M2608.001300
Machine Learning Fundamentals & Applications

[0: Class Introduction]

Electrical and Computer Engineering
Seoul National University

Class logistics

- ⋆ time and place
  - 11:00am–12:15pm, Mon/Wed
  - Room 201, Bldg. 301
- ⋆ instructor: Prof. Sungroh Yoon
  - sryoon@snu.ac.kr
  - office hours (@301-908): TBA
- ⋆ teaching assistants:
  Heonseok Ha (head), Seil Lee, Jangho Lee, Jeonghee Jo & HyeMi Jang
  - ml.class.snu@gmail.com
  - office hours & place: TBA

Class objectives

- ⋆ main objectives:
  - understand fundamentals of machine learning
  - learn state-of-the-art AI techniques such as deep learning
  - have hands-on experience using Python and other ML tools
  - learn AI & ML applications in ECE

Prerequisites

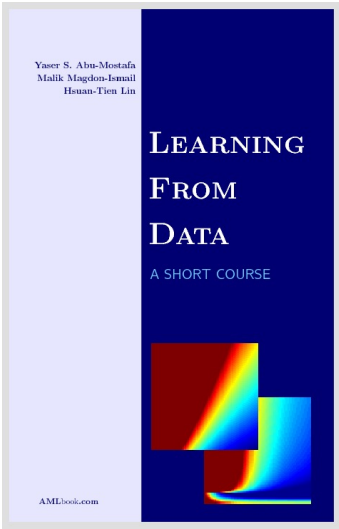
- ⋆ this class:
  - intended to be the first course in machine learning
- ⋆ strongly recommended (although not required)
  - understanding of data structure and algorithm analysis
  - knowledge on basic probability & linear algebra
  - programming ability

Additional notes

- ⋆ approximately five programming assignments + one final project
- ⋆ official programming language: Python
  - ▶ no need to know Python in advance (we'll cover it)
- ⋆ weekly TA session
  - ▶ when? (don't leave early today; TAs will run a poll)
  - ▶ attendance: optional but highly recommended

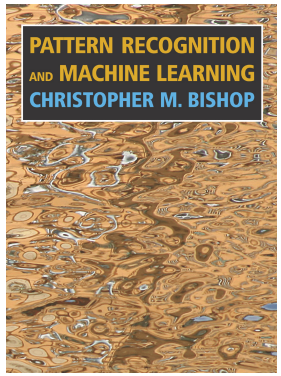
References

- ⋆ *Learning from Data*
  - by Abu-Mostafa, Magdon-Ismail, Lin
  - ML basics & fundamental models
  - supporting website: ▸ Link

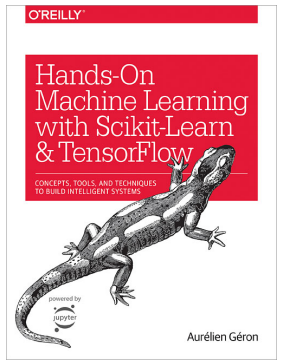


- ⋆ *Deep Learning*
  - by Goodfellow, Bengio, Courville
  - neural networks & deep learning
  - available at: ▸ Link

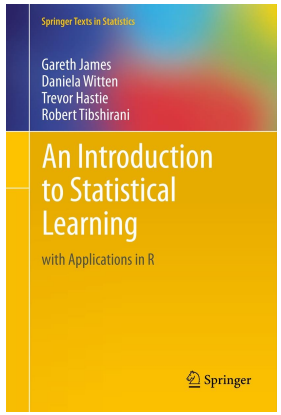
- ⋆ *Pattern Recognition and Machine Learning*
  - by Bishop
  - Bayesian ML, general reference



- ⋆ *Hands-On Machine Learning*
  - by Géron
  - Python for ML, TensorFlow



- ⋆ *An Introduction to Statistical Learning*
  - by James, Witten, Hastie, Tibshirani
  - statistical perspectives



Syllabus (tentative)

Part I: foundations

1. introduction
   - the learning problem
   - Python
   - elements of ML
2. fundamental models
   - linear classification
   - linear regression
   - logistic regression
   - artificial neural networks

Part II: learning machines

3. Bayesian methods
   - Bayes net
   - naïve Bayes classifier
   - expectation maximization
   - Gaussian mixture models

§ midterm

Part II: learning machines (cont'd)

4. support vector machines
   - linear discriminant
   - kernel trick
5. hidden Markov models

Part III: deep learning

6. motivation and overview
7. deep architecture
   - convolutional neural networks
   - recurrent neural networks

§ final project

Performance evaluation

- ⋆ midterm exam (30%)
  - tentatively 11:00am on **4/25 (Wed)** or **4/30 (Mon)**
- ⋆ assignments (40%): done individually
  - 5 programming assignments
  - IPython notebook will be given
- ⋆ final project (25%): team of two students
  - paper-style writeup + poster presentation
  - challenging projects are welcome
- ⋆ class attendance (5+%)

Final remarks

- ⋆ pick a partner for the final project not too late
  - ▶ let the teaching staff know if you need help
- ⋆ absolutely no negotiation for your final grades!
- ⋆ any questions?