

# ECE 697DA: Data Analytics

Fall 2016

Syllabus

- Instructor: C. M. Krishna; KEB 309K.
- Office Hours: Tues, Thurs: 10:00-11:00 AM in KEB 309K and by appointment.
- Texts:
  - Charu Aggarwal, *Data Mining: The Textbook*, Springer-Verlag, 2015.
  - J. Leskovic, A. Rajaraman, J. Ullman, *Mining of Massive Datasets*, Cambridge University Press, 2014;  
<http://infolab.stanford.edu/~ullman/mmds/book.pdf>
  - J. Hopcroft and R. Kannan, *Foundations of Data Science*, 2014;  
<https://www.microsoft.com/en-us/research/wp-content/uploads/2016/02/book-No-Solutions-Aug-21-2014.pdf> .

These books are referred to below as CA, LRU, and HK, respectively.

- Background: Knowledge of basic probability theory and linear algebra. The essential concepts of these will be reviewed in class but prior exposure to these topics in engineering or mathematics courses is assumed. We assume a level of mathematical maturity consistent with the graduate engineering level.
- Grading:
  - Two midterms, 25% each.
  - Final examination, 35%
  - Homework, 15%.

### Detailed (Tentative) Coverage List

- Mathematical Refresher (NOT meant as a substitute for exposure in an earlier course):
  - Probability theory
  - Linear algebra
- Introduction
  - CA Chapter 1.
  - LRU: (Read by yourself: no lecture coverage): Section 1.3 for background material.
- Distance Measures
  - LRU Sections 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.8.
  - CA Sections 3.1, 3.2 (skip 3.2.1.7 onwards), 3.3, 3.4.
- Principal Component Analysis and Singular Value Decomposition
  - LRU Sections 11.1 to 11.3. Students should read Section 11.3.4 by themselves.
- Pattern Analysis
  - CA Sections 4.4.2, 4.4.3, 5.4.
  - LRU Sections 6.1, 6.2, 6.3, 6.4.
- Clustering Techniques
  - CA Sections 6.1, 6.2.1.
  - LRU Sections 7.1, 7.2, 7.3, 7.4, 7.5.
- Outlier Analysis
  - CA Sections 8.2, 8.3, 8.5, 8.8.
  - Paper by Chandola, et al. (will be posted)
- Data Classification
  - CA Sections 10.1, 10.2, 10.3, 10.5
  - LRU Section 12.3
- Recommendation Systems
  - LRU Chapter 9
- Pagerank Algorithm
  - LRU Chapter 5