Machine Learning and Bioinformatics: Biomedical Data Science - 2016

University of Eastern Finland will arrange a summer school/seminar on machine learning and bioinformatics on August 2016. This course will cover current topics related to bioinformatics challenges and machine learning applications in biomedicine. The topics include accessing and analyzing different types of data, including –omics technologies and imaging data. The course consists of lectures and small hands-on computer exercises given by international experts. This course is applicable to undergraduate and post-graduate students with biomedical or computational background.

Dates: August 8-19th, 2016

Venue: University of Eastern Finland, Kuopio, Finland, www.uef.fi

Teaching language: English

Credits: 2/5 ECTS

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General information: For general information related to registration, travel and other practical arrangements, contact Jussi Keinänen (jussi.keinanen@uef.fi).

Preliminary Scientific Program

Mon 8.8. **Lecture session 1: Basics in nutshell**

9.15-10.00 Merja Heinäniemi, Institute of Biomedicine, Molecular biology in nutshell & biomedical data

10.15-11.00 Ville Hautamäki, Speech and Image Processing Unit, Machine learning in a nutshell & statistical approaches

Hands-on session 1: Biological data and working with data

13.15-15 Measurement technologies and data resources in biomedicine

15.15-16 **Group A:** Basics of programming and using command-line programs – how does the computer see my data (for biologists)

Group B: Biological experiments – what steps are behind the data matrices (for computer scientists)

Tue 9.8. **Lecture session 2: State-of-the-art and ongoing research: Biomedicine**

Topic I Single cell genomics

9.15-10.00 Sui Huang, Prof., Institute for Systems Biology, USA. Single-Cell Gene Expression Profiling and Cell State Dynamics

10.15-11.00 Peter Kharchenko, HSCI Affiliated Faculty member, Harvard Medical School, Boston USA. Linking transcriptional and genetic heterogeneity in human cancers with single-cell analysis

11.15-12.00 Project presentations (3 x 10 mins) from researchers

Topic II Data integration and cancer genomics

13.15-14.00 Ilya Shmulevich, Prof. Computational Biology, Institute for Systems Biology, USA. The Cancer Genome Atlas (TCGA) multilevel data and cloud computing

14.15-15.00 Sampsa Hautaniemi, Prof. Systems Biology, Helsinki University. Data integration applications in biomedicine

Topic III Biomedical data science in the field of Neuroscience

15.30-16.00 Dr. Thanneer Parumal SAGE Bionetworks, Seattle, WA, USA. Open science and patient engagement

16.00-16.30 Dr. Neil Dawson, Lancaster University, UK, The application of graph theory in studying brain network connectivity

16.30-17.00 Dr. Jo Knight, Lancaster University, UK, Genome-wide association studies (GWAS) in a nutshell

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Wed 10.8. **Lecture session 3: State-of-the-art and ongoing research: Machine learning**

Topic IV Representing data for human interpretation & biology to a machine

9.00-9.45 Samuel Kaski, Prof. Computer Science, Aalto University. Dimensionality reduction and visualization in bioinformatics

10.00-10.45 Bartek Wilczyński, Assistant Prof., Institute of Informatics, University of Warsaw. Poland Regulatory sequence analysis.

11.00-12.30 Dr. Juha Kesseli, Modelling features of interest in genome-wide signal data

14.00-14.30 Project presentations (2 x 10 mins) from researchers

Topic V Computational Psychiatry

15.00-15.30 Dr. Diana Prata, IMM Lisboa, Portugal, Neuroimaging genetics: insights for psychiatric research

15.45-16.15 Dr. Tiago Maia, IMM Lisboa, Portugal, Computational Psychiatry

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Thu 11.8. **Hands-on session 2**

9.00-12 Getting familiar with analysis of genome-wide data – User-friendly Galaxy interface and Genome Browsers

13.15-16 **Group A:** Machine learning: Genomic dimensionality reduction and visualization

Group B: Computational models applied to behavioral and brain imaging data

Fri 12.8.	**Hands-on session 3**
9.00-12	**Group A:** TCGA data analyzed on the cloud
	Group B: Neuroimaging Genetics
13.15-16	Machine learning: Inferences in sequential data

Organization team: Merja Heinäniemi, Ville Hautamäki, Petri Pölönen, Jussi Paananen, Jussi Keinänen, Mikko Hiltunen, Asla Pitkänen

Responsible departments: Institute of Biomedicine, School of Computing

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