



IMSc Diamond Jubilee Distinguished Lecture

What is Control Theory in 2021?

Can AI do Better?

Until the twentieth century it was assumed that knowledge means control. Automatic control came in the sixties for electronics with Bellman's dynamic programming and Kalman's filter and received a boost in the eighties with robust and H^∞ control. Will artificial intelligence algorithms change the practice of control drastically? Parallel Optimal Control, which dates from the calculus of variations of Hadamard and the Pontryagin principle, is a more functional approach to the optimization of systems. It is heavily used for the design of mechanical devices like airplanes (optimal shape design) and the topological optimisation of materials. Stochastic control remained up to now a mathematical field except for the rare semi-analytical solutions as in the case of linear quadratic control. It is now computationally feasible and its applications to finance for instance, though challenged by deep neural networks, are in daily use for risk assessment of bank's portfolios. Finally, perhaps the most mathematically demanding is the mean-field type control and its application to the Monge-Ampere problem. As this is a colloquium talk, the problems and the main results will be stated only, without assuming any prior knowledge of these sometimes difficult fields. Yet the talk is for a mathematically trained audience.



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Ramanujan Auditorium

The Institute of Mathematical Sciences, Chennai