

Anirudh Subramanyam

CONTACT INFORMATION	Argonne National Laboratory Mathematics and Computer Science Division 9700 S. Cass Ave., Lemont, IL 60439	Phone: (412) 608-9877 E-mail: asubramanyam[at]anl[dot]gov Webpage: www.mcs.anl.gov/~subramanyam/
CURRENT POSITION	ARGONNE NATIONAL LABORATORY – Lemont, USA Postdoctoral Researcher in Mathematics and Computer Science Mentors: Mihai Anitescu and Kibaek Kim	2019 - present
EDUCATION	CARNEGIE MELLON UNIVERSITY – Pittsburgh, USA Ph.D. in Process Systems Engineering Thesis: Robust optimization of vehicle routing problems under uncertainty Advisor: Chrysanthos Gounaris	2013 - 2018
	INDIAN INSTITUTE OF TECHNOLOGY (IIT), BOMBAY – Mumbai, India B.Tech. in Chemical Engineering Thesis: Stochastic modeling of biochemical reaction networks	2009 - 2013
HONORS AND AWARDS	INFORMS Best Dissertation Award in Transportation Science and Logistics, 2nd place Finalist in Computing and Systems Technology (CAST) Directors' Student Presentation Award FOCAPO/CPC Conference Travel Award CMU John and Claire Bertucci Graduate Fellowship CMU Dean's Fellowship Best Student Paper Award at Institute of Chemical Technology, Mumbai IIT Bombay Undergraduate Research Award	2019 2017 2017 2015 2013 2012 2011
RESEARCH INTERESTS	Theory and computational methods for large-scale nonlinear and combinatorial optimization under uncertainty, to address problems in energy, transportation and process systems engineering.	
PUBLICATIONS	Refereed Journal Articles <ol style="list-style-type: none">1. A. Subramanyam, F. Mufalli, J.M. Laínez-Aguirre, J.M. Pinto, C.E. Gounaris: Robust multi-period vehicle routing under customer order uncertainty. <i>Operations Research</i>, (in press), 2020. PREPRINT: optimization-online/2017/04/5947.2. A. Subramanyam, P.P. Repoussis, C.E. Gounaris: Robust optimization of a broad class of heterogeneous vehicle routing problems under demand uncertainty. <i>INFORMS Journal on Computing, Articles in Advance</i>, 2019. DOI: 10.1287/ijoc.2019.0923.3. A. Subramanyam, C.E. Gounaris, W. Wiesemann: K-adaptability in two-stage mixed-integer robust optimization. <i>Mathematical Programming Computation</i>, 2019. DOI: 10.1007/s12532-019-00174-2.4. A. Subramanyam, A. Wang, C.E. Gounaris: A scenario decomposition algorithm for strategic time window assignment vehicle routing problems. <i>Transportation Research Part B: Methodological</i>, 117, 296–317, 2018. DOI: 10.1016/j.trb.2018.09.008.5. A. Subramanyam, and C.E. Gounaris: A decomposition algorithm for the consistent traveling salesman problem with vehicle idling. <i>Transportation Science</i>, 52(2), 386–401, 2017. DOI: 10.1287/trsc.2017.0741.6. A. Subramanyam, and C.E. Gounaris: A branch-and-cut framework for the consistent traveling salesman problem. <i>European Journal of Operational Research</i>, 248(2), 384–395, 2016. DOI: 10.1016/j.ejor.2015.07.030. Refereed Conference Proceedings <ol style="list-style-type: none">7. A. Subramanyam, F. Mufalli, J.M. Laínez-Aguirre, J.M. Pinto, C.E. Gounaris: Robust multi-period vehicle routing under customer order uncertainty. <i>ODYSSEUS 2018, 7th International Workshop on Freight Transportation and Logistics</i>, Cagliari, Italy (pp. 154–157).	

