CS194-26: Image Manipulation and Computational Photography

Computer Science Division
University of California Berkeley

INSTRUCTOR: Alexei (Alyosha) Efros (Office hours: Wed 5:00-6:00pm at 724 Sutarja Dai Hall)
GSI: Jun-Yan Zhu (Office hours: Tue 6:45-7:45pm at 611 Soda Hall and Thu 10:00-11:00am at 341B Soda Hall.)
UNIVERSITY UNITS: 4
SEMESTER: Fall 2017
WEB PAGE: http://inst.eecs.berkeley.edu/~cs194-26/fa17/
Q&A: Piazza Course Website
HW SUBMISSIONS: how to submit
LOCATION: Mulford 159
TIME: TR 3:30 PM-4:59 PM

PREREQUISITES:
Programming experience (**CS61B**) and familiarity with linear algebra (**MATH 54** or **EE16A/B** or Strang's online class) and calculus is assumed. Some background in computer graphics, computer vision, or image processing is helpful. This class does not significantly overlap with cs184 (Computer Graphics) and can be taken concurrently.
Note: if the system doesn't let you sign up, or puts you on the waitlist, do talk to me.

COURSE OVERVIEW:
Computational Photography is an emerging new field created by the convergence of computer graphics, computer vision and photography. Its role is to overcome the limitations of the traditional camera by using computational techniques to produce a richer, more vivid, perhaps more perceptually meaningful representation of our visual world.

The aim of this advanced undergraduate course is to study ways in which samples from the real world (images and video) can be used to generate compelling computer graphics imagery. We will learn how to acquire, represent, and render scenes from digitized photographs. Several popular image-based algorithms will be presented, with an emphasis on using these techniques to build practical systems. This hands-on emphasis will be reflected in the programming assignments, in which students will have the opportunity to acquire their own images of indoor and outdoor scenes and develop the image analysis and synthesis tools needed to render and view the scenes on the computer.

TOPICS TO BE COVERED:

- Cameras, Image Formation
- Visual Perception
- Image and Video Processing (filtering, anti-aliasing, pyramids)
- Image Manipulation (warping, morphing, mosaicing, matting, compositing)
- Modeling and Synthesis with Visual Big Data
- High Dynamic Range Imaging and Tone Mapping
- Image-Based Lighting
- Image-Based Rendering
- Non-photorealistic Rendering

PROGRAMMING ASSIGNMENTS:

Project 1: Images of the Russian Empire -- colorizing the Prokudin-Gorskii photo collection

See student responses here
Class Choice Awards: Kevin Lin

Project 2: Building a Pinhole Camera