

Waquar Kaleem

The Pennsylvania State University
Industrial and Manufacturing Engineering
University Park, PA 16802

Webpage: wkaleem.github.io
Email: wzk5140@psu.edu

Education

Ph.D. in Industrial Engineering and Operations Research, Penn State, 2022 – 2027 (expected)
Advisor: Anirudh Subramanyam
Thesis: *Scalable AI-integrated optimization for electrified transportation and logistics*
Committee: Paul Griffin, Aron Laszka, S. Ilgin Guler, Changhyun Kwon
M.S. in Industrial Engineering and Operations Research, Penn State, 2024 (earned en route to the Ph.D.)
B.Tech. in Petroleum Engineering, Rajiv Gandhi Institute of Petroleum Technology (RGPT), India, 2020
Thesis: *Machine learning for lithology and hydrocarbon zone identification from well log data*
Director's Gold Medal, awarded to one graduating student across all disciplines

Research Interests

Models and algorithms for operations and supply chain management using AI-integrated discrete optimization at scale, applied to matching and pricing in freight markets, distribution network design, last-mile delivery, and electrified fleet operations.

Honors & Awards

Argonne Training Program on Extreme-Scale Computing (U.S. Department of Energy), 2026.
Top ten finalist, Lee Schipper Memorial Scholarship (VREF), Global Scholar track, 2026.
IISE Future Faculty Fellow, selected nationally, 2025–2026.
Marcus Graduate Student Scholarship (Penn State), \$10,000, one of six from twenty-two, 2025.
Honorable Mention, Poster Award (Penn State AI Hub), 2025.
Travel Award (Mixed Integer Programming Workshop), 2025.
Best Paper (IISE Logistics and Supply Chain Division), 2024.
S.N. Bose Scholar (Indo-US Science and Technology Forum), sole petroleum engineering student selected from India, 2019.
DAAD WISE Research Scholarship (Germany), 2019.
AAPG L. Austin Weeks Undergraduate Research Grant, 2019.
Second Runner-Up, Best Paper (SPE South Asia Regional Student Paper Contest), 2019.

Proposals and Funded Projects

1. Offline Model-Based Discrete Optimization: Theory, Algorithms, and Applications to Service Systems, The Harold and Inge Marcus Endowment for Technion/PSU IE Partnership, 2024–2026, \$24,000.
2. Climate-Resilient Electric Bus Infrastructure Planning, Lee Schipper Memorial Scholarship for Sustainable Transport and Energy Efficiency, Volvo Research and Educational Foundations (VREF), Global Scholar track, \$12,500, 2026. Top ten finalist.

Publications

Refereed Journal Articles

1. **W. Kaleem**, T. Cokyasar, J. Larson, O. Verbas, T. H. Bhuiyan, A. Subramanyam.
Extreme-scale EV charging infrastructure planning for last-mile delivery using high-performance parallel computing.
Transportation Research Part B: Methodological, 205, 103403, 2026.
DOI: [10.1016/j.trb.2026.103403](https://doi.org/10.1016/j.trb.2026.103403)
2. S. H. Hosseini Dolatabadi, T. H. Bhuiyan, **W. Kaleem**, A. Subramanyam, T. Cokyasar.
A branch-and-cut algorithm for routing a heterogeneous drone-ground vehicle fleet to deliver time-sensitive products.
Transportation Research Part C: Emerging Technologies, 183, 105454, 2026.
DOI: [10.1016/j.trc.2025.105454](https://doi.org/10.1016/j.trc.2025.105454)
3. **W. Kaleem**, S. Tewari, M. Fogat, D. A. Martyushev.
A hybrid machine learning approach based study of production forecasting and factors influencing the multiphase flow through surface chokes.
Petroleum, 10(2), 354–371, 2024.
DOI: [10.1016/j.petlm.2023.06.001](https://doi.org/10.1016/j.petlm.2023.06.001)
Among the journal's most cited articles since 2023.
4. **W. Kaleem**, K. A. Khan, A. Saxena.
Statistical feature engineering using discrete wavelet transform for improving the prediction of compressional and shear sonic travel time logs.
Petroleum Science and Technology, 43(3), 219–240, 2023.
DOI: [10.1080/10916466.2023.2292781](https://doi.org/10.1080/10916466.2023.2292781)
5. K. R. Chaturvedi, D. Ravilla, **W. Kaleem**, P. Jadhawar, T. Sharma.
Impact of low salinity water injection on CO₂ storage and oil recovery for improved CO₂ utilization.
Chemical Engineering Science, 229, 116127, 2021.
DOI: [10.1016/j.ces.2020.116127](https://doi.org/10.1016/j.ces.2020.116127)
6. **W. Kaleem**, A. Kumar, D. Panda.
Luminescent N, S-doped carbon nanodot: an effective two-fluorophore system of pyridone and thiazolopyridone.
The Journal of Physical Chemistry C, 122(46), 26722–26732, 2018.
DOI: [10.1021/acs.jpcc.8b08249](https://doi.org/10.1021/acs.jpcc.8b08249)

