



M.Sc. or Ph.D. Research topic:

## Forecasting

Forecasting is the quantitative model-based prediction of future properties of a system based on historical data.

**Conventional forecasting:** When the laws governing the evolution of the system are known, then forecasting becomes the problem of using data to calibrate the equations which express those laws. That is, in this case forecasting is basically an estimation problem. The difficulty which the forecaster faces arises from noisy or incomplete data.

**In this research we are concerned with a more difficult problem,** namely, with systems for which at least some of the laws are unknown or subject to change. In this situation the forecast must deal both with noisy and incomplete data, and with incomplete understanding of the rules governing the future evolution of the system.

Forecasting in this latter and more complex sense arises in many areas, including:

- In control of technological systems we wish to forecast the future state of the system when environmental or human agents act on the system in ways we do not know.
- In macro-economics we wish to forecast the values of variables such as inflation, unemployment, productivity, etc., where the economy is evolving in ways that we do not entirely understand.
- In medical diagnostics we wish to forecast the outcome of medical interventions based on data from clinical trials. However, the interventions are often made on patients who differ from the trial populations. In fact, patients of interest often would not have been accepted to the clinical trial due to various pathologies.
- In biological conservation we wish to forecast the impact of plant and animal populations of various policies or actions. However, the understanding of the eco-system is faulty and incomplete, despite extensive data and models.

The proposed research topic involves the application of info-gap decision theory, together with statistical tools, to develop and apply forecasting algorithms and to study their analytical properties. Interested students are invited to contact me by phone or e-mail.