



Dr. Irfan Essa

Professor
School of Interactive Computing

Computational Photography

Study the basics of computation and its impact on the entire workflow of photography, from capturing, manipulating and collaborating on, and sharing photographs.





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Introduction to the Course

- ★ Instructor Introductions
- ★ Overview of the Course Structure
- ★ What to Expect?



Instructor Introductions

Denis Lantsman
MS Student
Georgia Institute of Technology

Irfan Essa
Professor of Computing
Georgia Institute of Technology
PhD MIT 1995
<http://prof.irfanessa.com>

Instructor Introductions



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Denis Lantsman
MS Student
Georgia Institute of Technology

Overview of the Course Structure

- ★ Introduction to Computational Photography
 - presented in 5 Modules over 5 weeks.
- ★ Video Lectures, Quizzes, Weekly Homework Assignments, Final Examination
- ★ Learn about Imaging and Computing Concepts as applied to Computational Photography with Hands-on Experimentation



http://commons.wikimedia.org/wiki/File:Question_book.png

Requirements

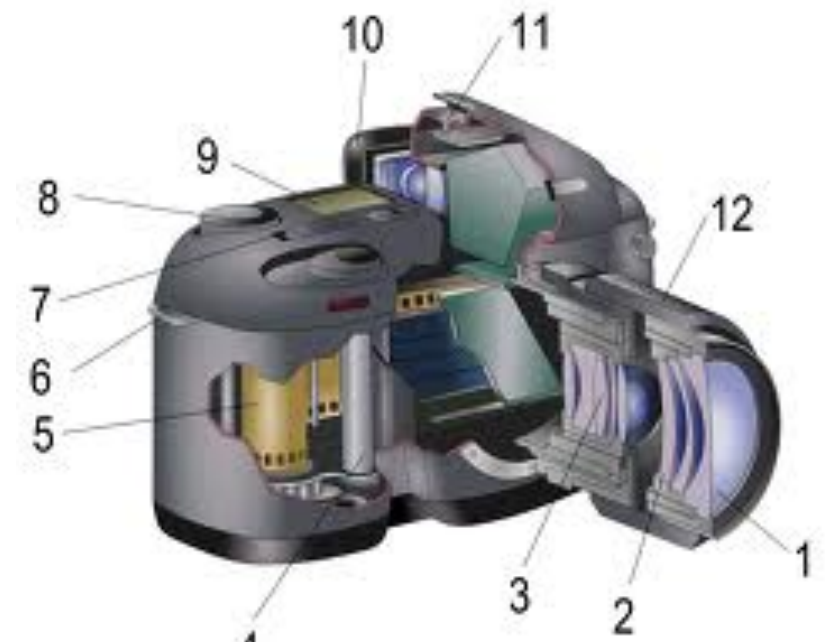
- ★ Mathematics
 - Will need College-level knowledge of Math
 - Linear Algebra, Calculus
- ★ Computing
 - Will need access to a computer to do some work.
- ★ Programming
 - We will use Python with a toolkit for doing Image Analysis called OpenCV
 - All free/public domain
 - We will show you how to get set up
- ★ Camera
 - Could be useful. We will provide sample images.



commons.wikimedia.org/

Module 1: Introduction

- ★ What is Computational Photography?
- ★ Examples of Computational Photography to provide context.
- ★ Overview of the scope of Computational, with respect to other disciplines, and its potential impact.
- ★ *Homework Assignment: Setting up to do Assignments and Initial Image Manipulation*



[https://commons.wikimedia.org/wiki/File:Reflex_camera_\(description\).svg](https://commons.wikimedia.org/wiki/File:Reflex_camera_(description).svg)

Module 2: Image Processing and Analysis

- ★ Digital Image Representation
- ★ Pixel/Point Processes for Images
- ★ Smoothing and Filtering methods for Images
- ★ Extracting Features from Images
- ★ *Homework Assignment:
Experiments with Image Filtering*



<http://www.flickr.com/photos/markcph/5137142884/>

Module 3: Cameras, Optics and Sensors

- ★ Pin-Hole Camera
- ★ Importance of Optics
- ★ How does a Camera work?
- ★ Sensors
- ★ Light Fields
- ★ *Homework Assignment: Experiments with Image Blending and Compositing*



<http://commons.wikimedia.org/wiki/File:Cameras.jpg>

Module 4: Doing Computational Photography

- ★ Epsilon Photography

- ★ Panoramas

- ★ HDR

- ★ Image Editing

- ★ *Homework Assignment:*
Experiments with HDR/Panoramas



http://commons.wikimedia.org/wiki/File:Cumulus_clouds_panorama.jpg

Module 5: Topics in Computational Photography

- ★ Extension to Videos
 - Video Textures
- ★ Computational Cameras
- ★ *Homework Assignment:
Experiments with Video
Textures*



commons.wikimedia.org/wiki/File:Video_camera_operator_icon.png

What to Expect?

This *Computational Photography* Course is:

- ★ Not a Photography Class
 - Presentation of Technology-related Content
 - *"You will not become a better photographer"*
- ★ An Introductory Class
 - You will Experience Introductory, Basic, and Foundational Material Only
- ★ A Hands-on Activities Class
 - You will Learn by Doing, by Yourself and with the Class



commons.wikimedia.org/

For more information

★ *Forums:*

- *Post Comments,*
- *Ask Questions, and*
- *Engage in Discussions with each other.*
- Please use forums to communicate with us.



<http://pixabay.com/en/question-mark-exclamation-point-63981/>

Summary and Next Class

- ★ In this lesson we overviewed the course and what we will cover in upcoming weeks
- ★ In the next lesson, we will cover the basic elements of computational photography





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