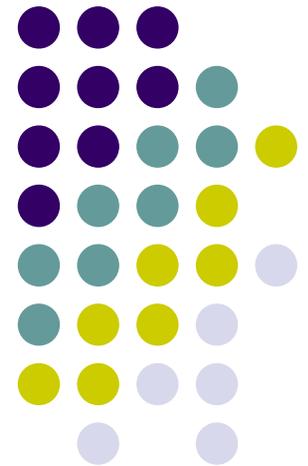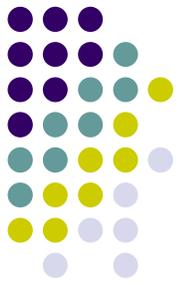# Machine Learning: Introduction

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Syllabus

- Covers a set of Machine learning techniques –from basic and state-of-the-art.

- You will learn:
  - PCA, MDS, LLE,K-mean, mean-shift, spectrum based clustering, Naïve-Bayes classification, boosting, logistic regression, decision tree, EM, HMM, Kalman filtering…

- We will try to tell the stories behind the algorithms, theory and applications.

- It is going to be fun and hard work.

Rough schedule

- 06.09: Introduction
- 06.16: Classification
- 06.23: Clustering
- 06.30: HMM
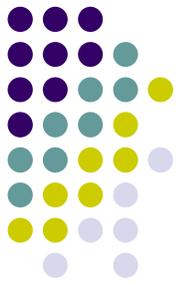
Homework

- Paper reading report.
  - Read a typical learning paper. Report the main idea and your own opinions.
    - Paper source: SIGGRAPH 2004/2005, ICCV/ECCV/ACCV, CVPR, NIPS 2003/2004, ICML, etc.
    - Report can be in English or Chinese. And please hand out in PFD format.

Prerequisites

- Probabilities
  - Distributions, densities, marginalization…
- Basic statistics
  - Moments, typical distributions, regression…
- Algorithms
  - Dynamic programming, basic data structures, complexity…
- Programming
  - Mostly your choice of language: C/C++, MATLAB, JAVA
- We provide some background, but the class will be fast paced

- Ability to deal with "abstract mathematical concepts"
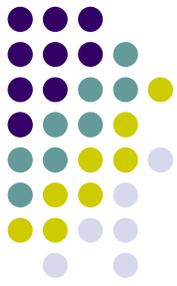
Text books

- [Machine Learning](), *by Tom Mitchell*.
- [Pattern Classification (2nd Edition)](),*by Duda, Hart and Stork*.
- [Information Theory, Inference, and Learning Algorithms](), *by David MacKay*.
- Statistical Inference, *by George Casella and Roger L. Berger*.
- *And more …*

- *All above books are optional. Everyone have their own learning algorithms,* ☺

Internet resources

- http://www.cad.zju.edu.cn/home/zhx/ML/
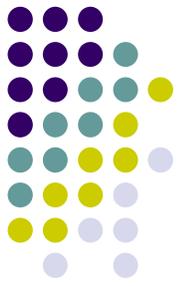
Enjoy!

- Machine Learning is becoming ubiquitous in science, engineering and beyond.

- This class should give you the basic foundation for applying ML and developing new methods.

- The fun begins…

Reference

- http://www-2.cs.cmu.edu/~guestrin/Class/10701/slides/CarlosIntro.pdf