8. **A. Subramanyam**, C.E. Gounaris, P.P. Repoussis: Robust optimization of heterogeneous vehicle routing problems under demand uncertainty. *ODYSSEUS 2018, 7th International Workshop on Freight Transportation and Logistics*, Cagliari, Italy (pp. 150–153).
9. **A. Subramanyam**, C.E. Gounaris: Strategic Allocation of Time Windows in Vehicle Routing Problems under Uncertainty. *FOCAPO/CPC 2017, Foundations of Computer-Aided Process Operations*, Tucson, USA.
10. **A. Subramanyam**, C.E. Gounaris: Exact Methods for the Multi-Period Traveling Salesman Problem with Arrival Time Consistency. *ODYSSEUS 2015, 6th International Workshop on Freight Transportation and Logistics*, Ajaccio, France (pp. 227–230).
11. S. Bandyopadhyay, H. Mukundarajan, S. Mulay, M. Chaturvedi, M. Patel, S. Diwale, A. Shah, G.P. Subramanian, **A. Subramanyam**, K. Kaur, M. Dhanasree, A. Kumar, K.R. Eedara: System Engineering and Integration of Pratham, Indian Institute of Technology Bombay's first Student Satellite. *International Astronautical Congress (IAC) 2010*, Prague, Czech Republic.

Under Review and In-Progress Articles

1. **A. Subramanyam**, M. El Tonbari, K. Kim: Data-driven two-stage conic optimization with rare high-impact zero-one uncertainties. *Under review*, PREPRINT: [arXiv:2001.04934](https://arxiv.org/abs/2001.04934)
2. **A. Subramanyam**, J.M. Roth, M. Anitescu: Cascading failure constrained optimal power flow. *In preparation*.
3. **A. Subramanyam**, N.H. Lappas, C.E. Gounaris: Generalizing the robust cutting plane algorithm to decision-dependent uncertainty sets. *In preparation*.
4. **A. Subramanyam**, W. Wiesemann, C.E. Gounaris: Robust vehicle routing with detours under demand uncertainty. *In preparation*.
5. H. Cai, J.A. Dolan, **A. Subramanyam**: Optimal design of crystal metasurfaces. *In preparation*.

TALKS

- = INVITED
- = CONTRIBUTOR

Data-driven two-stage conic optimization with zero-one uncertainties

- INFORMS 2019, Seattle, WA, USA *October 2019*
- ICCOPT 2019, Berlin, Germany *August 2019*
- EURO 2019, Dublin, Ireland *June 2019*

Robust optimization with decision-dependent uncertainty sets

- INFORMS 2019, Seattle, WA, USA *October 2019*
- EURO 2019, Dublin, Ireland *June 2019*

Robust optimization of vehicle routing problems under uncertainty

- Los Alamos National Laboratory, Center for Nonlinear Studies, Los Alamos, USA *March 2018*
- Argonne National Lab, Mathematics and Computer Science division, Lemont, USA *February 2018*
- Penn State University, Dynamics and Controls Seminar, State College, PA, USA *January 2018*
- Exxon Mobil Process Technology Department, Annandale, NJ, USA *December 2017*

K-adaptability in two-stage mixed-integer robust optimization

- ISMP 2018, Bordeaux, France *July 2018*
- AIChE 2017, Minneapolis, MN, USA *October 2017*
- IFORS 2017, Quebec City, Canada *July 2017*
- INFORMS 2016, Nashville, TN, USA *November 2016*

Robust multi-period vehicle routing under customer order uncertainty

- AIChE 2018, Pittsburgh, PA, USA *October 2018*
- ODYSSEUS 2018, Cagliari, Italy *June 2018*
- IFORS 2017, Quebec City, Canada *July 2017*
- INFORMS 2016, Nashville, TN, USA *November 2016*
- INFORMS Transportation Science and Logistics Society Workshop, Atlanta, USA *June 2016*

- Robust heterogeneous vehicle routing problems under demand uncertainty
- INFORMS 2018, Phoenix, AZ, USA *November 2018*
 - ODYSSEUS 2018, Cagliari, Italy *June 2018*
 - INFORMS Transportation Science and Logistics Society Conference, Chicago, IL, USA *July 2017*
- Strategic time window allocation in vehicle routing problems
- AIChE 2018, Pittsburgh, PA, USA *October 2018*
 - INFORMS 2017, Houston, TX, USA *October 2017*
 - (Poster) FOCAPO/CPC 2017, Tucson, AZ, USA *January 2017*
- Exact algorithms for consistent vehicle routing problems
- AIChE 2015, Salt Lake City, UT, USA *November 2015*
 - INFORMS 2015, Philadelphia, PA, USA *November 2015*
 - ISMP 2015, Pittsburgh, PA, USA *July 2015*

FUNDING AND
MENTORSHIP

Funded Proposals

- **A. Subramanyam** (PI), V. Rao (co-PI). Advanced algorithms for optimizing critical infrastructure systems affected by high-impact rare events. *Laboratory Directed Research and Development Innovate Seed*, Argonne National Laboratory, 2020. Award: \$25,000.

