



# Hamilton Institute

## **The Changing Face of Adaptive Control:**

### **The Use of Multiple Models**

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**Abstract:** The term “adaptation” is defined in biology as “advantageous conformation of an organism to changes in its environment.” Inspired by this definition the term “adaptive system” was introduced in engineering to represent systems that monitor their own performance, and attempt to improve it by adjusting their parameters. The past fifty years have witnessed major advances in the analysis and design of adaptive systems operating in time-invariant environments. In the past decade, a new face of adaptive systems has begun to emerge. As in the past, this is being fueled by the demands of a rapidly growing technology, advances in computation, and new theoretical developments. Rapidly varying environments arise in medicine, and neuroscience. In vision, the contrast of the image may vary rapidly in the visual field. In the control of autonomous vehicles, the environment changes constantly as the vehicle moves into new regions. Rapid changes of opinions occur in political systems and rapid price adjustments in financial markets. In all these cases classical adaptation based on time-invariant models is found to be inadequate. It is becoming increasingly clear that the sterile metaphor of a time-invariant environment needs to be replaced by a dynamic and constantly changing one.

The central thesis of this lecture is that the use of multiple models for the identification of the process to be controlled is an efficient way of dealing with adaptation in a time-varying environment, and will provide a convenient mathematical framework for dealing with such problems. The lecture will discuss progress in the field in the past five years, important theoretical questions that have arisen, and applications of the theory to problems in engineering and economics.

**Venue:** Seminar Room, Hamilton Institute, Rye Hall, NUI Maynooth

**Time:** 10.30am - 11.30am

Travel directions are available at [www.hamilton.ie](http://www.hamilton.ie)