CS 101-1 (Special Topics in Computer Science) Computational Cameras - Professor Katherine Bouman

prerequisite: ACM 104 or ACM 107

Computational cameras overcome the limitations of traditional cameras, by moving part of the image formation process from hardware to software. In this course, we will study this emerging multi-disciplinary field at the intersection of signal processing, applied optics, computer graphics, and vision.

At the start of the course, we will study modern image processing and image editing pipelines, including those encountered on DSLR cameras and mobile phones. Then we will study the physical and computational aspects of tasks such as coded photography, light-field imaging, astronomical imaging, medical imaging, and time-of-flight cameras.

The course has a strong hands-on component, in the form of homework assignments and a final project. In the homework assignments, students will have the opportunity to implement many of the techniques covered in the class. Example homework assignments include building an end-to-end HDR imaging pipeline, implementing Poisson image editing, refocusing a light-field image, and making your own lensless "scotch-tape" camera.

Prerequisites: linear systems/algebra (with a recommendation of some signal processing)