

Sagar Malhotra

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Current position

05.2023-now

Postdoctoral Researcher

Hosted by Prof. Thomas Gärtner
Machine Learning Research Unit
Information Systems Engineering Institute
Faculty of Informatics
TU Wien (Technical University of Vienna), Austria

11.2019-04.2023

PhD Candidate

Advisor: Prof. Luciano Serafini
Thesis: On Tractability and Consistency of Probabilistic Inference in Relational Domains
Data and Knowledge Management Unit
Fondazione Bruno Kessler, Italy
and,
Information Engineering and Computer Science Doctoral School
University of Trento, Italy
Achievements:

- Provided polynomial time closed-form formulas for weighted model counting in the 2-variable fragment of first-order logic and its extensions with cardinality constraints, counting quantifiers, Directed Acyclic Graph Axiom and Connected Graph Axiom.
- Provided the first non-trivial fragment of Markov Logic Networks that admits consistent parameter estimation. Showed this fragment to be complete w.r.t the 2-variable Markov Logic.
- Provided an extended class of weight functions, that admit efficient weighted model counting, expanding the expressivity of many probabilistic logic frameworks.

Research Experience and Education

- 2018-2019 **Junior Research Fellow**
Advisors: Luciano Serafini, Radim Nedbal
Project: Variational Inference in Hybrid Domains
Fondazione Bruno Kessler, Italy
- 2015-2018 **MSc in Physics**
Advisors: Roberto Iuppa (Unitn), Marco Cristoforetti (FBK)
Thesis: Deep Learning For Track Reconstruction in Next Generation HEP Experiments
Fondazione Bruno Kessler, Italy
University of Trento, Italy
- 2012-2015 **BSc in Physics**
University of Delhi, India

Conference Publications

- 2023 Alessandro Daniele, Tommaso Campari, **Sagar Malhotra** and Luciano Serafini.
Deep Symbolic Learning: Discovering Symbols and Rules from Perception
Proceedings of the Thirty-Second International Joint Conference on Artificial Intelligence
[IJCAI 2023](#)
- 2022 **Sagar Malhotra** and Luciano Serafini. On Projectivity in Markov Logic Networks
Proceedings of Machine Learning and Knowledge Discovery in Databases. Research Track - European Conference, ECML PKDD 2022
[ECML PKDD 2022](#).
- 2022 **Sagar Malhotra** and Luciano Serafini. Weighted Model Counting in FO^2 with Cardinality Constraints and Counting Quantifiers: A Closed Form Formula
(Oral presentation) *Proceedings of the 36th AAAI Conference on Artificial Intelligence*.
[AAAI 2022](#)
- 2021 **Sagar Malhotra** and Luciano Serafini. A Combinatorial Approach to Weighted Model Counting in the Two Variable Fragment with Cardinality Constraints
Proceedings of the 20th International Conference of the Italian Association for Artificial Intelligence
[AIXIA 2021](#)

Workshop Publications

- 2023 Alessandro Daniele, Tommaso Campari, **Sagar Malhotra** and Luciano Serafini.
Deep Symbolic Learning: Discovering Symbols and Rules from Perception
Accepted for spotlight presentation [NeSy 2023](#)
- 2022 **Sagar Malhotra** and Luciano Serafini. On Projectivity in Markov Logic Networks
9th International Workshop on Probabilistic Logic Programming 2022, FLoC 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
10th *International Workshop on Statistical Relational AI, IJCLR 2021*. [StarAI 2021](#)
- 2020 **Sagar Malhotra** and Luciano Serafini. Weighted Model Counting in C^2 (Abstract)
9th *International Workshop on Machine Learning and Data Mining, AIXIA 2020*. [MLDM 2020](#)

Under Review and Preprints

- 2023 **Sagar Malhotra**, Davide Bizzaro and Luciano Serafini
Lifted Inference beyond First Order Logic
Under Review at Artificial Intelligence Journal [arXiv:2302.09830](#)
- 2023 **Sagar Malhotra** and Luciano Serafini.
Weighted First Order Model Counting with Directed Acyclic Graph Axiom
[arXiv:2302.09830](#)

Talks and Tutorials

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

Reviewing and PC Experience

Reviewer ICLR 2024, AISTATS 2024, PC Member AAAI 2024, 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)