Introduction to COMP219

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https://cgi.csc.liv.ac.uk/~xiaowei/

Content

- Module Information
- Contents of the module
- What is machine learning?

Module Outline

- The module consists of
  - 25~30 lectures
  - ~8 lab sessions

- Please ensure sufficient time on self study

Module Outline

- Assessment
  - a two-hour exam, or two one-hour exams (80%)
  - two practical assignments (10% each)

- Module information on Vital or course webpage (https://cgi.csc.liv.ac.uk/~xiaowei/ai.html)

Module Delivery: Demonstrators

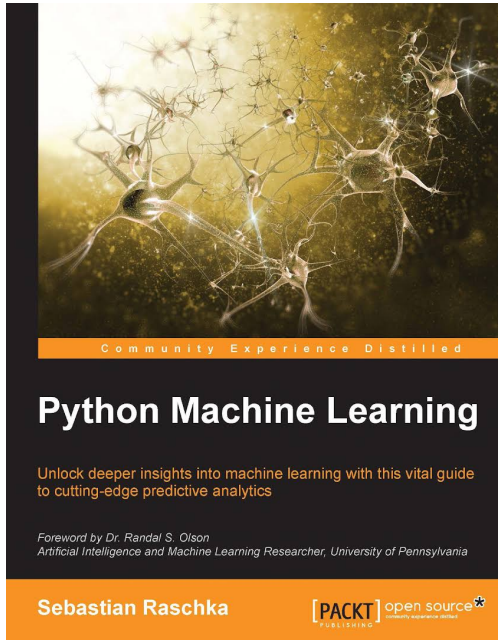
- 6 lab sessions
- Who is going to do this? TBD

Timetable: Lectures

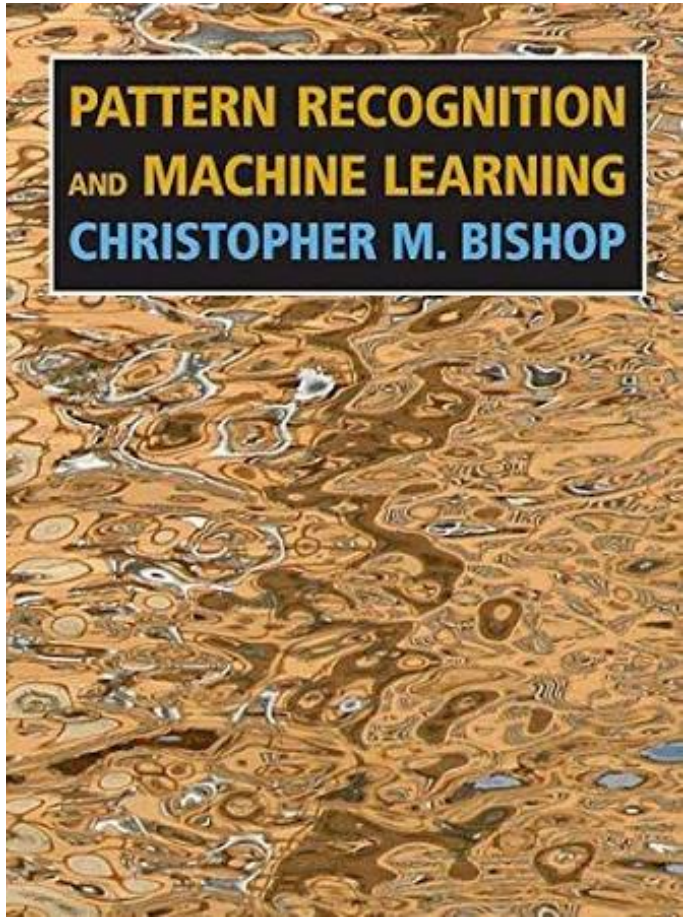
- Tuesday 12am
- Wednesdays 10am
- Thursdays 1pm

