



SIMULATION AND PERFORMANCE EVALUATION

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with the help of

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



- Scope of the course
- The program at large
- Knowing each other
- Exam rules & Homeworks



- 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?



- 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



- 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



- 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
 - ...

- 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 collected on-line (more later, maybe via Moodle/DoL or similar)
- They are part of the final evaluation: no homeworks, no 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 18 points
 - The remaining 15 points (30-15=15) are assigned at the oral
- 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



- 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