Introduction to Scientific Image Processing and Analysis
ME 891 (CMSE 890)

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The purpose of this course is to introduce the students to the implementation and application of algorithms used in image processing an analysis. This course introduces just enough of the math to explain the workings of the algorithms, emphasizing on the practical reasons for the use of the methods rather than on the underpinnings of the mathematical theory. This is a hands-on course in the sense that each class will focus on implementing a different algorithm to solve a specific problem given in class. With this in mind, by the end of the semester, each student will have her/his own image processing and analysis suite. Basic notions of computer programming are required. While code implementation will be demonstrated with MATLAB, students are free to use different programming languages. The following are some of the subjects to be covered in the class:

- Pixel value adjustment: optimizing contrast, correcting non-uniform illumination, geometric transformations, image arithmetic.
- Neighborhood operations: convolution, filters, derivatives, and edge detection.
- Image Processing in the Fourier Domain: the Fourier transform, filters, convolution and deconvolution.
- Binary images: Thresholding and morphological processing.
- Measurements: global and feature measurements, pattern matching for displacement and deformation detection.

Attendance is required. This course will be evaluated based on a term project and the problems worked in class. For the term project, students are encouraged to work in problems coming directly from their own research projects.