Speaker: Jüri Lember

Institute: Tartu University, Estonia

Title: "Segmenataion with Hidden Markov Models"

Abstract: We consider a unified approach to the segmentation/decoding problem based on the Baysian decision theory. Our focus is on using Hidden Markov Models, where this approach allows us to re-examine various properties of some of the well-known decoders as well as develop a new class of path inference methods. Asymptotic properties of several of such segmentation methods will also be discussed.

Speaker: Christopher Yau

Institute: Imperial College London

Title: "Decision theoretic approaches to segmentation problems in genomics using Hidden Markov Models"

Abstract: Signal segmentation is a fundamental ingredient in many bioinformatics analyses. Hidden Markov Model (HMM) based approaches are a popular statistical model for these problems due to their simplicity and computational tractability. In this talk, I will discuss some applications of HMMs in cancer genomics and the application of Bayesian decision theoretic ideas to obtain flexible summary statistics.

Speaker: Wicher Bergsma

Institute: LSE

Title: "Nonparametric testing of conditional independence"

Abstract: Random variables Y and Z are conditionally independent given X if, knowing the value of X, information about Y does not provide information about Z. Conditional independence relations are the building blocks of graphical models, applications of which include information extraction, speech recognition, computer vision, decoding of low-density parity-check codes, modelling of gene regulatory networks, gene finding and diagnosis of diseases, and graphical models for protein structure. The present talk discusses a new method to test conditional independence. Existing literature on the topic is usually restricted to the normal and categorical cases, but recently nonparametric testing has also received a fair amount of attention. Our method is also nonparametric, but differs from previous ones in that it is based on the following decomposition, which gives some advantages: Denote by $\Psi_{g,h}(x)$ the conditional covariance between $g(Y)$ and $h(Z)$ given $X=x$. Conditional independence of Y and Z given X holds if and only if the following two conditions hold: 1) For arbitrary g and h, $E[\Psi_{g,h}(X)]=0$ 2) For arbitrary g and h, $\Psi_{g,h}(x)$ does not depend on x. Each condition can be tested separately. However, there are some technical difficulties which we explain and for which we provide a solution.