



Main approaches in NLP

1. Rule-based methods

- Regular expressions
- Context-free grammars

• ...

2. Probabilistic modeling and machine learning

- Likelihood maximization
- Linear classifiers

• ...

3. Deep Learning

- Recurrent Neural Networks
- Convolutional Neural Networks

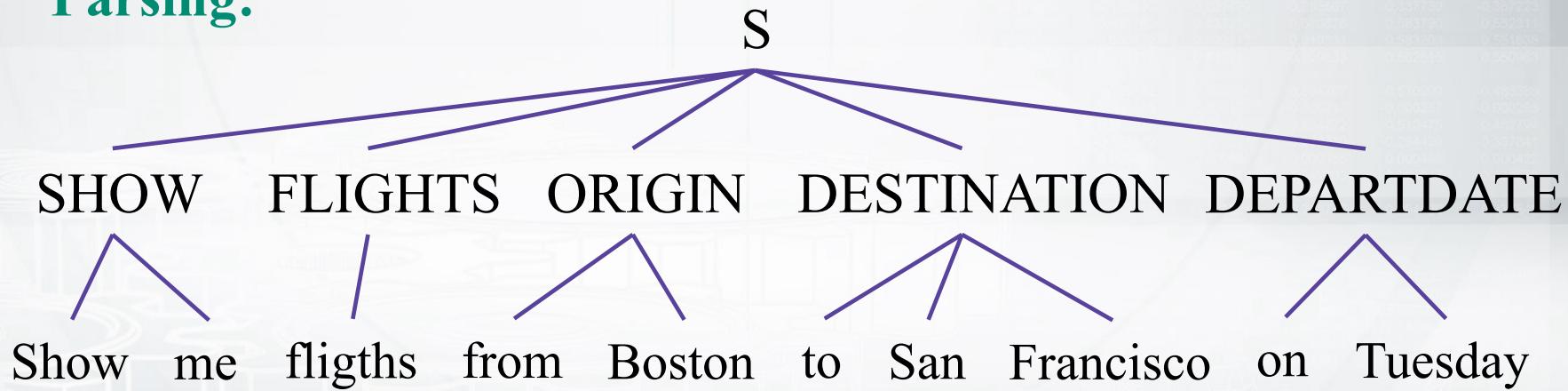
• ...

Semantic slot filling: CFG

Context-free grammar:

- SHOW → show me | i want | can i see | ...
- FLIGHTS → (a) flight | flights
- ORIGIN → from CITY
- DESTINATION → to CITY
- CITY → Boston | San Francisco | Denver | Washington

Parsing:



Semantic Slot Filling: CRF

Training corpus:

Show me flights from Boston to San Francisco on Tuesday.

Feature engineering:

- Is the word capitalized?
- Is the word in a list of city names?
- What is the previous word?
- What is the previous slot?
-

Semantic Slot Filling: CRF

Probabilistic graphical model:

- Conditional Random Field (CRF)

$$p(\text{tags}|\text{words}) = \dots$$

↑ features
↑ parameters Θ

Training:

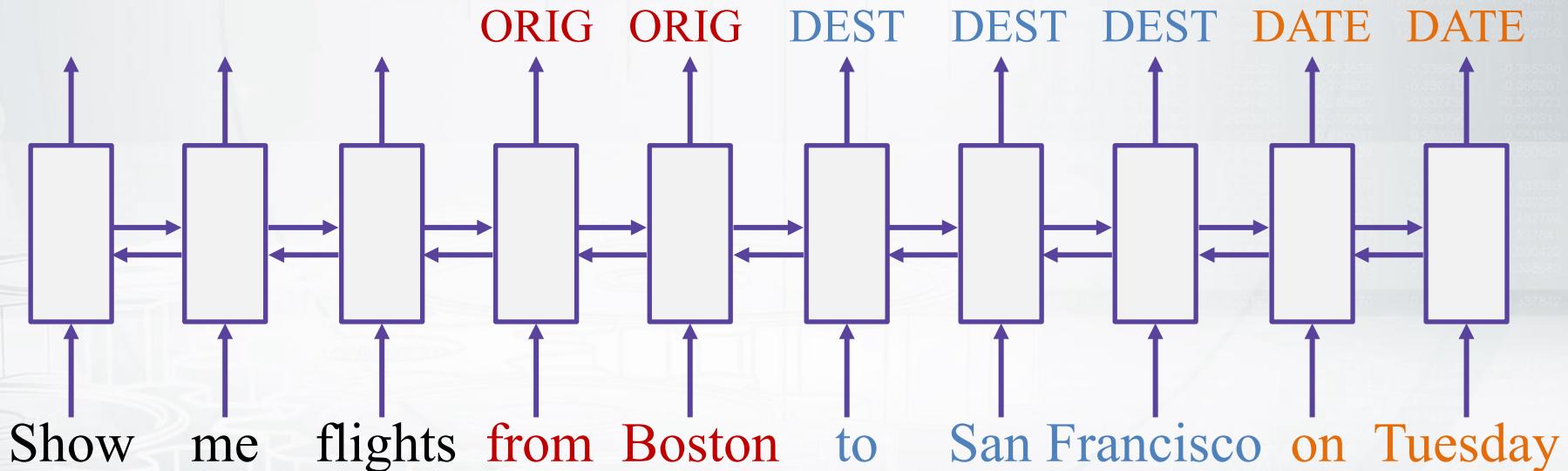
$$p(\text{tags}|\text{words}) \rightarrow \max_{\Theta}$$

Inference:

$$\text{tags}^* = \operatorname{argmax} p(\text{tags}|\text{words})$$

Semantic Slot Filling: LSTM

- Big training corpus
- No feature generation
- Defining the model
- Training and inference



Deep Learning vs. traditional NLP

Oh, for fucks sake, DL people, leave language alone and stop saying you solve it.

Yoav Goldberg

Why do we need to study traditional NLP?

- Perform good enough in many tasks

Example: sequence labeling

- Allow us not to be blinded with the hype

Example: *word2vec* / distributional semantics

- Can help to further improve DL models

Example: word alignment priors in machine translation

Deep Learning vs. traditional NLP

Why do we need to study DL in NLP?

- Provide state-of-the-art performance in many tasks
Example: machine translation
- This is where most of research in NLP is now happening
Example: papers from ACL, EMNLP, etc.
- Look fancy and everyone wants to know them ☺

Our way?

- Study two approaches in parallel!