Arnav Aakash

122 E Gilman St, Madison, Wisconsin, 53703

608-312-6184 aaakash@wisc.edu linkedin.com/in/arnav-aakash-6a3a01152 https://optimumbadger.github.io

Summary

Graduate student specializing in optimization, with research interests in developing theoretical frameworks for linear and stochastic programming to address large-scale optimization challenges.

Education

University of Wisconsin-Madison **Jan 2024 – Present**
Master's in Industrial and Systems Engineering *GPA: 3.85/4*
***Relevant Coursework**: Linear Optimization, Combinatorial Optimization, Game Theory, Probabilistic Modelling*

Indian Institute of Technology Bombay **Jul 2017 – May 2021**
B.Tech in Chemical Engineering with Minors in Computer Science and Engineering *GPA: 8.37/10*
***Relevant Coursework**: Data Structures & Algorithms, Network Analysis, Machine Learning, Data Analysis*

Research Experience

Optimizing Modest Size Solution Set Selection | *University of Wisconsin-Madison* **Sept 2024 – Present**
Advisor: Dr. Carla Michini

- Reviewing literature to identify key methodologies for addressing modest-size solution selection problems under uncertainty using stochastic optimization techniques
- Working on formulating a two-stage mixed-integer stochastic programming model to account for parameter uncertainty impacting both the objective function and constraints

Military Air Cargo Routing Optimization | *IIT KGP & Defence Research and Dev.(DRDO)* **May 2022 – Mar 2023**
Advisor: Dr. Goutam Sen

- Developed a Mixed-Integer Linear Program (MILP) model for optimizing air cargo transportation and maintenance scheduling of aircraft with fleet and task assignment integration
- Designed an insertion heuristic achieving near-optimal solutions with a **1.32%** optimality gap, scalable for complex cargo missions involving **190** ports and **95** aircraft
- Formulated a fuel-efficient acyclic route planning strategy that addresses refueling, maintenance, and task prioritization in emergency scenarios

Heuristic For Mixed Palletization | *IIT KGP & Centre for AI and Robotics (CAIR)* **Sept 2022 – Mar 2023**
Advisor: Dr. Goutam Sen

- Implemented layer-building algorithm inspired from MBPP paper to efficiently partition loads in optimized sets of layers
- Developed a two-stage layer-based heuristic for solving the Mixed-Case Multi-Size Palletization Problem (MC-MSPP), optimizing space efficiency while managing diverse item and pallet constraints
- Incorporated real-world constraints like orthogonal item rotation, fragility, and compressibility into a comprehensive mathematical model, ensuring robustness in palletization
- Achieved high-quality solutions tested against industry benchmarks, delivering optimal results for complex pallet configurations within a **two-minute** computational time

State Estimation of Styrene Polymerization | *Indian Institute of Technology Bombay* **Sept 2020 – Nov 2020**
Advisor: Dr. Mani Bhushan

- Analyzed exothermic polymerization reaction multiplicity via concentration state generation using specified noise mode
- Monitored the dynamic evolution of estimated states including temperature, concentration of reactants and polymer moments with time by implementing Kalman Filter, Extended Kalman Filter and Unscented Kalman Filter
- Concluded superiority of Unscented Kalman Filter by computing NEES for each filter and RMSE for each state variable

Publications

- Deepak Kushwaha, Goutam Sen, **Arnav Aakash**, Shyni Thomas, Air cargo transportation, loading, and phase-based maintenance service scheduling in demand channel routes, Computers and Industrial Engineering, Vol 195, September 2024 .*(view paper)*
- Deepak Kushwaha, **Arnav Aakash**, Post-Disaster Routing and Scheduling of Helicopters Deployed in HADR Mission, Annual International Conference of Society of Operations Management, IIM Indore. *(view paper)*

Teaching Experience

University of Wisconsin Madison | ***Graduate Teaching Assistant*** **Aug 2024 – Present**
Linear Programming 525 *Madison, Wisconsin*

- Conducted tutorial sessions for a class of **70** students, providing individual support and clarifying course material
- Designed and graded assignments and exams, ensuring alignment with course objectives and learning outcomes

Professional Experience

Dr Reddy's Laboratories | ***Process Engineering Scientist*** **Aug 2021 – June 2023**
Research & Development *Hyderabad,India*

* Realized **40%** reduction in BEM-6 molecule size at the plant scale through strategic development and modification of the production process, precisely aligning with and exceeding client specifications
* Raised yield from **87%** to **95%** of the existing product through strategic implementation of back integration and solvent modification techniques, resulting in significantly enhanced process efficiency and cost savings
* Conducted **100+** experiments to generate feasibility data required for scale-up analysis and informed decision-making
* Coordinated **3** cross functional teams across different units to drive API flow projects with strict customer deadlines

Manufacturing Stint *Vishakhapatnam, India*

* Led seamless installation and commercialization of GLR vessel for Formoterol and R-Formoterol production, coordinating internal teams and vendors to meet project timelines and budget constraints
* Conducted **2** placebo trials for Formoterol to assess process feasibility and safety issues in newly installed GLR reactor
* **150%** increase in commercial API capacity by line balancing & employing 6-σ tools, hence optimizing productivity
* Estimated **25%** reduction in overall training time and by installing Augmented Reality Headsets in operating lines
* Enhanced solvent recoveries by **20%** of flagship API molecules by executing protocol studies and data analytics

Dr Reddy's Laboratories **Apr 2020 – Jun 2020**
Intern *Hyderabad, India*

* Secured Pre-Placement Offer for exceeding project goals, displaying strong work ethic and commitment
* Conducted Multivariate Image Analysis of Microscopic Images to accurately determine the Average Bubble Radius
* Utilized exponential operators to intensify high pixel values, enhancing image readability for precise analysis
* Implemented watershed algorithms to improve bubble image identification, count, and overlap resolution

Technical Skills

Languages: C++, Python, MATLAB, Julia/JuMP, SQL, R
Software/Packages: Google OR tools, Gurobi, CPLEX, HiGHS, Numpy, Pandas, Keras, TensorFlow, LaTeX, ImageJ
Operating Systems: Linux, Windows

Test scores

JEE Mains 2017 : 99.99 percentile out of 1.1 million candidates
JEE Advanced 2017 : 99.5 percentile out of 160k+ candidates
Common Aptitude Exam 2022 : 99.68 percentile out of 200k+ candidates
RMO 2014 : Qualified Regional Mathematics Olympiad and Appeared for Indian National Mathematics Olympiad 2015

Leadership / Extracurricular Activities

Department Academic Mentor **May 2020 – May 2021**
Chemical Engineering Department Association *IIT Bombay*

* Part of a **30-member team** selected out of 90+ candidates after rigorous screening, peer reviews, interpersonal skills, and prudence based on drastic situations
* Counseled **5** sophomores, offering support in managing academic pressure alongside extracurricular commitments
* Aided **2** students requiring additional academic support in framing timelines to manage their academic responsibilities
* Fostered academic changes to align curriculum with student interests in the chemical department during the pandemic

Volunteer **Oct 2022 – Nov 2022**
NICE Foundation *Madhya Pradesh, India*

* Interviewed 100+ families in 30+ villages in Satna district, collecting data on high-risk pregnancies and neonatal deaths
* Surveyed health workers, ASHA staff and 50+ adolescents around the region to pinpoint anemia causes among girls
* Designed slogans for awareness campaigns aimed at educating women about precautionary activities during pregnancy