
Experimental Methods in Computer Science

(Metodologias Experimentais em Informática)

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(baseado nos slides de Henrique Madeira para edições anteriores)

Course profile

Experimental Methods in Computer Science

- **Scientific Area:** Informatics
- **School Year:** 1st year MEI
- **Semester:** 1st semester
- **Classes**
 - Lectures (**T**): 2:00h per week
 - Practice-Lab./Assignment support (**PL**): 2h per week
- **ECTS:** 4
- **Teacher: Luís Paquete**
 - Email: paquete@dei.uc.pt
 - Office: D2.18
 - Available for students: Thursday, from 9:00h to 13:00h

Syllabus

- The experimental method: experimental scenarios in computer science
- Data analysis: distributions, correlation, linear regression, etc.
- Exploratory data analysis
- Measurements and benchmarking
- Experiment design (covering different types)
- Hypothesis testing
- Experiments with people

(do not follow exactly this order in the lectures)

Course organization

- Lectures (**T**):
 - Presentation of the topics of the syllabuses
 - Discussion of key aspects and topics of the syllabuses
- Practice-Lab./Assignment support (**PL**):
 - Assignment support oriented
 - Present and discuss the assignments that will be made by the students
 - Discuss specific questions related to the assignments
 - Evaluate the progress (milestones) of the assignments and provide support for the final assignment grading
 - Present and discuss concrete experiments that can be used as motivation examples

Assessment

- Assignments: 50%
 - **Note:** Although the assignments are co-authored by a group of students, the grading is individual. The final assignment presentation and discussion will include questions to be answered individually by each member of the group.
- Written exam: 50%
 - Questions about the topics addressed in the lectures (T)
 - Questions related to issues found in the assignments and discussed in the PL classes
 - Minimum requirement: 35%

Assignments

- One project with three milestones:
 - *How are sorting algorithms affected by memory faults?*
- The output of each milestone is a **written report**
- Up to 3 students per group - **send me the elements in the group until September 27**
- The same group of students for all the milestones
- Deadlines:
 - **October 25: Exploratory Data Analysis**
 - **November 22: Hypothesis Testing**
 - **December 20: Regression Analysis**

Bibliography

- Documents provided by the teacher and papers available online
- D.J.Lilja, *Measuring Computer Performance*, Cambridge University Press, 2000
- P. Cohen, *Empirical Methods in Artificial Intelligence*, MIT Press, 1995
- N. Juristo, A.M. Moreno, *Basics of Software Engineering Experimentation*, Springer, 2010.
- R. Jain, *The Art of Computer Systems Performance Analysis*, Wiley 1991.
- J. Lazar, J. Feng, H. Hochheiser, *Research Methods in Human-Computer Interaction*, Wiley, 2009
- W. G. Zikmund, B. J. Babin, J.C. Carr, M. Griffin, *Business Research Methods*, Cengage Learning, 2009.
- T. Bartz-Beielstein, M. Chiarandini, L. Paquete, M. Preuss, *Experimental Methods for the Analysis of Optimization Algorithms*, Springer, 2010

Tools and other resources

For the assignments and for the PL classes

- R (<http://www.r-project.org/>)

Book on statistics and probabilities (to refresh your mind on the subject), e.g.:

- Gary W. Oehlert, *A First Course in Design and Analysis of Experiments* 2010 (available online from the author's webpage)

Effort estimation

Activity	Hours	
Lectures (T)	28	(contact)
Practice-Lab./Assignment support (PL)	28	(contact)
Assignments	40	
Study (for exams and assignment discussion)	10	
Assignment final presentation & discussion	0.5	(contact)
Written exams	1.5	(contact)
Total	108	

4 ECTS \Leftrightarrow 108 hours (average effort expected from the students)

Other issues

- Classes are highly relevant to save time for students...
- Plagiarism → Internal disciplinary procedure
- Questions and difficulties → Luís Paquete
<paquete@dei.uc.pt>
- Feedback from students is very welcome

Questions?
Suggestions?