COURSE ANNOUNCEMENT FOR MACHINE LEARNING (S 2018)

Shingchern D. You

Instructor

- Shingchern (David) You
- Office: 1533 Tech building
- Tel: x 4234
- E-mail: you@csie.ntut.edu.tw (preferred)

Grading

- Midterm: 30 %
- Final: 40 %
- Homework: 30 %
- Project: 10 % (optional)

Exam

- MT & final are open-book exams (3 hrs)
- Do not bring too many materials, as you may not have enough time to both read books and answer questions
- Problems are mainly arithmetic-oriented (you may need a calculator)

Homework

- Homework problems are programming-based assignments
- NO official language used. Suggested languages include MATLAB, Python, and C
- Tensorflow is handy for neural-network simulations

Project

- Project is optional, meaning you may elect NOT to do it
- Bonus points will be given based on completeness and difficulty level
- Need a live demo and a written report
- Give me your proposal (1 page) by the end of 14th week

Textbook

- Introduction to machine learning, 2nd ed, E. Alpaydin
- Note that 3rd edition is also available (**expensive**)
- The textbook is kind of dry: lots of texts and math. Not too many examples (and figures)
- It is up to you to decide to buy it or not
- Lecture PPT available at Taipei Tech i-school
- Contact: 魏錦玲 (Ms. Wei) 0939-852-332 for 50% off the list price (group rate)

Lecture style

- Follow the presentation order of the textbook
- Skip some (or actually most) of the detailed math, presenting only the main concepts
- Provide additional examples (mainly searched over the Internet) to illustrate how to implement the algorithms

Outline (1)

- Class announcement and introduction (CH 1)
- Basics of supervised learning (Ex: K NN), VC dimension, and regression (CH 2). Baysian decision theory (CH 3) (Ex: Naive Bayes classifiers (CH 5))
- ML and MAP estimation; Bias vs variance (CH 4); Sample mean and sample covariance (CH 5) Dimension reduction techniques: PCA, FA (CH 6), LDA and ICA
- Clustering algorithms: k-mean (CH 7)

Outline (2)

- Unsupervised neural networks (CH 12): Competitive learning, SOFM, and ART. Decision trees: ID3, C4.5, and random forest (CH 8)
- Mixer model: GMM and EM algorithm (CH 7)
- Genetic algorithms. Basics of optimization
- Gradient search and linear discrimination (CH 10)
- Feedforward neural networks with examples: Radical basis networks and Multi-layer perceptrons; Back propagation and regularization (CH 11)

Outline (3)

- Deep learning and convolutional neural networks
- More on deep neural networks: Autoencoder, LSTM, and others
- SVM (CH 13) and HMM (CH 15)
- Combining multiple classifiers (CH 17)
- Design and analysis of experiments (CH 19)
- Reinforcement learning (CH 18)

Why to study so many tools

- Neural networks with deep learning algorithms are good for massive training examples, but sometimes we do NOT have (e.g., medical imaging)
- It is like a chef needs various kinds of knifes

Let's start today's lecture

- I will NOT modify the original PPT files from the textbook
- My own PPT files are in separate files with explanatory file names
- Many concerns… Such as what if I want to switch to 3rd ed of the textbook later on