

# INFN School of statistics 2015

Ischia, 25-29 June 2015

Hotel LLOYD's Baia

Timetable	25/5/2013 Monday	26/5/2013 Tuesday	27/5/2013 Wednesday	28/5/2013 Thursday	29/5/2013 Friday
9:00-9:30		Lecture 2.1	Lecture 3.1	Lecture 4.1	Lecture 5.1
9:30-10:00					
10:00-10:30		Coffee break	Coffee break	Coffee break	Coffee break
10:30-11:00					
11:00-11:30	Registration	Lecture 2.2	Lecture 3.2	Lecture 4.2	Lecture 5.2
11:30-12:00					
12:00-12:30					
12:30-13:00	Lunch	Lunch	Lunch	Lunch	Departure
13:00-13:30					
13:30-14:00			Excursion		
14:00-14:30					
14:30-15:00	Lecture 1.1	Interactive session: 1+2			Interactive session: 3+4
15:00-15:30					
15:30-16:00	Coffee break	Coffee break			Coffee break
16:00-16:30					
16:30-17:00	Lecture 1.2	Interactive session: 1+2			Interactive session: 3+4
17:00-17:30					
17:30-18:00					
18:00-18:30					
18:30-19:00					
19:00-19:30					
19:30-20:00					
20:00-20:30	Dinner	Dinner	Social dinner	Dinner	
20:30-21:00					
21:00-21:30					

## Lecture programme

Lectures 1.1, 1.2

### Probability theory

**Roger Barlow (Univ. of Huddersfield)**

Introduction to probability theory  
 Random variables: discrete and continuous distribution, cumulative function  
 Most popular discrete and continuous statistical distributions  
 Multiple random variables: covariance and correlation coefficient  
 Distribution moments: expected value and variance  
 Conditional probability and Bayes theorem  
 Bayesian approach to probability  
 Bayesian inference

Lectures 2.1, 2.2

### Statistical methods

**Glen Cowan (Royal Holloway, London)**

Parameter estimates, properties of estimators  
 Maximum likelihood method  
 Error propagations  
 The error ellipse and its properties  
 Neyman belt and confidence intervals  
 Pearson and Neyman chi-squares  
 Combination of more measurements

Lectures 3.1, 3.2

### Confidence intervals and upper limits

**Jan Conrad (Stockholm University)**

Hypothesis testing  
 Definition of p-value and significance and use in goodness of fit  
 Feldman-Cousins method  
 Frequentist vs Bayesian upper limits  
 CLs, the modified frequentist approach  
 Treatment of nuisance parameters  
 Look-elsewhere effect

Lectures 4.1, 4.2

### Multivariate discriminants

**Helge Voss (Max-Planck-Gesellschaft)**

Signal/background discrimination  
 Overview of multivariate discrimination methods  
 Fisher discriminant  
 Likelihood ratio discriminant  
 Artificial neural networks, including Bayesian neural networks  
 Boosted decision trees

Lectures 5.1, 5.2

### Statistical software tools

**Mario Pelliccioni (INFN Torino)**

Overview of the main statistical tools  
 Strong/weak point of the main tools  
 RooFit  
 RooStats  
 Usage examples code demonstrations