

# Computer Systems Performance Analysis and Benchmarking (37-235)

**Analytic Modelling  
Simulation  
Measurements / Benchmarking**

**Lecture by:**  
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**Assignments/Projects:**  
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**Textbook:**  
Raj Jain, "The Art of Computer Systems Performance Analysis", 1991 Wiley & Sons, New York

**Topic of Today:**

- **A systematic approach to Evaluation**
- **Evaluation Techniques (Selection)**
- **Popular Benchmarks**

# A Systematic Approach

- **Define the system and state goals**

Given: two CPUs

Wanted: better timesharing system

Given: two integer ALUs

Wanted: best implementation of an architecture

What are the boundaries?

- **List services and outcomes**
  - Network transports user packets
  - Database system responds to queries

## **Outcomes:**

- Packets are lost or delayed.  
Define what is acceptable?
- Database queries are answered wrongly or hung due to a deadlock.  
Define what is acceptable - what not?

- **Select Metrics:**

Criteria to compare performance

- Speed
- Accuracy
- Availability of services

- **List parameters**

System parameters are software and hardware characteristics that are usually held constant during study.

Workload parameters are characteristics of the users request, that typically vary from one installation to another.

- **Select factors**

These are the parameters that vary.  
Values are levels.

We expect high impact on systems performance.

- **Select evaluation technique**

- analytic modeling
- simulation
- measuring a real system

- **Select workload**

- Analytic model:  
Probability/Distribution of requests.
- Simulation:  
Traces of requests.
- Measurement:  
User scripts, sample problem.

- **Design an experiment**

Sequence of steps (simulations, measurements) that offer maximal information, maximal coverage with minimal effort.

Fractional factorial experimental design.

- **Analyze and interpret data**

- Deal with randomness and variability.
- Interpret the results of the analysis.
- Prepare to draw conclusions.

- **Present data properly**

- Spreadsheets, charts and graphics
- Integral part of activity turn around time important