

- **Part 1: Introduction to Structured Prediction (60min)**
 - **Motivation**
 - **Examples:**
 - NE + Relations
 - Vision
 - Additional NLP Examples
 - **Problem Formulation**
 - Constrained Conditional Models: Integer Linear Programming Formulations
 - **Initial thoughts about learning**
 - Learning independent models
 - Constraints Driven Learning
 - **Initial thoughts about Inference**
 - Amortized Inference

- **Part 2: Learning a Structured Prediction Model (45min)**
 - **Definition**
 - **Local Learning v.s. Global Learning**
 - **Global Learning Algorithms**
 - **Online learning: Structured Perceptron**
 - **Batch learning: Structured SVM**
 - **Optimization methods for Structured SVM**
 - **Stochastic Gradient Decent**
 - **Dual Coordinate Descent**
 - **Learning on a multi-core machine**

■ Part 3: Amortized Inference (45min)

□ Overview

□ Amortization at Inference Time:

- Theorems
- Decomposition
- Results

□ Amortization during Learning:

- Approximate Inference
- Results

■ Part 4: Distributed Representations for Structured Prediction

- Distributional representations for **inputs** is a success story
 - Eg. word vectors
- **Outputs** are discrete objects
 - One of a set of labels (document classification)
 - Label sequences (POS tagging, Chunking, NER)
 - Trees with labeled edges/nodes (Parsing)
 - Arbitrary graphs (Semantic Role Labeling, event extraction)
- *Can we think of distributional representations for structures?*
 - Starting with individual labels to compose full structures
 - A natural generalization of standard structured prediction formalism

■ Part 5: Structured Prediction Software

□ *Illinois Structured Learning Library*

- A general purpose learning library in JAVA
- Support Structured Perceptron and Structured SVM

□ Implement your own applications

- Part 6: Conclusion and Discussion