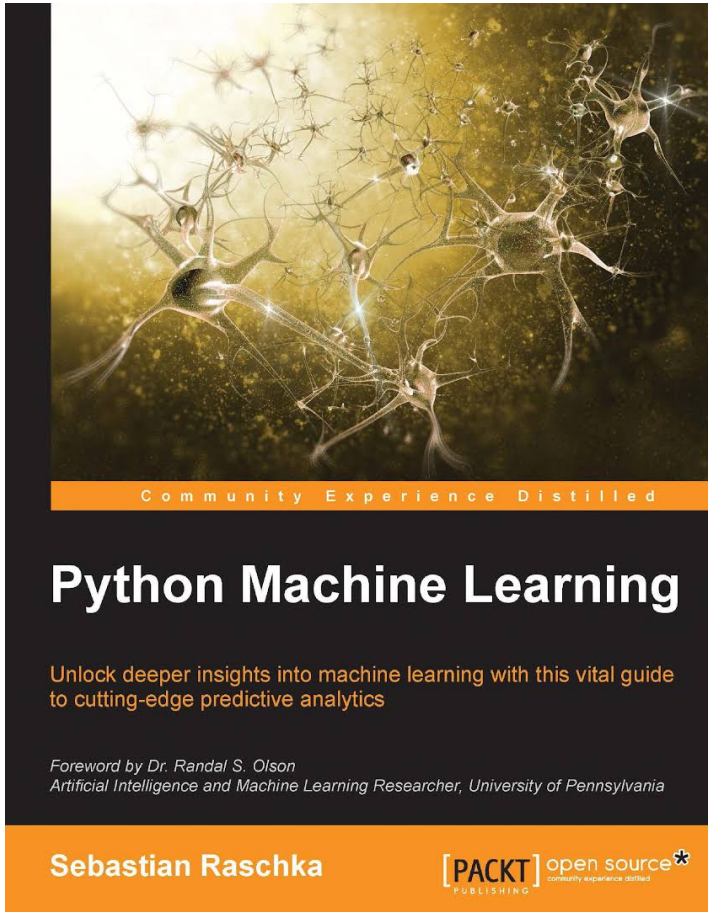
Lab Session

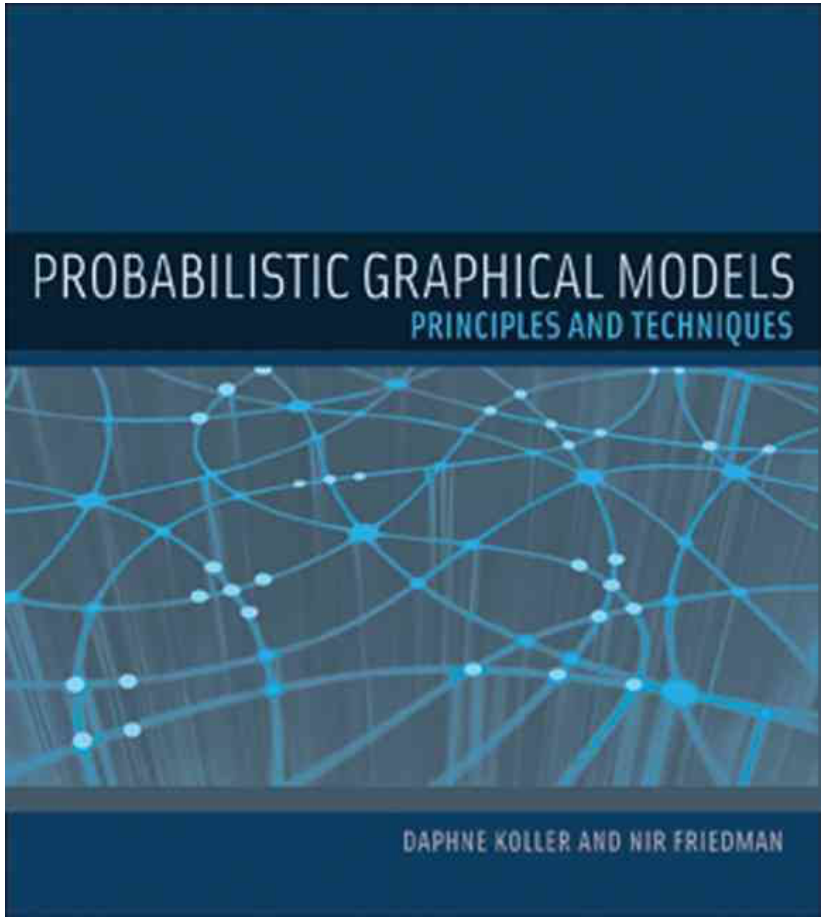
- You are expected to follow the book “Python Machine Learning” to practice your ML skills
  - All codes are available at https://github.com/rasbt/python-machine-learning-book
  - Demonstrators will try to help you



