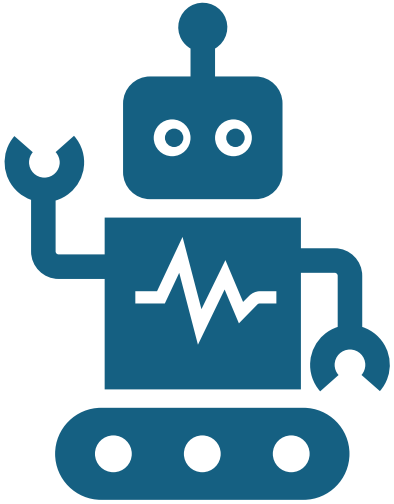
CS 5/7320 Artificial Intelligence

Conclusion

Slides by Michael Hahsler

What We Have Covered

- Agents and the environment
- Many flavors of search for good actions
- Uncertainty and the Bayesian update rule
- Supervised machine learning and agents



In the following, I will go through important areas that we have not covered and that you can take a class on.

Reinforcement Learning

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

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

Model-based approaches: Transition and reward model are known.

- 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

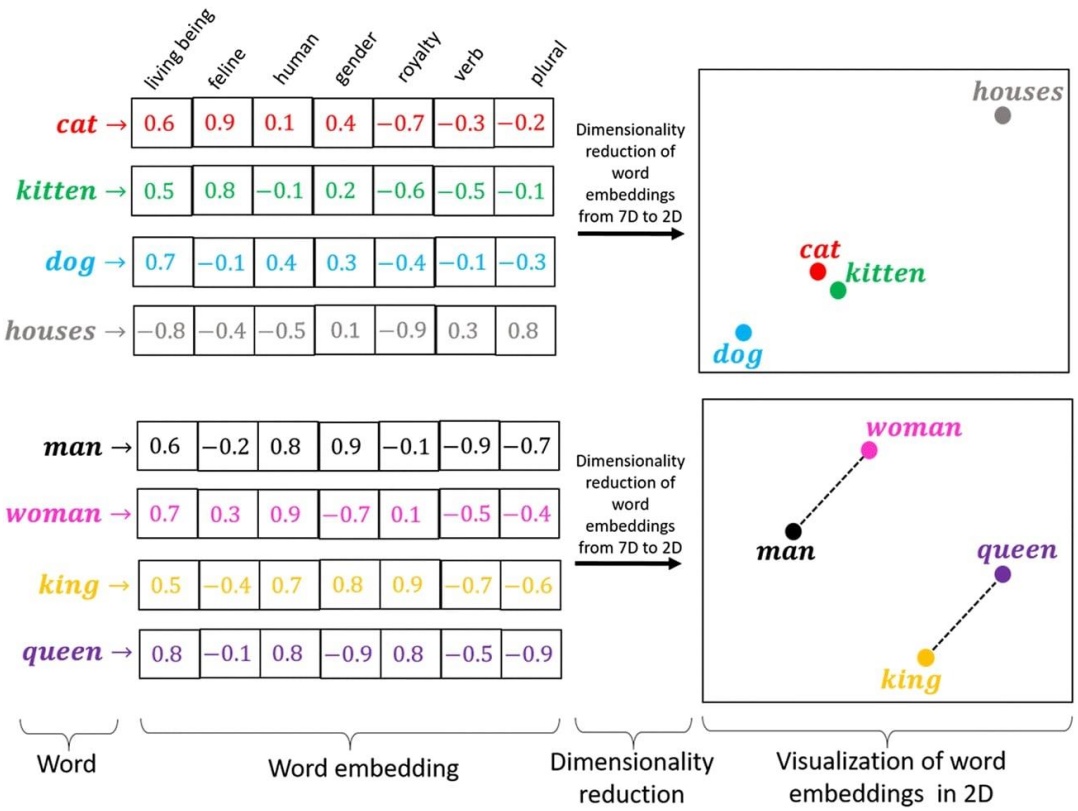
Natural Language Processing (NLP)

Tasks:

- Speech recognition
- Text classification
- Natural-language understanding
- Natural-language generation.

