SYSTEMS DESIGN ENGINEERING

Statistical Image Processing

SYDE 770 - *Topic 4* **Fall 2015**

This is technically not a course in image processing per se; rather it is a course that will study the statistical modelling, analysis, and numerical methods of data processing, especially multidimensional data processing, with problems in image processing serving as a motivating context throughout the term. Thus there is only limited overlap with courses in image processing, although such courses will be excellent preparation.

The course will begin with a linear systems and statistics review, followed by an overview of inverse problems, ill-posedness, estimation theory, and Kalman filtering.

The body of the course will examine specialized Kalman filtering algorithms, multi-dimensional estimation (marching methods, nested dissection, multigrid), conditional methods (coordinate descent, expectation-maximization), changes of bases (wavelets, radial basis functions, Gabor functions etc.), implicit models (Markov random fields, Gibbs random fields, simulated annealing), hypothesis testing, and hypothesis trees.

Many of the motivating problems and statistical models will be taken from the current state of the art in remote sensing.

The course grade is based on a few computer labs and a term project.

Prerequisite: Any one of SYDE 372, SYDE 575, SYDE 675, ECE 604.

Textbook: P. Fieguth, "Statistical Image Processing and Multidimensional Modeling," Springer, 2010

http://www.amazon.ca/Statistical-Image-Processing-Multidimensional-Modeling/dp/1441972935/ref=sr_1_2?ie=UTF8&qid=1440513329&sr=8-2&keywords=fieguth

http://link.springer.com/book/10.1007/978-1-4419-7294-1

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