

Abhishek Kumar Umrawal

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Research Interests

Machine Learning, Algorithms, Optimization, Social Networks, Influence Maximization, Intelligent Transportation

Education

Purdue University <i>Doctor of Philosophy, Industrial Engineering</i> Area of Research: Operations Research Concentration: Computational Engineering Advisor: Dr. Vaneet Aggarwal	2022
Purdue University <i>Master of Science, Economics</i>	2021
Indian Institute of Technology (IIT) Kanpur <i>Master of Science, Statistics</i>	2011

Research Experience

Machine Learning for Social Networks Aug 2017 - Present
Purdue University, West Lafayette IN

Developed an approximation algorithm for maximizing the spread of influence through a social network under partial incentives with non-uniform linear relation between discount and adoption likelihood.

Developed a community-based algorithm for maximizing the spread of influence through a social network.

Machine Learning for Statistical Power Analysis Jan 2021 - Present
Purdue University, West Lafayette IN

Working on developing machine learning algorithms for statistical power analysis for problems involving high-dimensional parameter space.

Multi-Armed Bandits and Online Learning Aug 2017 - Present
Purdue University, West Lafayette IN

Developed efficient algorithms with improved time, space, and sample complexity for top- k subset selection with non-linear full-bandit feedback (ALT 2021, AAAI 2021) with applications to online influence maximization.

Developed a submodular-bandit greedy algorithm for n choose k subset selection with applications to online influence maximization.

Deep Reinforcement Learning for Efficient and Intelligent Transportation Systems Jan 2020 - Dec 2020
Purdue University, West Lafayette IN

Developed deep reinforcement learning algorithms for shared passengers and goods delivery with multi-hop ride-sharing (TITS 2021) and package delivery with multi-transfer freight delivery (ICAPS 2021).

Publications

Published/Submitted

Umrawal, A. K. (2021). COMMUNITY-IM: A Community-Based Algorithm for Social Influence Maximization. *Submitted to IEEE Transactions on Network Science and Engineering (TNSE)*.

Chen, J., Umrawal, A. K., Lan, T., and Aggarwal V. (2021). DeepFreight: A Model-free Deep-reinforcement-learning-based Algorithm for Multi-transfer Freight Delivery. *Published in Proceedings of the 31st International Conference on Automated Planning and Scheduling (ICAPS)*.

Agarwal, M., Aggarwal V., Quinn, C. J., and Umrawal, A. K. (2021). DART: aDaptive Accept RejecT for non-linear top-K subset identification. *Published in Proceedings of the 35th AAAI Conference on Artificial Intelligence (AAAI)*.

Agarwal, M., Aggarwal V., Quinn, C. J., and Umrawal, A. K. (2021). Stochastic Top-*k* Subset Bandits with Linear Space and Non-Linear Feedback. *Published in Proceedings of the in 32nd International Conference on Algorithmic Learning Theory (ALT)*.

Manchella, K., Umrawal, A. K., and Aggarwal V. (2021). FlexPool: A Distributed Model-Free Deep Reinforcement Learning Algorithm for Shared Passengers and Goods Delivery. *Published in IEEE Transactions on Intelligent Transportation Systems (TITS)*.

Work in Progress

Umrawal, A. K., Quinn, C. J., Agarwal, M., and Aggarwal V. (2021). Stochastic Combinatorial Multi-Armed Bandits with Submodular Rewards.

Umrawal, A. K., Quinn, C. J., and Aggarwal V. (2021). Maximizing the Spread of Influence through a Social Network under Partial Incentives.

Industry Experience

Marketing Analyst

Jun 2011 - Nov 2012

Accenture Management Consulting, Gurugram, India

Worked on promotional marketing, pricing strategy, and sales forecasting for clients from retail, finance, and telecom using SAS, VBA, and MS-Excel.

Teaching Experience

Graduate Teaching Assistant

Aug 2017 - Dec 2020

Purdue University, West Lafayette, IN

IE 335 Operations Research - Optimization, IE 546 Economic Decisions in Engineering, IE 330 Probability and Statistics in Engineering II, NCN URE Summer 2018, ENGR 133 Transforming Ideas to Innovation EPICS, ENGR 132 Transforming Ideas to Innovation II, ENGR 131 Transforming Ideas to Innovation I, and MA 162 Plane Analytic Geometry and Calculus II.

