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Education

2018- BS in Computer Science; University of California, Los Angeles (UCLA)
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

Areas of interest

Graph representation learning, with a focus on **self-supervised methods**, **substructures and semantics**, and **fairness**. I also enjoy reading, theorizing about, and discussing **graph neural network scalability and expressivity**, as well as **bias** in modern, deep learning-powered systems and the representational and allocational harms it poses. Lastly, I care deeply about the **inclusion** of LGBTQIA+ individuals and people with disabilities in AI research.

Research Projects

Lab Research

2020- **Learning Fair Node Embeddings Without Demographics**
Research Mentors: Professor Kai-Wei Chang, Professor Yizhou Sun
Locations: UCLA-NLP, UCLA Scalable Analytics Institute
Description: Currently, algorithms for learning fair node embeddings in graphs rely on explicit knowledge of sensitive node metadata. However, these sensitive attributes are often not available because of privacy laws. I'm researching an adversarial, self-supervised, training-time framework for learning fair node embeddings without demographics. My framework assumes that nodes belonging to the same sensitive group form natural communities in graphs. 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. I'm simultaneously exploring bias in TransE embeddings from

the polblogs, ConceptNet, and YAGO datasets.
Notes: **Related talks:**

- **Fair Machine Learning, Microsoft Garage Brown-Bag**
- **"MONET: Debiasing Graph Embeddings via the Metadata-Orthogonal Training Unit," Microsoft Research Cambridge Paper Reading Group**

2020 **Motif-Driven Contrastive Learning of Graph Representations**
Research Mentors: Shichang Zhang, Ziniu Hu, Professor Yizhou Sun
Location: UCLA Scalable Analytics Institute
Description: Graph motifs are significant subgraph patterns occurring frequently in graphs, and they play important roles in representing the whole graph characteristics. However, mining and utilizing motifs is a non-trivial task for large graph datasets. We propose MICRO-Graph (a framework for MotIf-driven Contrastive leaRning Of Graph representations) 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. By pretraining on the ogbg-molhiv molecule dataset with MICRO-Graph, a GNN model can enhance various chemical property prediction downstream tasks with scarce labels by 2.8%.
Notes: **Manuscript titled "Motif-Driven Contrastive Learning of Graph Representations" submitted to ICLR 2021, currently under review.**

2019-2020 **Heterogeneous Graph Transformer**
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.
Notes: **Resulted in publication: Hu, Ziniu, Yuxiao Dong, Kuansan Wang, and Yizhou Sun. "Heterogeneous graph transformer." In Proceedings of The Web Conference 2020, pp. 2704-2710. 2020.**

2018-2019 **Automated, Cost-Effective Optical System for Accelerated Antimicrobial Susceptibility Testing (AST) Using Deep Learning**
Research Mentors: Calvin Brown, Professor Aydogan Ozcan
Location: UCLA Ozcan Research Group
Description: I designed a neural network that detects bacterial resistance to antibiotics, which shortens the timeline of prescribing antibiotics to patients by about 60%. Furthermore, 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. Our optical system enables faster, inexpensive, automated AST, especially in resource-limited settings, helping to mitigate the rise of global antimicrobial resistance.
Notes: **Resulted in publication: Brown, Calvin, Derek Tseng, Paige MK Larkin, Susan Realegeno, Leanne Mortimer, Arjun Subramonian, Dino Di Carlo, Omai B. Garner, and Aydogan Ozcan. "An Automated, Cost-Effective Optical System for Accelerated Anti-microbial Susceptibility Testing (AST) using Deep Learning." arXiv preprint arXiv:2005.11454 (2020).**

