

COS 702: Data Analysis Techniques

Fall 2017

Instructor: Dr. C.S. Chen

Office: Southern Hall 308

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Office Hours: MWF 10:00-11:30 a.m., MW: 1:30-3:30 p.m., and by appointment

Lecture: MW 5:00-6:15 p.m., TEC101

Textbook: None.

References:

1. Scientific Computing with Radial Basis Functions, C.S. Chen, Y.C. Hon, Robert Schaback, unpublished book manuscript.
2. Meshfree Approximation Methods with MATLAB, Gregory E. Fasshauer, World Scientific, 2007.
3. Research articles from journals.

Requirement of computer skills: The proficiency of MATLAB coding or at least one scientific computer language.

Course Description: Working with the numerical data using basic tool and computational methods which are used to manipulate and analyze data set. It provides an elementary introduction to using fundamental tools as well as elementary introduction to fundamental ideas in numerical and functional approximation to regularize, reconstruct, and simplify data.

Course Objectives: One of the purposes of this course is to help students establishing skills in managing the data set using basic numerical techniques. The course also prepare students how to analyze data related to the writing of their dissertation. Through this course, students is expected to develop the knowledge on how to reconstruct a given or collected data set. For noisy data and ill-posed problems, how the regularization techniques can be applied to obtain the reliable results.

Topics:

- MATLAB Introduction
- Singular Value Decomposition (SVD)
- SVD data compression and its applications
- Image reconstruction
- Face recognition
- Principle component analysis (PCA)
- Radial basis functions for data reconstruction
- Approximation and interpolation of scattered data in 2D and 3D
- Approximation of point cloud data in 3D
- Localized methods for large-scale problems
- Leave on out cross validation: a statistics approach
- Regularization least squares approximation
- Regression analysis
- Least Squares smoothing of noisy data
- Others

Grading:

All homework assignments must be submitted by the given due date. Every day that an assignment is late, 10% of the total points will be deducted from the overall grade. Overall, there is expected to have six assignments and one final project. The report of each assignment needs to be written in the format of research report which contains sections of Introduction, Methodology, Numerical Results, Conclusions, and References.

Your grade will be determined by the average of the following grades:

Attendance	--- 10%
Homework	--- 50%
Presentation	--- 10%
Final project	--- 30%

Your final grade for the course will be based on the following overall percentages:

A: 90-100% B: 80-89% C: 70-79% D: 60-69% F: 0-59%

Class Conduct:

All students are expected to be attentive in class. Please make every effort to arrive on time. Being late for class or leaving class before dismissal may be construed as an absence. It is the student's responsibility to attend class, pay attention, respond to the teacher, and participate in discussions.

ADA Syllabus Statement

If a student has a disability that qualifies under the American with Disabilities Act (ADA) and requires accommodations, he/she should contact the Office for Disability Accommodations (ODA) for information on appropriate policies and procedures. Disabilities covered by ADA may include learning, psychiatric, physical disabilities, or chronic health disorders. Students can contact ODA if they are not certain whether a medical condition/disability qualifies.

Address:

The University of Southern Mississippi
Office for Disability Accommodations
118 College Drive # 8586
Hattiesburg, MS 39406-0001

Voice Telephone: (601) 266-5024 or (228) 214-3232 Fax: (601) 266-6035

Individuals with hearing impairments can contact ODA using the *Mississippi Relay Service* at 1-800-582-2233 (TTY) or email Suzy Hebert at Ouzanne.Hebert@usm.edu