



Course Syllabus: Special Topics: Comp. Imaging & Display - CS 390D

Division	Computer, Electrical and Mathematical Sciences & Engineering
Course Number	CS 390D
Course Title	Special Topics: Comp. Imaging & Display
Academic Semester	Spring
Academic Year	2018/2019
Semester Start Date	01/27/2019
Semester End Date	05/23/2019
Class Schedule (Days & Time)	02:30 PM - 04:00 PM Mon Thu

Instructor(s)				
Name	Email	Phone	Office Location	Office Hours
Wolfgang Heidrich	wolfgang.heidrich@kaust.edu.sa	+966128080250	2113, 1, Al-Khawarizmi (bldg. 1)	By appointment.

Teaching Assistant(s)	
Name	Email
N/A	N/A

Course Information	
Comprehensive Course Description	This course provides an introduction to computational imaging and display. Starting from image formation models for conventional and unconventional camera designs, we derive inverse problems for image reconstruction in 2D and 3D. Specific applications include standard camera imaging pipelines, light field and high dynamic range cameras, 3D imaging using conventional cameras as well as transient and time-of-flight approaches. Finally we will discuss how to apply the same techniques to the design of computational displays with extended capabilities.
Course Description from Program Guide	
Goals and Objectives	The goals of this course are to prepare students for <ul style="list-style-type: none"> -research in computational imaging and display, -reading and analyzing research articles in visual computing, -discussing research in a formal presentation, and -technical writing in visual computing
Required Knowledge	Linear Algebra, Multivariable Calculus, Advanced Programming Skills.
Reference Texts	The course does not use a textbook but will be based on the discussion of original research articles. A list will be presented at the beginning of the term.
Method of evaluation	10.00% - Active participation 50.00% - Research Project 30.00% - Oral presentation 10.00% - Homework /Assignments

Nature of the assignments	Programming assignment
Course Policies	Assignments and projects are to be completed individually. Late submissions will not be accepted.
Additional Information	N/A

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Mon 01/28/2019 Thu 01/31/2019	Introduction Image Sensors
2	Mon 02/04/2019 Thu 02/07/2019	Cameras Inverse Problems I
3	Mon 02/11/2019 Thu 02/14/2019	Inverse Problem II Intra-Image Priors: BM3D, NLM
4	Mon 02/18/2019 Thu 02/21/2019	Proximal OPTimization Frameworks Bilateral Filters
5	Mon 02/25/2019 Thu 02/28/2019	Deconvolution/coded apertures Cross-channel prior, achromat
6	Mon 03/04/2019 Thu 03/07/2019	Optimization pipelines in imaging HDR reconstruction
7	Mon 03/11/2019 Thu 03/14/2019	TOF Sensors Transient imaging
8	Mon 03/18/2019 Thu 03/21/2019	Looking around corners Convolutional Sparse Coding
9	Mon 03/25/2019 Thu 03/28/2019	Spring Break
10	Mon 04/01/2019 Thu 04/04/2019	Fluid Imaging
11	Mon 04/08/2019 Thu 04/11/2019	HDR Displays
12	Mon 04/15/2019 Thu 04/18/2019	Light Fields
13	Mon 04/22/2019 Thu 04/25/2019	Light Field Cameras Light Field Displays
14	Mon 04/29/2019 Thu 05/02/2019	Aberration Correction Displays
15	Mon 05/06/2019 Thu 05/09/2019	Special Topics (TBD)
16	Mon 05/13/2019 Thu 05/16/2019	Special Topics (TBD)
17	Mon 05/20/2019 Thu 05/23/2019	Final Exam Week

Note

The instructor reserves the right to make changes to this syllabus as necessary.