MLDM-EL1: Machine Learning and Biomarker Signatures

Person in charge and Representative	Hiller and O'Connor
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Semester	1-2
Topic cluster	Biomedical data science OR Machine Learning and Data Mining
Duration/Credit	48h incl. homework
Time	Winter semester, Mondays, depending on topic either 5pm-6:30pm or 5pm-8pm
Place	BRICS building, TU Braunschweig Must be present for experimental part
Prerequisite for the lecture/course	Please fill in
Aim of the lecture/course	After completion of the module, participants have the ability to • Perform metabolome analyses of human saliva and blood samples by mass spectrometry • Analyze the raw data with the help of bioinformatics to determine quantitative and semi-quantitative metabolite concentrations • Identify biomarker signatures by application of machine learning algorithms (logistic regression, neuronal networks) • Quantify selected biomarkers with high precision and reproducibility • Apply basic concepts of metrology and standardization • Understand the relevance of standardization for experimental design and performance Integrated Seminar and Experimental course: Seminar: Introduction into MS-driven metabolome analysis, Understanding the selection of suitable mass units to ensure reproducible measurements, understanding the relevance of measurement traceability and uncertainty for data interpretation. Introduction to algorithms for statistical biomarker prediction, correction for multiple testing, basics of logistic regression, data normalization. Understanding the relevance of quality controls for data backup and safety. Experimental course: Isolation of metabolites from saliva and/or blood followed by analysis via mass spectrometry. The method will be optimized for specific metabolites and quantification of these performed via isotope dilution. Acquisition of different methods for optimization of sample withdrawal and sample processing as well as data analysis. Determination of biomarker signatures, e.g. based on saliva samples to distinguish whether donor was male or female.