

Decision and Risk

Lecture 0: Introduction

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Purpose of This Course

The ultimate purpose of this course is to gain an understanding of how to use statistical techniques to quantify and reason about risks and uncertainty. We will discuss questions such as:

- What was the probability of a terrorist attack that killed as many people as the 9/11 New York event occurring, given what we know about other historical terrorist attacks? How long do we expect before a similarly sized attack occurs again?
- How can financial institutions make sensible decisions about the risks associated with the portfolios of stocks that they are invested in, so that they can try to control how much money they stand to lose on a day-to-day-basis?
- How can we predict how likely an earthquake is to occur in a certain geographical region, and how do we balance the costs of giving false alarms against the costs of not evacuating people in time?

Three Main Learning Outcomes

We will gain familiarity with three main areas:

- **Bayesian Inference** - how do we learn about unknown quantities?
- **Decision Theory** - how do we translate what we learn about unknown quantities into actual decision making?
- **Applied Data Analysis** - we will look at real data as we proceed.
This can be done in a statistical programming language such as R.

Note – because we need to learn some techniques before we can perform any analysis, the mathematical content in this course is somewhat front-loaded. We will spend this week and next learning the basics of Bayesian statistics and decision theory, and then later see how they are applied to real problems.

Structure of This Course

- Ten 2 hour lectures, taking place each Friday at 9am. I will devote the last part of each lecture (15-40 minutes) to problem sheets.
- Three 2 hour long workshops on Friday at 2pm, during weeks 22, 25, and 30 (i.e. the first is next week!)
- An ICA (exam) in week 5 midway through the course, followed by a final exam at the end
- An office hour each week (at a time to be announced)
- All course material will be available on moodle