SIMULATION
AND
PERFORMANCE EVALUATION

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with the help of

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http://disi.unitn.it/locigno/spe

- Scope of the course

- The program at large

- Knowing each other

- Exam rules & Homeworks

- More material & the assignments are on Google Classroom

- 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

- Event Driven Simulation – a Computer Science View
  - Discrete Event Simulation
  - Implementing a DV Simulator
  - Collecting results & presenting them
  - Understanding the result of a simulation

- Evolving (stochastic) processes
  - Continuous time
  - Discrete time: Chains
- Markov Chains
- Semi-Markov Chains (discrete time - SMC)

- Event Driven Simulation – a Mathematical Perspective
  - Interpretation as a an SMC
  - Importance of the interpretation
  - Monte Carlo Techniques
  - Understanding the 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

- Me …

- You …

- A Google Classroom is associated with this course

- The Classroom is closed
  - Part of the 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 2019 Classroom Access

- And you will be invited
  - Don't "share" the access, it's personal

- During the course we will assign **two mandatory individual** homeworks
  - The first one is about manipulation and interpretation of measure results
  - The second one is about simulating a simple communication network
- Homeworks are assigned and collected through Google Classroom
- They are (the largest) part of the final evaluation: no homeworks, no exam!!!

- An indicative maximum length will be assigned to each homework report

    – e.g., 5 page double column, 11pt, 2-4 plots

- They must be in English and easily readable, e.g.:

    – if a plot need magnification → -1 point

    – If there are tons of English errors → -1 point

- Homeworks can be delivered at any time within the given deadline, indicatively (dates will be specified upon assignment) mid May for the first one and end of June for the second

- You can come and "discuss" you homeworks with us ... this does not mean you can simply ask "How can I do it"

- Exam evaluation is a proper blend of the homeworks and the oral

- 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, with particular attention to Analytic Models, that are not covered by homeworks

  – 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