



UNIVERSITÀ
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DI PADOVA



PHD COURSE
IN STATISTICS

Short Course | Cycle XXXVIII

December, 2022 | Campus S. Caterina

Introduction to Basic Concepts of Robustness

Alan H. Welsh

The Australian National University

Tuesday	December 6	14.30 – 17.30	Room SC30
Wednesday	December 7	10.30 – 13.30	Room SC30

The course will also be available on Zoom:

<https://anu.zoom.us/j/95288970870?pwd=aDB1NENUK3RPRnVSdkY1N0FObnFKZz09>

Meeting ID: 952 8897 0870

Password: 634437

Program

<https://www.stat.unipd.it/ricerca/courses-202223-xxxviii-cycle>

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Introduction to Basic Concepts of Robustness

Alan H. Welsh

**Research School of Finance, Actuarial Studies and Statistics,
The Australian National University, Canberra, Australia.**

Course Description

Parametric statistical models are at the heart of statistics because they are a very effective starting point for extracting and conveying information obtained from empirical data. Standard approaches to statistical inference tend to assume that parametric models are exactly correct, even though this is unrealistic in general. In contrast, robustness theory recognises that models are usually at best approximately correct. We will use the simple problem of estimating the rate parameter in the independent exponential model to illustrate the concepts and ideas that underly the bounded influence approach (Hampel et al 1986) to distributional robustness.

We will start by briefly discussing maximum likelihood estimation and likelihood inference when the independent exponential model holds and when it does not. We will explore the stability properties of inferences under perturbation of observations in a dataset and use this to motivate the abstract formulation of estimators as functionals of distribution functions and robustness as making inferences under approximately correct models. We will introduce the influence function and use it to explore the frequentist properties of some simple robust M-estimators and inferences based on them. We end with a discussion of Hampel's optimality theorem for M-estimators.

Use will be made of the following books:

Hampel, F..R., Eonchetti, E.M., Rousseeuw, P.J. and Stahel, W.A. (1986). Robust Statistics: The Approach based on Influence Functions.

Welsh, A.H. (1996). Aspects of Statistical Inference.