INTERNSHIP PROGRAM FOR INTERNATIONAL STUDENTS

INTERNSHIP SUBJECT FORM

Name of the Host Laboratory	Laboratoire d'informatique de l'École polytechnique
Website of the Host Laboratory	https://www.lix.polytechnique.fr/
Research Group	MAX team (http://www.lix.polytechnique.fr/max/max-web/max/max-home.en.html)
Internship Supervisor	Gleb Pogudin
Internship Subject	Simplifying identifiable functions for ODE models
Student's level	☒ Advanced Undergraduate Students (3rd or 4th year) ☒ Master's students (1st or 2nd year) ☒ PhD students
Proposed Duration	☒ 3 months ☒ 4 months ☒ 5 months ☒ 6 months
Prerequisites	Programming (Julia or Python, Julia preferred), knowledge of algebra (a good grade for the linear algebra course; any experience with computational algebra and/or number theory will be a significant advantage)
Internship description (max. 15 lines)	Many processes in nature are modeled by ordinary differential equations with unknown parameters. The unknown parameters are usually estimated from experimental data. In some cases, due to the structure of the model, this estimation problem does not have a unique solution even in the case of continuous noise-free data. It is therefore desirable to check the uniqueness a priori before carrying out actual experiments. Recent algorithms allow to produce a list of functions in the parameters identifiable from the experiments but these functions are usually complicated. Thus, it is hard to analyze them and gain insights from them. The problem for the internship will be to develope algorithms aimed at simplifying this set of functions to make in interpretable and, if time permits, use the result to suggest a reparametrization of the original model. No knowledge of differential equations is required. The tools to be used will come from computational algebra/number theory: evaluation/interpolation, modular computation, Groebner bases.

The boxes marked with cross implies eligible