Sebastijan Dumančić | KU Leuven
Postdoctoral fellow in Artificial intelligence

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Education

KU Leuven, Belgium

2014 – 2018   PhD in Computer Science
- **Advisor:** Professor Hendrik Blockeel
- **Thesis title:** Learning Symbolic Latent Representations for Relational Data
- **Examination Committee:** Jesse Davis, Mathias Niepert, David Poole, Sebastian Riedel, Johan Suykens

University of Zagreb, Croatia

2012 – 2014   MSc in Computer Science
- **Advisor:** Professor Hendrik Blockeel
- **Thesis title:** Classification of human epithelial cell's staining patterns
- Spent a year at KU Leuven as an Erasmus exchange student

2009 – 2012   BSc in Computer Science
- **Advisor:** Professor Damir Seršić
- **Thesis title:** Machine learning and signal processing applications to biology and medicine - classification of autoimmune diseases

Experience

KU Leuven, Belgium

2019 – present   Postdoctoral fellow
- personal research fellowship grant from Research Foundation - Flanders (FWO)
- working with Prof. Hendrik Blockeel and Prof. Luc de Raedt

2014 – 2018   Research assistant

Research visits and internships

2018   Visiting Researcher, NEC Labs Europe, Germany
- Host: Mathias Niepert, PhD

2013   Research Intern, Jozef Štefan Institute, Slovenia
- Host: Nada Lavrač, PhD

2012 – 2013   Software Development Intern, Ericsson Ltd., Croatia

Selected Publications

AAAI 2021	**Knowledge Refactoring for Inductive Program Synthesis** Sebastijan Dumančić, Tias Guns, Andrew Cropper	
IJCAI 2020	**Learning Large Logic Programs by Going Beyond Entailment** Andrew Cropper, Sebastijan Dumančić	
IJCAI 2019	**Learning Relational Representations with Auto-encoding Logic Programs** Sebastijan Dumančić, Tias Guns, Wannes Meert, Hendrik Blockeel	
NeurIPS 2018	**DeepProbLog: Neural Probabilistic Logic Programming** Robin Manhaeve, Sebastijan Dumančić, Angelika Kimmig, Thomas Demeester, Luc De Raedt	

🎓 Awards and Recognitions

2021	**IAAI Deployed Application Award** at IAAI-21
2019	**Honourable mention** at the **EurAI AI Dissertation Award**
	Distinguished reviewer at IJCAI 2019 (113/2818 reviewers)
2018	**Summa cum laude** distinction for PhD thesis (top 5% of PhD awardees)
	Best paper award at Discovery Science 2018
	Travel grant for the NAMPI workshop at ICML 2018
2017	**Best student paper award** at ILP 2017
2013	**Erasmus student exchange scholarship**, one year stay at KU Leuven, Belgium

🗄 Funding

Neural Probabilistic Logic Programming
2020 - 2023

project co-supervisor with Luc De Raedt and Angelika Kimmig. Research Foundation - Flanders (FWO).   *338.800,00 EUR.*

FWO Postdoctoral Fellowship
2019 - 2022

Research Foundation - Flanders (FWO). Success rate: 25 %   *salary + bench fee*

Travel grant for the research visit to Mathias Niepert at NEC Laboratories
2018

Research Foundation - Flanders (FWO)   *1650,00 EUR*

💬 Talks

From Statistical Relational to Neuro-Symbolic Artificial Intelligence
> AAAI 2021 Tutorial   Feb 2021

What Can Abstraction Do for Program Induction
> Samsung AI Research Center, Cambridge, UK   Jan 2021
> Automated Verification Group (Marta Kwiatkowska), Oxford, UK   Jan 2021
> Computational Cognitive Science Group (Josh Tenenbaum), MIT, USA   Dec 2020

Neural Probabilistic Logic Programming with DeepProblog
> Data and Web Science Group (Heiner Stuckenschmidt), University of Mannheim, Germany   Oct 2020

Crash course on Machine Learning
> European Patent Office, Den Haag, the Netherlands   Jun 2020

Constraint Solving with Z3
> Decision Analytics Closing Symposium at KU Leuven, Belgium   2019

Anomaly Detection in Advanced Telecommunication Networks
> Artificial Intelligence Applied in Industry Symposium at KU Leuven, Belgium   2019

Learning Relational Representations with Auto-encoding Logic Programs
> Declarative Learning Based Programming workshop at IJCAI, China   2019
> Data Analytics Lab at VUB, Belgium   2019

Learning Relational Feature Hierarchies
> LICT Deep Learning Symposium at KU Leuven, Belgium   2019

👥 Teaching

Lecturer

Digital Humanities Master programme, KU Leuven
> Scripting languages (B-KUL-G0W95B) — 2019 – present

Master of Computer Science, KU Leuven
> Capita Selecta AI: Neural-Symbolic Artificial Intelligence (B-KUL-H05N0A) — 2020 – present