2017 **Estimating the Ages of FGK Dwarf Stars Through the Use of GALEX FUV Magnitudes**
Research Mentors: Professor Graeme Smith, Sara Crandall
Collaborator: Kelly Ho
Location: University of California, Santa Cruz, Smith Lab
Description: I programmatically collected and processed stellar data from online databases, like NASA ADS, with Python. I then statistically analyzed and generated scatter plots of the data using NumPy and matplotlib to better understand different physical quantities of stars (e.g. luminosity, color magnitude, etc.), as well as the relationships between them. Finally, 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.
Notes: **Resulted in publication: Crandall, Sara, Smith, Graeme, Arjun Subramonian, Kelly Ho, Evelyn Cochrane. "Estimating the Ages of FGK Dwarf Stars Through the Use of GALEX FUV Magnitudes.", to appear in The Astronomical Journal.**

2016 **An Empirical Characterization Of Internet Round-Trip Times**
Research Mentor: Daniel S.F. Alves
Collaborators: Ishani Karmarkar, Alice Lim
Location: University of California, Santa Cruz, Internetworking Research Group (i-NRG)
Description: I employed NumPy, matplotlib, and shell scripting to programmatically construct time series plots of packet round-trip time (RTT) data from international TCP/IP networks, which aids in the development of RTT boundary prediction algorithms with a temporal component. Furthermore, I implemented various RTT boundary prediction algorithms from relevant literature using Python scientific computing libraries (e.g. SciPy). Lastly, I built a TCP/IP network simulator with Python to evaluate and compare the performance of the algorithms, in order to determine which techniques of each algorithm to harness in the creation of an original, improved RTT boundary prediction algorithm. 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.
Notes:

- **Resulted in publication: Alves, Daniel S.F. and Obraczka, Katia. "An Empirical Characterization Of Internet Round-Trip Times.", In Q2SWinet '17: Proceedings of the 13th ACM Symposium on QoS and Security for Wireless and Mobile Networks November 2017, Pages 23–30, https://doi.org/10.1145/3132114.3132123.**
- **Manuscript titled "Network State Estimation Through Online Multivariate Polynomial Regression" submitted to IEEE/ACM Transactions on Networking, rejected.**

Seminar Research

2020 **Robust Model-Agnostic Meta-Learning for Binary Content Moderation Tasks in Natural Language Processing**
Research Mentor: Professor Kai-Wei Chang
Collaborator: John Dang

Location: University of California, Los Angeles
Description: Content moderation makes the Internet more welcoming. We investigated applying Model-Agnostic Meta-Learning (MAML) to boost performance on binary content moderation tasks in low-resource contexts. We used the MAML algorithm, implemented in PyTorch, to pre-train a model whose internal representation is amenable to a variety of content moderation tasks with minimal finetuning. Our distribution of content moderation tasks comprised 8 tasks, including sentiment analysis and insincere question detection, each with a separate dataset. We compared the ability of this model pre-trained with MAML to adapt to perform well on unseen binary content moderation tasks to that of a model pre-trained using traditional transfer learning approaches and a model trained from scratch.
Notes: **Report**

2020 **On the Complexity and Convergence of Approximate Policy Iteration Schemes**
Research Mentor: Professor Lin Yang
Collaborators: Shree Kesava Narayan Prasanna, Nikil Roashan Selvam, Justin Yi
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. We concluded with promising future directions of research in analyzing the performance of approximate policy iteration schemes.
Notes: **Report**, **Poster**

2020 **Model-Agnostic Meta-Learning for a Policy Gradient Approach to MuJoCo Continuous Control Tasks**
Research Mentor: Professor Jonathan Kao
Collaborator: John Dang
Location: University of California, Los Angeles
Description: In deep reinforcement learning (RL) tasks, transfer learning can even result in worse performance than training from scratch (i.e negative transfer). Hence, we investigated the adaptive power of Model Agnostic Meta-Learning (MAML), a method that directly optimizes for fast adaptation to new tasks, on a policy gradient approach to MuJoCo continuous control tasks.
Notes: **Report**

