling their temporal dynamics using an advanced platform of mini-bioreactors coupled to a cytometer. By this setup, our aim is to achieve feedback control not only of mean behavior, but also of variability of growth and gene expression between and within subpopulations.

For more information:

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Keywords: Natural and synthetic control of bacterial populations; systems biology; control; synthetic biology; engineering
Skills
 Applicants may come from different disciplinary backgrounds - physics, biology, engineering, and computer science. We expect them to be strongly motivated by interdisciplinary research combining experimental work in the lab with modeling of biological systems and data analysis. Basic knowledge in microbiology is required and previous experience with some of the above-mentioned techniques would be appreciated. Good relational skills are important for the project, as it will be carried out in an interdisciplinary and international environment.

Benefits package
- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours
- Sports facilities

Remuneration

Monthly salary after taxes: around 1596,05€ for 1st and 2nd year. 1678,99€ for 3rd year. (medical insurance included).