UNIVERSITY OF TRENTO
Department of Information Engineering and Computer Science

SIMULATION AND PERFORMANCE EVALUATION

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http://disi.unitn.it/locigno/index.php/teaching-duties/spe

Outline

- Scope of the course
- The program at large
- Knowing each other
- Exam rules & Homeworks
- Material & Assignments are on Google Classroom

Scope

- Systems: what are they?
  - Hardware systems
  - Software systems
- Performance: how can we define it?
  - Is performance only “speed” (whatever it means)?
- Understanding the behaviour of a system through its performance
  - Is it suitable for its goals?
  - Is it Reliable?
  - Is it Dependable?
  - Will it be better than others?

Program I

- Learning how to evaluate the performance of systems
  - Definition of systems (not all of them, those that we treat)
  - Examples of systems we can evaluate
- PE methodologies
  - Measures
  - Simulations
  - Analytical Models
- The ties to probabilities
  - Understand our common knowledge
  - Some basics and exercises to warm up

Program II

- Stochastic Processes
  - Continuous time
  - Discrete time
- Measure noise as a stochastic process (or RVs)
- Memory and correlation
  - Auto Correlation in a process
  - Memoryless property

- Measures as a noisy stochastic process
  - Evaluating means and moments
  - Estimating confidence intervals
  - Estimating transient behaviours (if present)
  - Understanding stationarity and ergodicity
  - Evaluating auto-correlation and measuring it

Program IV

- Evolving (stochastic) processes
  - Continuous time
  - Discrete time: Chains
- Markov Chains
- Semi-Markov Chains (discrete time - SMC)
- Event Driven Simulation
  - Interpretation as a an SMC
  - Importance of the interpretation
  - Monte Carlo Techniques
  - Understanding the result of a simulation
  - Estimation of the results reliability & confidence

- Analytical models
  - Generalities and importance for asymptotic behaviour & rare events
- Markovian modelling
  - Birth – Death processes
- Formal descriptions beyond Markov chains (a quick overview)
  - Queuing systems
  - Petri Nets
  - …

Knowing Each Other

- Me ...

- You ...

Google Classroom

- A Google Classroom is associated with this course
- The Classroom is closed
  - Material and assignments are posted there
- Access is granted (by me) with your University Credentials
- Send me (locigno@disi.unitn.it) and e-mail
  - from your unitn account (the others will not be considered)
  - with subject: SPE 2016 Classroom Access
- And you will be invited
  - Don’t “share” the access

Homeworks I

- During the course we will assign **three (3) mandatory individual** homeworks
  - Fitting data
  - Interpreting results
  - Running Simulations
  - Solving some models
  - Design a simple simulator or model
- Homeworks will be assigned and collected through Google Classroom
- They are part of the final evaluation: no homeworks, no exam!!!

Homeworks II → Exam

- A maximum length will be assigned to each homework report
  - e.g., 1 page double column, 11pt, 2 plots
- They must be in English and easily readable
  - e.g., if a plot need magnification → -1 point
    - remember I'm old and my vision is not perfect ☺
- Overall they will sum up to 33 points ... to be confirmed with the oral colloquium
- Homeworks can be delivered at any time
  - Those delivered within the "assigned deadline" will be corrected and in some cases there will be the possibility of re-doing them
  - Those delivered after the assigned deadline will be corrected before the oral exam, but there will be no possibility of improving a wrong one

Final Exam

- In general you will have the possibility of taking the final oral upon appointment ... within sessions and with some reasonable constraints
  - i.e., we “agree” the date, you do no “choose” it
- It will consist of a general “chat” on the homeworks, and on all the topics and material we touched in class
  - If you cannot come to classes find a colleague who is willing to share his notes with you!
  - The slides and other material posted on-line may not contain all discussions done in class
    - slides are a “trace” for the lesson
    - other materials are “vertical” insight on a specific topic, not a complete coverage