MATH 6390.001 Spring 2017
Introduction to Compressive Sensing

Class Meeting Hours

T/Th 2:30-3:45pm CB 1.219 (classroom will be ready by Spring 2017)

Professor Contact Information

Instructor:	Dr. Yifei Lou
E-mail:	yifei.lou@utdallas.edu
Phone:	972-883-6445
Office:	FO 2.604E
Office Hours:	T/Th 1:00 – 2:00 PM or by appt.

Course Pre-requisites, Co-requisites, and/or Other Restrictions

Pre-requisites: MATH 2418 (Linear Algebra) and MATH 2451 (Multivariable Calculus), or equivalent. Matlab familiarity for homeworks and projects.

Course Description

The goal of this course is to provide an overview of the recent advances in compressive sensing. The course focuses on describing the novel ideas that have emerged in sparse signal recovery with emphasis on theoretical foundations, numerical algorithms, and various signal/image processing applications. Topics will be supplemented with MATLAB programming assignments.

Course Objectives

1. To convey a basic understanding of signal/image processing
2. To expose students to recent ideas in modern convex/non-convex optimization
3. To provide hands-on experience with real applications that might benefit from compressive sensing

Required Textbooks and Materials

Textbook: **S. Foucart and H. Rauhut, "A mathematical introduction to compressive sensing." Basel: Birkhauser, 2013. ISBN 978-0-8176-4948-7**

Additional Recommended Resources

1. M. A. Davenport, M. F. Duarte, Y. C. Eldar, G. Kutyniok, "Introduction to Compressed Sensing."
2. M. Elad, "Sparse and Redundant Representations", Springer, 2010.
3. http://dsp.rice.edu/cs

Tentative schedule (subject to change)

Week 1-2	introduction and preliminaries: sampling theorem and sparse representation, Fourier Transform, Discrete Cosine Transform
Week 3-5	Optimization algorithms: L0 (OMP, IHT, IRL1), L1 (ADMM and FBS), Lp for $0<p<1$
Week 6-8	Theoretical results: NP-hardness of L0 minimization, coherence, restricted isometry property (RIP), D-RIP, random matrices, stable recovery with measurement errors, Prony's method, and Johnson-Lidenstrauss embedding
Week 9-11	Matrix completion, nuclear norm minimization, algorithms and theories
Week 12-14	Applications: image processing, face recognition, and machine learning
Week 15	Presentation/exam

Grading Policy

Homeworks	30%
Exam	30%
Final Project (presentation/report)	40%

Guideline for Letter Grades: A: 90%+, B: 80%+, C: 70%+. A curve may be used if appropriate.

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus.

Please go to http://go.utdallas.edu/syllabus-policies for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.