Prof. Dr. Christian L. Müller
Ludwig-Maximilians-Universität München
Institut für Statistik
Ludwigstr. 33
80539 München
christian.mueller@stat.uni-muenchen.de

M.Sc. Thesis Proposal: *Prediction of sRNA regulatory targets in Campylobacter jejuni*

Objective: The purpose of this M.Sc. thesis is to predict the regulatory targets of short RNA (sRNA) molecules in the bacterial pathogen *Campylobacter jejuni* and assess their biological relevance. To achieve this task, the student will have the freedom to apply previously developed methods such as the Inferelator (https://msystems.asm.org/content/5/3/e00057-20) or develop their own method using more modern approaches. In both cases, prior biological knowledge, such as DNA sequence, should assist the prediction task.

We will use a combination of publicly available gene expression datasets, and datasets generated by experimental collaborators. Once the regulatory targets have been predicted, the student can determine their biological function by using pathway enrichment analysis.

Plan and deliverables: At the moment, there are few known regulatory interactions of *C. jejuni* sRNAs. Furthermore, the biological pathways in which they participate is also unclear. Therefore, the student will produce a set of predicted regulatory relationships, aided by DNA sequence complementarity information. This will likely require the development of a reproducible pipeline, that can easily be used by others and can incorporate new data. A successful outcome of the M.Sc. could be the following result: "sRNA-X is predicted to regulate a set of genes that are required for the virulent behavior of *C. jejuni*". A write-up in thesis form and commented code on GitHub are mandatory deliverables at the end of the thesis.

During this project, the student will have the opportunity to analyze, high-throughput biological experiments, thereby expanding their bioinformatic skills. At the same time, support will be given on code management and pipeline development. This project also provides the opportunity to collaborate directly with experimental collaborators.