

Sagar Malhotra

Fondazione Bruno Kessler
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email: smalhotra@fbk.eu
url: countinglogic.github.io
Born: May 6, 1994
Nationality: Indian

Current position

11.2019-01.2023

PhD Candidate

Advisor: Prof. Luciano Serafini

Thesis: Towards Efficient and Consistent Probabilistic Inference in Relational Domains¹

University of Trento, Italy

Fondazione Bruno Kessler, 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 and counting quantifiers.
- 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

2018-2015

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

2015-2012

BSc in Physics

University of Delhi, India

¹Tentative title

Publications

- 2022 Alessandro Daniele, Tommaso Campari, **Sagar Malhotra** and Luciano Serafini.
Deep Symbolic Learning: Discovering Symbols and Rules from Perception
Under Review [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 $\sim 25\%$ [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 36th AAAI Conference on Artificial Intelligence*.
Flagship AI conference with ~ 10000 submissions and an acceptance rate of $\sim 10\%$ 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 20th 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
9th 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
10th International Workshop on Statistical Relational AI, 2021
[StarAI 2021](#)
- 2020 **Sagar Malhotra**, Luciano Serafini. A Closed Form for Weighted Model Counting in C^2
9th International Workshop on Machine Learning and Data Mining, 2020
[MDLM 2020](#)

Ongoing Projects

Efficient Approaches to Counting Extremal Relational Structures
Collaborators: Felix Weitkämper (LMU Munich, Germany), Luciano Serafini (FBK, Italy)

Graphon Estimation and Inference for Relational Structures
Collaborators: Manfred Jaeger (Aalborg University, Denmark), Luciano Serafini (FBK, Italy)

Talks and Tutorials

- 2022 On Consistency of Learning and Inference in Statistical Relational Learning
Invited Talk at MLDM Workshop at the AIXIA Conference 2022
- 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

Programming Skills

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

Reviewing and PC Experience

PC Member at AAAI 2023, Reviewer at AISTATS 2023, Sub-Reviewer at KR 2021

Awards and Achievements

- 2017 Part of the winning team in Industrial Problem Solving using Physics ([IPSP 2017](#))
- 2017 Awarded fully funded trip to Innovation Days-Innsbruck in StartUp Lab, Trento
- 2016 Awarded full Scholarship for the Joint Masters in Theoretical Physics at University of Trento and SISSA- Trieste (Declined)
- 2016 Awarded Opera Universitaria Scholarship for Masters in Physics at University of Trento
- 2016 Amongst top 5% candidates in the Joint Entrance Screening Test- Physics 2016 among ~ 5000 candidates
- 2016 Amongst top 5 % candidates in IIT Joint Admission Test for Masters in Physics 2016 among ~ 10000 candidates

References

Prof. Luciano Serafini
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Data and Knowledge Management Group
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Prof. Manfred Jaeger
Aalborg University, Aalborg, Denmark
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Dr. Felix Weitkämper
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