Refereed Conference Proceedings

1. **W. Kaleem**, D. Lee, C. Kwon, A. Subramanyam.
Neural embedded mixed-integer optimization for location-routing problems.
NeurIPS Workshop on Differentiable Learning of Combinatorial Algorithms, 2025.
URL: openreview.net/forum?id=WCILzWMXq9
2. **W. Kaleem**, H. Ayala, A. Subramanyam.
Neural embedded optimization for integrated location and routing problems.
IIE Annual Conference Proceedings, 1–6, 2024.
DOI: [10.21872/2024iise_6627](https://doi.org/10.21872/2024iise_6627)
Best Paper Award, IIE Logistics and Supply Chain Division. [Coverage](#).
3. S. Tewari, P. Jain, S. Sahu, **W. Kaleem**, P. K. Jain.
A novel surface roughness estimation and optimization model for turning process using the RSM-JAYA method.
Data Engineering and Applications, IDEA 2022, Lecture Notes in Electrical Engineering, vol. 1146, 137–153, Springer, Singapore, 2024.
DOI: [10.1007/978-981-97-0037-0_11](https://doi.org/10.1007/978-981-97-0037-0_11)

Under Review and Submitted

1. **W. Kaleem**, D. Lee, C. Kwon, A. Subramanyam.
Neural embedded mixed-integer optimization for location-routing problems.
Under review at *Transportation Research Part E*.
PREPRINT: [arXiv:2412.05665](https://arxiv.org/abs/2412.05665)
2. **W. Kaleem**, T. Cokyasar, A. Ismael, O. Sahin, H. Uhm.
Approximate dynamic programming for matching, scheduling, and pricing in truckload freight markets.
Submitted to the *106th Transportation Research Board Annual Meeting*, 2027.
3. **W. Kaleem**, A. Subramanyam.
Permutation invariant neural estimators for vehicle routing costs.
Submitted.

Working Papers

1. **W. Kaleem**, A. Subramanyam, A. U. Raghunathan.
Generating practically implementable EV charging schedules at depots with rich infrastructure and operational constraints.
2. **W. Kaleem**, E. Lopez Ledezma, A. Subramanyam.
Neural embedded mixed-integer optimization for structurally decomposable vehicle routing problems.
3. **W. Kaleem**, T. Kwon, H. Lefebvre, A. Subramanyam.
A survey on optimization with feedforward neural network constraints: models, methods, and applications.
4. **W. Kaleem**, A. M. Kazachkov, A. Subramanyam.
An embarrassingly parallel probe, dive, and propagate heuristic on GPU for mixed-integer programming.

