Project

- Proposal presentation
  - Jan. 10, 12
    - Schedule has been announced in BB
  - $\leq$ 5min per group
  - To introduce your topic, motivation, possible methods

Project

- Project presentation
  - Time:
    - 7pm, Jan. 25 (Thu)
    - 7pm, Jan. 26 (Fri)
  - Each group has ≤ 7 minutes for presentation
  - Schedule: TBA

- Project submission
  - Report
    - Due: 11:59pm, Jan. 26 (Fri)
    - Submission link at BB => Project => Project Report Submission
    - Format: PDF, academic paper, no page requirement
    - Each group only needs to submit once
  - Source code
    - In a zip file
    - Do not include external libraries

Project

- Grading
  - relevance to this course
  - substance, soundness
  - quality of the report and presentation

- Usage of external code and tools
  - At the end of your final presentation and report
    - List the external resources (e.g., code, lib, tools) that you use
      - We will check your code
    - Explain how/why you use them

Final Exam

- Time
  - 10:30-12:10, Jan. 19 (Fri)
- Location
  - 教学中心 301
- Format
  - Closed-book. You can bring an A4-size cheat sheet and nothing else.
  - 10 multiple-choices, 4 problems
- Grade
  - 25% of the total grade

- F2018 final exam paper is available at: Blackboard menu → Previous Exams

Final Review

Disclaimer

▸ Topics covered in this review may not appear in the exam.

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Probabilistic temporal models

- Markov models
  - Markov assumption, Transition model
- Hidden Markov models
  - Transition model (states) + emission model (evidence)
  - Filtering: $P(X_t|e_{1:t})$
    - Forward algorithm
  - Most likely explanation: $\text{argmax}_{x_{1:t}} P(x_{1:t} | e_{1:t})$
    - Viterbi algorithm
- Dynamic Bayes networks
- Approximate inference by particle filtering
  - Propagate forward → Weight → Resample

Markov Decision Processes

- Markov Decision Process
  - States S, Actions A, Transitions $P(s'|s,a)$, Rewards $R(s,a,s')$
- Quantities:
  - Policy, Utility, Values, Q-Values
- Solve MDP
  - Bellman equation
  - Value iteration
  - Policy iteration
    - Policy evaluation + Policy improvement

Reinforcement Learning

- Reinforcement learning
  - MDP without knowing T and R
  - Offline planning vs. online learning
- Model-based learning
- Model-free learning
  - Policy evaluation: Temporal Difference Learning
    - Exponential moving average
  - Computing q-values/policy: Q-Learning
- Exploration vs. Exploitation
  - Random exploration, exploration function
- Approximate Q-Learning
  - Feature-based representation of states

Supervised machine learning

▸ To learn an unknown target function f from labeled examples

▸ Classification (f with discrete output value)
  ▸ Naïve Bayes
    ▸ Empirical rate, maximum likelihood estimation
  ▸ Generalization and overfitting, smoothing, tuning
  ▸ Perceptron, logistic regression, neural networks
    ▸ Gradient ascent / descent

▸ Regression (f with continuous output value)
  ▸ Linear regression, minimizing summed squared error, regularization

▸

Unsupervised machine learning

- K-means
  - Clustering
  - Iteration:
    - Assign each data instance to closest center
    - Assign each center to the average of its assigned data points
- Expectation-Maximization
  - Learning Mixture of Gaussians
  - Iteration:
    - E-step: Compute label distribution of each data point
    - M-step: Update each Gaussian based on its (proportionately) assigned points

