

# Concept Learning in Description Logics — Part 4:

## Conclusion & Outlook

# Overview

In this tutorial we addressed KR's **knowledge acquisition bottleneck** for the particular case of **Description Logic Concepts**

1. **Separability Problem**
2. **Neurosymbolic Concept Learning**
3. **Exact and PAC Learning**

We covered both

- theoretical foundations (1,3):
  - ⇒ characterizations, complexity, relations to other notions
- tools (2,3):
  - ⇒ practical implementations using modern techniques (reinforcement learning, tensors, SAT)

# What we did not talk about

Ontology Learning

Survey: [Ozaki, Künstliche Intelligenz 2020]

Other natural and relevant languages like LTL or temporal description logics

[Neider & Gavran, FMCAD 2018]+follow-ups

[Fortin, Konev, Ryzhikov, Savateev, Wolter, & Zakharyashev, KR 2022]

[J, Ryzhikov, Wolter, & Zakharyashev, DL 2023]

Concept Learning for Explainable AI

For example [Dalal, Sarker, Barua, & Hitzler, arxiv 2023]

Knowledge Graphs, e.g. link / class prediction

[Bordes, Usunier, Garcia-Duran, Weston, Yakhnenko, Neurips 2013]+follow-ups

Graph Neural Networks (GNNs)

For example, [Barcelo, Kostylev, Monet, Perez, Reutter & Silva, ICLR 2020]

# More on Learning at DL and KR

## DL

Mon, Sep 4th, 09:30-10:30: Invited Talk by Francesca Toni:

*Knowledge Representation and Reasoning in the time of Data-Centric AI*

Mon, Sep 4th, 14:00-15:15: Session on Learning & Planning,

ten Cate, Funk, J, Lutz:

*SAT-Based PAC Learning of Description Logic Concepts*

J, Ryzhikov, Wolter, Zakharyashev:

*Temporalising Unique Characterisability and Learnability of Ontology-Mediated Queries*

## KR

- Invited Talk by Luc de Raedt: *How to make Logics Neurosymbolic?*
- DC on Learning and Cognition
- Session on Learning
- Session on Explainable AI

# Concept Learning in Description Logics

## The End

Questions?