Experimental Methods in Computer Science

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2020/2021

Course profile

Experimental Methods in Computer Science

- Scientific Area: Informatics
- 1st year, 1st semester
- Classes
  - Lectures (T): 2 hours per week
  - Practice Labs (PL): 2 hours per week
- ECTS: **6**

Teachers

- Carlos M. Fonseca <cmfonsec@dei.uc.pt>
  - Lectures and practice labs 1 and 2
  - Office hours (D2.10)
    - In person or remotely via zoom
    - Wednesdays 10:00-13:00 and 14:00-18:00
    - Appointment requests by e-mail (required)
  - Web: https://eden.dei.uc.pt/~cmfonsec/

Teachers

- Alexandre Jesus <ajesus@dei.uc.pt>
  - Practice labs 3
  - Office hours (D2.24)
    - In person or remotely via zoom
    - Wednesdays 16:00-17:00
    - Appointment requests by e-mail (required)
  - Web: https://eden.dei.uc.pt/~ajesus/

Syllabus

- Introduction: experimental studies in engineering and science
- Data analysis and exploratory data analysis
- Overview of experiment design
- Sampling and data distributions
- Measurements, uncertainty, variability, and confidence intervals
- Contingency tables, measures of association, and correlation
- Hypothesis testing
  - Parametric methods and nonparametric methods

Syllabus

- Linear regression, data transformations
- Simulation experiments
  - Simulation models
  - Simulation languages
  - Pseudorandom number generation
  - Model calibration and validation
  - Design of simulation experiments and analysis of results
- Experiments with people

Course organisation

- Lectures (T)
  - Presentation and discussion of the topics of the syllabus
- Practice Labs (PL)
  - Examples and exercises
  - Presentation and discussion of the term assignment
  - Progress monitoring (milestones) and support
  - Bring your laptop

Course organisation

- Practice Labs (PL)
  - Room capacity has been reduced to a half in order to respect social distancing
  - Students alternate between remote and in-person attendance
    - First week – odd-numbered students attend in person
    - Second week – even-numbered students attend in person
    - Following weeks – the split will be based on student groups

Assessment

- Assignments (50%)
  - Carried out in groups of up to 3 students
  - Final presentation and discussion will include questions to be answered individually by each member of the group
  - Minimum grade requirement: 40%
- Written test / exam (50%)
  - Questions about the topics addressed in the lectures
  - Questions related to issues found in the assignments and discussed in the practice labs
  - Minimum grade requirement: 40%

Assignments

- One project with two milestones
- The output of each milestone is a written report
- Up to 3 students per group – register in inforestudante by September 30
- The same group for both milestones
- Deadlines
  - Milestone 1 - 30/10/2020
  - Milestone 2 - 11/12/2020
  - Oral defence - January 2021

Bibliography

- D. J. Lilja, Measuring Computer Performance, Cambridge University Press, 2000
- P. Cohen, Empirical Methods for Artificial Intelligence, MIT Press, 1995
- Natalia Juristo and Ana M. Moreno, Basics of Software Engineering Experimentation, Springer Publishing Company, 2010
- R. Jain, The Art of Computer Systems Performance Analysis, Wiley 1991.
- J. Lazar, J. Feng, H. Hochheiser, Research Methods in Human-Computer Interaction, (Chapter11 - Analyzing qualitative data), John Wiley and Sons, 2010.
- C.C. McGeoch, A Guide to Experimental Algorithmics, Cambrigde University Press, 2012.
- T. Bartz-Beielstein, M. Chiarandini, L. Paquete, M. Preuss, Experimental Methods for the Analysis of Optimization Algorithms, Springer, 2010.