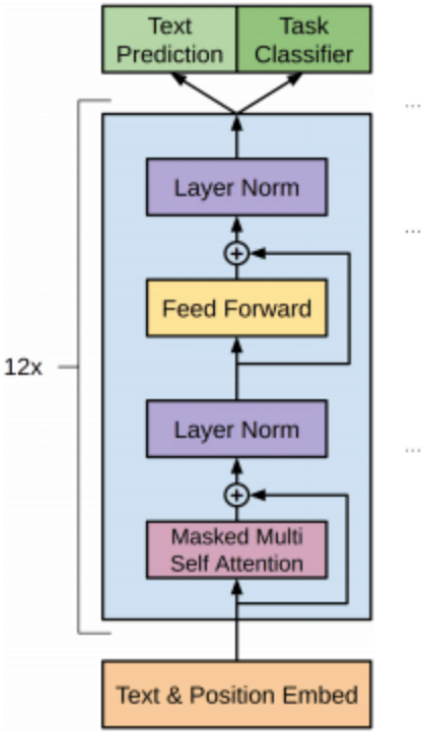
Techniques:

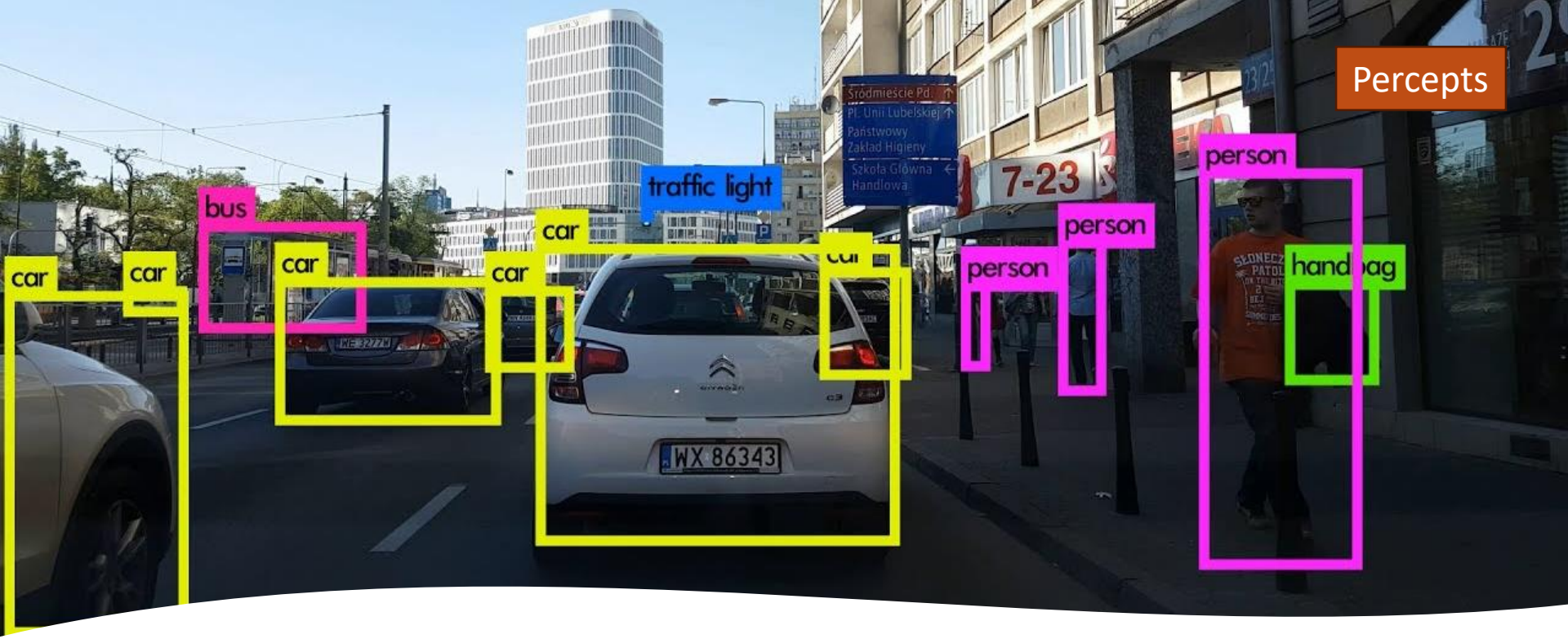
- Text embeddings
- Transformers
- Large language models (LLMs)



Source: [Word Embeddings for PyTorch Text Classification Networks]