Guest lectures

▸ Not to be covered in the exam ☺

The Road Forward

The Road Forward – SIST Courses

- Undergraduate
  - CS172   Computer vision I
  - CS173   Data Mining
  - CS182   Introduction to Machine Learning
  - CS183   Introduction to Robotics
- Graduate
  - CS280   Deep Learning
  - CS282   Machine Learning
  - CS243   Introduction to Algorithmic Game Theory
  - CS272   Computer Vision II
  - CS274A   Natural Language Processing
  - CS283   Robotics
  - CS286   AI for Science and Engineering
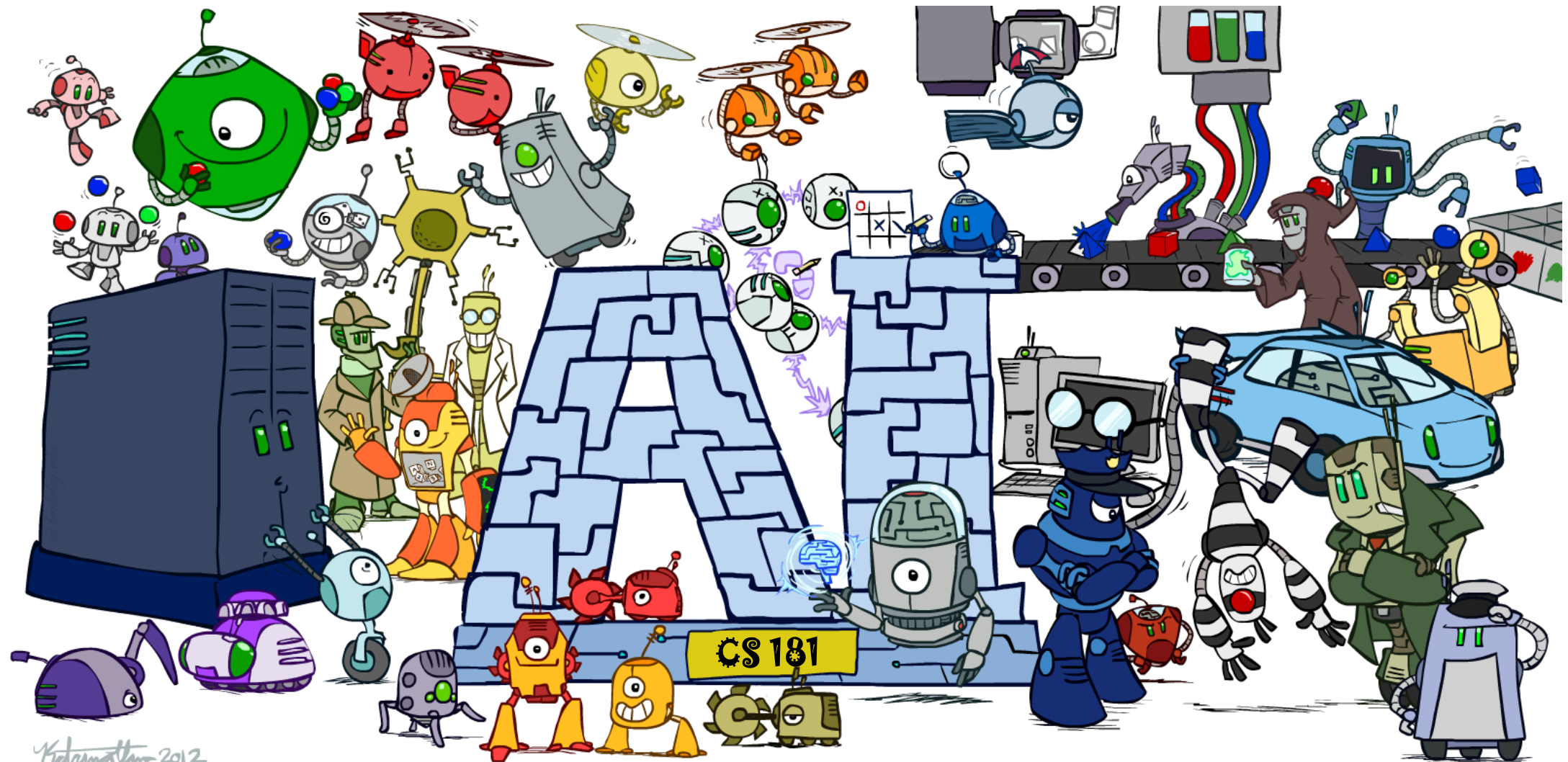 - SI252   Reinforcement Learning
- And more…

The Road Forward – Research

- Learning recent developments in AI from top conferences
  - AI: IJCAI, AAAI
    - Caution: not top in ML, NLP, CV
  - ML: NIPS, ICML, ICLR
  - NLP: ACL, EMNLP, NAACL
  - CV: CVPR, ICCV, ECCV
  - Other: KDD, AAMAS, UAI, …
- A good (but not perfect) way to judge a publication venue
  - Google Scholar Metrics

- Participating in research projects…

That's all!

期末评教

https://evaluation.shanghaitech.edu.cn/tqnmaep/login