Arjun Subramonian (they/them)

Department of Computer Science

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Research Interests

graph representation learning, self-supervised learning, fairness

Education

BS in Computer Science; University of California, Los Angeles (2018-2021), *GPA:* 3.936

Work Experience

Incoming Software Engineering Intern, Allen Institute for AI (2021)
Location: Seattle, Washington
Description: I will implement state-of-the-art models and fairness evaluators to contribute to AllenNLP, AI2's open-source NLP library.

Software Engineering Intern, Microsoft Corporation (2020)
Location: Sunnyvale, California
Description: I crafted a peer-to-peer-anonymous, secure backend technical design for a feature to report harassment on Microsoft Teams.

Software Engineering Intern, Get Heal, Inc. (2019)
Location: Los Angeles, California
Description: I engineered full-stack integrations of mechanisms used every day at Heal that enhance the automated routing of medical providers, like automated triaging, doctor-assistant match prevention, and phone number verification. I also adapted Heal's automated routing algorithm to optimally schedule telemedicine visits, which greatly benefits patients during the COVID-19 pandemic.

Deep Learning Engineer, Sike AI (2018-2019)
Location: Los Angeles, California
Description: I designed and implemented the in-house deep learning model for working style-analysis from video with TensorFlow.

Publications

Zhang, Shichang, Ziniu Hu, **Arjun Subramonian**, and Yizhou Sun. "Motif-Driven Contrastive Learning of Graph Representations." Submitted to **ICLR 2021**. (Under double-blind peer review.)

Subramonian, Arjun. "MOTIF-Driven Contrastive Learning of Graph Representations." Accepted to **Undergraduate Consortium @ AAAI 2021**. (Under editorial review.)

Brown, Calvin, Derek Tseng, Paige M. K. Larkin, Susan Realegeno, Leanne Mortimer, **Arjun Subramonian**, Dino Di Carlo, Omai B. Garner, and Aydogan Ozcan. "Automated, Cost-Effective Optical System for Accelerated Antimicrobial Susceptibility Testing (AST) Using Deep Learning." **ACS Photonics 2020** 7 (9), 2527-2538 DOI: 10.1021/acsphotonics.0c00841

Crandall, Sara, Graeme H. Smith, **Arjun Subramonian**, Kelly Ho, and Evelyn M. Cochrane, "Estimating the Ages of FGK Dwarf

Stars Through the Use of GALEX FUV Magnitudes." **Astronomical Journal 2020** 160, 217, DOI: https://doi.org/10.3847/1538-3881/abb77d

Subramonian, Arjun. "Queer | Inclusive | Badass." Accepted to **Resistance AI Workshop @ NeurIPS 2020**.

Talks

2021 (upcoming) - MOTIF-Driven Contrastive Learning of Graph Representations, **Undergraduate Consortium @ AAAI 2021**
2021 - Introduction to Probabilistic Graphical Models, **UCLA Scalable Analytics Institute**
2020 - Queer | Inclusive | Badass, **Resistance AI Workshop @ NeurIPS 2020**
2020 - Spectral Graph Sparsification, **UCLA Scalable Analytics Institute**
2020 - "MONET: Debiasing Graph Embeddings via the Metadata-Orthogonal Training Unit," **Microsoft Research Cambridge Paper Reading Group**
2020 - Fair Machine Learning, **Microsoft Garage Brown-Bag**
2019 - An Automated and Cost-Effective System for Early Antimicrobial Susceptibility Testing Using Optical Fibers and Deep Learning, **UCLA HHMI Day 2019**

Honors and Awards

2020 - Computing Research Association Outstanding Undergraduate Researcher Honorable Mention
2020 - AAAI Undergraduate Consortium (1 of 14 accepted out of 82 applicants)
2020 - IBM Quantum Challenge (1 of 574 winners out of 1745 participants)
2020 - Out for Undergrad Tech Conference (1 of 300 accepted applicants)
2020 - Google Queer Tech Voices Conference (1 of 32 accepted out of hundreds of applicants)
2019 - 3rd Place Award for Best Hack @ Rose Hack, Major League Hacking
2018-2020 - Dean's Honors List
2017 - Siemens Competition Regional Finalist (1 of 101 finalists selected from 4092 entrants)
2016 - Award of Achievement, Association for Computing Machinery, San Francisco Bay Area Professional Chapter

Research Projects

Learning Fair Node Embeddings Without Demographics (2020-)
Research Mentors: Professor Kai-Wei Chang, Professor Yizhou Sun
Locations: UCLA-NLP, UCLA Scalable Analytics Institute
Description: I'm researching an adversarial, self-supervised, training-time framework for learning fair node embeddings without demographics. Leveraging the graph's topology to perform community detection, my framework learns embeddings that make it difficult to identify which community a node belongs to while preserving valuable inter-node information through link prediction.

Motif-Driven Contrastive Learning of Graph Representations (2020)
Research Mentors: Shichang Zhang, Ziniu Hu, Professor Yizhou Sun
Location: UCLA Scalable Analytics Institute
Description: We propose MICRO-Graph to: 1) pre-train Graph Neural Networks (GNNs) in a self-supervised manner to automatically extract graph motifs from large graph datasets; 2) leverage learned motifs to guide the contrastive learning of graph representations, which further benefit various graph downstream tasks.

Heterogeneous Graph Transformer (2019-2020)
Research Mentors: Ziniu Hu, Professor Yizhou Sun
Location: UCLA Scalable Analytics Institute
Description: I adapted the implementation of the Heterogeneous Graph Transformer (HGT) to efficiently embed web-scale knowledge graphs (e.g. YAGO, DBpedia) for link prediction and ran R-GCN baselines. Additionally, I prepared an OGB leaderboard submission

in which I applied HGT to the ogbl-ppa dataset.