Decoder-only transformer used by LLMs

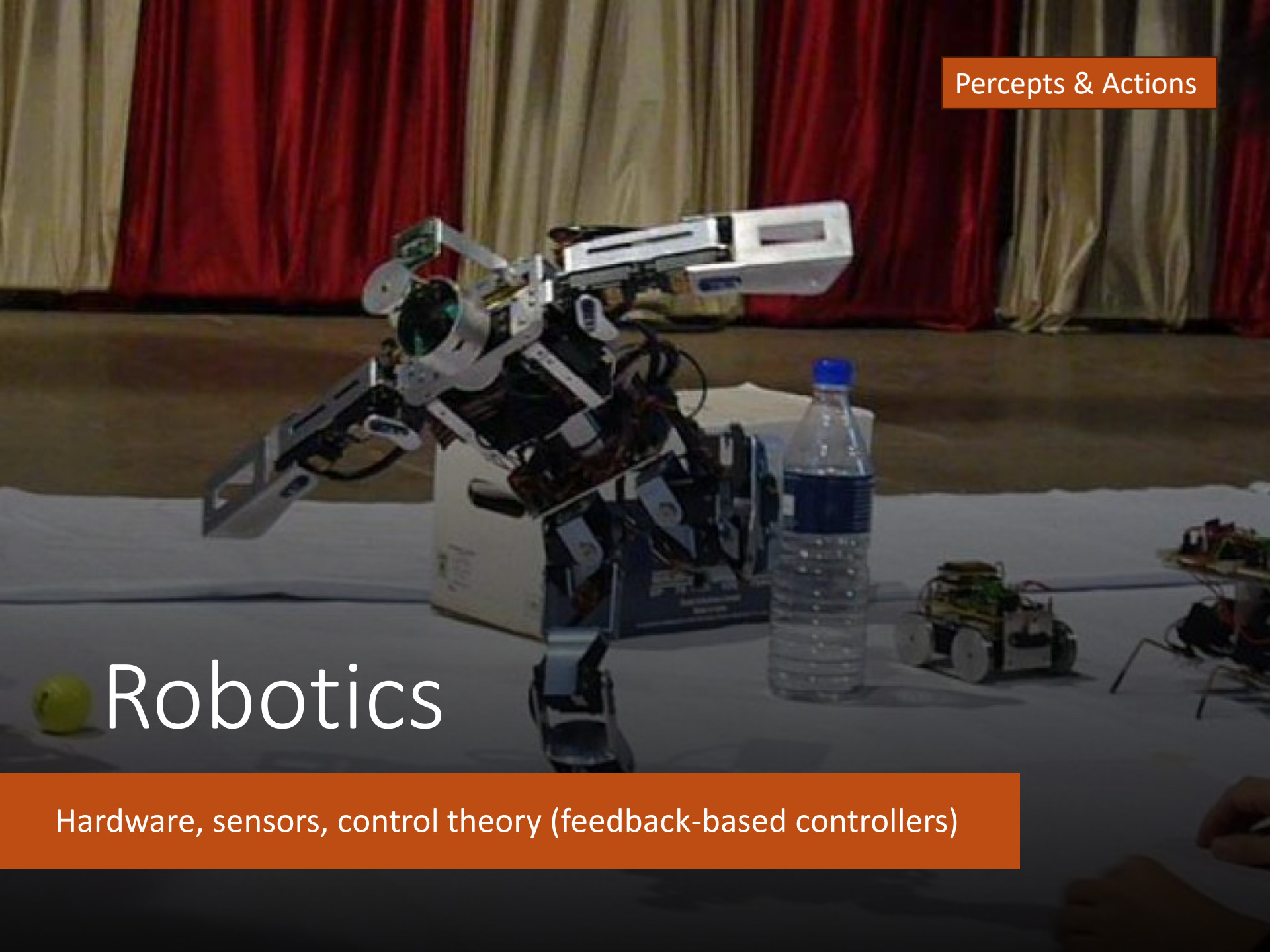




Computer Vision

- Object detection
- Event detection
- Activity recognition
- Video tracking
- Object recognition
- 3D pose estimation

- Uses **Deep Convolutional Neural Networks**



Robotics

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

Multiagent Decision Making

Communication and Coordination

Conclusion

AI development is currently moving at the speed of light!