

AKANG WANG

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EDUCATION

Carnegie Mellon University

Pittsburgh, USA

Doctor of Philosophy in Chemical Engineering (Process Systems Engineering)

May 2020

Thesis Title: Optimization Algorithm for Vehicle Routing and Packing Problems

Thesis Committee: Chrysanthos E. Gounaris (advisor), Ignacio E. Grossmann, Nikolaos V. Sahinidis, Willem-Jan Van Hoes, Alexandre Jacquillat, and Jeffrey E. Arbogast

Tianjin University

Tianjin, China

Bachelor of Science in Chemical Engineering

Jul. 2015

Nankai University

Tianjin, China

Bachelor of Arts in Finance

Jul. 2015

WORK EXPERIENCE

Shenzhen Research Institute of Big Data

Shenzhen, China

Research Scientist

Jun. 2021 - Present

DiDi

Beijing, China

Algorithm Engineer

Aug. 2020 - Jun. 2021

RESEARCH EXPERIENCE

Ph.D. Research, Process Systems Engineering, Carnegie Mellon University

Aug. 2015 - May 2020

Supply Chain & Logistics Optimization

- Implemented tailored branch-price-and-cut algorithms to exactly solve several variants of vehicle routing problems (time windows, multiple trips, multiple depots, heterogeneous fleets, and multiple periods) and closed numerous previously open benchmark instances
- Presented a generic branch-price-and-cut approach for solving robust vehicle routing problems under demand and travel time uncertainty and demonstrated its versatility under various types of uncertainty sets
- Established a scenario-sampling framework to estimate the marginal cost of serving individual customers and delivered C++ codes to Air Liquide for commercial use
- Proposed a novel branch-and-cut algorithm for solving the continuous-time inventory routing problem that arises in the industrial gas business (e.g., Air Liquide) and obtained superior results over the state-of-the-art approach
- Built a compact mixed-integer linear programming model for the full truckload pickup and delivery problem and demonstrated its effectiveness and efficiency through extensive computational studies on industrial data from Braskem

Global Optimization

- Developed a customized branch-and-bound approach for irregular shape nesting and solved five-polygon nesting instances to global optimality for the first time in literature
- Incorporated strengthened intersection cuts to deal with reverse convex quadratic constraints and achieved superior computational performance over the state-of-the-art global solvers on solving circle-packing instances

SKILLS

Professional Expertise: Operations Research, Mathematical Optimization

Application Software: CPLEX, Gurobi, SCIP, GAMS

Programming Languages: C, C++, Python, Julia

Languages: Mandarin (native), English (fluent)

PUBLICATIONS

V. A. Silva, **A. Wang**, V. J. M. Ferreira Filho, and C. E. Gounaris. Routing and scheduling of platform supply vessels in offshore oil and gas logistics. *In Preparation*

A. Wang, X. Li, J. E. Arbogast, G. Bonnier, and C. E. Gounaris. A novel branch-and-cut algorithm for continuous-time inventory routing. *Ready for Submission*

A. Wang, A. Subramanyam, and C. E. Gounaris. Robust vehicle routing under uncertainty via branch-price-and-cut. *Optimization and Engineering (Under Review)*, 2021b

A. Wang, J. E. Arbogast, G. Bonnier, Z. Wilson, and C. E. Gounaris. Estimating the marginal cost to deliver to individual customers. *European Journal of Operational Research (Under Review)*, 2020a

A. Wang, N. Ferro, R. Majewski, and C. E. Gounaris. Mixed-integer linear optimization for full truckload pickup and delivery. *Optimization Letters*, pages 1–17, 2021a

A. Wang and C. E. Gounaris. On tackling reverse convex constraints for non-overlapping of unequal circles. *Journal of Global Optimization*, 80(2):357–385, 2021

S. J. Bakker, **A. Wang**, and C. E. Gounaris. Vehicle routing with endogenous learning: Application to offshore plug and abandonment campaign planning. *European Journal of Operational Research*, 289(1):93–106, 2021

A. Wang, A. Subramanyam, and C. E. Gounaris. A branch-price-and-cut algorithm for robust vehicle routing under demand uncertainty. *Proceedings of the TSL Second Triennial Conference*, 2020c

