

# Probability theory and statistical inference

Jesus Urtasun Elizari

February 26, 2024



# Contents

<b>Index</b>	<b>v</b>
<b>Introduction</b>	<b>1</b>
0.1 Background . . . . .	1
<b>1 Introduction to probability theory</b>	<b>3</b>
1.1 What is probability? . . . . .	3
1.2 Discrete probability distributions . . . . .	3
1.3 Continuous probability distributions . . . . .	3
<b>2 Linear models</b>	<b>5</b>
2.1 Functions and variables . . . . .	5
2.2 Modelling uncertainty in random events . . . . .	5
<b>3 Introduction to statistical inference</b>	<b>7</b>
3.1 Hypothesis testing . . . . .	7
3.2 The idea of significance and p-values . . . . .	7
3.3 Parametric and non parametric tests . . . . .	7
<b>4 Introduction to bayesian statistics</b>	<b>9</b>
4.1 Frequentist and bayesian approach . . . . .	9
4.2 Bayesian statistics . . . . .	9
<b>Bibliography</b>	<b>11</b>



# Index



# Introduction

## 0.1 Background

In the following pages one will find an introductory text to one of the key subjects within mathematical sciences. The text is composed by four chapters, together with some appendix reviewing basic mathematical concepts, and a bibliographic note. The purpose of this lecture notes is to make both probability and statistical analysis an easy, interesting and engaging topic for anyone interested, without the need for prior experience with mathematical training.

First, we will introduce and explore the concept of probability itself, and we will discuss how to model information, surprise, and various random processes, also referred to as stochastic. Then we will introduce the idea of a function and how functions need to be adapted to implement uncertainty when discussing random events





## Chapter 1

# Introduction to probability theory

### 1.1 What is probability?

Your content for Chapter 1 goes here.

### 1.2 Discrete probability distributions

Your content for Chapter 1 goes here.

### 1.3 Continuous probability distributions

Your content for Chapter 1 goes here.



## Chapter 2

# Linear models

### 2.1 Functions and variables

Your content for Chapter 2 goes here.

### 2.2 Modelling uncertainty in random events

Your content for Chapter 2 goes here.



## Chapter 3

# Introduction to statistical inference

### 3.1 Hypothesis testing

Your content for Chapter 3 goes here.

### 3.2 The idea of significance and p-values

Your content for Chapter 3 goes here.

### 3.3 Parametric and non parametric tests

Your content for Chapter 3 goes here.



## Chapter 4

# Introduction to bayesian statistics

### 4.1 Frequentist and bayesian approach

Your content for Chapter 4 goes here.

### 4.2 Bayesian statistics

Your content for Chapter 4 goes here.





# Bibliography