Bayesian Learning – Graduate Course

@ Tsinghua Berkeley Shenzhen Institute

Instructor: Prof. Ercan (尔江) Engin KURUOGLU

Teaching Assistant: Zifeng WANG wangzf18@mails.tsinghua.edu.cn

Email: ercan.kuruoglu@isti.cnr.it & kuruoglu@sz.tsinghua.edu.cn

Wechat: ErcanItaly

Cell: 13603062176

Office: Information Building, 13F, 1308

Classroom: to be announced

Class hours: Thursday: 10:25-12:00

Office hours: Tuesday: 09:00 – 12.00 & Thursday: 14:00 – 17:00

You can come any time in my office even outside my office hours but you might not find me. In the initial weeks, you can catch me on WeChat.

Prerequisites: Basic programming skills (one of C, C++, Python, Matlab), undergraduate probability theory and statistics knowledge, Calculus, undergraduate linear algebra.

Evaluation: Home assignments: 20%, Final exam: 40%, Project: 40%

Text Books:

1. Bayesian Data Analysis, A. Gelman, et al, Fourth Edition, Chapman & Hall.
2. Data Analysis: a Bayesian Tutorial, A.S. Sivia and J. Skilling, Oxford Science Publications.

Topics:

1. Introduction: Why do we study Bayesian Learning?
2. Thomas Bayes – History
3. Bayesian interpretation of probability
4. Bayes´ theorem
5. Bayesian learning
6. Prior distributions
7. Posterior distributions
8. Bayesian analytics for Gaussian processes
9. Bayesian hypothesis testing
10. Markov chain Monte Carlo

11. Advanced sampling methods
12. Bayesian model selection – Reversible Jump MCMC
13. Bayesian non-parametrics
14. Sequential Monte Carlo / particle filtering
15. Variational Bayes
16. Bayesian Networks / Graphs
17. Towards Bayesian Deep Learning
18. Project presentations

Objective: This course covers all aspects of Bayesian learning and Bayesian data analysis. By the end of the course you will acquire the skills to model problems of machine learning and data analysis in the Bayesian framework and solve problems of estimation, prediction, classification using Bayesian methods. You will become up to date with advanced sampling methods such as MCMC, particle filtering, Bayesian non-parametrics.