19BF99

R Programming Language

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Introduction

R is one of the most popular programming languages nowadays. This course introduces the fundamentals of computing in R that will be necessary to succeed in the rest of the courses throughout the master. The course features programming assignments that should be completed each day before the class.

Objectives

The objectives of the course are to (i) understand data structures and basic data manipulation techniques, (ii) get familiar with programming essentials, (iii) master basic numerical operations in R.

Required Background Knowledge

The course is self-contained and students are not expected to have prior knowledge about R.

Learning Outcomes

Provide students the necessary theoretical and practical background to successfully write programs in R:
1. Understanding data structures and data management techniques
2. Getting familiar with fundamental programming concepts
3. Preprocessing real world datasets
4. Being able to reformulate a task from natural language to an algorithm

Methodology

The class format consists of a short lecture on each topic, followed by a solution of several exercises related to it. Students shall work individually to solve suggested assignments. For each problem, students will be proposing their solutions followed by a presentation of a benchmark answer. The goal with exercises is to develop skills that enable students to write proper algorithms independently.

Evaluation

(i) Assignments: 20%
(ii) Exam: 80%

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Course contents (preliminary)

1. Data Structures:

• Vectors
• Lists
• Matrices
• Data Frames

2. Data Manipulation:

• Creating, Adding and Deleting Elements in Vectors and Lists
• Creating, Merging and Applying Functions to Matrices and Data Frames
• Downloading External Datasets

3. Programming Essentials:

• Control Statements
• Customized Functions
• Installation of Packages
• Plotting

4. Numerical Operations:

• Math Functions
• Functions for Statistical Distributions
• Linear Algebra Operations on Vectors and Matrices

Bibliography

Kabacoff, Robert. 2011. *R in Action*.
Matloff, Normann. 2011. *The Art of R Programming*.