Automated, Cost-Effective Optical System for Accelerated Antimicrobial Susceptibility Testing (AST) Using Deep Learning (2018-2019)

Research Mentors: Calvin Brown, Professor Aydogan Ozcan

Location: UCLA Ozcan Research Group

Description: I designed a neural network that inexpensively and automatically detects bacterial resistance to antibiotics, which shortens the timeline of prescribing antibiotics to patients in resource-limited settings by about 60%, helping to mitigate the rise of global antimicrobial resistance. I implemented and trained the neural network with Python and Keras, tuning hyperparameters and visualizing learning curves, weights, and hidden-layer activations, achieving FDA essential agreement for 99.5% of drugs.

Estimating the Ages of FGK Dwarf Stars Through the Use of GALEX FUV Magnitudes (2017)

Research Mentors: Professor Graeme Smith, Sara Crandall

Location: University of California, Santa Cruz, Smith Lab

Description: I applied machine learning and statistics to discover a novel method for estimating the age of FGK dward stars using GALEX far-ultraviolet (FUV) magnitudes that is more cost and time-efficient, as well as more accessible, than existing methods.

An Empirical Characterization Of Internet Round-Trip Times (2016)

Research Mentor: Daniel S.F. Alves

Location: University of California, Santa Cruz, Internetworking Research Group (i-NRG)

Description: I applied machine learning to develop an RTT boundary prediction algorithm which employs online linear regression to predict future RTTs, thereby reducing unnecessary packet retransmissions, delays in retransmission, and overall network congestion.

Course Projects

Robust Model-Agnostic Meta-Learning for Binary Content Moderation Tasks in Natural Language Processing (2020)

Research Mentor: Professor Kai-Wei Chang

Location: University of California, Los Angeles

Description: We investigated applying Model-Agnostic Meta-Learning (MAML) to boost performance on binary content moderation tasks in low-resource contexts. Using PyTorch, we compared the ability of a model pre-trained with MAML to adapt to unseen binary content moderation tasks to those of a model pre-trained using traditional transfer learning approaches and a model trained from scratch.

**Notes:** Report

On the Complexity and Convergence of Approximate Policy Iteration Schemes (2020)

Research Mentor: Professor Lin Yang

Location: University of California, Los Angeles

Description: We surveyed relevant literature in approximate policy iteration, and provided theoretical proof sketches involved in the analysis of the complexity bounds, convergence guarantees, and rates of convergence for various approximate policy iteration algorithms.

**Notes:** Report, Poster

Model-Agnostic Meta-Learning for a Policy Gradient Approach to MuJoCo Continuous Control Tasks (2020)

Research Mentor: Professor Jonathan Kao

Location: University of California, Los Angeles

Description: We investigated the adaptive power of Model Agnostic Meta-Learning on a policy gradient approach to MuJoCo continuous control tasks.

**Notes:** Report

Quantum Programming Algorithms (2020)

Research Mentor: Professor Jens Palsberg

Location: University of California, Los Angeles

Description: We implemented Deutsch-Jozsa, Bernstein-Vazirani, Grover's algorithm, and Simon's algorithm using PyQuil and Qiskit.

We then evaluated the implementations and modern quantum compile and runtime capabilities using the Rigetti and IBM quantum simulators and IBMQX quantum devices.
Notes: PyQuil Report, Qiskit Report 1, Qiskit Report 2

MovieLens Recommender System (2019)
Research Mentors: Jyun-Yu Jiang, Professor Wei Wang
Location: University of California, Los Angeles
Description: We created a recommender system to predict the binary rating for 4M unseen UserID-MovieID pairs in the MovieLens dataset. We surveyed the performance of content-based (e.g. TF-IDF, genre-based decision tree, etc.) and collaborative filtering (e.g. SVM, SVD, element-wise matrix factorization, tabular matrix factorization, hybrid matrix factorization, etc.) methods. **We achieved the third highest ROC-AUC on the test set in our data mining class.**
Notes: Report

Service

Outreach Director, ACM AI at UCLA (2019-)
Location: Los Angeles, California
Description: I strive to make an AI education accessible to everyone. I co-founded, lead, and teach an open-source, accessible machine learning and fairness course at underserved schools in LA. I lead the development of interactive, online learning modules (e.g. gradient descent, mean-squared error, convolutional filters, etc.) I also created and produce the "You Belong in AI!" podcast, which empowers underrepresented youth to pursue AI opportunities through inspiring interviews with researchers. Lastly, I organize events for diverse students to access AI research opportunities.

Co-Founder and Organizer, QWER Hacks (2019-)
Location: Los Angeles, California
Description: I co-founded and organize Major League Hacking's first-ever LGBTQIA+ event and the first collegiate LGBTQIA+ hackathon in the US.

Undergraduate Learning Assistant (2018)
Location: Los Angeles, California
Description: I led weekly recitation sections of 20 students for the introductory computer science class (programming in C++), walking through practice problems and actively applying pedagogy techniques (e.g. open questioning, inclusion of all perspectives, etc.)

Coursework and Skills

Graduate-level Coursework: Fairness, Ethics, Accountability and Transparency in Natural Language Processing; Neural Networks and Deep Learning; Reinforcement Learning Theory and Applications; Adversarial Robustness in Machine Learning; Quantum Programming (transcript)
Relevant Skills: Python, PyTorch, PyTorch Geometric, shell scripting, LaTeX