**News**[Old News](#)**Class**

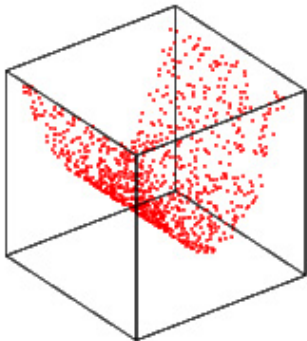
CS 36/136 | Numerical and Computational Tools for Applied Science | Summer 2007

**Lecture**

MWF, 1:45-2:50 (X-hour: Th 1:00-1:50), 108 Kemeny Hall

**Instructor**Prof. Hany Farid | farid@cs.dartmouth.edu | Sudikoff 159 | 646.2761  
office hours are by appointment, or just stop by my office**Description**

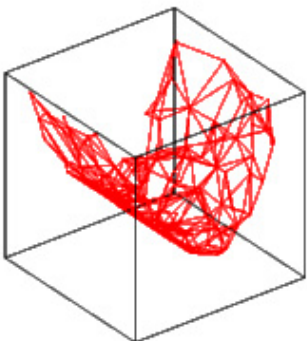
This course provides a practical and principled coverage of useful numerical and computational tools of use in many disciplines. The first half of this course provides the mathematical (linear algebra) and computing (Matlab) framework upon which data analysis tools are presented. These tools include data fitting, Fourier analysis, dimensionality reduction, estimation, clustering, and pattern recognition. This course is designed for undergraduate and graduate students across the sciences and social sciences.

**Textbooks**

Linear Algebra and Its Applications (4th Edition), G. Strang  
 Pattern Classification (2nd Edition), R. Duda, P. Hart, D. Stork

**Resources**

[Lecture Notes](#)  
[Gilbert Strang's on-line Linear Algebra Course \(18.06\)](#)  
[Matlab Tutorial](#)  
[Statistical Pattern Recognition](#)

**Syllabus**

- **Matlab, part I**  
basic arithmetic; vectors and matrices; matrix arithmetic; control structures; input/output; scripts and functions
- **Linear Algebra, part I**  
vectors and matrices; solving  $Ax=b$
- **Matlab, part II**  
data structures; 1-D plotting; 2-D images; 3-D surfaces; GUI programming
- **Linear Algebra, part II**  
vector spaces; linear independence; linear basis; singular value decomposition (SVD); eigenvalues and eigenvectors
- **Data Fitting**  
linear regression (least-squares); polynomial fitting; Bezier curves
- **Fourier Analysis**  
Fourier series; Fourier transform
- **Dimensionality Reduction**  
principal components analysis (PCA); multi-dimensional scaling (MDS); independent components analysis (ICA)
- **Estimation**  
least-squares estimation (LSE); total least-squares estimation (TLSE); maximum likelihood estimation (MLE); Bayesian estimation
- **Cluster Analysis**  
K-means; expectation/maximization (EM)
- **Pattern Recognition**  
linear discriminant analysis (LDA); support vector machines (SVM)

**Grading**

Homework (33.3%) | Midterm (33.3%) | Final (33.3%)

**Homework** There will be weekly written and programming homeworks.

**Honor Code** You cannot collaborate or copy in any way on exams.

On the computer programming portion of homeworks, you may discuss general approaches with other students before you sit down at the computer to write code. Once you are writing code, however, your code must be written by you: any copying (electronic or otherwise) of another person's code or code fragments is a violation of the honor code - this includes code from any web page (other than our class web page) that you find on the web.

On the written portion of homeworks, you may discuss general approaches with other students before you sit down to write out your solutions. Once you are writing your solutions, however, your work must be your own: any copying of another person's solution, or portions of their solution, is a violation of the honor code - this includes solutions from any web page (other than our class web page) that you find on the web.

You must reference all sources of help and collaboration on each homework. For example, if you talked with Jane Smith about your homework (in any way), you must note this on your homework. If you used a source outside of one provided by me or the class web page, you must cite it on your homework. Not doing so is a violation of the honor code.

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*Teaching Home*