Conducting research for a changing society: This is what drives us at Forschungszentrum Jülich. As a member of the Helmholtz Association, we aim to tackle the grand societal challenges of our time and conduct research into the possibilities of a digitized society, a climate-friendly energy system, and a resource-efficient economy. Work together with around 7,500 employees in one of Europe's biggest research centres and help us to shape change!

As a leading research institution for microbial biotechnology the Institute of Bio- and Geosciences – Biotechnology (IBG-1) focuses on the development of biotechnological processes for the sustainable bio-based production of pharmaceutical and chemical products. We investigate how microorganisms and isolated enzymes can be used to produce a variety of products from renewable raw materials. IBG-1 is a leading institution in process development for industrial biotechnology with increasingly miniaturized and automated experiments. The institute provides an excellent infrastructure for parallelized lab robotic experiments on microtiter plates. Various analytical methods are available for online and at-line measurements. These are combined with advanced digital technologies for data analysis, modeling, experimental design and process optimization.

We are looking to recruit a

Master Thesis - Efficient Markov Chain Monte Carlo Techniques for Studying Large-scale Metabolic Models

Your Job:
Our Modeling and Simulation Group offers an interdisciplinary and agile research environment within a dynamic and diverse group. The project is an excellent example for research at the interface of computational systems biology and mathematics/statistics with a strong attitude to open research software development. For more information visit http://www.fz-juelich.de/ibg/ibg-1/modsim or http://github.com/modsim.

Quantifying the activity of enzymes operating within the large-scale biochemical network is a fundamental challenge in Systems Bio(tech)nology. Here, the unknown parameters must be inferred from models that are incomplete and data that involve errors. For such challenges, Bayesian analysis using Markov Chain Monte Carlo (MCMC) has become the gold standard.

The job will be advertised until the position has been successfully filled. You should therefore submit your application as soon as possible. We look forward to receiving your application via our **Online-Recruitment-System!**

Questions about the vacancy?
Get in touch with us by using **our contact form.**
Please note that for technical reasons we cannot accept applications via email.
www.fz-juelich.de

For addressing high dimensional parameter inference problems with Bayesian statistics, powerful MCMC methods have been proposed, for example the MCMC differential evolution and the Riemann Manifold Langevin Monte Carlo methods. Because of the specific structure of the inference problems occurring in metabolic models, direct application of these MCMC algorithms is, however, not possible.

In this project, you will bring MCMC methods into the setting of metabolic flux inference and, with inspiration from existing algorithms, develop tailored MCMC algorithms. You will implement the ensuing algorithms in an existing C++ framework, validate and benchmark them with a realistic case study.

The main focus of the project can develop either more in the mathematical theory of MCMC, the implementation of code for the Jülich supercomputers (GPU/CPU), or being combined with a practical modeling project.

Your Profile:

- You are highly motivated, with an interest in probability theory, mathematics, and data science.
- Very good practical C++ and Python programming skills allow you to make your ideas happen.
- You have strong interest in curiosity-driven multidisciplinary research.

Our Offer:

We work on the very latest issues that impact our society and are offering you the chance to actively help in shaping the change!

We support you in your work with:

- An interesting and socially relevant topic for your thesis with future-oriented topics
- Ideal conditions for gaining practical experience alongside your Master studies
- An interdisciplinary collaboration on projects in an international, committed and collegial team
- Excellent technical equipment and the newest technology
- Qualified supervision and support
- The chance to independently prepare and work on your tasks
- Flexible working hours as well as working location

In addition to exciting tasks and a collaborative working atmosphere at Jülich, we have a lot more to offer: https://go.fzj.de/benefits

We welcome applications from people with diverse backgrounds, e.g. in terms of age, gender, disability, sexual orientation / identity, and social, ethnic and religious origin. A diverse and inclusive working environment with equal opportunities in which everyone can realize their potential is important to us.