Workshop in Omics Integration and Systems Biology

5 - 9 October 2020 Lund







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Individual presentations



What is multi-omics integration?



Themes

- Machine learning methods in integration
- Biological network analysis
- Genome-scale metabolic modeling
- Visualization



Overview: Machine learning in integrative omics

Advantages and pitfalls in integration

- Why should we do integrative omics
- Horizontal vs vertical integration
- Big data and curse of dimensionality

Supervised omics integration

- Classification
- Feature projection in latent space (e.g. PLS-DA)

Unsupervised omics integration

- Clustering and Dimensionality reduction (e.g. PCA)
- Feature projection on latent space (e.g. MOFA)
- NMF and Recommender systems



Overview: Machine learning in integrative omics

Deep Learning

- Neural Networks
- Autoencoders

Integration in single-cell

- UMAP and graph abstractions
- CCA (Seurat)



Overview: Network Analysis

Biological Network topology

- Network inference and properties
- Centrality and community analysis
- Visualization with Cytoscape

Similarity network fusion



Overview: Genome-scale metabolic modeling

Modeling

- Flux balance analysis, biological objective functions
- Simulation with GRN as scaffolds
- Metabolism-driven integration

Metabolism-associated omics analysis

- GSEA from GSMM
- Reporter metabolite analysis
- Visualization with Metabolic Atlas



Overview: Visualization

Network visualisation with Cytoscape

Visualization for integrative omics

- Circos and circular visualization
- Hive plots



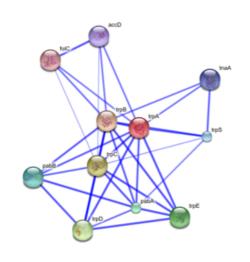
Invited talks

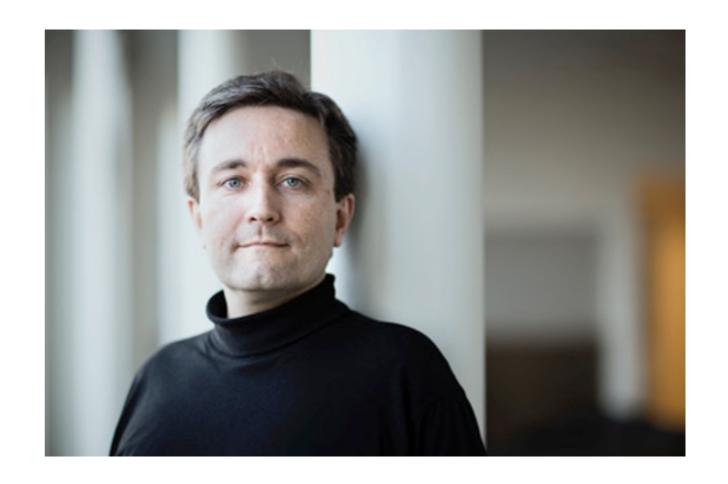


Prof. Lars Juhl Jensen, Novo Nordisk Foundation, Univ. Copenhagen

"Network-based omics integration, analysis, and visualization"









Mihail Anton, Ph.D., NBIS, Chalmers Univ. of Technology

"Metabolic Atlas"

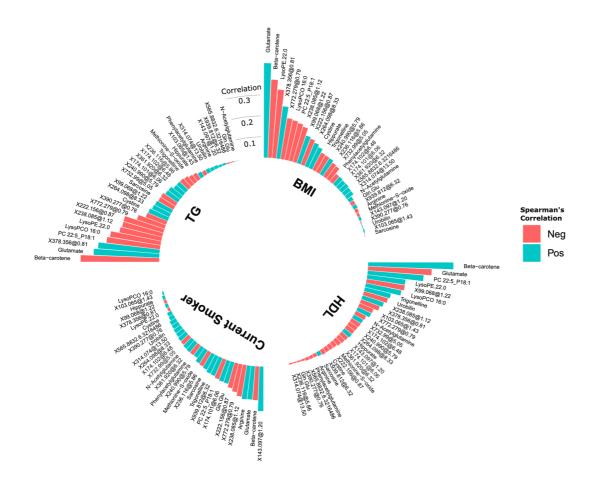
METABOLIC ATLAS THE ATLAS FOR EXPLORATION OF METABOLISM





Prof. Marju Orho-Melander, Dpt. Clinical Sciences, Lund Univ.