Software

1. **W. Kaleem**, D. Lee, C. Kwon, A. Subramanyam.
NEO-LRP. Neural embedded optimization for location-routing problems (written in Python).
URL: github.com/Subramanyam-Lab/NEO-LRP
2. Contributor, with accepted pull requests, to two open-source optimization packages.
cuOpt.jl, a Julia interface to the NVIDIA cuOpt solver. URL: github.com/jump-dev/cuOpt.jl
VRPSolverEasy, a branch-cut-and-price exact solver for vehicle routing problems. URL: github.com/inria-UFF/VRPSolverEasy

Patents

1. **W. Kaleem**, A. U. Raghunathan.
Systems and methods for multi-timescale scheduling and control of energy charging infrastructure.
Filed with the United States Patent and Trademark Office, 2026.
Joint filing with *Mitsubishi Electric Research Laboratories*.

Talks

Conference Talks

Neural embedded mixed-integer optimization for location-routing problems	
INFORMS TSL Conference, MIT, Cambridge, MA	July 2026
INFORMS Computing Society Conference, Toronto, Canada	March 2025
Optimization over deep ReLU networks using penalty methods	
INFORMS Annual Meeting, Atlanta, GA	October 2025
Extreme-scale EV charging infrastructure planning for last-mile delivery	
INFORMS Computing Society Conference, Toronto, Canada	March 2025
Neural embedded optimization for sets	
IISE Annual Conference, Montreal, Canada	May 2024
INFORMS Optimization Society Conference, Houston, TX	March 2024
Neural embedded optimization for integrated location and routing problems	
IISE Annual Conference, Montreal, Canada	May 2024

Seminars and Symposia

Approximate dynamic programming for matching, scheduling, and pricing in truckload freight markets	
Transportation and Mobility Group, Argonne National Laboratory	August 2026
Extreme-scale EV charging infrastructure planning for last-mile delivery	
Summer Argonne Student Symposium (SASSy), Lemont, IL	August 2024

Poster Presentations

Offline model-based routing optimization with MIP-representable deep set surrogates	
Mixed Integer Programming Workshop, Stamford, CT	May 2026

Extreme-scale EV charging infrastructure planning	
Mixed Integer Programming Workshop, Minneapolis, MN	June 2025
Neural embedded mixed-integer optimization for location-routing problems	
AI Week, Penn State. Coverage	April 2025
AAAI Bridge Program, Philadelphia, PA	February 2025
Large-scale stochastic charger location and allocation in last-mile delivery	
Transportation Research Board Annual Meeting, Washington, DC	January 2025
Neural embedded optimization for sets	
Symposium on Computational Mathematics, Penn State	November 2023
ICDS Symposium, Penn State	October 2023

Research Experience

Argonne National Laboratory, Lemont, IL.	May – August 2026
Research Aide Technical, Transportation and Power Systems Division.	
Supervisor: Taner Cokyasar.	
Robust EV charging infrastructure planning under decision-dependent uncertainty.	
Value function approximation for matching and pricing in truckload freight markets.	
Mitsubishi Electric Research Laboratories, Cambridge, MA.	September – December 2025
Optimization Research Intern. Supervisor: Arvind U. Raghunathan.	
Grid-connected EV charging schedule optimization, leading to a joint patent filing.	
Argonne National Laboratory, Lemont, IL.	May – August 2024
Givens Associate, Mathematics and Computer Science.	
Supervisors: Jeffrey M. Larson and Taner Cokyasar.	
Stochastic charger location and allocation for last-mile delivery.	
Lagrangian decomposition with cutting planes across 680 CPU cores, producing the largest solved instance in the literature.	
Rezlytix Technologies, Remote.	July – October 2020
Machine Learning Research Intern.	
Synthetic seismic datasets and machine learning models outperforming conventional three-dimensional mapping at 87 percent accuracy.	
Penn State, State College, PA.	May – August 2019
Undergraduate Research Assistant. Advisor: Sanjay Srinivasan.	
Lattice Boltzmann simulator for modeling CO ₂ plume migration in saline reservoirs.	
S. N. Bose Scholar, Indo-US Science and Technology Forum. Program feature.	