Teaching assistant

Department of Computer Science, KU Leuven

> Machine Learning: Project (B-KUL-H0T25A)	2017–present
> Machine Learning and Inductive Inference (B-KUL-H02C1A)	2018–2019
> Knowledge and the Web (B-KUL-G0B34D)	2015–2018
> Introduction to Databases (B-KUL-H01O9A)	2015

Thesis supervision

Department of Computer Science, KU Leuven

> Clara De Smet, "Improving the initialisation of COBRAS"	2019–2020
> Shanza Iftikhar, "Metric Learning and Spectral Transformation with COBRAS"	2019–2020
> Jonas Soenen, "Active semi-supervised clustering with noisy constraints"	2018–2019
> Antoon De Cleen, "A Machine Learning Approach for the Detection of Airplane Component Degradation"	2018–2019
> Bavo Luysterborg, "Preventive airplane maintenance"	2018–2019
> Jasper Sarrazin, "Neurally guided theorem proving in knowledge graphs"	2018–2019
> Victor Gutierrez, "Neurally guided Inductive Logic Programming"	2018–2019
> Bernd Schrooten, "An approach to unsupervised feature ranking for predictive airplane maintenance"	2016–2017
> Hannes Busneye, "Convolutional Neural Networks for fundamental frequency detection in music"	2016–2017
> Jeroen Tempels, "Automatically constructing deep hierarchies with arbitrary clustering algorithms"	2016–2017
> Servaas Vandecappelle, "Aerospace condition monitoring using Hidden Markov models"	2016–2017
> Tom Van Braband, "Interpreting Deep Neural Networks"	2016–2017
> Thomas Dierckx, "Model merging in relational learning"	2016–2017
> Alexandru Nicolae Onete, "Predicate invention using meta-interpretative learning"	2014–2015
> Philippe Moeyersoms, "Explicit optimal control of a hybrid-electric heavy-duty vehicle"	2014–2015

💻 Professional Activities

Conference Co-Chair

> International Joint Conference on Learning and Reasoning (IJCLR)	2021

Workshop Co-Chair

> Ninth International Workshop on Statistical Relational AI (StarAI) @ AAAI 2020	2020
> Spring Meeting on Mining and Learning (SMiLe), KU Leuven	2015

Senior Program Committee Member

> European Conference on Artificial Intelligence (ECAI)	2020
> AAAI Conference on Artificial Intelligence (AAAI)	2021
> International Joint Conference on Artificial Intelligence (IJCAI)	2021

Program Committee Member

> International Joint Conference on Artificial Intelligence (IJCAI)	2018-2021
> AAAI Conference on Artificial Intelligence (AAAI)	2019-2020
> ECML & PKDD	2019-2020
> International Conference on Principles and Practice of Constraint Programming (CP)	2019
> SIAM International Conference on Data Mining (SDM)	2020

Journal Reviewer

> Journal of Machine Learning Research (JMLR)   2018-2020
> Machine Learning Journal (MLJ)   2017-2020
> Data Mining and Knowledge Discovery   2017

Outreach

> Society for Out-of-frame Education: secretary since 2018; organised the Summer School of Science   2012-now
> Young Mathematicians "Marin Getaldić": organised Young Mathematicians Summer Camp   2010-2012

External Examiner

> Polytechnic University of Valencia, PhD thesis of Lidia Contreras Ochando
  (supervised by Jose Hernandez Orallo and Cesar Ferri)   2020
> University of Edinburgh, MSc Thesis of Amit Parag (supervised by Vaishak Belle)   2019

📖 Publications

Dissertation

Learning Symbolic Latent Representations of Relational Data
Sebastijan Dumančić
KU Leuven, 2018
Summa cum laude *(top 5% of PhD awardees)*

Peer-reviewed Journal Papers

J.1   **An efficient and expressive similarity measure for relational clustering using neighbourhood trees**
Sebastijan Dumančić, Hendrik Blockeel
Machine Learning Journal, 106, pages 1523–1545, 2017

Peer-reviewed Conference Papers

C.1   **Knowledge Refactoring for Inductive Program Synthesis**
Sebastijan Dumančić, Tias Guns, Andrew Cropper
AAAI Conference of Artificial Intelligence (AAAI), to appear

C.2   **Automated Reasoning and Learning for Automated Payroll Management**
Sebastijan Dumančić, Wannes Meert, Stijn Goethals, Tim Stuyckens, Jelle Hutgen, Koen Denies
Annual Conference on Innovative Applications of Artificial Intelligence (IAAI), to appear

C.3   **Learning Large Logic Programs by Going Beyond Entailment**
Andrew Cropper, Sebastijan Dumančić
International Joint Conference on Artificial Intelligence (IJCAI), 2073-2079, 2020

C.4   **Turning 30: New Ideas in Inductive Logic Programming**
Andrew Cropper, Sebastijan Dumančić
International Joint Conference on Artificial Intelligence (IJCAI), Survey Track, 4833-4839, 2020