"Omics interplay for cardiometabolic disease"

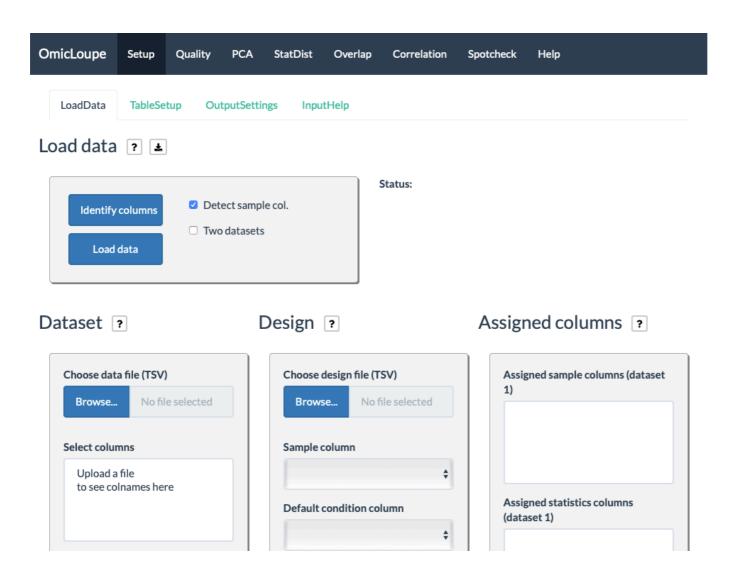






Jakob Willforss, Dpt. Immunotechnology, Lund Univ.

"Rapid, interactive visualization of tabular multi-omics data using OmicLoupe"







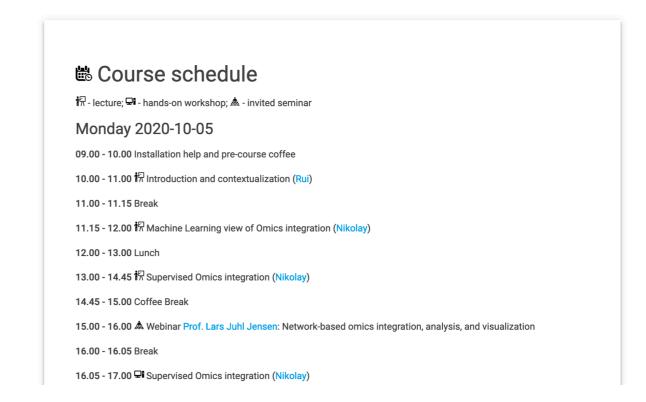
Resources

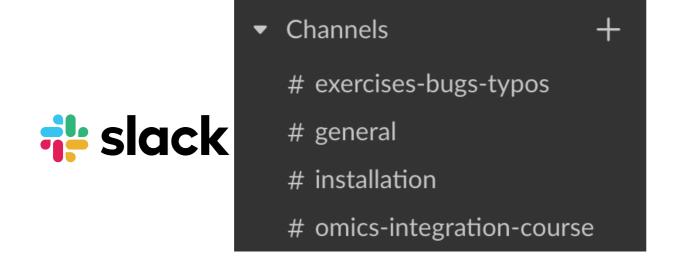
NBS Overview Schedule Syllabus Labs Reading materials Pre-course Location Contra

Slides and scripts: Schedule

Specific instructions: Labs

Workshops: conda env





Bugs

General questions

Installation issues



Logistics

Fikas

Lunch

Mask usage

Attendance sheets

Feedback (short and long)