Instructor of Mathematics & Economics

Jun 2019 - Aug 2019

Johns Hopkins University, Santa Cruz, CA

Designed and instructed an advanced summer course titled Game Theory and Economics (GMTH) to academically gifted students for Johns Hopkins Center for Talented Youth at the University of California Santa Cruz site.

Instructor of Statistics

Jan 2013 - Aug 2017

University of Delhi, New Delhi, India

Paper 401 Econometrics and Time Series Analysis, Paper 404-406 (vi) Advanced Statistical Computing and Data Mining, Paper 102 Probability Theory, and Lab Courses in SPSS, R, MATLAB, and C.

Visiting Instructor of Business Analytics

Apr 2015 - Jul 2017

Bridge School of Management, New Delhi, India

Module 2 Modeling Methods, Module 3 Advanced Modeling Methods, and Module 4 Analytics Communication and Management, in collaboration with Northwestern University.

Certifications

Deep Learning Specialization offered by deeplearning.ai, Feb 2018 - Aug 2018.

Probabilistic Graphical Models Specialization offered by Stanford University, Nov 2017 - Feb 2018.

Managerial Economics & Business Analysis Specialization offered by UIUC, Jul 2016 - Jan 2017.

Data Science Specialization offered by Johns Hopkins University, May 2014 - May 2015.

Software Skills

Python - TensorFlow, PyTorch, R, SAS, MATLAB, SPSS, Tableau, MS-Excel, VBA, C, BASIC, ~~TeX~~

Invited Talks, Lectures & Workshops

'Introduction to Economics and Finance for Engineering Undergraduates'. Purdue Society of Professional Engineers (PSPE), Purdue University, Feb 18, 2019.

'Skill Training in Data Analytics'. Center for Science Education and Communication (CSEC), University of Delhi, India, Jun 20 - Jun 24, 2017.

'Introduction to SAS and SAS Analytics'. Bridge School of Management, India, Sep 26 - Nov 14, 2016.

'Market Basket Analysis using R'. FORE School of Management, India, Aug 28, 2016.

'Programming and Predictive Modeling using R'. Weekendr Innovation Labs, India, Apr 02 - Apr 30; Jun 03 - Jul 03; and Jul 10 - Aug 06, 2016.

'SPSS Winter Training'. Weekendr Innovation Labs, India, Dec 20, 2015 - Jan 09, 2016.

'Visual Analytics through R'. Bridge School of Management, India, Oct 10, 2015.

'Econometric Modeling and Statistical Simulation using SPSS'. IIS University, India, Mar 18 - Mar 19, 2014.

Awards & Honors

Academic & Professional Awards

'Grad-Track Mentor' by College of Engineering, Purdue University, Aug 2021.

'Runner-up in Poster Competition' by ABE Graduate Students Association, Purdue University, Feb 2021.

'Graduate Mentor Award' by Vertically Integrated Projects (VIP), Purdue University, Apr 2020.

'OSG User School Travel Grant' by Open Science Grid (OSG), Apr 2019, Apr 2020.

'Faculty Excellence Award' by Bridge School of Management, Dec 2015.

'Management Consulting Rockstar Sales Award' by Accenture, Jun 2012.

'Ranked 5th in Master Degree' at IIT Kanpur, 2011.

'Junior Research Fellowship' Joint CSIR-UGC National Eligibility Test (NET), Dec 2010.

'Ranked 1st in Bachelor Degree' at the University of Rajasthan, 2008.

Extra Curricular Awards

'21.1K Finisher' at Purdue Boilermaker Half-Marathon, Oct 2019.

'Cum Laude for INFORMS Student Chapter' by INFORMS, Oct 2019.

'21.1K Finisher' at Purdue Boilermaker Half-Marathon, Oct 2018.

'Elementary Urdu Proficiency Certificate' by Rekhta Foundation, Jun 2017.

'1st Prize in English Open Mic' at Delhi Poetry Festival, Season 4, Dec 2016.

'Certificate of Appreciation in Hindi/Urdu Open Mic' at Delhi Poetry Festival, Season 4, Dec 2016.

'French - Level I Certificate' by Department of Humanities & Social Sciences (HSS), IIT Delhi, Apr 2013.

'2nd Prize in Essay Writing Competition' at Youth Festival, University of Rajasthan, 2008.

'2nd Prize in Poster Making Competition' at the University Rajasthan College, 2007.

'1st Prize in Essay Writing Competition' at Youth Festival, University of Rajasthan, 2007.