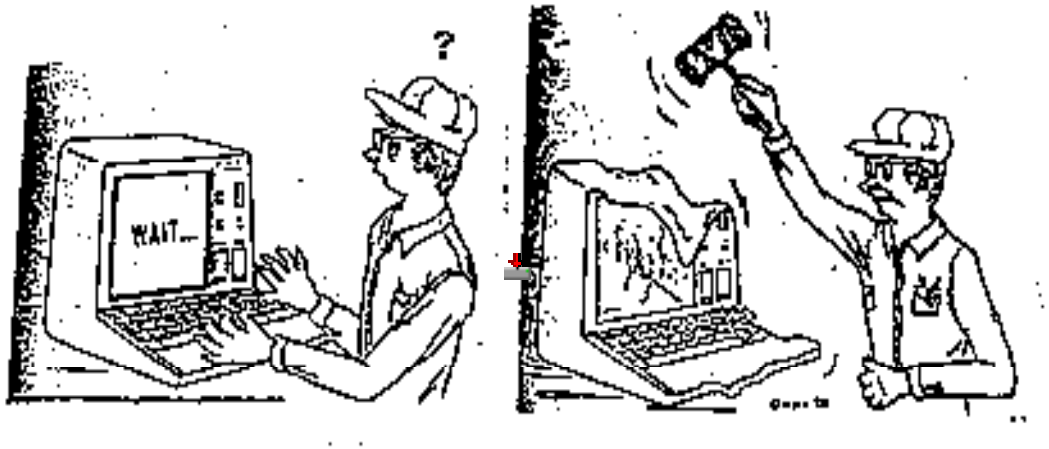
CS5239 Computer System Performance Evaluation

2010/11 – Semester 2



Assoc Professor Teo Yong Meng
Room: COM2, #04-39
Department of Computer Science
National University of Singapore
E-mail: teoym@comp.nus.edu.sg
www.comp.nus.edu.sg/~teoym/cs5239-11/

What I do?

- **Teaching**
  - Systems Modeling & Simulation
  - Performance Analysis of Computer Systems
  - Distributed Systems
  - Applied Parallel Computing (joint teaching with MIT)
  - Computer Systems Engineering (joint teaching with MIT)
  - ....

- **Research** - parallel & distributed computing
  - parallelism theory and many-core systems
  - performance evaluation
  - resource management
  - composable parallel simulation
  - fault tolerance & check-pointing in distributed systems

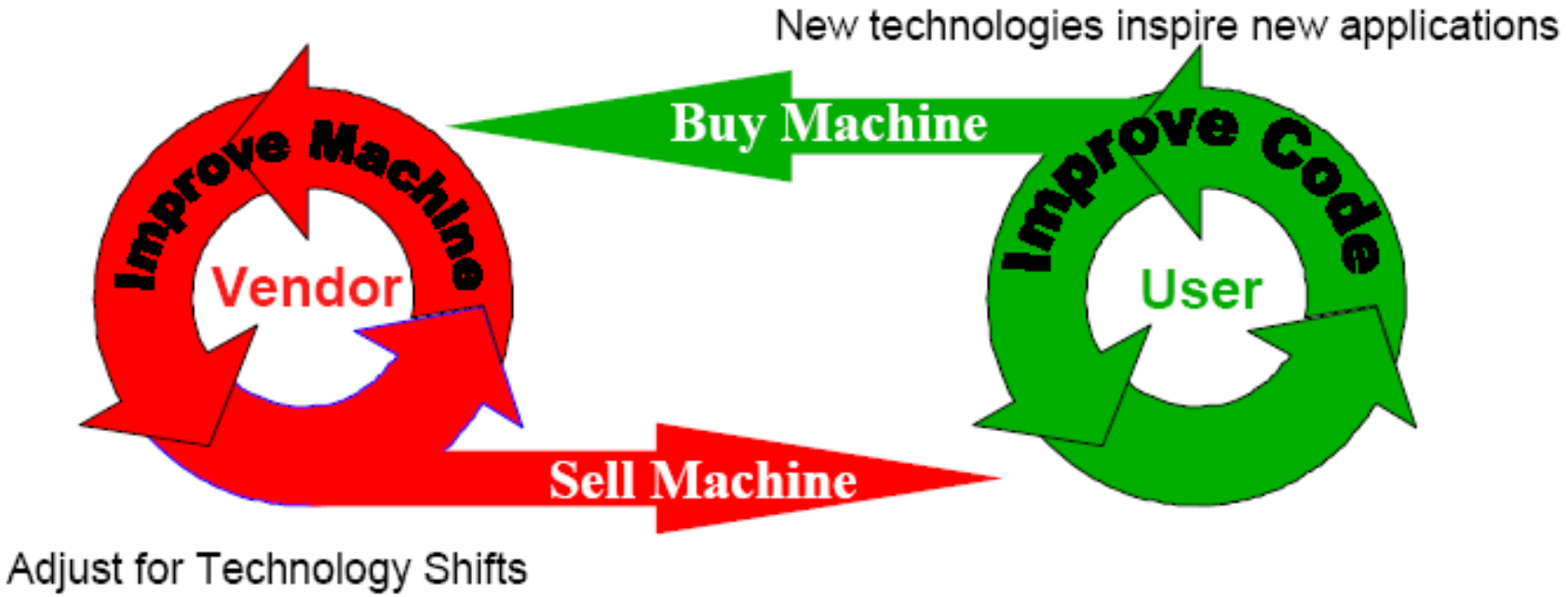
Performance

My Apple is faster than your Cray!

