JOHNS HOPKINS
WHITING SCHOOL
of ENGINEERING

Applied Mathematics & Statistics 493.01
Mathematical Image Analysis
Spring, 2017 (4 credits)

Instructor
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Teaching Assistant
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Office hours: Mondays 3:00–4:00 pm and Wednesdays 3:00-4:00pm

Meetings
Tuesday, Thursday, 4:30–5:45 pm, Croft Hall G02

Textbook
No textbook required, course notes will be posted online.

Online Resources
Please log in to Blackboard for all materials related to this course.

Course Information

- This course is meant to give an overview of the various mathematical methods related to some problems encountered in image processing and analysis, and present numerical schemes to address these. The problems that shall be focused on are essentially image denoising and deblurring, segmentation and compression. The mathematical material shall be introduced during the course, which includes in particular functional spaces such as Sobolev and BV, Fourier and Wavelet transforms, as well as some notions from numerical analysis. Most of these methods will be illustrated with algorithms implemented in MATLAB and simulations on usual discrete images and images related to biomedical applications.

- **Prerequisites**
  Calculus 3 (AS.110.202 or the equivalent)
  Linear Algebra (AS.110.201 or the equivalent)
  Some prior experience with MATLAB is helpful but not required.

Course Goals

- Understand the mathematical concepts behind an important part of recent methods in image processing and analysis.
- Learn how to formulate a given image analysis problem in mathematical terms and derive algorithms to solve them.
- Implement efficiently such algorithms in MATLAB and compare the results of different methods.

Course Topics

- Formation and representation of visual images.
- Continuous and discrete Fourier Transform.
- Functional analysis and variational approach for image processing.
- Image denoising.
- Image deblurring.
- Segmentation.
- Wavelet transform and image compression.

Course Expectations & Grading
Final grade will be obtained from the average of assignments' grade (total of around six Assignments).

Assignments & Readings
One assignment approximately every two weeks, available on Blackboard. Homework will include questions requiring some programming in MATLAB.

Ethics
The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition.
Report any violations you witness to the instructor.

You can find more information about university misconduct policies on the web at these sites:

- For undergraduates: http://e-catalog.jhu.edu/undergrad-students/student-life-policies/
- For graduate students: http://e-catalog.jhu.edu/grad-students/graduate-specific-policies/

Students with Disabilities

Any student with a disability who may need accommodations in this class must obtain an accommodation letter from Student Disability Services, 385 Garland, (410) 516-4720, studentdisabilityservices@jhu.edu .