Sareh Nabi

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Google Scholar

Education

Postdoc Scholar
Amazon Ads Early Career Scientist Program
Seattle, WA, USA, 2021-2023

Ph.D. in Operations Research
University of Washington
Information Systems and Operations Management Department
Seattle, WA, USA, 2013-2018

Master of Arts in Economics
Simon Fraser University, Department of Economics
Burnaby, BC, Canada, 2011-2012

Master of Science in Mathematics
Simon Fraser University, Department of Mathematics
Burnaby, BC, Canada, 2008-2011

Bachelor of Science in Mathematics
Sharif University of Technology, Department of Mathematics
Tehran, Iran, 2003-2007

Industry Research Positions

Postdoc Scholar & Research Scientist
Amazon, Sep 2021-Present

I completed my postdoctoral research under the supervision of Dr. Lihong Li as part of the Amazon Ads Early Career Scientist Program (Sep 2021 - Sep 2023). My research focused on leveraging RL and multi-agent RL to advance Amazon's advertising solutions. Upon completing my postdoc, I worked on applying Large Language Models to the Keyword Recommendation Service, launching the LLM-powered Keyword Group in May 2024. Brief summary of my projects:

MESOB: Balancing Equilibria & Social Optimality

- Investigated multi-agent games with a large number of agents, in the presence of both collaboration and competition, aiming to balance individual interests with collective goals.
- Developed a novel optimization framework called MESOB (Mean-field Equilibria & Social Optimality Balancing) that balances mean-field Nash equilibria and social optimality.
- Transformed MESOB into a single-objective optimization problem called MESOB-OMO using approximate Pareto efficiency and occupation measure optimization (OMO).
- Implemented and applied MESOB-OMO to simulated ad auctions, demonstrating its capability to enhance social welfare and ensure closeness to Nash equilibria.
- Presented findings at SIAM Conference on Optimization, MarbleKDD, and AMLC.
- Paper under review; available on Amazon Science and arXiv: 2307.07911.

Advancing Ad Auction Realism: Practical Insights & Modeling Implications

- Investigated and analyzed modern online ad auctions, addressing key differences from traditional and textbook ad auction models.

– Modeled advertisers as agents using adversarial bandit algorithms.
– Simulated 'soft-floor' auctions and compared revenue with that of optimal reserve prices.
– Inferred advertiser value distributions based on bids observed on an e-commerce website.
- Presented at AdKDD; our work won the Sponsored Brand hackathon in Amazon.
- Paper under review; available on Amazon Science and arXiv: 2307.11732.

LLM-powered Keyword Recommendation in Amazon Ads

– Launched the LLM-powered Keyword Group, a new targeting control for Sponsored Products campaigns, enhancing advertisers' targeting strategies and campaign effectiveness.
– Identified giftable products and conducted opportunity sizing for the Gifting Keyword Group to maximize advertising campaign effectiveness during key gifting seasons.
– Engaged in prompt engineering, integrating diverse data sources to refine and optimize LLM performance in keyword generation.
– Evaluated LLM-generated keywords against organic search benchmarks.

Machine Learning Scientist
Microsoft, Oct 2017-Aug 2021
Selected Projects:

– Optimal Cloud Resource Allocation for Finance & Operations (F&O service)
  - Performed comprehensive feature engineering using telemetry signals.
  - Built a machine learning model that predicts Azure SQL Database Transaction Unit (DTU) with a high accuracy and recommended optimal database tier.
  - Achieved annual savings of $2.9M by optimizing tiers for over 300 production databases.
  - This project was in close collaborated with a group of researchers at Microsoft Research, and data science, performance, and COGS execution teams at Microsoft Dynamics.

– Customer Sentiment Driver Project
  - This project aimed to track and classify customer sentiments, correlating them with actual usage to derive actionable insights and prioritize work items for enhancing user experience.
  - Implemented search-based auto-tagging using text-mining capabilities.
  - Obtained about 92% accuracy on our sentiments' classifications.