C.5   **From Statistical Relational to Neuro-Symbolic Artificial Intelligence**
Luc De Raedt, Sebastijan Dumančić, Robin Manhaeve, Giuseppe Marra
International Joint Conference on Artificial Intelligence (IJCAI), Survey Track, 4943-4950, 2020

C.6   **Tackling Noise in Semi-Supervised Clustering**
Jonas Soenen, Sebastijan Dumančić, Hendrik Blockeel, Toon Van Craenendonck
European Conference on Machine Learning and Principles of Knowledge Discovery in Databases (ECML), 2020

C.7   **Learning Relational Representations with Auto-encoding Logic Programs**
Sebastijan Dumančić, Tias Guns, Wannes Meert, Hendrik Blockeel
International Joint Conference on Artificial Intelligence (IJCAI), 6081-6087, 2019

C.8   **A Comparative Study of Distributional and Symbolic Paradigms for Relational Learning**
Sebastijan Dumančić, Alberto García-Durán, Mathias Niepert
International Joint Conference on Artificial Intelligence (IJCAI), 6088-6094, 2019

C.9   **DeepProbLog: Neural Probabilistic Logic Programming**
Robin Manhaeve, Sebastijan Dumančić, Angelika Kimmig, Thomas Demeester, Luc De Raedt
Advances in Neural Information Processing Systems (NeurIPS), 3749–3759, 2018

C.10   **COBRAS: Fast, Iterative, Active Clustering with Pairwise Constraints**
Toon Van Craenendonck, Sebastijan Dumančić, Elia Van Wolputte, Hendrik Blockeel
Symposium on Intelligent Data Analysis (IDA), 353–366, 2018

C.11   **COBRAS-TS: A new approach to Semi-Supervised Clustering of Time Series**
Toon Van Craenendonck, Wannes Meert, Sebastijan Dumančić, Hendrik Blockeel
Discovery Science, 179–193, 2018. Best paper award

C.12   **Learning Sequence Encoders for Temporal Knowledge Graph Completion**
Alberto García-Durán, Sebastijan Dumančić, Mathias Niepert
Empirical Methods in Natural Language Processing (EMNLP), 4816–4821, 2018

C.13   **Demystifying Relational Latent Representations**
Sebastijan Dumančić, Hendrik Blockeel
International Conference on Inductive Logic Programming (ILP), 63–77, 2017. Best student paper award

C.14   **Clustering-Based Relational Unsupervised Representation Learning with an Explicit Distributed Representation**
Sebastijan Dumančić, Hendrik Blockeel
International Joint Conference on Artificial Intelligence (IJCAI), 1631–1637, 2017.

C.15   **COBRA: A Fast and Simple Method for Active Clustering with Pairwise Constraints**
Toon Van Craenendonck, Sebastijan Dumančić, Hendrik Blockeel
International Joint Conference on Artificial Intelligence (IJCAI), 2871–2877, 2017.

C.16   **An Efficient and Expressive Similarity Measure for Relational Clustering Using Neighbourhood Trees**
Sebastijan Dumančić, Hendrik Blockeel
European Conference on Artificial Intelligence (ECAI), Short paper track, 1674-1675, 2016.

Workshops Papers

W.1   **Inventing Abstractions by Refactoring Knowledge**
Sebastijan Dumančić, Andrew Cropper
Conceptual Abstraction and Analogy in Natural and Artificial Intelligence workshop at AAAI Fall Symposium, 2020

W.2   **Feature Interactions in XGBoost**
Kshitij Goyal, Sebastijan Dumančić, Hendrik Blockeel
AIMLAI workshop at ECML&PKDD, 2019

W.3   **DeepProbLog: Neural Probabilistic Logic Programming**
Robin Manhaeve, Sebastijan Dumančić, Angelika Kimmig, Thomas Demeester, Luc De Raedt
BNAIC/BENELEARN, 2019

W.4   **On embeddings as an alternative paradigm for relational learning**
Sebastijan Dumančić, Alberto García-Durán, Mathias Niepert
8th workshop on Statistical Relational Artificial Intelligence StarAI at IJCAI/ICML, 2018

W.5   **Auto-encoding Logic Programs**
Sebastijan Dumančić, Tias Guns, Wannes Meert, Hendrik Blockeel
2nd workshop on Neural Abstract Machines and Program Induction NAMPI at ICML, 2018

W.6   **Unsupervised Relational Representation Learning via Clustering: Preliminary Results**
Sebastijan Dumančić, Hendrik Blockeel
6th workshop on Statistical Relational Artificial Intelligence StarAI at IJCAI, 2016

W.7   **Theory reconstruction: a representation learning view on predicate invention**
Sebastijan Dumančić, Wannes Meert, Hendrik Blockeel
6th workshop on Statistical Relational Artificial Intelligence StarAI at IJCAI, 2016