Course Wrapup

# Upcoming Courses

## Fall 2023

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## Spring 2024

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Monte Carlo Methods and Applications

21-387 | 15-327 | 15-627 | 15-860 FALL 2023

Instructors: Keenan Crane (CSD/RI) and Gautam Iyer (MSC)

Units: 9 (3 in-class/6 outside)

Course Description

The Monte Carlo method uses random sampling to solve computational problems that would otherwise be intractable, and enables computers to model complex systems in nature that are otherwise too difficult to simulate. This course provides a first introduction to Monte Carlo methods from complementary theoretical and applied points of view, and will include implementation of practical algorithms. Topics include random number generation, sampling, Markov chains, Monte Carlo integration, stochastic processes, and applications in computational science. Students need a basic background in probability, multivariable calculus, and some coding experience in any language.
15-463/15-663/15-862 Computational Photography
Learn about scientific and unconventional cameras – and build your own!

- cameras that capture video at the speed of light
- cameras that measure depth in real time
- cameras that see around corners
- cameras that measure entire lightfields

http://graphics.cs.cmu.edu/courses/15-463/
15-466/15-666 Computer Game Programming

http://graphics.cs.cmu.edu/courses/15-466-f22/
Title: Understanding and Critiquing Generative Computer Vision
Instructors: Abhinav Gupta and Jun-Yan Zhu
Description: In recent years, there have been significant advances in the field of large-scale generative modeling for visual data, such as DALL·E 2 and Stable Diffusion. This seminar course explores these advances beyond just reading and discussion. The goal is to not only inform state of the art but also develop critical and philosophical thinking among students. The course will involve reading papers, presentations, and discussions. The course will also involve reviewing and developing critical thinking.
Reading 9—Choose Your Own Adventure (due 4/26)

There are way more topics and ideas in Discrete Differential Geometry than we could ever hope to cover in this course. For this final reading assignment, you can choose from one of several options that we’ll cover in the remainder of our course:
CS 15-458/858: Discrete Differential Geometry
CARNEGIE MELLON UNIVERSITY | SPRING 2022 | TUE/THU 11:50-1:10 | GHC 4215

Assignment 4 [Coding]: Conformal Parameterization (due 4/20)

April 6, 2022
Assignments
Leave a comment

For the coding portion of your assignment on conformal parameterization, you will implement the Spectral Conformal Parameterization (SCP) algorithm as described in the course notes. Please implement the following routines in your code:
Learn all about modeling, simulating, differentiating, and inverting light!

theory and simulation of light transport
computational light transport, time-of-flight sensors
scientific imaging applications
speckle imaging, confocal microscopy
acousto-optics, tissue imaging
glossy reflections
volumetric scattering
laustic
indirect light
indirect shadow

rendering competition (win free SIGGRAPH registrations!)
differentiable, inverse, and neural rendering
original image
derivative image
original image

http://graphics.cs.cmu.edu/courses/15-468/
15-468, 15-668, 15-868
Physics-based rendering,
Rendering competition

🏆 Technical award winner

Max Slater

🏆 Art award winner

Arpit Agarwal

http://graphics.cs.cmu.edu/courses/15-468/2021_spring/
16-726 Learning-based Image Synthesis

https://learning-image-synthesis.github.io/

Classic machine learning (KNN, Graphcut, PCA, GMM)

Style Transfer (cGANs, neural style)

GANs (StyleGAN, GauGAN)

Autoregressive Models

Diffusion models (DALL-E 2)
Research related to hands has increased dramatically over the past decade. Robot hand innovation may be at an all time high, with new materials and manufacturing techniques promoting an explosion of ideas. Hands have become a priority in virtual reality and telepresence. Even the study of how people use their hands is seeing the growth of new ideas and themes.

With all of this attention on hands, are we close to a breakthrough in dexterity, or are we still missing some things needed for truly dexterous manipulation?

In this course, we will survey robotic hands and learn about the human hand with the goal of pushing the frontiers on hand design and control for dexterous manipulation. We will consider the necessary kinematics and dynamics for dexterity, what sensors are required to carry out dexterous interactions, the importance of reflexes and compliance, the role of machine learning in grasping and manipulation, and the challenge of uncertainty. We will explore state of the art manufacturing and design techniques, including innovations in soft robotics and embedded sensing. We will examine the human hand: its structure, sensing capabilities, human grasp choice and control strategies for inspiration and benchmarking. Students will be asked to present one or two research papers, participate in discussions and short research or design exercises, and carry out a final project.


with Pragna Mannam, Kenny Shaw, Jean Oh, and Deepak Pathak
COMPUTER GRAPHICS CONCENTRATION

The SCS Computer Graphics Concentration provides an opportunity for SCS undergraduate students at Carnegie Mellon to learn Computer Graphics foundations and specialties from a variety of application and research areas. Students gain a broad view of Computer Graphics in an introductory course and in-depth experience from a choice of topic areas, including the option of independent research.

Courses include:

- Computational photography
- Computer games
- Computer animation
- Computational geometry
- Physics-based rendering

This concentration provides an excellent introduction to the area for students considering industry and the opportunity for research experience for those considering graduate study.

https://csd.cmu.edu/academics/undergraduate/computer_graphics_concentration
Required core course (12 units)

15-462 — Computer Graphics

Electives (minimum 33 units)

Students must complete 3 electives from the following list of courses for a minimum of 33 units. A maximum of 12 units of research may be applied to the elective count and must be approved by the concentration advisor.

- 15-365 — Experimental Animation
- 15-418 — Parallel Computer Architecture and Programming
- 15-456 — Computational Geometry
- 15-458 — Discrete Differential Geometry
- 15-463 — Computational Photography
- 15-464 — Technical Animation
- 15-465 — Animation Art and Technology
- 15-466 — Computer Game Programming
- 15-468 — Physics-Based Rendering
- 15-469 — Algorithmic Textiles Design
- 16-726 — Learning-based Image Synthesis 16-823 Physics-based Vision
Your projects!
A1
illescoat
Imerino
tzuhsuan
ziyul
A2
agerald
aisparya
jiayiq
jrduvall
kflorend
siruih
smcgrady
ziqiye
elx
jiayiq
kflorend
llescoat
mkoshy
sarahdi
siruih
elx
ttruelso
Thanks for being a great class!
See you at the final! (study hard, but don’t stress too much)

Credit: Inside Out (Pixar)