Balasubramaniam Srinivasan

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RESEARCH
INTERESTS

Graph Representation Learning, Deep Learning, Relational Learning, Applications of Group Theory, Representation Theory, Invariant Theory

EDUCATION

Purdue University West Lafayette, Indiana
PhD in Computer Science Aug 2018 – Jul 2022 (Expected)
Advisor: Prof. Bruno Ribeiro
GPA: 4.00

University of California, San Diego La Jolla, California
MS in Computer Science (Concentration: AI) Sep 2016 – Jun 2018
GPA: 3.97
Award for Excellence in Teaching

Birla Institute of Technology and Science, Pilani Pilani, Rajasthan
B.E. (Hons) Electrical and Electronics Engineering Aug 2011 – May 2015
Thesis: Massively Parallel Dynamically Reconfigurable Accelerators
Advisor: Prof. S.K. Nandy (Indian Institute of Science)
GPA: 8.97/10.0 Core GPA: 9.54/10.0
Top 2% Scholarship Holder

PUBLICATIONS

Leveraging Conditional Equivariances for Modeling Non Rigidity of Protein Molecules
Balasubramaniam Srinivasan, Vassilis N. Ioannidis, Soji Adeshina, George Karypis, Bruno Ribeiro.
In Preparation

Equivariant Subgraph Aggregation Networks
Beatrice Bevilacqua*, Fabrizio Frasca*, Derek Lim*, Balasubramaniam Srinivasan, Chen Cai, Gopinath Balamurugan, Haggai Maron.
arXiv 2021

Learning over Families of Sets - Hypergraph Representation Learning for Higher Order Tasks
Balasubramaniam Srinivasan, Da Zheng, George Karypis.
SIAM International Conference on Data Mining (SDM), 2021.

On the Equivalence between Positional Node Embeddings and Structural Graph Representations
Balasubramaniam Srinivasan, Bruno Ribeiro.
International Conference on Learning Representations (ICLR), 2020.

Relational Pooling for Graph Representations
Ryan Murphy, Balasubramaniam Srinivasan, Vinayak Rao, Bruno Ribeiro.
International Conference on Machine Learning (ICML), 2019.

Janossy Pooling: Learning Deep Permutation-Invariant Functions for Variable-Size Inputs
Ryan Murphy, Balasubramaniam Srinivasan, Vinayak Rao, Bruno Ribeiro.
International Conference on Learning Representations (ICLR), 2019.

NetGloVe: Learning Node Representations for Community Detection
Balasubramaniam Srinivasan⋆, Kumaran Gunasekaran⋆, Jeyavaishnavi Muralikumar⋆, Sudarashan Srinivasan⋆, Fragkiskos Malliaros.
International Conference on Complex Networks and Their Applications (Complex Networks), 2017.

EXPERIENCE

Applied Scientist Intern – Amazon
Mentor: Prof. George Karypis   May 2021 – Aug 2021
Proposed a message passing neural network to capture non rigidity of protein molecules. We defined conditional transformations (via conditional group equivariances and invariances) that can better describe non-rigidity and conformations of different proteins, while respecting the restrictions posed by constraints on dihedral (torsion) angles and steric repulsions of atoms. We demonstrated performance gains over existing baselines and also provided a model agnostic strategy to improve baseline models.

Applied Scientist Intern – Amazon
Mentor: Prof. George Karypis   Jun 2020 – Sep 2020
Proposed a hypergraph neural network which exploited the incidence structure and hence worked on real world sparse hypergraphs. Provided provably expressive representations of vertices and hyperedges, as well as that of the complete hypergraph which preserved properties of hypergraph isomorphism. Introduced a new task on hypergraphs – namely variable sized hyperedge expansion and also performed variable sized hyperedge classification and demonstrated improved performance over existing baselines.

Software Engineer Intern – Salesforce
Mentor: Dr. Satish Raghunath   Jun 2017 – Sep 2017
Performed anomaly detection on experienced page load time data accumulated from high traffic network logs with over 100 million data points over 30-days across all continents. Performed incremental spectral clustering to analyze attribute based anomalies using Spark and discovered correlations among various metrics using spectral decomposition as a part of root cause analysis. Built an online random forests model on Spark for real time root cause analysis.

Software Engineer – ARM Holdings
Mentor: Dr. Suresh Srinivasan   Jul 2015 – Jul 2016
Analyzed SPEC (via clustering techniques) and streaming workload performance for mobile and enterprise systems with strong emphasis on big. LITTLE clusters, interconnect and memory. Developed and characterized benchmarks for the cache hierarchy and memory controllers Developed a light weight architecture agnostic Power Model with an accuracy of 97% represented by a multivariate linear regression of various PMU counters, learnt from carefully selected micros. Developed a scheduler for a shared emulator, modeled as a constraint satisfaction problem.

Research Intern – Indian Institute of Science
Mentor: Prof. S.K. Nandy   Jan 2015 – May 2015

Designed a Runtime Resource Manager for a Massively Parallel Dynamically Reconfigurable Accelerator to efficiently map code and data to a distributed memory for the acceleration of specific compute kernels. Developed kernel modules and a host user application to provide support for a device driver to facilitate communication over a PCIe Interface. A simulator for the whole system was also implemented.

TEACHING ASSISTANTSHIPS

Fall 2021 - Data Mining and Machine Learning (Purdue)
Spring 2021 - Introduction to Artificial Intelligence (Purdue)
Fall 2020 Graduate Data Engineering (Purdue)
Winter 2018 Advanced Data Structures (UC San Diego) [Head TA]
Spring 2018, Winter, Spring, Fall 2017 Computer Architecture (UC San Diego)
Winter 2014 Microprocessor Programming and Interfacing (BITS Pilani)

GRADUATE COURSEWORK

Differential Geometry, Topology, Mathematical Logic, Model Theory, Ring Theory and Commutative Algebra, Deep Learning, Graph Mining and Network Analysis, Machine Learning, Advanced Statistical NLP, Data Analysis using Spark, Web Mining and Recommender Systems, Neural Networks for Pattern Recognition, AI: Probabilistic Reasoning and Decision Making, Algorithms, Numerical Analysis, Computer Architecture.

SERVICE

Reviewer for AAAI, ICLR, ICML, NeurIPS since 2020.