Karan Samel

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https://karans.github.io/

My current research revolves around joining deep learning with symbolic reasoning for label efficient learning and model interpretability. I am also broadly interested in structured prediction methods, healthcare ML and drug discovery applications.

EDUCATION

Georgia Institute of Technology, Atlanta, GA *August 2019 - Present*
Ph.D. in Machine Learning - Advisor: Prof. Irfan Essa

Purdue University, West Lafayette, IN . *August 2014 - May 2017*
B.S in Computer Science, Applied Statistics - Graduated with Highest Distinction

EXPERIENCE

Georgia Institute of Technology: Research Assistant *August 2019 - Present*

- Researching neuro-symbolic methods for machine reasoning tasks given limited labels. The domain of this work is applied to multi-modal question answering, temporal, and text reasoning.
- Underlying methods involve program synthesis, logic programming, knowledge graph reasoning, and deep learning models.

Amazon: Applied Scientist Intern *May 2021 - Present*

- Linking Amazon e-commerce products to knowledge graph entities for enhanced downstream recommendation.

IBM Research AI: Research Intern *June 2020 - August 2020*

- Developed inference and rule extraction methods for complex time series events using deep learning and logical reasoning, primarily focusing on video data.

Astound: Data Scientist *July 2017 – June 2019*

- Researched and engineered human-in-the-loop machine learning systems to improve data quality. Method developed is optimized to reduce human annotator feedback while maximizing the performance of deep learning models. Resulting paper accepted at KDD'18.
- Developed transfer learning methods to improve a deep learning model performance given limited data.

Undergraduate Researcher: Advertisement Real Time Bidding Predictions *August 2015 – May 2017*

- Tested various deep learning architectures to predict customer clicks on the iPinYou advertisement dataset. Achieved high prediction scores even with sparse positive click data.

- Utilized an external GPU setup to speed up convolutional network training by a factor of 80.

PUBLICATIONS

Neural Temporal Logic Programming
Karan Samel, Zelin Zhao, Binghong Chen, Shuang Li, Dharmashankar Subramanian, Irfan Essa, Le Song
Under review at *Neural Information Processing Systems 2021*

ProTo: Program-Guided Transformer for Program-Guided Tasks
Zelin Zhao, **Karan Samel**, Binghong Chen, Le Song
Under review at *Neural Information Processing Systems 2021*

Scallop: From Probabilistic Deductive Databases to Scalable Differentiable Reasoning
Jiani Huang, Ziyang Li, Binghong Chen, **Karan Samel**, Mayur Naik, Le Song, Xujie Si
Under review at *Neural Information Processing Systems 2021*

How to Design Sample and Computationally Efficient VQA Models
Karan Samel, Zelin Zhao, Kuan Wang, Robin Luo, Binghong Chen, Le Song
Preprint 2021. [PDF]

Abductive Visual Question Answering for Label Efficient Learning
Karan Samel, Binghong Chen, Le Song
Preprint 2020. [PDF]

Active Deep Learning to Tune Down the Noise in Labels
Karan Samel, Xu Miao
In *Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining (KDD'18)*. ACM, New York, NY, USA, 685-694. [PDF]

Predicting Advertisement Clicks Using Deep Networks: Interpreting Deep Learning Models
Karan Samel, Xiao Wang, Qiang Liu
In *The Journal of Purdue Undergraduate Research*: Vol. 7, Article 8. [PDF]

PENDING PATENTS

A Method and System for Composite Event Estimation Through Temporal Logic (IBM, filing pending)
Karan Samel, Dharmashankar Subramanian

Framework for Building and Sharing Machine Learning Components (Astound.ai, filed 2020)
Xu Miao, Masayo Iida, Zhenjie Zhang, **Karan Samel**, Adil Mohammed, Baiji He, Ankit Arya, Naghi Prasad

Active Deep Learning to Reduce Noise in Labels (Astound.ai, filed 2019)

Karan Samel, Xu Miao, Zhenjie Zhang, Masayo Iida, Naghi Prasad

GRANTS & AWARDS

- Georgia Tech President's Fellowship (2019 - 2023)
- NSF GRFP Honorable Mention: Relational Recursive Models for Trustable Medical Diagnoses (2019)
- KDD Startup Research Award (2018)
- NSF Mentoring Through Critical Transition Points in the Mathematical Sciences: Purdue Statistics Living Learning Community (NSF 1246818) (2016 - 2017)
- Purdue Presidential Scholarship (Awarded for 2014 - 2018)