A. Subramanyam, **A. Wang**, and C. E. Gounaris. A scenario decomposition algorithm for strategic time window assignment vehicle routing problems. *Transportation Research Part B: Methodological*, 117:296–317, 2018b

A. Wang, C. L. Hanselman, and C. E. Gounaris. A customized branch-and-bound approach for irregular shape nesting. *Journal of Global Optimization*, 71(4):935–955, 2018b

PRESENTATIONS

A. Wang, A. Subramanyam, and C. E. Gounaris. A branch-price-and-cut approach for robust vehicle routing. *INFORMS Annual Meeting*, 2020b

A. Wang, X. Li, J. E. Arbogast, G. Bonnier, and C. E. Gounaris. A branch-and-cut algorithm for continuous-time inventory routing. *INFORMS Annual Meeting*, 2019d

A. Wang, J. E. Arbogast, G. Bonnier, Z. Wilson, and C. E. Gounaris. Estimation of marginal cost to serve individual customers. *INFORMS Annual Meeting*, 2019b

V. A. Silva, C. E. Gounaris, and **A. Wang**. Routing of platform supply vessels in offshore oil and gas logistics. *INFORMS Annual Meeting*, 2019 (Poster)

A. Wang, X. Li, J. E. Arbogast, G. Bonnier, and C. E. Gounaris. A branch-and-cut algorithm for continuous-time inventory routing. *AIChE Annual Meeting*, 2019c

A. Wang, J. E. Arbogast, G. Bonnier, Z. Wilson, and C. E. Gounaris. Estimation of marginal cost to serve individual customers. *AIChE Annual Meeting*, 2019a

A. Wang and C. E. Gounaris. A customized branch-and-bound approach for circle packing. *INFORMS Annual Meeting*, 2018b

A. Wang, C. L. Hanselman, and C. E. Gounaris. A novel branching scheme for problems with reverse convex quadratic constraints and its application to packing problems. *AIChE Annual Meeting*, 2018a

- A. Wang** and C. E. Gounaris. Solving robust vehicle routing via a branch-price-and-cut approach. *AICHE Annual Meeting*, 2018a
- A. Subramanyam, **A. Wang**, and C. E. Gounaris. Strategic time window assignment in vehicle routing operations. *AICHE Annual Meeting*, 2018a
- A. Wang**, C. L. Hanselman, and C. E. Gounaris. Irregular shape nesting via branch-and-bound using custom relaxations. *INFORMS Annual Meeting*, 2017
- A. Wang** and C. E. Gounaris. A branch-price-and-cut approach for robust vehicle routing. *INFORMS Annual Meeting*, 2017b
- A. Wang** and C. E. Gounaris. A branch-price-and-cut approach for robust optimization in vehicle routing. *AICHE Annual Meeting*, 2017a

HONORS & AWARDS

H. William and Ruth Hamilton Prengle Graduate Fellowship, Carnegie Mellon University	<u>Apr. 2018</u>
James C. Meade Graduate Fellowship, Carnegie Mellon University	<u>Dec. 2016</u>
Institutional Honor, Tianjin University	<u>Jun. 2015</u>
Shanghai Pudong Development Bank Endeavour Fellowship, Tianjin University	<u>Dec. 2014</u>
National Scholarship, Tianjin University	<u>Nov. 2013</u>
Shanghai Pudong Development Bank Scholarship, Tianjin University	<u>Dec. 2012</u>

PROFESSIONAL SERVICE

Journal reviewer: *Integer Programming and Combinatorial Optimization 2019* (subreviewer), *Optimization Letters*, *Optimization and Engineering*, *Transportation Research Part C*

Conference session chair: *INFORMS Annual Meeting 2018/2019*

Conference organizing committee: *YinzOR 2019*

TEACHING EXPERIENCE

- Teaching Assistant, Carnegie Mellon University Jan. 2016 - May 2020
- Optimization Modeling and Algorithms, Chemical Process Systems Design, Special Topics in Process Systems Engineering (CMU courses for undergraduate and graduate students)
 - Models and Algorithms for Supply Chain Optimization (CAPD short course for industrial participants)