

ACB 1 Syllabus

DAY 1-1: 1 PM - 3 PM, Thu April 2, 2020

Lecturer: Fritz Roth (confirmed)

Intro, Probability/Statistics + Sequence Analysis 1

- Course overview
- Historical perspective on computational molecular genetics
- Lecture: Basic probability & statistics (Bayesian and frequentist)
- Lecture: Sequence similarity, Dynamic programming, Smith-Waterman sequence alignment
- TA schedules office hours / finds a room

ASSIGNMENT #1.1 MADE AVAILABLE

DAY 1-2: 1 PM - 3 PM, Thu April 9, 2020

Lecturer: Gary Bader (confirmed)

Networks, Pathways and Function I

- Lecture: Gene ontologies, gene function analysis, pathway enrichment analysis, network visualization and analysis, interaction networks
- Paper discussion:

Pathway enrichment analysis and visualization of omics data using g:Profiler, GSEA, Cytoscape and Enrichment Map

Jüri Reimand, Ruth Isserlin, Veronique Voisin, Mike Kucera, Christian Tannus-Lopes, Asha Rostamianfar, Lina Wadi, Mona Meyer, Jeff Wong, Changjiang Xu, Daniele Merico & Gary D. Bader

Nature Protocols (2019)

<https://www.nature.com/articles/s41596-018-0103-9>

DAY 1.3: 1 PM - 3 PM, Thu April 16, 2020

Lecturer: Fritz Roth (confirmed)

Sequence Analysis 2 + Clustering

- Lecture: Substitution matrices, BLAST
- Lecture: Clustering -- K-means, Hierarchical agglomerative clustering, EM-Gaussian mixture models
- Paper discussion:

Distinct types of diffuse large B-cell lymphoma identified by gene expression profiling

Alizadeh *et al.* *Nature* 403: 503-511 (2000)

<http://www.nature.com/nature/journal/v403/n6769/full/403503a0.html>

ASSIGNMENT #1.1 DUE

ASSIGNMENT #1.2 MADE AVAILABLE

DAY 1.4: 1 PM - 3 PM, Thu April 23, 2020

Lecturer Zhaolei Zhang (confirmed)

Sequence Analysis 3: Phylogenetics and Comparative Genomics

- Lecture: Phylogenetics, Tree inference (+ UPGMA), ancestral sequence inference
- Lecture: Conserved sequence elements, PHASTCONS, PHYLOP
- Paper discussion:

Analysis of protein-coding genetic variation in 60,706 humans

M Lek, KJ Karczewski,, D MacArthur, Exome Aggregation Consortium

Nature 2016

<https://www.nature.com/articles/nature19057>

DAY 1.5: 1 PM - 3 PM, Thu April 30, 2020

Lecturer: Philip Awadalla (confirmed)

Statistical Genetics

- Lecture: association studies for common and rare variation
- Paper:

Gene-by-environment interactions in urban populations modulate risk phenotypes

M-J Favé, FC Lamaze, D Soave, A Hodgkinson, H Gauvin, V Bruat, J-C Grenier, E Gbeha, K Skead, A Smargiassi, M Johnson, Y Idaghdour & P Awadalla. Nature Communications (in press 2018).

ASSIGNMENT #1.2 DUE

DAY 1.6: 1 - 3 PM, Fri May 1, 2020 Black Room [note the time and day difference to accommodate Donnelly retreat]

Lecturer: Hannes Rost (confirmed)

Proteomics

- Lecture: Protein mass spectrometry and analysis
- Paper: High-throughput phosphoproteomics reveals in vivo insulin signaling dynamics
Sean J Humphrey, S Babak Azimifar & Matthias Mann
Nature Biotechnology (2015)