2020 **Quantum Programming Algorithms**
Research Mentor: Professor Jens Palsberg
Collaborators: Vaishnavi Tipireddy, Siddarth Chalasani
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. We subsequently detailed our implementations, designs, and compile and runtime analyses in three in-depth reports.
Notes: **PyQuil Report**, **Qiskit Report 1**, **Qiskit Report 2**

2019 **MovieLens Recommender System**
Research Mentors: Jyun-Yu Jiang, Professor Wei Wang

Collaborators: Amit Mondal, Bryan Chiang, John Dang
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 Movie Lens 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

2019- **Outreach Director, ACM AI at UCLA**
Location: Los Angeles, California
Description: My goal is to make an AI education accessible to everyone. I hope that exposing youth to AI will inspire them to pursue a career in the field, make them aware of the pervasive applications of AI in modern society and think critically about these applications, and help underrepresented and marginalized youth fight against algorithmic injustices.

- I co-founded, lead, and teach an open-source, accessible machine learning course at North Hollywood High School that emphasizes foundational deep learning concepts and fairness, ethics, accountability, and transparency.
- I created and produce the "You Belong in AI!" podcast, which empowers youth of all identities and backgrounds, especially those who are underrepresented, to pursue AI opportunities through inspiring interviews with individuals in the AI community.
- I promote interactive, online learning labs for students to build a conceptual understanding of AI concepts (e.g. gradient descent, mean-squared error, convolutional filters, etc.)
- I organize events for all students to access AI research opportunities and for non-CS majors to receive a non-technical introduction to AI and how it intersects with disciplines from political science to neuroscience (through diverse speakers, activities, and panels).

2019- **Co-Founder and Organizer, QWER Hacks**
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 USA. Through empowering talks from queer individuals in tech, technical and diversity & inclusion workshops, and the development of new products, QWER Hacks increases the visibility of and celebrates the queer and trans community in STEM, as well as engages and brings together queer and trans individuals and allies. Last year, I enhanced hacker experience, processing upwards of 300 applications, handling hacker logistics, scheduling inspiring workshops and speakers, and designing the judging system and criteria.

2018- **Director, ACM Teach LA at UCLA**
Location: Los Angeles, California
Description: I speak and lead discussions at underserved schools in Los Angeles about AI research and equity, diversity, and inclusion (EDI) in computer science. I also spearhead chapter-wide EDI initiatives for ACM, employing actionable goalsetting and reflection to take concrete steps

towards making the organization more inclusive of everyone. I secured funding for transportation to schools by writing proposals and attending hearings to explain the immense benefit of teaching CS to youth in LA. Lastly, I recruit and mentor diverse volunteer instructors to teach at schools.

2018 **Undergraduate Learning Assistant**
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.)

Honors

2020 ACM AI at UCLA, Outreach + Events Feature in A.I. For Anyone
2020 IBM Quantum Challenge Certificate
2020 O4U Tech Conference 2020 Attendee
2020 Google Queer Tech Voices Attendee
2019 3rd Place Award for Best Hack @ Rose Hack, Major League Hacking
2018- Dean's Honors List
2017 Siemens Competition Regional Finalist
2016 Award of Achievement, Association for Computing Machinery, San Francisco Bay Area Professional Chapter

Work Experience

2020 **Software Engineering Intern, Microsoft Corporation**
Location: Sunnyvale, California
Description: I crafted a P2P-anonymous, secure backend technical design for a feature to report harassment on Microsoft Teams. I also conducted accessibility research for our feature and authored an 8-page report with actionable insights to improve it for disabled individuals.Lastly, I developed a two-player card game to teach youth about quantum gates using Python and Q#.

2019 **Software Engineering Intern, Get Heal, Inc.**
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. Additionally, I improved existing and designed new algorithms for automated routing in Python, which greatly increased the number of patients seen by doctors each day. Finally, I adapted automated routing algorithm to optimally schedule telemedicine visits, which greatly benefits patients during the COVID-19 pandemic.

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