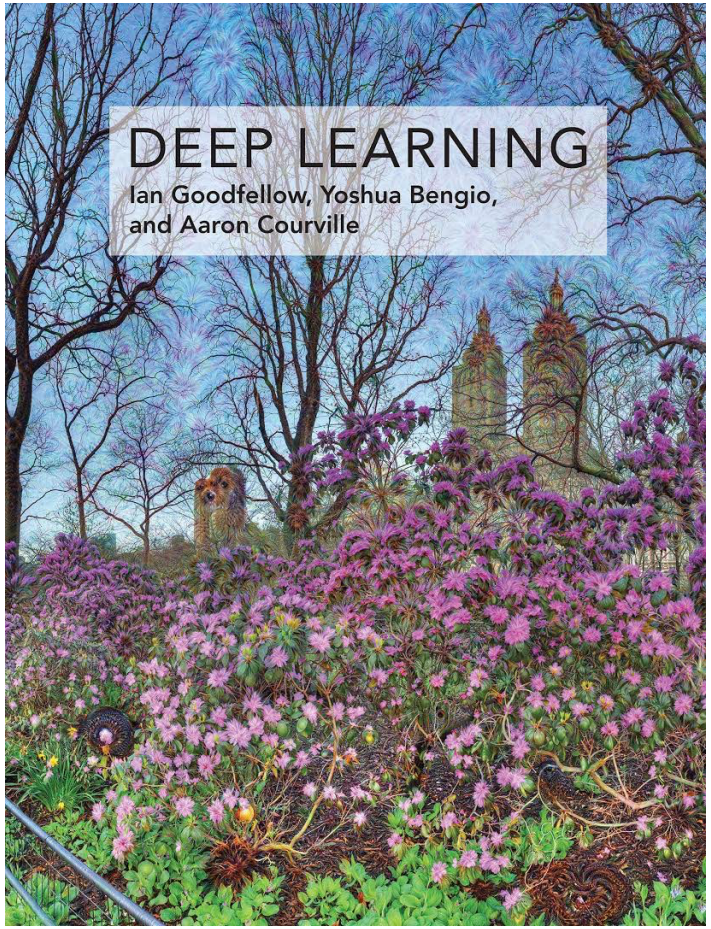
Reading

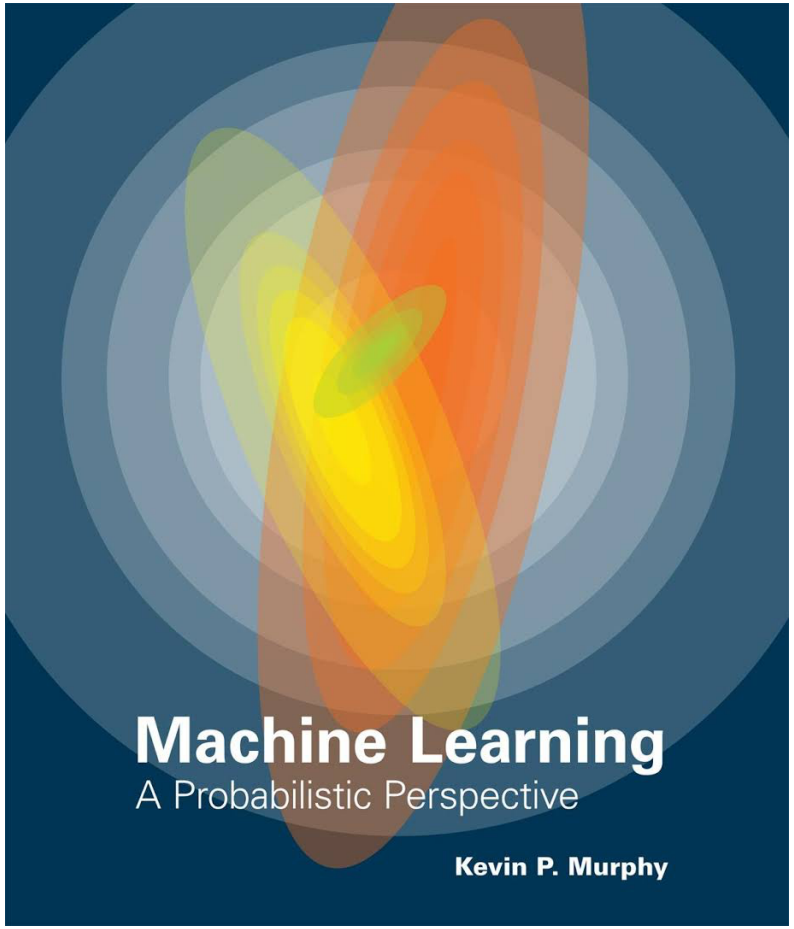

PATTERN RECOGNITION
AND MACHINE LEARNING
CHRISTOPHER M. BISHOP


Community Experience Distilled
Python Machine Learning
Unlock deeper insights into machine learning with this vital guide to cutting-edge predictive analytics
Foreword by Dr. Randal S. Olson
Artificial Intelligence and Machine Learning Researcher, University of Pennsylvania
Sebastian Raschka
[PACKT] open source
PUBLISHING


PROBABILISTIC GRAPHICAL MODELS
PRINCIPLES AND TECHNIQUES
DAPHNE KOLLER AND NIR FRIEDMAN

Other Reading:





Other Reading:

- Tensorflow on-line documentations
- Github (plenty of resources, code, tutorials, etc)
- Various on-line courses
- Reddit, quite some good discussions. Experts are around there.
- Kaggle competitions, you can participate in to get more hand-on experience
- Wikipedia, for various concepts, key pointers, etc
- …. Many other on-line resources, please Google whatever you want

Aims

- To equip students with the knowledge about basic algorithms that have been used to enable the AI agents to conduct the perception, inference, and planning tasks;
- To equip students with the knowledge about machine learning algorithms;
- To provide experience in applying basic AI algorithms to solve problems;
- To provide experience in applying machine learning algorithms to practical problems;

Module Content

- Some basic math backgrounds (probability theory, linear algebra)
- Introduction to scipy/numpy and tensorflow
- Traditional machine learning (decision tree learning, KNN, model evaluation, linear regression, naïve Bayes)
- Deep Learning
- Probabilistic graphical model
