M2 Master's Research internship:

High-throughput Estimation of Protein Expression costs

A Master's research internship (6 months) is available at the Micalis Institute (INRAE UMR1319), Jouy-en-Josas. The intern will participate in a project funded by the LivingMachines@Work interdisciplinary programme at the University of Paris-Saclay.

Project Summary

When synthetic genetic circuits are installed inside living cells, they result in increased cellular growth burden. This causes many circuits to break due to negative selection pressure, especially when the engineered cells are grown for prolonged periods of time. Understanding the growth burden of protein expression is essential for optimising synthetic circuits and metabolic pathways, as well as for predicting evolutionary dynamics of engineered biological systems. This project aims to build on a high-throughput method for measuring the expression burden of a library of protein-coding sequences. Our approach will combine a modular reporter system with pooled competition assays and next-generation sequencing. The expression levels and fitness data will be used to estimate the expression cost of each barcoded sequence variant. Ultimately, this work will provide a useful framework for studying how protein sequence variation impacts cellular fitness and resource allocation, helping inform the design choices for low-burden sequences for synthetic biology and metabolic engineering.

We are looking for a highly motivated candidate, with experience in experimental microbiology and / or molecular biology. Background in computational modelling/ bioinformatics will be an advantage. They should have strong communication skills and the willingness to work collaboratively with other members of the team.

The work will be carried out in the Cellular Computing team at Micalis Institute, in collaboration with the Synthetic Metabolism team (Alaksh Choudhury) at Genoscope (UMR 8030).

Start date: around 12 Jan 2026

Stipend: €4.35/hour (35 hours/week)

Application process: Please send a cover letter outlining why you are interested in this position, together with you CV and grades to Manish.Kushwaha@inrae.fr