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A Four-Day Workshop on  
**Info-Gap Theory and Its Applications in Design and Strategic Planning**

Department of Mathematical Sciences, Durham University, Durham, U.K.

### Course Rationale

Decisions under uncertainty arise in many disciplines, including engineering, economics, public policy, medicine, biological conservation, homeland security and so on. In these disciplines one uses data and models to formulate and evaluate designs and plans.

*Info-gap theory* is a method for analysis, planning, decision and design under uncertainty. The future may differ from the past, so our models may err in ways we cannot know. Our data may lack evidence about surprises: catastrophes or windfalls. Our scientific and technical understanding may be incomplete. These are info-gaps: incomplete understanding of the system being managed. Info-gap theory provides decision-support tools for modelling and managing severe uncertainty. Info-gap theory has been applied by scholars around the world to engineering, biological conservation, financial and monetary economics, project management, medicine and homeland security, and more.

This workshop is devoted to learning the methodology of info-gap analysis and its integration with other decision tools.

### Course Structure

This course has three components. *Lectures* present new material and *exercises* allow the participants to master this material. The first two days are devoted to lectures and exercises. The last two days are devoted to *mini-projects* which are formulated and implemented by the participants, in small groups. This facilitates the thorough internalization of the concepts and methods learned, their integration with other methods familiar to the participants, and their application to problems of interest.

### Lecture Topics

In the lectures we will consider the following topics.

*The art of uncertainty modelling.* Quantitative models and data, as well as conceptual understanding, are important in formulating decisions. Often the uncertainties surrounding these entities are subtle and require careful modelling in themselves. Info-gap models of uncertainty are useful for representing severe uncertainty. Combination of info-gap and probabilistic models is discussed.

*Preference reversal under competition.* Numerous paradoxes of decision under uncertainty—Ellsberg, Allais, and others—entail reversal of preferences between options. We explain how info-gap robust-satisficing provides an explanation.

*Relation between robust-satisficing and min-max.* These strategies are interchangeable as tools for *describing observed behavior* of an agent. However, they can lead to very different choices when used by an agent to *select an action*, depending on the agent's beliefs. We explain the *observational equivalence* and *behavioral difference* between these decision strategies.

*Robustness and the probability of survival.* Evidence suggests that agents in uncertain competition do not always try to optimize, but rather try to *satisfice* their outcomes. We discuss conditions for sub-optimal robust-satisficing being equivalent to maximizing the probability of survival.

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*Opportuneness: The other side of uncertainty.* Uncertainty can be either *pernicious* (threatening failure), or *propitious* (offering windfall). We discuss the relation between info-gap robust-satisficing and opportune-windfalling, and show how these strategies can be combined in decision making.

### The Instructor

Professor Yakov Ben-Haim has lectured at universities, medical and technological research institutions and central banks throughout the world and has been a visiting scholar in more than 10 different countries. He has developed info-gap theory and has published 4 books (the 5th will appear shortly) and more than 80 articles. He holds the Yitzhak Moda'i Chair in Technology and Economics at the Technion—Israel Institute of Technology.

### The Participants

This course is intended for decision analysts of all sorts: engineers, economists, policy analysts, biological conservationists, applied mathematicians, and so on. Participants will need access to personal computers for implementation of the mini-projects.

### Time and Place

Monday–Thursday, 17–20 May 2010.

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### Sources

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