Sagar Malhotra

Machine Learning Research Unit,
TU Wien, Austria

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Personal website: countinglogic.github.io

Academic Employment

2023-now **Postdoctoral Researcher**
Host: Prof. Thomas Gärtner
Machine Learning Research Unit,
TU Wien (Technical University of Vienna), Austria

Education

2019-2023 **PhD in Computer Science**
Thesis: On Tractability and Consistency of Probabilistic Inference in Relational Domains
Advisor: Prof. Luciano Serafini
University of Trento, Italy
Fondazione Bruno Kessler, Italy (dual affiliation)

2016-2018 **MSc in Physics**
University of Trento, Italy

2012-2015 **BSc in Physics (Honors)**
University of Delhi, India

Research Interests

I study automated learning and reasoning algorithms, working at the intersection of logic, probability and Machine Learning. I am especially interested in methods that are provably efficient, sound and explainable by construction. Recently, I am also interested in developing formal verification methods for black-box Machine Learning models.

Conference Publications[*]

2024 Alexander Pluska, Pascal Welke, Thomas Gärtner and **Sagar Malhotra**.
Logical Distillation of Graph Neural Networks
International Conference on Principles of Knowledge Representation and Reasoning 2024
KR 2024 (CORE Rank **A***, **17%** acceptance rate in special track)

[*]Supervised student coauthors are underlined.

2024 Florian Chen, Felix Weitkämper, and **Sagar Malhotra**.
Understanding Domain-Size Generalization in Markov Logic Networks
Machine Learning and Knowledge Discovery in Databases. Research Track - European Conference, ECML PKDD 2024
ECML PKDD 2024 (CORE Rank **A**, **24%** acceptance rate)

2024 Alessandro Daniele, Tommaso Campari, **Sagar Malhotra** and Luciano Serafini
Simple and Effective Transfer Learning for Neuro-Symbolic Integration
International Conference on Neural-Symbolic Learning and Reasoning, NeSy 2024
NeSy 2024 (**Accepted as full paper with a spotlight presentation**)

2023 Alessandro Daniele, Tommaso Campari, **Sagar Malhotra** and Luciano Serafini.
Deep Symbolic Learning: Discovering Symbols and Rules from Perception
International Joint Conference on Artificial Intelligence 2023
IJCAI 2023 (CORE Rank **A***, **15%** acceptance rate)

2022 **Sagar Malhotra** and Luciano Serafini
On Projectivity in Markov Logic Networks
Machine Learning and Knowledge Discovery in Databases. Research Track - European Conference, ECML PKDD 2022
ECML PKDD 2022(CORE Rank **A**, **26%** acceptance rate).

2022 **Sagar Malhotra** and Luciano Serafini
Weighted Model Counting in FO^2 with Cardinality Constraints and Counting Quantifiers: A Closed Form Formula
AAAI Conference on Artificial Intelligence 2022
AAAI 2022 (CORE Rank **A***, **15%** acceptance rate, **accepted as oral presentation**)

2021 **Sagar Malhotra** and Luciano Serafini
A Combinatorial Approach to Weighted Model Counting in the Two Variable Fragment with Cardinality Constraints
International Conference of the Italian Association for Artificial Intelligence 2019
AIxIA 2021

Workshop Publications*

2024 Patrick Indri, Peter Blohm, Anagha Athavale, Ezio Bartocci, Georg Weissenbacher, Matteo Maffei, Dejan Nickovic, Thomas Gärtner, **Sagar Malhotra**
Distillation based Robustness Verification with PAC Gaurentees
Next Generation of AI Safety Workshop, ICML 2024
NextGenAISafety, ICML 2024

2024 Alexander Pluska, Pascal Welke, Thomas Gärtner and **Sagar Malhotra**.
Logical Distillation of Graph Neural Networks
Workshop on Mechanistic Interpratability, ICML 2024
MI Workshop, ICML 2024

*Supervised students coauthors are underlined

2023 Alessandro Daniele, Tommaso Campari, **Sagar Malhotra** and Luciano Serafini.
Deep Symbolic Learning: Discovering Symbols and Rules from Perception
International Workshop on Neural-Symbolic Learning and Reasoning 2023
NeSy 2023 (**Accepted for spotlight presentation**)

2022 **Sagar Malhotra** and Luciano Serafini
On Projectivity in Markov Logic Networks
International Workshop on Probabilistic Logic Programming 2022
PLP 2022

2021 **Sagar Malhotra** and Luciano Serafini. Weighted Model Counting in FO^2 with Cardinality Constraints and Counting Quantifiers: A Closed Form Formula
International Workshop on Statistical Relational AI, IJCLR 2021.
StarAI, IJCLR 2021

2020 **Sagar Malhotra** and Luciano Serafini. Weighted Model Counting in C^2 (Abstract)
Workshop on Machine Learning and Data Mining, AIxIA 2020
MLDM 2020

Preprints*

2024 Davide Bizzaro, Luciano Serafini and **Sagar Malhotra**
Towards Counting Markov Equivalence Classes with Logical Constraints
Arxiv

2023 **Sagar Malhotra**, Davide Bizzaro and Luciano Serafini
Lifted Inference beyond First Order Logic
Under Review at Artificial Intelligence Journal (Major Revision)
Arxiv

Talks and Tutorials

2024 Fundamental Problems in Statistical Relational AI
Tutorial proposal accepted for KR 2024

2022 On Consistency of Learning and Inference in Statistical Relational Learning
Invited Talk at MLDM Workshop at the AIxIA Conference 2022, Udine, Italy (Abstract)

2022 On Probabilistic Inference in Logical Domains
Invited talk at the Institute of Informatics, Ludwig Maximilian University of Munich, Germany

2022 A Tutorial on Probabilistic Inference in Logical Domains
Guest Lecture at the Knowledge representation and Learning course, University of Padova, Italy

2022 Weighted First-Order Model Counting
DocInProgress Colloquium, Department of Mathematics, University of Trento, Italy

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2022 Weighted First-Order Model Counting
AAAI 2022@FBK Workshop, Trento, Italy (Video)

Reviewing and PC Experience

Reviewer KR 2024, PC Member IJCAI 2024, Reviewer ICLR 2024, Reviewer AISTATS 2024, PC Member AAAI 2024, PC Member SAC 2024, Reviewer NeurIPS 2023, PC Member MLG Workshop-ECML 2023,PC Member PLP workshop 2023, PC Member KR 2023, PC Member AAAI 2023, Reviewer AISTATS 2023, Sub-Reviewer KR 2021, Reviewer for Data Mining and Knowledge Discovery (Q1 Journal)

Student Supervision

2024 Peter Blohm, TU Wien, Italy
Thesis: Lifted Inference Beyond First Order Logic

2023 Davide Bizzaro, University of Padova, Italy
Thesis: Lifted Inference Beyond First Order Logic