CS 5/7320 Artificial Intelligence

More Important AI Topics

Slides by Michael Hahsler

Learn Heuristics from Data

- Assume we do not know the environment so we cannot specify a heuristic by using a relaxation or a subproblem.

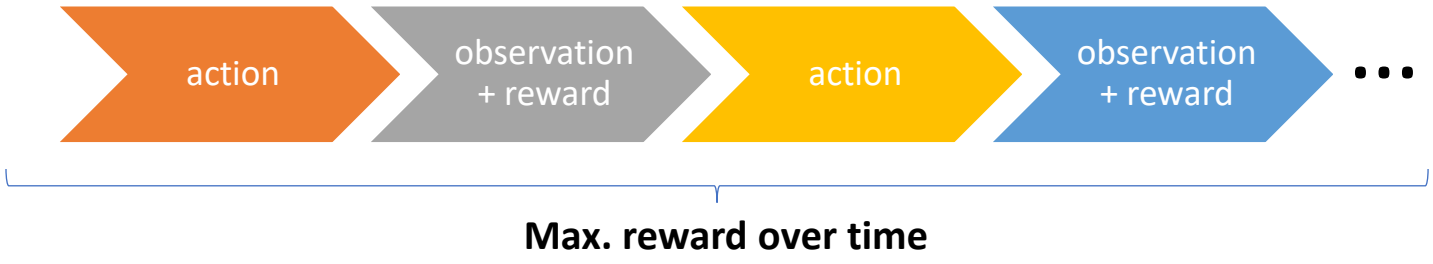
- Assume we have observations of the form:
  In state s_1 the path to the goal had a length of l
  In state …

- We can **learn** a from the data a function

$$h(s) = f(s; \theta)$$

- The function $f(s; \theta)$ has the parameters θ that we need to learn from data. The function can be represented as a neural net, a SVM, a decision tree,…

Reinforcement Learning



Sequential decision making: Find a policy π that maximizes the expected discounted sum of rewards over time.

$$U = \mathbb{E}\left[\sum_{t=1}^{\infty} \gamma^t R(s_t, \pi(s_t), s_{t+1})\right]$$

Models for the environment and the reward are known (and states evolve Markovian)
- Markov Decision Model (MDP)
- Partially Observable Markov Decision Model (POMDP)

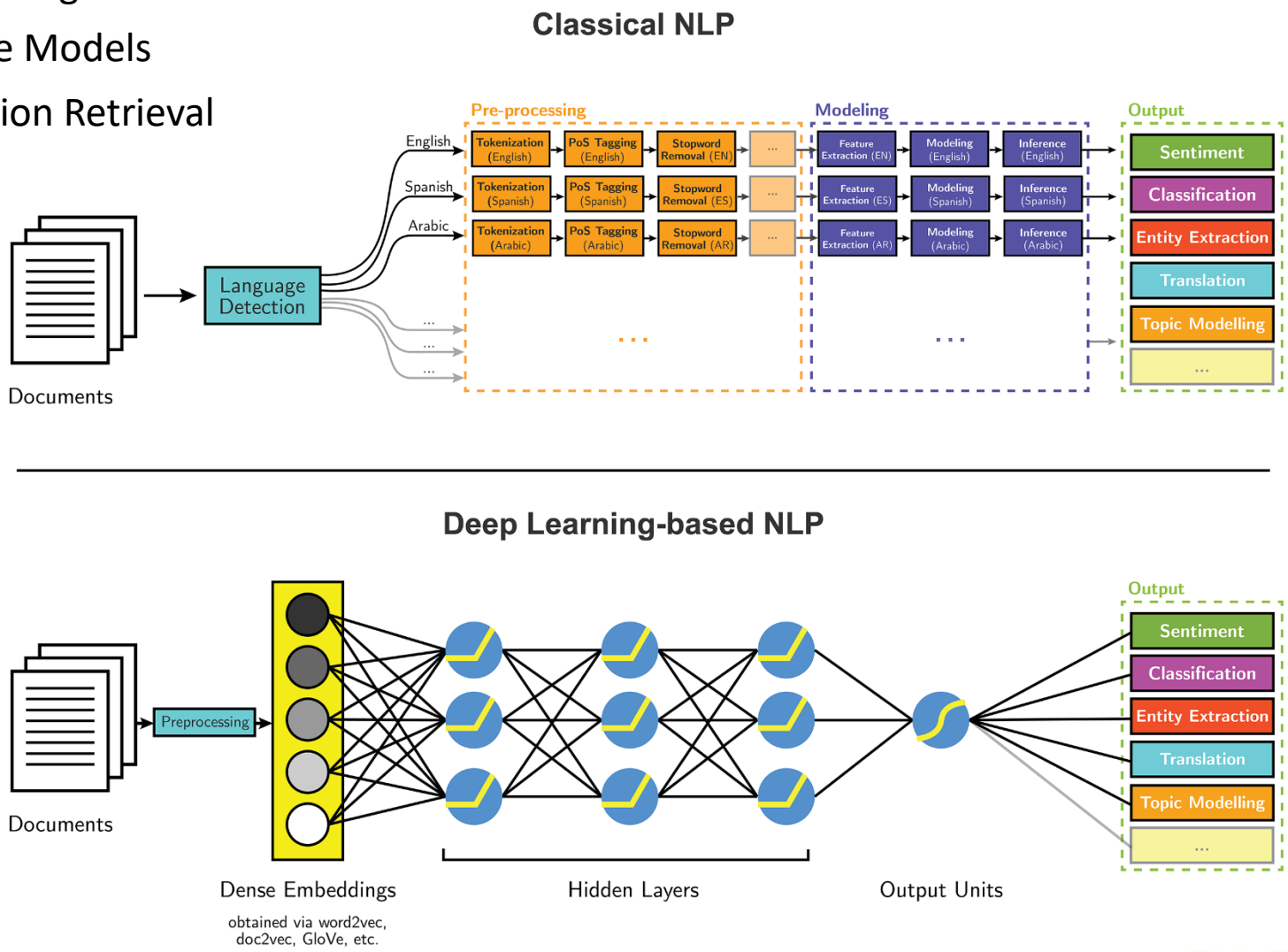
Dynamic Programming
- Value iteration $V(s)$
- Policy iteration $\pi(s)$