- (optional) reinforcement learning

Learning Outcomes

- Ability to explain in detail how the techniques in the perceive-inference-action loop work
- Ability to choose, compare, and apply suitable basic learning algorithms to simple applications
- Ability to explain how deep neural networks are constructed and trained, and apply deep neural networks to work with large scale datasets
- Understand reinforcement learning, and is able to develop deep reinforcement learning algorithms for suitable applications (this is the part you have to learn by yourself and do assignment! :-D)

Credits

- I used many resources from the web

COMP111

- Brief history of AI including recent developments
- Intelligent Agents: A classification
- Search (applications: route planning, game playing)
- Knowledge Representation (applications: structured web search output)
- Reasoning under Uncertainty (application: almost everywhere)
- Learning (applications: face recognition, selfdriving cars)
- Philosophy and Ethics of AI (motivation: deducing sexual orientation from your picture ok? Visit `https:`

Contents of this module

- Introduction
- preliminary knowledge (probabilistic foundation, linear algebra)
- Traditional machine learning (gradient descent, decision tree learning, K-nn, model evaluation, linear regression, naïve Bayes)
- Practical tutorial (python, tensorflow)
- Deep learning
- Probabilistic graphical models
- (optional) reinforcement learning
- (optional) advanced topics

What is Machine Learning?

- (Software) programs that can improve their performance by applying learning algorithm on training data
- Typically the program has a (large) number of parameters whose values are learnt from the data