Electrical and Computer Engineering
MSE Concentration in Image Processing

Introduction
This concentration involves topics surrounding image processing including image acquisition and reconstruction, image compression and coding, image analysis, and image understanding. Applications including optical and biomedical imaging are emphasized and core techniques such as digital signal processing, random signal analysis, and sparse signal processing are offered.

General Requirements
Students are expected to satisfy all the requirements of the ECE Master’s program. In addition, they are expected to satisfy the following requirements:

- Completion of eight one-semester graduate courses (400-799 level), and
- Completion of (1) two additional graduate courses, or (2) a master’s essay, or (3) a special research project approved by an ECE faculty member.

List of ECE Courses Relevant to the Concentration
(based on the current course schedule)

520.403 Introduction to Optical Instruments
520.414 Image Processing & Analysis (Goutsias, fall)
520.415 Image Process & Analysis II (Goutsias, spring)
520.432 Medical Imaging Systems (Prince, fall)
520.433 Medical Image Analysis (Prince, spring)
520.434 Modern Biomedical Imaging Instrumentation and Techniques (Tsui, spring)
520.473/673 Magnetic Resonance in Medicine (Herzka, fall, even years)
520.613 Advanced Topics in Optical Medical Imaging
520.651 Random Signal Analysis (Staff, fall)
520.652 Filtering and Smoothing (Weinert, spring)
520.646 Wavelets and Filter Banks (Tran, fall)
520.648 Compressed Sensing and Sparse Recovery (Tran, spring)

Relevant classes in other departments

Applied Mathematics & Statistics
550.493 Mathematical Image Analysis (Younes)

Biomedical Engineering
580.477 Advanced Topics in Magnetic Resonance Imaging
580.478 Biomedical Optical Imaging (Li, spring, odd years)
580.479. X-ray Imaging and Computed Tomography (Siewerdsen, spring)
580.483 Nuclear Medicine Imaging (Tsui, fall)
580.677. Advanced Topics in Magnetic Resonance Imaging (Herzka, spring)
580.679. X-ray Imaging and Computed Tomography

Mechanical Engineering
ECE Activity in Image Processing

Core Faculty

- John I. Goutsias
- Jerry L. Prince
- Trac D. Tran
- Paul A. Bottomley (Joint appointment in ECE)
- Eric C. Frey (Joint appointment in ECE)
- Donald Geman (Secondary appointment in ECE)
- Greg D. Hager (Secondary appointment in ECE)
- Xinde Li (Secondary appointment in ECE)
- Michael I. Miller (Secondary appointment in ECE)
- Dzung L. Pham (Adjunct appointment in ECE)
- Arman Rahmim (Joint appointment in ECE)
- J. Webster Stayman (Secondary appointment in ECE)
- Benjamin M.W. Tsui (Joint appointment in ECE)
- Rene Vidal (Secondary appointment in ECE)

ECE Research Activity in Image Processing

- Whole-body quantitative (parametric) PET/CT imaging
- Quantitative Imaging Methods for Targeted Radionuclide Therapy (TRT)
- Dual Isotope SPECT Imaging Technique
- Texture and shape analysis (radiomics), and radiogenomics, as applied to medical imaging (SPECT/PET)
- Optical and photoacoustic imaging through the intact brain for in vivo assessment of brain network activity
- Compressive Ultrahigh-speed Continuous Imaging
- Magnetic Resonance Tissue Contrast Synthesis
- Brain image segmentation in multiple sclerosis
- Retinal Layer Segmentation in Optical Coherence Tomography
- Motion Analysis of the Tongue During Speech using Magnetic Resonance Imaging

Contact Information

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