Student co-supervision

- Mohamed El Tonbari. Argonne National Laboratory Givens Associate. Topic: Data-driven algorithms for optimal power flow, 2019.
- Tushar Rathi. CMU Master's Thesis in Chemical Engineering. Topic: Decomposition algorithms for consistent vehicle routing problems, 2018.
- Garry Taifan. CMU Master's Thesis in Chemical Engineering. Topic: Models and algorithms for vehicle routing problems with consistency constraints, 2017.
- Misna Sameer. CMU Master's Thesis in Chemical Engineering. Topic: Benders schemes for driver-consistent vehicle routing problems, 2016.
- Nikhil Apte. CMU Master's Thesis in Chemical Engineering. Topic: Models and formulations for multi-compartment vehicle routing, 2016.

TEACHING
EXPERIENCE

Teaching Assistant, Department of Chemical Engineering, Carnegie Mellon University *2015, 2017*
Instructor: Chrysanthos Gounaris.

Courses: Special Topics in Process Systems Engineering (PhD), Optimization Modeling and Algorithms (Senior), Chemical Product Design (Senior).

Responsibilities: Mentor student projects, grade homeworks and deliver lectures.

Guest lectures: (110 minutes each)

- Introduction to stochastic programming
- Column generation and Dantzig-Wolfe decomposition
- Branch-price-and-cut algorithms

Teaching Assistant, Tepper School of Business, Carnegie Mellon University *2015, 2016*
Instructor: Fatma Kılınç-Karzan.

Courses: Optimization Models for Operations (MBA), Applications of Operations Research (MBA).
Responsibilities: Design homeworks and exams, and grade homeworks.

Teaching Assistant, Department of Chemical Engineering, Carnegie Mellon University *2014*
Instructor: Ignacio Grossmann.

Courses: Chemical Process Systems Design (Senior).

Responsibilities: Mentor student projects and grade homeworks.

Institute Tutor, Department of Mathematics, IIT Bombay *2012, 2013*
Instructor: Neela Nataraj.

Courses: Differential Equations – I, Differential Equations – II, Complex Analysis (Sophomore).

Responsibilities: Teach weekly hour-long recitation sessions.

OTHER R&D EXPERIENCE	<p><i>Undergraduate Research Assistant, IIT Bombay, India</i> <i>2012 – 2013</i> Developed probabilistic models of biochemical reaction networks.</p> <p><i>Member of Structures Subsystem of Pratham (IIT Bombay's first student satellite)</i> <i>2010 – 2012</i> Validated design of the satellite structure by performing simulations of launch loads.</p> <p><i>Research Intern, ITC Limited, Guntur, India</i> <i>2012</i> Applied statistical process control tools to increase yields in a spice production facility.</p> <p><i>Undergraduate Research Assistant, IIT Bombay, India (Advisor: Rochish Thaokar)</i> <i>2011</i> Developed first principles fluid flow equations for electrorotation of vesicles in electric fields.</p>
SKILLS	Proficient in C++, Git and Unix. Some comfort with C, Julia and Matlab.
PROFESSIONAL MEMBERSHIPS	<p>Institute for Operations Research and the Management Sciences (INFORMS) Society for Industrial and Applied Mathematics (SIAM) American Institute of Chemical Engineers (AIChE) Mathematical Optimization Society (MOS)</p>
OUTREACH AND SERVICE	<ul style="list-style-type: none"> • Co-organized <i>YinzOR-2017</i>, 1st Conference of the CMU INFORMS Student Chapter. • Organized and chaired sessions at INFORMS-2019, ICCOPT-2019, ISMP-2018, IFORS-2017 and INFORMS-2016. • Reviewer for: American Control Conference, Applied Mathematical Modeling, Computational Management Science, Computational Optimization and Applications, Computers and Operations Research, European Journal on Operational Research, INFORMS Journal on Computing, Management Science, Mathematical Programming, Naval Research Logistics, Networks, Operations Research Letters, Optimization Letters, Optimization Methods and Software, SIAM Journal on Optimization, Transportation Science. • Institute Student Mentor at IIT Bombay: mentored 20 undergraduate freshmen over a period of two years from 2011 to 2013. • Convener of the music clubs at IIT Bombay: organized (and performed at) various festivals, competitions and clubs over a period of four years from 2010 to 2013.