Internship Positions

Research Scientist Intern
Amazon, June-Sep. 2017
I led a project on learning meta priors from early observations in Bayesian settings, under the supervision of Dr. Houssam Nassif and in consultation with Guido Imbens. In summary, we:

- Addressed two challenges in real-world applications: the absence of informative prior(s) in Bayesian settings and the inability to control parameter learning rates.
- Proposed and implemented a general framework to learn meta-prior from initial data using empirical Bayes and applied it to Generalized Linear Models.
- Performed experiments on a standard optimization problem as well as in a contextual bandit setting in Amazon's production system.
- Demonstrated marked improvements during both simulations and live experiments, especially in cases of small traffic.
- Published our findings in Management Science Journal; Management Science 68(3):1737-1755. Also, available on arXiv: 2002.01129.

Product Intelligence Scientist Intern
Microsoft, June-Sep. 2015

- Investigated various machine learning models to learn business processes a customer is engaged in while navigating Finance & Operations application.
- Applied and implemented Hidden Markov Model in R-language to solve the problem.
- Obtained over 90% accuracy on predicting customer's behavior.

Machine Learning Scientist Intern
Microsoft, June-Sep. 2014

- Built a heat map of search intent and topic identification for tools provided by Life Cycle Services (LCS) in Finance and Operations product at Microsoft Dynamics.
- Implemented and applied unsupervised topic clustering techniques on LCS search data logged internally. Analyzed and provided classification of search issues.
- Refined and labeled topic clusters based on more scaled data. Provided topic to business topics index map (business processes, issues, etc).

Computer Skills

Python, Pyspark, R, MATLAB, SQL, LaTex, MS Office, Exposures to C++, JAVA

Publications

MESOB: Balancing Equilibria & Social Optimality
Xin Guo, Lihong Li, Sareh Nabi, Junzi Zhang
Under review; available on Amazon Science and arXiv: 2307.07911.

Advancing Ad Auction Realism: Practical Insights & Modeling Implications
Ming Chen, Sareh Nabi, Marciano Siniscalchi
Under review; available on Amazon Science and arXiv: 2307.11732.

Bayesian Meta-Prior Learning Using Empirical Bayes
Sareh Nabi, Houssam Nassif, Joseph Hong, Hamed Mamani, Guido Imbens
Management Science 68(3):1737-1755, 2021; arXiv: 2002.01129.

Dynamic Pricing in the Presence of Strategic Behavior Using Thompson Sampling
Sareh Nabi, Hamed Mamani, David Simchi-levi
Working paper, 2021.

Study of Customer Behavior in a Revenue Management Setting Using Data-Driven Approaches, Sareh Nabi, PhD Thesis
Information System and Operations Management Department, University of Washington, 2018.

Paraglide: Interactive Parameter Space Partitioning for Computer Simulations
Steven Bergner, Michael Sedlmair, Torsten Moller, Sareh Nabi, Ahmed Saad
IEEE Transactions on Visualization and Computer Graphics, Vol. 19, Issue 9, pp. 1499-1512, 2013.

Equilibria of a Nonlocal Model for Biological Aggregations: Linear Stability and Bifurcation Studies, Sareh Nabi, M.Sc. Thesis
Department of Mathematics, Simon Fraser University, 2011.

Academic Positions

Research Associate
Foster School of Business, Information System and Operations Management Dept.
2017-2018

Performed research on dynamic pricing and demand learning in the presence of strategic customers. Applied multi-armed bandit modeling approach and implemented the solution in R-language.

Teaching Assistant
University of Washington, Foster School of Business, Seattle, WA, USA
Winter quarters 2014-2016

Taught Statistics to MBA students, held weekly review sessions, engaged students in discussions, provided homework support to 102 students, and graded their exams and homework.

Research Assistant
Pacific Institute for the Mathematical Sciences (PIMS), Simon Fraser University, Burnaby, BC, Canada
2009-2011

Modeled and implemented biological aggregations as distributed behavior in MATLAB.

Analyzed steady state stability and examined bifurcation diagrams using ParaGlide.

Awards and Fellowships

Recipient of Doctoral Fellowships, University of Washington, 2013-2015 and 2016-2017.

Recipient of outstanding Teaching award, ISOM Department, University of Washington, 2016.

Personal Interests

Curiosity: Learning about cosmology & the universe(s), contemplating fundamental questions.

Listening/Reading: Audiobooks on biography, history, and personal development.

Sports: Swimming, hiking, running, long walks. Past: biking, basketball, badminton, and soccer.

Referees

Available upon request.