Teaching Experience

<i>Lab Instructor and Teaching Assistant, Penn State</i>	Fall 2024
IE 418, Advanced Human-Computer Interaction in the Age of AI. Instructor: Hari	

Thiruvengada.

Led two weekly lab sections on AI interaction design, chatbot building, and workflow automation for more than sixty students. Held office hours and graded assignments and exams.

Student feedback: *“Waquar has been the most helpful especially during lab sessions which were clear and inclusive.”*

Learning Assistant, Penn State

Spring 2025

CMPEN/EE 454, Computer Vision. Instructor: Mohamed Almekkawy.

Facilitated active, collaborative problem solving in class and held regular office hours.

Student feedback: *“Thank you for all of your help and guidance in EE 454. You were very kind and I appreciate all of your guidance!”*

Graduate Teaching Assistant, Penn State

Spring 2025

IE 402, Engineering Economy. Instructor: Qiushi Chen.

Graded assignments, quizzes, and exams for more than thirty students, held weekly office hours, and assisted in course material preparation.

Undergraduate Teaching Assistant, RGIPT

Spring 2020

MTH 210A, Numerical and Statistical Methods.

Advising and Mentorship

- Eduardo Lopez Ledezma (Penn State)

2023 – 2026

Undergraduate researcher.

Topic: Neural embedded optimization for vehicle routing problems.

Working paper: *Neural embedded mixed-integer optimization for structurally decomposable vehicle routing problems.*

Placement: FTR Trader, Engelhart Commodities Trading Partners.

- Rudradip Khanra (RGIPT)

2025 – 2026

Undergraduate researcher.

Topic: Machine learning methods for production forecasting.

Preprint: *A simple gated recurrent network for multi-flow production forecasting, 2026.*

Industry Experience

Oil and Natural Gas Corporation, Rajahmundry, India.

November 2020 – July 2022

Drilling Engineer, Research and Development Division.

Well placement optimization in hydrocarbon reservoirs using machine learning models for spatial variability prediction.

Professional Service

Referee for Peer-Reviewed Journals and Conferences

Transportation Research Part C, European Journal of Operational Research, Engineering Applications of Artificial Intelligence, Computers and Industrial Engineering, Geoscience and Energy, Transportation Research Board Annual Meeting, IISE Annual Conference, AAAI/ACM Conference on AI, Ethics and Society, SBP-BRiMS.

Leadership and Committees

Secretary, INFORMS Student Chapter, Penn State, 2024–2026.

Former Committee Member, SPE Annual Technical Conference and Exhibition, Data Science Engineering and Analytics Subcommittee.

Volunteer organizer, International Conference on Unconventional Energy Resources (ICUER), 2019. Recognized with the Best Volunteer Award.

President, Society of Exploration Geophysicists Student Chapter, RGIPT.

Organizing Secretary, Science and Technical Committee, RGIPT.

Outreach

Volunteer, Gyan-Arpan, an initiative of the Arpan social club teaching students from local schools, RGIPT.

Professional Memberships

Institute for Operations Research and the Management Sciences (INFORMS)

Institute of Industrial and Systems Engineers (IISE)

Mathematical Optimization Society (MOS)

Society of Petroleum Engineers (SPE)

References

Anirudh Subramanyam

Charles and Enid Schneider Early Career Assistant Professor of Industrial and Manufacturing Engineering, The Pennsylvania State University

E-mail: azs7266[at]psu.edu

Changhyun Kwon

Professor of Industrial and Systems Engineering, Korea Advanced Institute of Science and Technology

E-mail: chkwon[at]kaist.ac.kr

Taner Cokyasar

Assistant Professor of Engineering Technology and Industrial Distribution, Texas A&M University, and Consultant, Argonne National Laboratory

E-mail: tcokyasar[at]tamu.edu