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 2016 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 and then finding an analytical model that approximate it
- 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., 1 page double column, 11pt, 2 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
- Overall they will sum up to 33 points (11 for the first one, 22 for the second) ... 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 positive one, only re-do the wrong ones

- 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