

Simulation Modeling for System Design and Analysis, II: Advanced Concepts

This course will discuss practical and easy-to-understand statistical techniques for comparing alternative system designs, variance-reduction techniques for obtaining more precise comparisons for the same amount of computing, the use of experimental design techniques to determine important system factors, and simulation-based optimization. The course will also present an introduction to **agent-based simulation**, which is arguably the “hottest” topic in simulation modeling today. All concepts will be illustrated by one or more examples. The prerequisite for this seminar is the “Fundamental Principles” course, or the equivalent knowledge. Each attendee who is taking this seminar as a stand-alone course will receive a copy of the book *Simulation Modeling and Analysis* (4th Edition) by Averill M. Law as part of their registration fee – this book is widely considered to be the “bible” of simulation with more than 135,000 copies in print.

Versions of this seminar have been given for organizations such as AT&T, Boeing, Northrop Grumman, Sandia National Labs, U.S. Air Force, U.S. Army, U.S. Forces Korea, and U.S. Navy.

What You Will Learn:

1. Advanced Techniques for Output-Data Analysis

- Analyzing steady-state simulations
- Estimating probabilities and percentiles
- Dealing with multiple measures of performance

2. Comparing Alternative System Designs

- Confidence intervals for comparing two or more systems
- Using the variance-reduction technique common random numbers to obtain more precise comparisons
- “Tricks” for synchronizing random numbers across different system designs
 - Multiple random-number streams
 - Generation of all entity attributes upon arrival
 - “Wasting” random numbers
 - “Feeding” the same entity arrivals to several simulation models

3. Design of Experiments for Simulation Modeling

- How experimental design can identify important system factors
- The danger of changing one factor at a time
- Factorial and fractional factorial designs

4. Simulation-Based Optimization

- How the integration of optimization modules into simulation software has added a whole new dimension to simulation modeling
- Live optimization of a model with 7 decision variables

5. Agent-Based Simulation

- What is agent-based simulation and how can it benefit your organization
- Available simulation software and toolkits
- Demonstration and analysis of an agent-based simulation

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