

Topic: Machine Learning for Systems Biology: Molecular Profiling of IBD Patients for Prediction and Monitoring of Response to Targeted Therapies

Inflammatory bowel diseases (IBD) are complex, immune-driven chronic diseases that can lead to lifelong morbidity. The introduction of targeted immunotherapies have made a major impact on the treatment of IBD patients, as it improved outcomes and altered the natural history of disease. However, only a subset of patients benefits from initiated therapy with consequent progression of disease in non-responders. There is therefore the unmet need to identify markers or diagnostic tests for prediction and monitoring of response to therapy. Within this project, supervised and unsupervised machine learning and systems biology approaches will utilize deep molecular phenotyping of patient profiles to identify and validate molecular signatures for prediction and assessment of treatment response. Clinical implementation of this approach would allow personalized medicine in individual IBD patients with higher response rates and lower levels of toxicity [1]. The thesis must contain a detailed description of all developed and used algorithms as well as a profound result evaluation and discussion. The implemented code has to be documented and provided. An extended research on literature, existing patents and related work in the corresponding areas has to be performed.

Advisors: Prof. Dr. Bjoern Eskofier
Prof. Dr. med. Raja Atreya
Start Date: now / as soon as possible

References

- [1] Schmitt, Heike, et al.: *Expansion of IL-23 receptor bearing TNFR2+ T cells is associated with molecular resistance to anti-TNF therapy in Crohn's disease*. *Gut* 68.5 (2019): 814-828.