Sagar Malhotra

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Current position

05.2023-now **Postdoctoral Researcher**
Advisor: 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
Accepted for Publication in the proceedings of IJCAI 2023 arXiv:2208.11561

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
Largest European conference on machine learning with ∼1000 submissions and an acceptance rate of ∼25% 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 36^{th} AAAI Conference on Artificial Intelligence.
Flagship AI conference with ∼10000 submissions and an acceptance rate of ∼ 10% for oral presentations 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 20^{th} International Conference of the Italian Association for Artificial Intelligence AIxIA 2021

Workshop Publications

2022 **Sagar Malhotra** and Luciano Serafini. On Projectivity in Markov Logic Networks
9^{th} International Workshop on Probabilistic Logic Programming 2022, FLoC 2022. PLP 2022
R.i.C.e.R.c.A: RCRA Incontri E Confronti, AIxIA 2022. R.i.C.e.R.c.A 2022

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

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

Under Review

2023 **Sagar Malhotra** and Luciano Serafini
Weighted First Order Model Counting with Connectivity Axioms
Under Review.

2023 **Sagar Malhotra** and Luciano Serafini.
Weighted First Order Model Counting with Directed Acyclic Graph Axiom
Under Review. 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)

Programming Skills

Fluent: Python, Pandas, LaTeX
Familiar: Mathematica, R, Pytorch, HTML

Reviewing and PC Experience

PC Member PLP workshop 2023, PC Member at KR 2023, PC Member at AAAI 2023, Reviewer at AISTATS 2023, Sub-Reviewer at KR 2021, Reviewer for Data Mining and Knowledge Discovery (Q1 Journal)