AMEL AWADELKARIM

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EDUCATION

Ph.D. in Computational and Mathematical Engineering, Stanford University — Sept 2017 - Dec 2023
Advised by: Johan Ugander. *NSF Graduate Research Fellow.*

M.S. in Engineering Science & Mechanics, The Pennsylvania State University — Aug 2016 - Dec 2017

B.S. in Engineering Science & Mechanics, The Pennsylvania State University — Aug 2012 - Dec 2016

TECHNICAL HIGHLIGHTS

Research Interests	Personalization & recommender systems, network science, computational social science
Relevant Courses	Machine Learning, Applied Statistics, Numerical Linear Algebra, Numerical Optimization
Languages & Tools	Python (Numpy, pandas, PyTorch, NetworkX, Matplotlib, Jupyter notebook), SQL, C++, Git, Hive, Presto

WORK EXPERIENCE

Meta, Research Scientist Intern — Oct 2023 - Mar 2024
Menlo Park, CA

- Working within Central Applied Science (CAS) to engineer features for ads-ranking models, in use across Meta's Family of Apps, based on Facebook comment-engagement signals.
- Building features that leverage comment and ad metadata, text (processed at a large-scale using Meta's large language model, LLaMA), and graph-based features of the user-ads bipartite comment network.
- Querying databases using Hive and Presto, and writing feature pipelines using SQL and Python.
- Features developed in my internship are estimated to increase ads revenue by $2M annually.

Google, Software Engineering Intern — Jun 2019 - Sept 2019
Mountain View, CA

- Developed an alternative score to the average star-rating of Google Maps features (places) based on Bayesian skill-based rating systems, implemented in C++.
- Average star-ratings suffer from the cold-start problem – our score better captures quality of scarcely-rated features by leveraging head-to-head comparisons of similar features within the same user's ratings.
- Our new score improves accuracy by up to 10% in predicting binary comparisons between features with few star ratings.

PUBLICATIONS

Algorithms, statistical models, and their applications to real-world networks and choice systems, PhD Thesis (Stanford 2023).
Modeling top-k partial orders, with J Ugander (Manuscript).
Rank-heterogeneous preference models for school choice, with A Seshadri, I Ashlagi, I Lo, and J Ugander (KDD 2023).
Prioritized restreaming algorithms for balanced graph partitioning, with J Ugander (KDD 2020).
Finite-element implementation and verification of complex fluid models based on evolving natural configurations, motivated by studies of blood, MS Thesis (PSU 2017).

RESEARCH PROJECTS

Statistical modeling of partial orders — Apr 2023 - Oct 2023

- *Why it matters:* We introduce an under-studied area in the rankings literature, the modeling of *partial* orders, which plays an important role in the simulation and evaluation of real-world social systems involving ranked preferences.
- Developed two approaches for modeling partial orders: *composite* models, which view a partial order as a truncation of a total order, and *augmented* models, which model a ranking as a sequence of choices, including the choice of `END`.
- Evaluated models predictive performance and ability to generate realistic synthetic datasets using real-world preferences from school choice and ranked choice voting settings.

Preference modeling for school choice — Jan 2021 - Jul 2023

- *Why it matters:* We developed better models of how families rank schools, which advances our ability to design and analyze school choice mechanisms.

- Applied recent advancements in discrete choice and ranking models in PyTorch to improve preference models for school choice research, in partnership with the San Francisco Unified School District.
- Improved goodness-of-fit (measured via NLL loss) by 15% by incorporating context effects—effects of already-chosen items on down-rank choices—and further enhanced top-choice prediction accuracy by 14% via model stratification.

Prioritized restreaming algorithms for balanced graph partitioning May 2018 - Feb 2020

- *Why it matters:* Balanced graph partitioning in a necessary step in efficient large-scale distributed graph computation.
- Developed a taxonomy of modern scalable algorithms for constrained graph partitioning, contributing a new family of algorithms with state-of-the-art performance.
- Our method improves on the min-cut objective by up to 9% over existing graph partitioning techniques such as Google's Linear Embedding algorithm, providing benchmarking that was previously void in the literature.

Training a playlist curator based on user taste Sept 2018 - Dec 2018

- *Why it matters:* A playlist is a form of self-expression that has the power to impact our mood and energy-level; this project uses machine learning to aid in the task of playlist creation by learning the unique taste of the user.
- Built a playlist classifier using PyTorch, mapping a list of unclassified songs to user-created playlists based on similarity.
- Performed feature engineering: collected features from Spotify's API like song metadata and artist genre tags, and computed artist embeddings from related-artists data using NetworkX and Stanford SNAP's implementation of `node2vec`.
- Tested various ML models for the classification task on Spotify-generated and real-user playlists with a shallow neural network reporting the lowest test NLL loss.

PRESENTATIONS

KDD 2023, Oral and poster presentation, "Rank-heterogeneous preference models for school choice", Promotional video.
IC2S2 2022, Poster presentation, "Improved preference modeling for school choice".
NeurIPS WHMD 2021, Contributed talk and poster, "Designing defaults for school choice", Recorded talk.
KDD 2020, Oral and poster presentation, "Prioritized restreaming algorithms for balanced graph partitioning", Slides.
SIAMNS 2020, Contributed talk, "Prioritized restreaming algorithms for balanced graph partitioning", Abstract.
Stanford SWIMM Seminar 2020, Seminar talk, "Prioritized restreaming algorithms for balanced graph partitioning".
Stanford Machine Learning Symposium 2018, Poster presentation, "Training a playlist curator based on user taste".

AWARDS

NSF Graduate Research Fellowship — Stanford University, 2017 - 2020
Outstanding Thesis Award — Penn State University, 2016
1^{st} place at College of Engineering Speaking & Presentation Contest — Penn State University, 2015

ACTIVITIES

Member, San Francisco Women's Ultimate team, Fury — Jun 2018 - present
Facilitator, Ultimate Impact African-American Affinity Group — Oct 2020 - Apr 2021
Coach, Stanford Women's Ultimate team, Superfly — Sept 2019 - Dec 2020
Mentor, Stanford Women in Math Mentoring (SWIMM) — Oct 2019 - Jun 2020