Structured Prediction as Search
Q: Can we have the handwritten notes from lectures?

A: Okay fine...

https://1drv.ms/u/s!Aqk9RupCw3gqhUENhKlkfjqrG5Tv?e=3wGwlo

...but just be warned that lots of education research suggests that taking your own notes is the best way to learn!
Reminders

• Recitation: PyTorch
  – Fri, Sep. 06, same time/location as lecture

• Homework 1: DAgger for seq2seq
  – Out: Mon, Sep. 09 (+/- a day)
  – Due: Mon, Sep. 23 at 11:59pm
LEARNING TO SEARCH
Learning to Search

Whiteboard:

– Problem Setting
– Ex: POS Tagging
– Other Solutions:
  • Completely Independent Predictions
  • Sharing Parameters / Multi-task Learning
  • Graphical Models
– Today’s Solution: Structured Prediction to Search
  • Search spaces
  • Cost functions
  • Policies
Learning to Search

**Whiteboard:**

- Scoring functions for “Learning to Search”
- Learning to Search: a meta-algorithm
- Algorithm #1: Traditional Supervised Imitation Learning
- Algorithm #2: DAgger
LEARNING TO SEARCH:
EMPIRICAL RESULTS
Dagger for Mario Tux Cart

Video from Stéphane Ross (https://www.youtube.com/watch?v=VoonpNnWzSU)
Experiments: Vowpal Wabbit L2S

Figure from Langford & Daume III (ICML tutorial, 2015)
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Experiments: Vowpal Wabbit L2S

Figure from Langford & Daume III (ICML tutorial, 2015)
Learning 2 Search

Some key challenges:

– performance depends heavily on search order, but have to pick this by hand

– reference policy is critical, but what if it’s too difficult to design one

– not always easy to make efficient on a GPU

Adapted from Langford & Daume III (ICML tutorial, 2015)
Learning Objectives

Structured Prediction as Search

You should be able to...

1. Reduce a structured prediction problem to a search problem
2. Contrast imitation learning with reinforcement learning
3. Implement Dagger, a learning to search algorithm
4. Explain the reduction of structured prediction to no-regret online learning
5. Contrast various learning to search algorithms based on their properties