Sagar Malhotra

Fondazione Bruno Kessler
Via Sommarive, 18
Trento, Trentino 38123 Italy
Phone: +39 320 841 2396
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 Domains[1]
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

[1] Tentative title

Publications

2022 Alessandro Daniele, Tommasso 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 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
PLP 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, 2021
StarAI 2021

2020 **Sagar Malhotra**, Luciano Serafini. A Closed Form for Weighted Model Counting in C^2
9^{th} 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) and Luciano Serafini (FBK, Italy)

Graphon Estimation and Inference for Relational Structures
Collaborators: Manfred Jaeger (Aalborg University, Denmark) and 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 $\sim$ 5000 candidates
2016 Amongst top 5 % candidates in IIT Joint Admission Test for Masters in Physics 2016 among $\sim$ 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
Email: jaeger@cs.aau.dk

Dr. Felix Weitkämper
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