Cancer, Stem cells & Developmental biology

The Master's & The PhD Programme

Analytics and Algorithms for Omics Data

June 18-22, 2018

Bioinformatics is at the heart of many modern genomics research, and encompasses the application of statistics and computer science to (large-scale) biomolecular datasets. In essence, bioinformatics is about smart ways of extracting knowledge from the enormous amounts of data that can be generated using modern measurement techniques. For instance, it plays an important role in finding the genetic origins of various diseases, such as cancer, diabetes or alzheimer.

In this course we will study some key examples of bioinformatics analyses, i.e. data analytics and computational algorithms, by reading a set of selected papers that present some significant biological conclusions. Instead of the teachers giving lectures about the methodologies, the students are stimulated to read, study and comprehend the available course material. Some lectures will be provided to ensure the basic concepts are clear.
Please note: This is an advanced course for students with a background in bioinformatics and computational biology. A working knowledge of statistics and mathematics (in particular linear algebra) is assumed

Schedule: The course runs for five days from 9.00 till approximately 17.00. Each day will start with a lecture followed by two rounds of paper discussions that goes into depth with regards to the computational approaches taken.

Content:

- Unsupervised learning, Hierarchical and k-means clustering, spectral clustering
- Supervised learning, cross-validation, overtraining, Bayes classifier, Random Forest classifier
- Dimension reduction, PCA, NMF, tSNE
- Hidden Markov Models, Forward Backward algorithm, Viterbi
- Sequence alignment, Dynamic programming
- Read mapping techniques
- Sequence data indexes, such as Burrows-Wheeler Transform
- Genome assembly basics, de Bruijn graphs, overlap graphs
- Hash-based techniques, for example for overlap detection

Literature/study material used:
Provided course materials (slides) will be made available through our online learning platform: elearning.ubc.uu.nl

Registration:
Please register online on the CS&D website: www.CSnD.nl/courses.
A direct link to the registration form can be found here.
Bioinformatics Profile students will have priority when this course is followed as a part of their profile.
Thereafter, registration is on 'first-come-first-serve' basis until the maximum number of 15 participants is reached.

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