

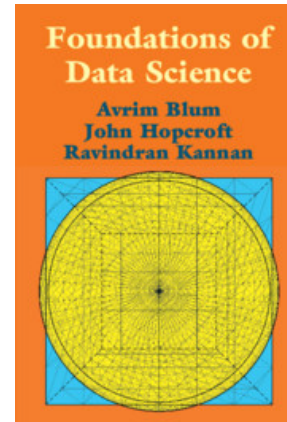
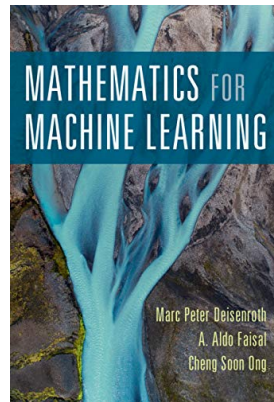
Lecture 0: Introduction to AI503

Jinwoo Shin

AI503: Mathematics for AI

Course information

- Goal: This course is to study mathematical skills useful for graduate students working in the area of artificial intelligence and machine learning.
- Lecture slides will be uploaded in https://alinlab.kaist.ac.kr/ai503_2021.html.
- Zoom link for the class: <https://zoom.us/j/2947126282?pwd=KzF1VmhkM1h2dCtUbGVwa1puektzdz09>
- Office hours: On demand (please email to the instructor or TA to arrange the time)
- Instructor: Jinwoo Shin (jinwoos@kaist.ac.kr), PhD from MIT Math in 2010
- TAs: Jihoon Tack (jihoontack@kaist.ac.kr), Junsu Kim (junsu.kim@kaist.ac.kr), Minkyu Kim (kimmk135@kaist.ac.kr), Seojin Kim (osikjs@kaist.ac.kr), Seokin Seo (tzs930@kaist.ac.kr), HyeongJoo Hwang (jakan3@kaist.ac.kr)



- Textbook A: Mathematics for Machine Learning¹, Cambridge University Press, Marc Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong
- Textbook B: Foundations of Data Science², Cambridge University Press, Avrim Blum, John Hopcroft, and Ravindran Kannan

¹Can be downloaded at <https://mml-book.github.io/>

²Can be downloaded at <https://www.cs.cornell.edu/jeh/book.pdf>

We will study the following chapters of textbook A and B.

- Textbook A
 - Chapter 4: Matrix Decompositions
 - Chapter 7: Continuous Optimization
 - Chapter 8: When Models Meet Data
 - Chapter 9: Linear Regression
 - Chapter 10: PCA
 - Chapter 11: GMM
 - Chapter 12: SVM
- Textbook B
 - Chapter 2: High-dimensional Space
 - Chapter 4: Random Walks and Markov Chains
 - Chapter 5: VC-Dimension
 - Chapter 6: Streaming, Sketching, and Sampling
 - Chapter 7: Clustering
 - Chapter 8: Random Graphs
 - Chapter 9: Topic Models, Nonnegative Matrix Factorization, Hidden Markov Models and Graphical Models

- Prerequisites
 - Some backgrounds on the math, e.g., vector calculus, linear algebra and probability, are required.
 - If you took undergraduate courses for them, it would be probably OK (but not guaranteed).
 - If you are not comfortable on your backgrounds, please study Chapter 1, 2, 3, 5, 6 of Textbook A on your own.
- Assignments & grading
 - 6 homeworks (30%), 1 mid-term exam (30%), 1 final exam (40%)

Some Advice

- Try to read the corresponding chapter of textbook before and after the class.
- Try to solve many exercises in the textbooks as possible.
- Try to prove theorems, claims or properties (which were introduced during the class) on your own.
- Do not ponder where this mathematics is useful.

- Any questions?