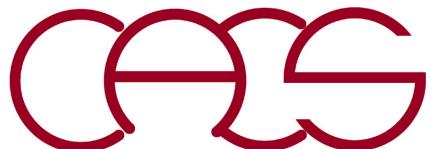


Courses on High Performance Computing and Simulations (HPCS)

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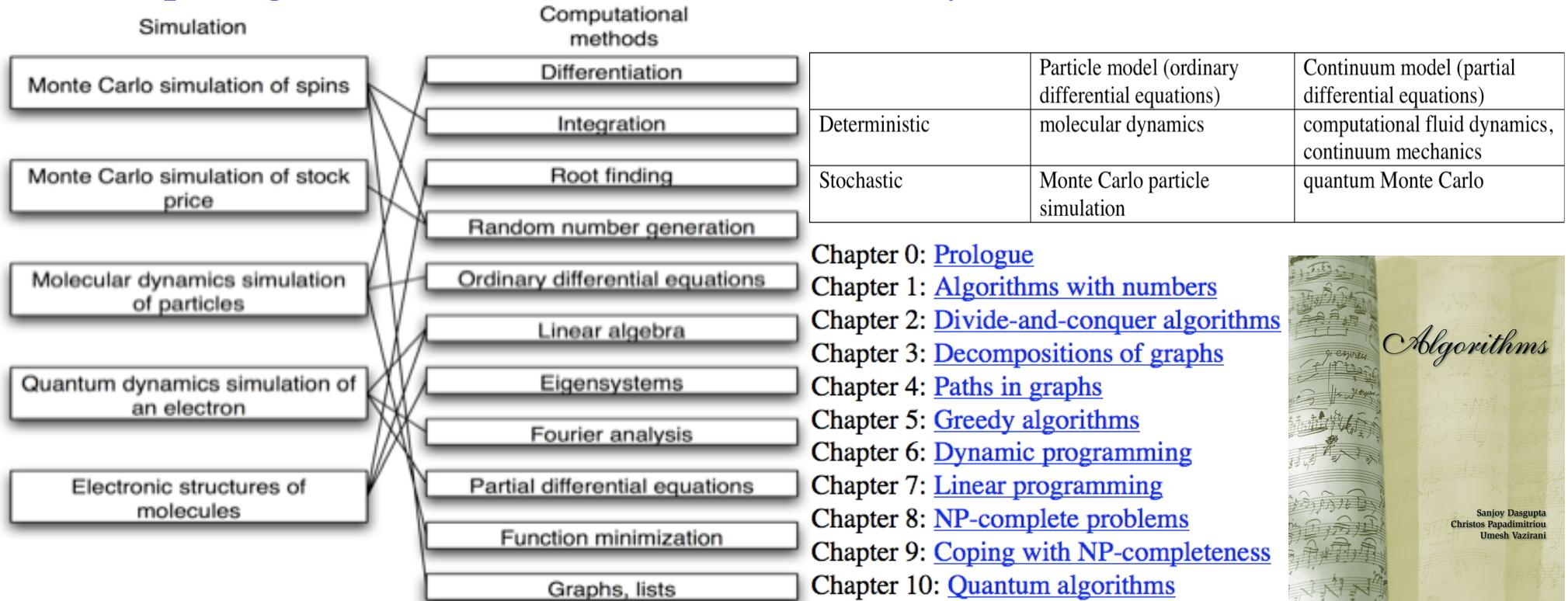


<http://cacs.usc.edu/teaching.php>



CACS HPCS Courses: Simulation!

- **PHYS516: Methods of Computational Physics (S)**
Numerical methods (+ algebra & calculus) in the context of simulations
- **SCCI596: Scientific Computing & Visualization (20F, 21F)**
Hands-on training on particle/continuum simulations, parallel computing & scientific visualization
- **CSCI653: High Performance Computing & Simulations (19F, 22F)**
Deterministic/stochastic simulation algorithms, scalable parallel/distributed computing & scientific data visualization/analytics in virtual environment



