PROBABILIDADES E ESTATÍSTICA

Degree in Engineering and Development of Digital Games

Code: 12313

Main Scientific Area: Statistic

Lecturer: Estela Maria dos Santos Ramos Vilhena

Language of Instruction: Portuguese

Regime: S2

Contact Hours: 60h Total Workload: 100h

ECTS: 6,0

Objectives

The objectives of this curricular unit are to

-Sensitize students to the importance of correct resolution of real problems that increasingly tend to be of large numbers;

-Provide students with mastery of basic quantitative techniques and methodologies in the treatment and analysis of data and inference from these;

- Promote the use of appropriate software for statistical analysis.

Learning Outcomes

It is intended that the student has skills to:

-Distinguish between population and sample;

- Organize and summarize data from statistical studies;

- Identify and classify variables;

- Decide which measures can be used in different situations, their advantages and disadvantages;

- Create and interpret graphs;

- Understand fundamental concepts of probability;

- Identify the most important probability distributions;

- Estimate and interpret population unknown parameters;

- Perform, interpret and make decisions based on confident intervals and hypothesis tests;

- Identify variables that affect a given response by using correlations and simple regressions;

-Make predictions;

-Analyze and interpret data using software.

Course Contents

1.Descriptive Statistics. Sample and population. Different types of data. Measurement scales: nominal, ordinal, interval and scale. Data presentation: charting and graphing. One-dimensional distributions. Frequency distribution of discrete and continuous variables. Observed and cumulative frequencies. Graphical representation of frequency distributions. Differential and integral diagrams. Histogram. Parameters and statistics. Measures of location. Arithmetic mean, median and mode. Quantiles. Measures of dispersion. Interquartile range. Mean absolute deviation, variance and standard deviation. Coefficient of variation. Measures of skewness and kurtosis. Boxplot.

2.Probability Theory. Random experience. Probability spaces. Sample space. Events. The axioms the theory of probability. Conditional probabilities. Total probability theorem and Bayes' theorem. Independence of events. Incompatible events.

3.Random variables. Distribution function. Discrete and continuous random variables. Probability and probability density functions. Parameters of random variables. Theoretical distributions. Binomial Distribution. Poisson distribution. Normal or Gaussian distribution. Central Limit Theorem.

4.Estimation. Point estimation. Estimator and estimate. Properties of estimators. Confidence intervals.

5.Hypothesis testing. Null hypothesis and alternative hypothesis. Simple and composite hypothesis. Unilateral and bilateral tests. Inference errors. Relationship between the two types of errors. The significance level. Power of the test. P-value. Relationship between confidence intervals and hypothesis testing. Normality tests.

6.Correlation and simple linear regression: Scatterplot. Simple Linear Regression Model. Pearson's correlation coefficient. Coefficient of determination.

Recommended Bibliography

Reis, E., Melo, P., Andrade, R., Calapez, T. (2015). Estatística Aplicada, volume 1. Edições Sílabo. Reis, E., Melo, P., Andrade, R., Calapez, T. (2015). Estatística Aplicada, volume 2. Edições Sílabo. Robalo, A. (2017). Estatística Exercícios, volume 1. Distribuições, Inferência Estatística (6ª Edição). Edições Sílabo.

Robalo, A. (2018). Estatística Exercícios, volume 2. Probabilidades, Variáveis Aleatórias (6ª Edição).Edições Sílabo.

Stirling, D. CAST, Computer-Assisted Statistics Textbooks. https://cast.idems.international/

Learning and Teaching Methods

The presentation of practical examples using appropriate software, together with the presentation of dynamical and interactive graphs and diagrams, enables a permanent discussion in the classroom, providing students with the control of the main quantitative methodologies and techniques in the treatment and analysis of data and inference from these.

Assessment Methods

The student will be assessed through

two partial tests (T1 and T2);
Group work (TG).

The final grade (NF) will be given by

NF=20%TG+40%T1+40%T2

Note:

The minimum mark in the second test is 7.

The minimum mark for the group work is 10 marks.

Group work is compulsory for all exam periods.

The group work is done in groups of 3.

Exam assessment system (any period)

The student will be assessed by:

taking an exam (E);
Group work (TG).

The final mark (NF) will be given by

NF=20%TG+80%E

Grade:

The minimum mark in the exam is 7;

The minimum mark for the group work is 10;

The compulsory group work is carried out during the continuous assessment period;

Failure to complete the group work implies failure to pass the course.