Applied Statistics and Probability Theory Colloquium, 4th April, 2013, Mathematics Department

Getting here   Bourne Laboratories – building 31 on the campus map

Time	Event	Venue
11:00-11:15	Welcoming tea and coffee	BLT2
11:15-12:15	*Segmenataion with Hidden Markov Models.* Dr Jüri Lember, Institute of Mathematical Statistics, Tartu University (Estonia)	BLT2
12:30-1:30	Lunch break (lunch provided free of charge for the invited speakers only, but everyone is welcome to join the group)	SCR (Founders building)
2:00-3:00	*Decision theoretic approaches to segmentation problems in genomics using Hidden Markov Models.* Dr Christopher Yau, Department of Mathematics, Imperial College London	BLT2
3:00-3:30	Discussion over tea and coffee	BLT2
3:30-4:30	Nonparametric testing of conditional independence. Dr Wicher Bergsma, Department of Statistics, LSE	BLT2
4:30-5:00	Closing discussions	BLT2

Abstracts of the invited talks:

1. *Segmenataion with Hidden Markov Models.* Dr Jüri Lember, Institute of Mathematical Statistics, Tartu University (Estonia).
   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.

2. *Decision theoretic approaches to segmentation problems in genomics using Hidden Markov Models.* Dr Christopher Yau, Department of Mathematics, Imperial College London
   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.

3. *Nonparametric testing of conditional independence.* Dr Wicher Bergsma, Department of Statistics, LSE
   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, modeling 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.

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