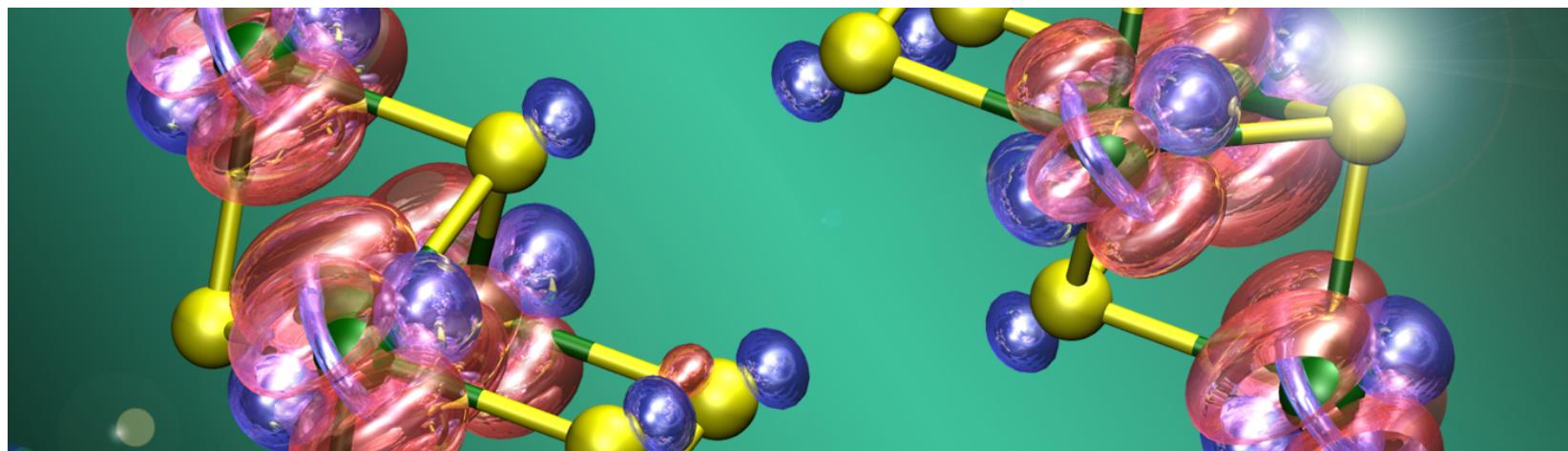
Additional HPCS Course

Detailed lecture notes are available at the course home page

CSCI 699: EXTREME-SCALE QUANTUM SIMULATIONS

Course Description

Computer simulation of quantum-mechanical dynamics has become an essential enabling technology for physical, chemical & biological sciences & engineering. Quantum-dynamics simulations on extreme-scale parallel supercomputers would provide unprecedented predictive power, but pose enormous challenges as well. This course surveys & projects algorithmic & computing technologies that will make quantum-dynamics simulations metascalable, *i.e.*, "design once, continue to scale on future computer architectures".



<http://cacs.usc.edu/education/cs699-lecture.html>

CSCI 653 Prerequisites

1. CS596 (Scientific Computing & Visualization)

OR

2. Basic knowledge of

- Numerical methods (CSCI 501, PHYS 516 or equivalent)
- Parallel computing—MPI, OpenMP, CUDA programming experience (EE 451 or equivalent)
- 3D graphics—OpenGL programming experience (CS580 or equivalent)

<https://classes.usc.edu/term-20193/classes/ee/>

CSCI 653 will apply these knowledge & techniques to simulations (or scientific/engineering applications)

MSCS-HPCS Objectives

CSCI 653 is a core elective for MSCS-HPCS

- Train a new generation of MS students in Computer Science to solve challenging scientific & engineering problems using high-end parallel computers, high-speed networks & advanced scientific visualization
- Support a unique dual-degree opportunity, in which students can obtain a Ph.D. in the physical sciences/engineering & an MS in Computer Science, to attract high-quality students

<https://www.cs.usc.edu/academic-programs/masters/>

Simulation + Data + Learning

- Master of Science in Computer Science (General)

Apart from the general Master of Science in Computer Science, the CS Department also offers the degree with the following specializations:

- Data Science
 - Game Development
 - Computer Security
 - Computer Networks
 - Software Engineering
 - Intelligent Robotics
 - Multimedia and Creative Technologies
 - High Performance Computing and Simulation
-

Aurora/A21 Early Science Program: Simulation ('17) + Data-Learning ('18)

Early Science Projects for Aurora Supercomputer Announced

Author: By Laura Wolf, Argonne Leadership Computing Facility
January 30, 2017

ALCF Selects Data and Learning Projects for Aurora Early Science Program

June 28, 2018

June 28, 2018 — The Argonne Leadership Computing Facility (ALCF), a U.S. Department of Energy (DOE) Office of Science User Facility, has selected 10 data science and machine learning projects for its Aurora Early Science Program (ESP). Set to be the nation's first exascale system upon its expected 2021 arrival, Aurora will be capable of performing a quintillion calculations per second.

<https://www.alcf.anl.gov/projects/aurora-esp>

<https://www.hpcwire.com/off-the-wire/alcf-selects-data-and-learning-projects-for-aurora-early-science-program>

MSCS-HPCS Requirement

A total of **32** units

1. Required Core Courses in Computer Science: 3 courses

- CSCI570 (analysis of algorithms)
- 2 from: CS561 (AI), CS 571 (Web), CS585 (database)

2. Required Core Course for MSCS-HPCS

CSCI596 (scientific computing & visualization)

Out of sequence

3. Elective Courses for MSCS-HPCS: Total of 3 courses from both tracks (a) & (b)

(a) Computer Science Track

CSCI653 (high performance computing & simulations),
CS520 (animation), CS551 (communication),
CS558L (network), CS580 (graphics), CS583 (comp geometry),
CS595 (advanced compiler)

(b) Computational Science/Engineering Application Track

AME535 (comp fluid dynamics), CE529 (finite element), CHE502 (numerical transport),
EE553 (comp optimization), EE653 (multithreaded arch), EE657 (parallel processing),
EE659 (network), Math501 (numerical analysis), MAS575 (atomistic simulation),
Phys516 (computational physics), PTE582 (fluid flow), ...

Q: Any addition to 3b?

HPC Tutorials & Office Hours

Series of tutorials + office hours (T, 2:30-5 pm, LVL 3M) at the USC Center for High Performance Computing (HPC):

- CUDA computing on GPU
- Parallel MATLAB
- ...



<http://hpcc.usc.edu/support/hpcc-computing-workshops>
<http://hpcc.usc.edu/officehours>

Students registered by the end of this week will get an HPC account

Master of Science in Computer Science with Specialization in High Performance Computing and Simulations (MSCS-HPCS)

<https://www.cs.usc.edu/academic-programs/masters/high-performance-computing-simulations>

Computational Sciences at USC

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