Bachelor/Master thesis bioinformatics

Who are we?

We are the Immuno-Metabolism Group, led by Prof. Karsten Hiller, based at the Braunschweig Integrated Centre of Systemsbiology (BRICS). Our research focuses on uncovering the links between cellular and mitochondrial metabolism in immune cells under conditions such as bacterial infections, cancer, metabolic disorders, and neurodegenerative disorders. By integrating computational modeling and high-dimensional data analysis, we provide system-level insights into metabolic processes.

Project background

Bioinformatics is a dynamic field that offers a wide range of project opportunities, allowing for purely computational work or a combination of lab and computer-based approaches. One exciting avenue is the meta-analysis of our extensive GC-MS dataset, consisting of over 100,000 measurements. Depending on your interests, projects can be tailored to explore areas such as building databases to link historical and new data (SQL), identifying shared metabolic patterns across organisms, or developing algorithms to enhance data calibration methods. Another option involves working with our IMPACT algorithm, which identifies unknown metabolites by analyzing stable-isotope labeling pattern similarities. Students could improve the annotation workflow or extend the algorithm with features like mass difference analysis, testing these with their own stable-isotope experiments.

Thesis Content

This thesis will focus on advancing bioinformatics applications in metabolomics, leveraging computational approaches to analyze large-scale datasets and improve data processing workflows.

Methodology

- Data analysis of extensive GC-MS datasets to extract meaningful patterns.
- Database design and implementation (e.g., SQL) for organizing and linking metabolite data.
- Algorithm development to improve metabolite annotation, calibration, or pattern recognition (e.g., Python).
- Experimental validation through stable-isotope labeling to test algorithm improvements.

This project provides flexibility to focus on computational tasks or incorporate experimental validation, depending on your interests and skills.

Interested?

Students with a keen interest in bioinformatics and metabolomics are encouraged to apply.

Beginner-level programming skills in Python are required. Please note that we are only accepting new students starting in January 2026.

Contact:

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