What is hard?

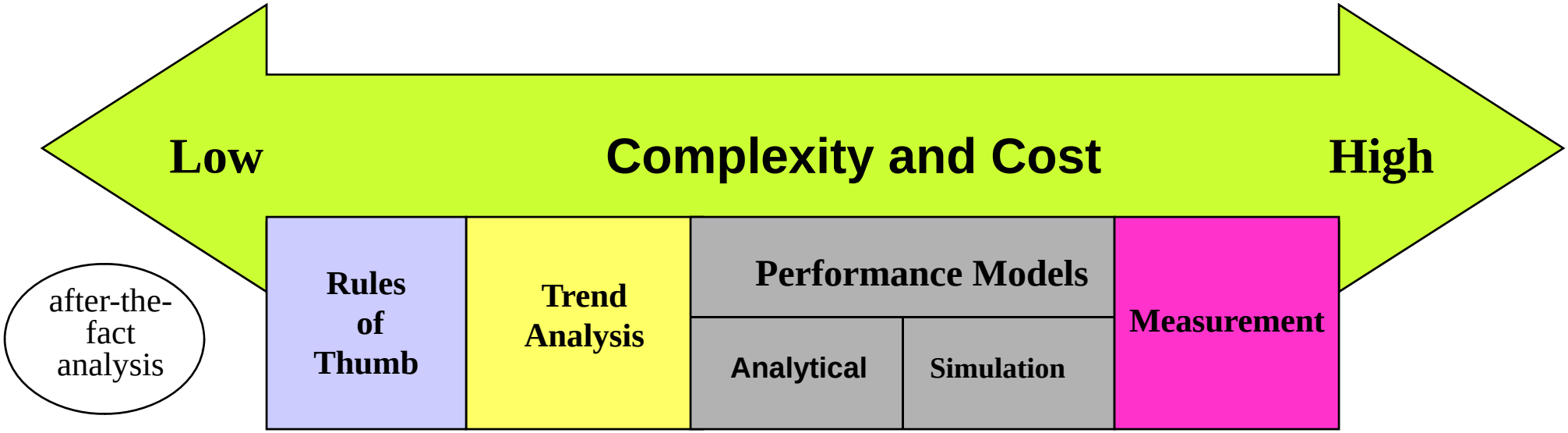
Performance of a computer system
is multidimensional.

Why Evaluated Performance?



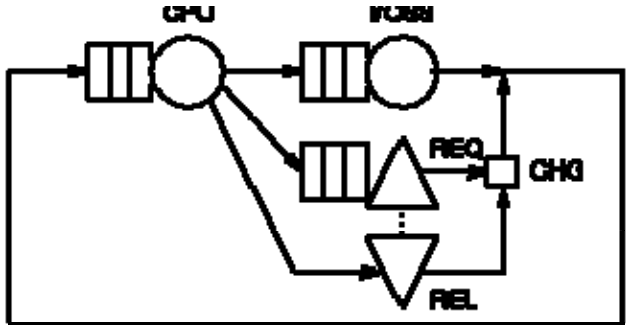
Goal: advance the state-of-the-art of computer architecture

Performance Evaluation



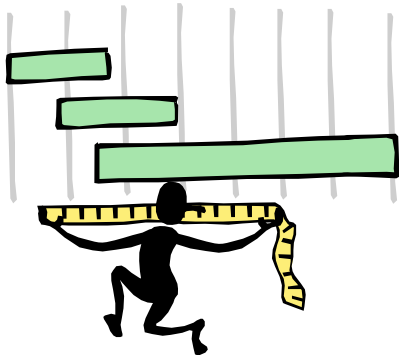
Three Fundamental Techniques

- **Measurements** of actual systems
- **Simulations** using software models
- **Mathematical modeling** using such techniques as queuing analysis