Model-free approaches
- Q-Learning (learns the value of actions in states $Q(s, a)$)
- Time differencing (TD learning)

Learn iteratively

Natural Language Processing

- Speech recognition
- Language Models
- Information Retrieval



Source: [Leveraging Deep Learning for Multilingual Sentiment Analysis - AYLIEN News API]

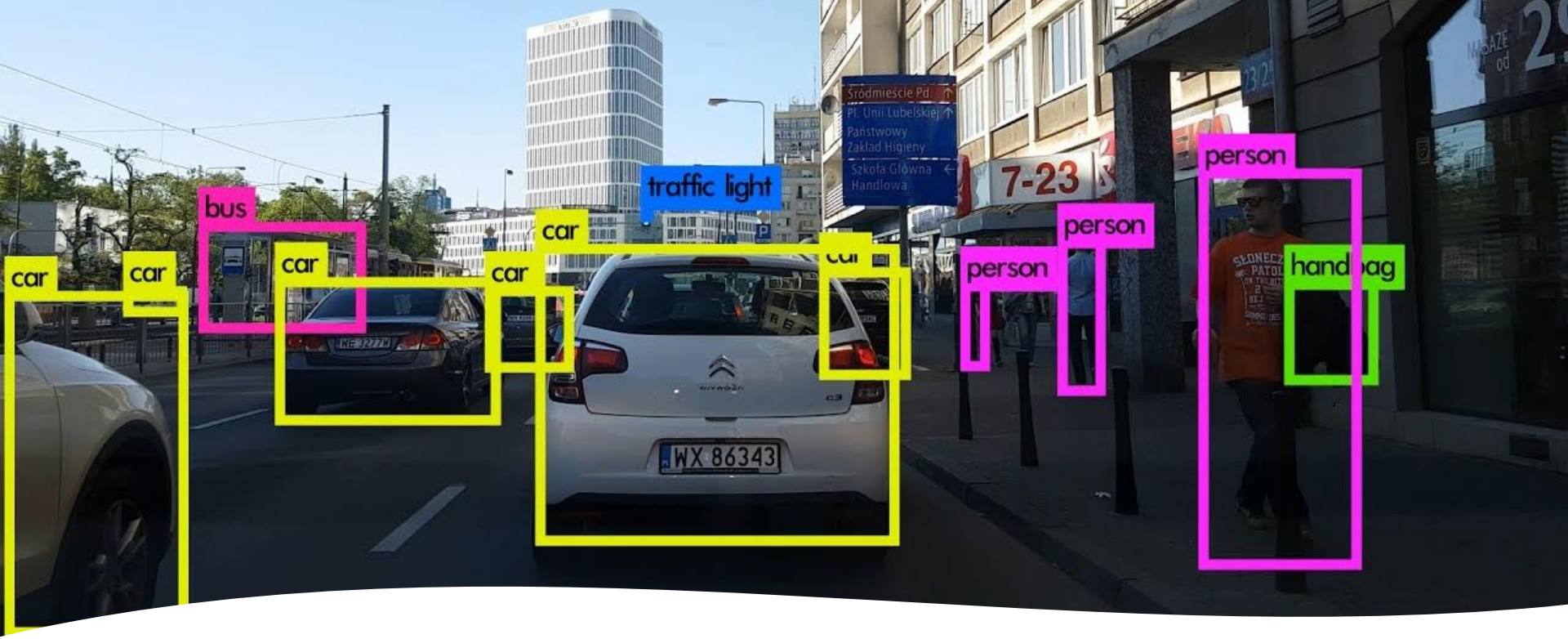


Image Processing & Object Recognition

Uses Deep Convolutional Neural Networks

Robotics

- Hardware, sensors, control theory (feedback-based controllers)