

Sagar Malhotra

Fondazione Bruno Kessler
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url: countinglogic.github.io
Born: May 6, 1994
Nationality: Indian

Personal Statement

I am a graduate researcher in Artificial Intelligence, working on probabilistic inference and learning in relational domains (e.g., graphs, databases, logic, etc.). My work has focused on developing efficient, expressive, and statistically consistent probabilistic relational models. Previously, I pursued a masters in physics with an exciting mix of quantitative biology and machine learning. I am passionate about solving and formulating rigorous foundational problems with a multi-disciplinary flavor. I believe my background in logic, probability, physics and machine learning can allow me to greatly contribute to research in experimental/behavioural economics.

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

¹Tentative title

- 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

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 ~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 ~ 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:Preprint](#)
- 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](#)

Talks and Tutorials

- 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 2022, Reviewer at AISTATS 2022, 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

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Institute of Informatics, LMU, Munich, Germany
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