Course Schedule

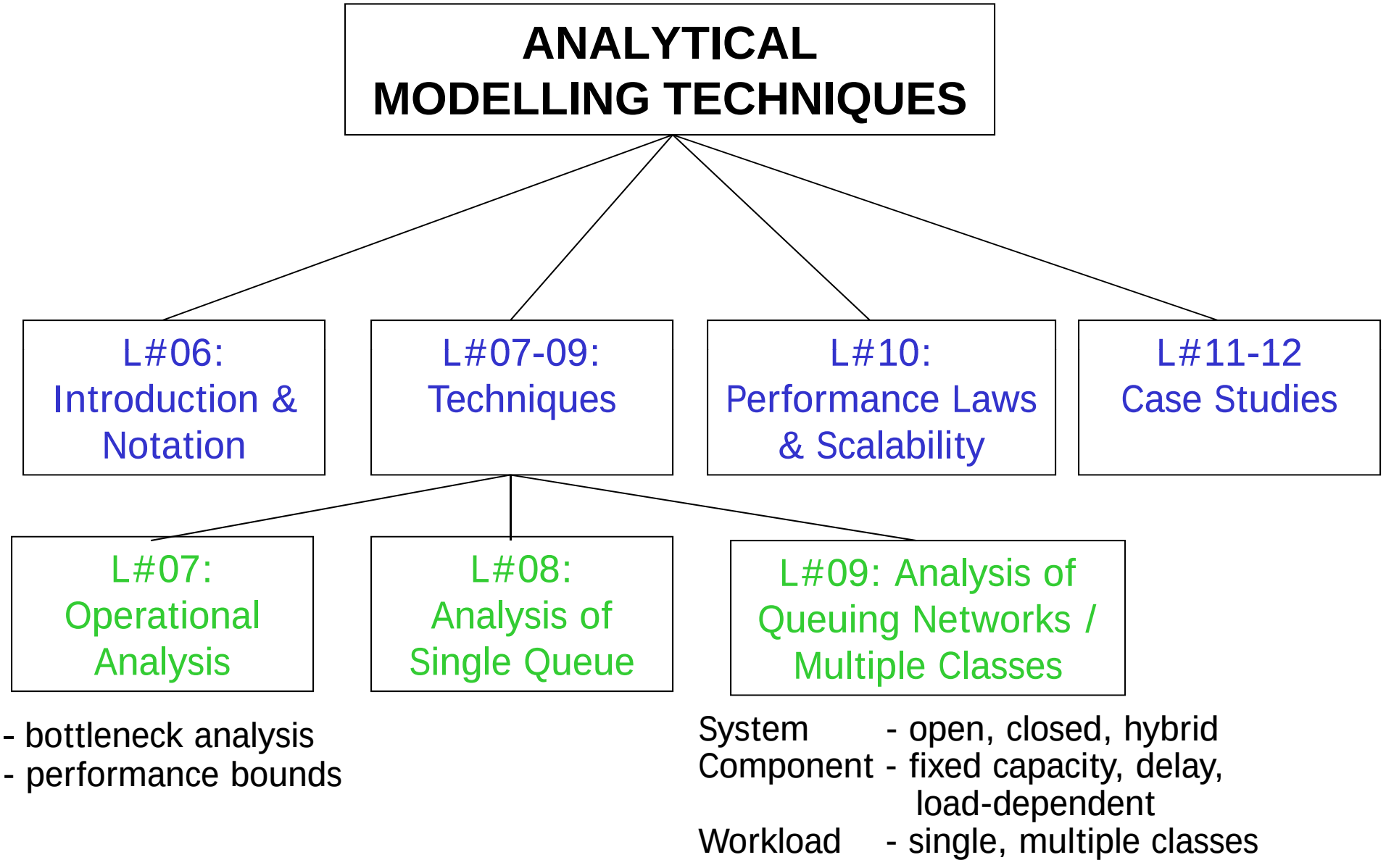
- Click here



MEASUREMENT TECHNIQUES & TOOLS

- L#03: Performance Metrics
- L#04: Workload Modeling
- L#05: Instrumentation & Representation of Measurement Data

"Measurements are not to provide numbers but insights."
Ingrid Bucher


ANALYTICAL MODELLING TECHNIQUES
L#06: Introduction & Notation
L#07-09: Techniques
L#10: Performance Laws & Scalability
L#11-12 Case Studies
L#07: Operational Analysis
L#08: Analysis of Single Queue
L#09: Analysis of Queuing Networks / Multiple Classes
- bottleneck analysis
- performance bounds
System - open, closed, hybrid
Component - fixed capacity, delay, load-dependent
Workload - single, multiple classes

Books

Main Textbooks

- **The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation and Modeling**, R. Jain, John-Wiley, 1991.
- Quantitative System Performance, E.D. Lazowska et al., Prentice-Hall, 1984, http://www.cs.washington.edu/homes/lazowska/qsp/.
- Measuring Computer Performance - A Practitioner's Guide, D.J. Lilja, Cambridge University Press, 2000.

Reference Books

- Capacity Planning and Performance Modeling - From Mainframes to Client-Server Systems, Daniel A. Menasce, et al., Prentice-Hall, 1994.
- Capacity Planning for Web Performance – Metrics, Models and Methods, D.A. Menasce, et al., Prentice-Hall, 1998.
- Simulation Modeling and Analysis, A.M. Law and W.D. Kelton, McGraw Hill, 3rd edition, 2000.
- Introduction to Parallel Computing, A. Grama, et al., Addison-Wesley, 2nd Edition, 2003.

Module Assessment

1. Continuous Assessment (60%)
   - Quiz (5%)
   - Assignment 1 (15%)
   - Assignment 2 (20%)
   - Test (20%)

2. Open Book Exam (40%)
   - 2 hrs

Everything should be made as simple as possible, but no simpler – attributed to Albert Einstein