A 4 Day Course on

Info-Gap Theory and Its Applications

17–20 August 2015

Charles Sturt University

Wagga Wagga, Australia

Course Rationale Scientists, engineers, policy planners and analysts use measurements and science-based models to design systems, evaluate reliability, and make plans and policies. However, models may be simpler than reality, causal factors may be unknown, measurements may err or be incomplete, and systems may change over time in unknown ways. Probability is useful for modeling and managing some of these uncertainties. However some uncertainties are info-gaps: disparities between what is known and what needs to be known in order to make good decisions. For instance, we sometimes do not know the correct probability distribution or all of the relevant physical mechanisms such as non-linearities or time dependencies. This course studies info-gap theory for modeling and managing uncertainties in planning, design and decision problems. The course emphasizes the added value of an info-gap analysis as well as its limitations, and the integration of info-gap theory with probabilistic analysis.

Course Structure This course has three components. Lectures use simple examples to illustrate the info-gap method for analyzing risk and prioritizing choices when faced with severe uncertainty. Exercises help the participants to master the operational aspects of info-gap theory. The first two days are devoted to lectures and exercises. The last two days are devoted to mini-projects that are formulated and implemented by the participants, in small groups, on topics of their choice such as simplified versions of projects they work on elsewhere. This facilitates the internalization of the concepts and methods learned, their integration with other methods familiar to the participants, and their application to problems of interest to the participants.

The Instructor Yakov Ben-Haim initiated and developed info-gap decision theory for modeling and managing severe uncertainty. Info-gap theory is applied in engineering, biological conservation, economics, project management, climate change management, national security, medicine, and other areas. He has been a visiting scholar in Australia, Austria, Canada, England, France, Germany, Italy, Japan, Korea, Netherlands, Norway, and the US. He has lectured at universities, medical and technological research institutions and central banks around the world. He has published more than 90 articles and 5 books. He is a professor of mechanical engineering and holds the Yitzhak Moda’i Chair in Technology and Economics at the Technion—Israel Institute of Technology.

The Participants Scientists, engineers and analysts involved in risk analysis, reliability assessment, policy selection, planning and design in environmental science, engineering, project management, economics, national security, health including food safety and epidemiology.
Schedule

Day 1  Monday 17 August 2015
MORNING
08:30–09:20 Lecture 1. Risk analysis with severe uncertainty.
LUNCH 11:30–13:00
AFTERNOON
13:00–13:50 Exercise. Betting (but you’re unsure of the probabilities).
14:00–14:50 Exercise. Choosing among policies with uncertain outcomes.
14:50–15:10 Coffee break.
15:10–16:00 Exercise. Project cost management.

Day 2  Tuesday 18 August 2015
MORNING
LUNCH 11:30–13:00
AFTERNOON
13:00–13:50 Exercise. Transportation network.
14:00–14:50 Exercise: Robustness and opportuneness of failure probability.
14:50–15:10 Coffee break.
15:10–16:00 Exercise. In-house or out-source?

Day 3  Wednesday 19 August 2015
MORNING
08:30–11:30 Brain-storm and initiate mini-projects.
LUNCH 11:30–13:00
AFTERNOON
13:00–16:00 Guided independent work on mini-projects.

Day 4  Thursday 20 August 2015
MORNING
08:30–10:00 Guided independent work on mini-projects.
10:00–11:30 Preliminary reports on mini-projects.
LUNCH 11:30–13:00
AFTERNOON
13:00–16:00 Guided independent work on mini-projects.
Selected Sources: Info-gap theory and applications

Books:

Foundations of info-gap theory:

Environmental protection:

Public policy:

Security:

Medicine:

Failure detection:

Info-gap statistics:

Engineering design:

   Selection from article: http://tx.technion.ac.il/~yakov/IGT/hambling2012selection.html

**More references, background material, links:** http://info-gap.com