**Systems & Control Seminar**

**4th March Wednesday: 13.00-14.00, Room: C164**

**Speaker: Professor Basil Kouvaritakis**

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**Systems & Control:***“* Classical, Robust and Stochastic MPC: an overview”

**Abstract:**In this seminar I will indulge myself by presenting some of the interesting results derived by my predictive control group in Oxford over the last twenty years or so although, where appropriate, the work of other groups will also be described. I will begin by presenting the main results of classical MPC by way of introducing the key concepts, namely invariance, control invariance, feasibility and recursive feasibility, monotonically non-increasing property of predicted cost and convergence. Special mention will be given to the lifted autonomous prediction dynamics and the optimized controller dynamics.

These ideas will be extended to robust MPC for the case of systems that are subject to additive and multiplicative uncertainty. For the former, open loop (over predicted input trajectories) and closed loop (over control strategies) optimization techniques will be discussed. Both the nominal and worst case predicted cost will be considered and the use of tubes in MPC will be described. For multiplicative uncertainty use will be made of tubes again and will be based on one-step-ahead inclusion conditions through the use of either low complexity polytopes or through the use of Farkas lemma.

When uncertainty has known probability distributions and some or all of the constraints are probabilistic in nature, one has to use Stochastic MPC. I will consider distributions with finite support rather than Gaussian distributions which preclude the statement of feasibility (and hence stability) results and do not ever appear in real life applications. Some of the more recent work will be mentioned but only briefly in the hope that those interested can follow this up more closely by reading the relevant literature.