Speaker: Boris Mitavskiy
Institute: Aberystwyth University
Title: "A Version of Geiringer-like Theorem for Decision Making in the Environments with Randomness and Incomplete Information"

Abstract: In recent years Monte-Carlo sampling methods, such as Monte Carlo tree search, have achieved tremendous success in model free reinforcement learning. A combination of the so called upper confidence bounds policy to preserve the "exploration vs. exploitation" balance to select actions for sample evaluations together with massive computing power to store and to update dynamically a rather large pre-evaluated game tree lead to the development of software that has beaten the top human player in the game of Go on a 9 by 9 board. Much effort in the current research is devoted to widening the range of applicability of the Monte-Carlo sampling methodology to partially observable Markov decision processes with non-immediate payoffs. The main challenge introduced by randomness and incomplete information is to deal with the action evaluation at the chance nodes due to drastic differences in the possible payoffs the same action could lead to not mentioning the exponentially exploding number of possibilities as the height of the game tree increases. In this talk I will present a novel and particularly general version of a Geiringer-like theorem (this kind of theorems originated from population genetics and have later been adopted in evolutionary computation theory to estimate heuristically the bias of recombination operators) that leads to the development of novel Monte Carlo sampling algorithms. This kind of algorithms exploit a similarity relation on the states (or observations an agent can make) to estimate the expected payoffs with respect to an exponentially larger sample of rollouts (random game plays) than the one simulated up to a certain time, with relatively little additional computational cost, thereby provably boosting the AI potential.

Speaker: Diwei Zhou

Institute: Uni. of Wolverhampton

Title: "Weighted Procrustes Analysis for Diffusion Tensor Imaging"

Abstract: There has been a substantial interest in the development of methods for processing diffusion tensor fields, taking into account the non-Euclidean nature of the tensor space. We recently applied the weighted Procrustes analysis to diffusion tensor smoothing, interpolation, regularisation and segmentation, in which an arbitrary number of tensors can be processed efficiently with the additional flexibility of controlling their individual contributions. A weighted regularisation model with the Procrustes size-and shape metric has been proposed which incorporates the smoothness of the neighbourhood and the regularisation with the diffusion behaviour of interest. Our methods and a study of Procrustes anisotropy measure are illustrated on both synthetic and real diffusion tensor data.

Speaker: Yuri Kalnishkan
Institute: Royal Holloway
Title: "An Identity for Kernel Ridge Regression"

Abstract: Ridge regression is a popular machine learning technique with widespread applications. In the talk I will discuss ridge regression in the contexts of functional analysis (reproducing kernel Hilbert spaces) and the theory of random fields (Gaussian covariances) and derive an identity linking the quadratic losses of kernel ridge regression in batch and on-line frameworks. Some corollaries of the identity providing upper bounds on the cumulative loss of on-line ridge regression will also be discussed. An alternative proof of the identity motivated by the aggregating algorithm will be presented.

Speaker: Farida Enikeeva
Institute: Queen's University, Canada
Title: “On two estimates related to the change-point problem”

Abstract: In some problems of nonparametric adaptive estimation the optimal (for a given functional class) rates of convergence cannot be achieved. One of these problems is adaptive estimation of a linear functional of the signal. In order to understand the arising difficulties we consider a simplest problem of estimating a linear functional of an unknown signal from Gaussian observations with the change in mean. This problem is closely related to the famous change-point problem. We obtain Bayesian and maximum likelihood estimates of the simplest linear functional and study their properties. The relation to adaptive estimation is discussed. Some simulation results and conclusions on non-asymptotic behaviour of these estimates are presented.