Keji Wei

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EDUCATION

Dartmouth College, Thayer School of Engineering *Hanover NH*
Ph.D. in Operations Research *2014 - 2019*
Co-advisors: Vikrant Vaze, Alexandre Jacquillat (MIT)

- Dissertation: Schedule Planning and Endogeneity of Travelers Decisions in Congested Large-Scale Transportation Networks
- Committee: Vikrant Vaze, Alexandre Jacquillat (MIT), Robert Shumsky (Tuck), Amro Farid

Xi'an Jiaotong University *Xi'an China*
BEng in Automation with Best Undergraduate Thesis Award *2007 - 2011*

APPOINTMENT

Assistant Professor *Apr 2023 - present*
School of Economics and Management, Tongji University, Shanghai

Research Scientist *Apr 2022 - present*
Civil Flight Services CAE, Irving, TX

Senior Operations Research Engineer *Sep 2019- Mar 2022*
Sabre Labs & Product Strategy, Southlake, TX

Operations Research Intern *Summer 2018*
Sabre Airline Solutions, Southlake, TX ☗: Xiaodong Luo

FIELD OF SPECIALIZATION

My research interest is large scale aviation operations optimization. The problems are complicated due to the uncertainty in demand and supply. Uncertainty in demand arises due to interactions with multiple state-holders, including competitors, collaborators and customers. Uncertainty in supply arises due to delays and disruptions in resource availability. By using emerging technologies and combined knowledge from operations research, economy and computer science, my research is to build the mathematical foundations for resource allocation, coupled with computational algorithm and empirical validation method. I use *Optimization models* to solve these decision making problems; *Data Analytic and Statistical Modeling, Machine Learning* to mimic stakeholder behavior; and simulations modeling to test the performance of proposed solution. Most of my research is focused on transportation problems and power system, with an emphasis on aviation area.

TEACHING EXPERIENCE

Dartmouth College, Thayer School of Engineering *Fall 2017, Fall 2018*

ENGG 103: Operations Research Teaching Assistant (🎓: Vikrant Vaze)

Course evaluation: 4.15/5.00 (Fall 2017), 5.00/5.00 (Fall 2018)

(citation from lecturer for overall superior performance as a teaching assistant)

- Holded non-scheduled recitation and weekly office hour to complement the lectures.
- Proofread teaching material including lecture notes, homework, mid-term and final exam; graded homework and exam.
- Assisted various background students (Ph.D. candidate, Master of Engineering Management, MBA, Undergraduate) in class to better understand the course.

SELECTED JOURNAL PUBLICATIONS

IN REVERSE CHRONOLOGICAL ORDER

[1] Keji Wei, Vikrant Vaze, and Alexandre Jacquillat. Transit planning optimization under ride-hailing competition and traffic congestion. *Transportation Science*, 56(3):725–749, 2022

- Featured in media *OR/MS Today*.

[2] **Wei, Keji**, Vikrant Vaze, and Alexandre Jacquillat. Airline timetable development and fleet assignment incorporating passenger choice. *Transportation Science*, 54(1):139–163, 2020

- Winner, AGIFORS Anna Valicek Award for Innovative Research in Airline Operations Research, 2019.

[3] Reed Harder, **Keji Wei**, Vikrant Vaze, and James E. Stahl. Simulation analysis and comparison of point of care testing and central laboratory testing. *MDM Policy & Practice*, 4(1), 2019

[4] **Wei, Keji** and Vikrant Vaze. Modeling crew itineraries and delays in the national air transportation system. *Transportation Science*, 52(5):1276–1296, 2018

- Second Place Winner, AGIFORS Anna Valicek Award for Innovative Research in Airline Operations Research, 2017.
- Featured in media like *ScienceDaily*.

[5] Wuhua Hu, Jianfeng Mao, and **Keji Wei**. Energy-efficient rail guided vehicle routing for two-sided loading/unloading automated freight handling system. *European Journal of Operational Research*, 258(3):943 – 957, 2017

WORK IN PROGRESS

- A Machine Learning Approach for Solution Space Reduction in Aircraft Disruption Recovery with N. Rashedi, N. Sankey,V. Vaze, Major Revision under EJOR.
- Efficient Construction of Arc-Based Transportation Network Models using Graph Attention Networks with V. Vaze, submitted to Transportation Science.

RESEARCH FUNDING

- NSFC Research Funding 72301197, *Machine Learning Based Aircraft Recovery Optimization.* (Principal Investigator). Total Amount 300,000 RMB. 2024 - 2026.
- NSFC Research Funding 72231006, *Integrated Aviation Operations Optimization and Innovation.* (Major Participant, Principal Investigator: Zhe Liang). Total Amount 2,000,000 RMB. 2023 - 2027.

HONORS & AWARDS

- Transportation Science Meritorious Service Award, INFORMS *Oct 2022*
- Shanghai Oversea Talent Program, Shanghai Government *Nov 2021*

- First Place Best Dissertation Award, Aviation Application Section, INFORMS *Nov 2020*
- Anna Valicek Silver Medal for Innovative Research in Airline, AGIFORS *Oct 2019*
- Anna Valicek Bronze Medal for Innovative Research in Airline, AGIFORS *Oct 2017*
- Neukom Travel Grant, Dartmouth College *July 2017*
- GSC Conference Travel Grant, Dartmouth College *July 2017*
- Outstanding Bachelors Thesis (1%), Xian Jiaotong University *July 2011*
- Meritorious Winner, Mathematical Contest in Modeling (10%), *July 2010*
- Outstanding Student (10%), Xian Jiaotong University *July 2009*

CONFERENCE PRESENTATIONS

IN REVERSE CHRONOLOGICAL ORDER

POMS-HK 2024 *Efficient Construction of Arc-Based Transportation Network Models using Graph Attention Networks.* The 5th Workshop on Transportation Research. Hong Kong, 01/2024.

ATRS 2023 *Efficient Construction of Arc-Based Transportation Network Models using Graph Attention Networks.* The 5th Workshop on Transportation Research. Beijing, 11/2023.

CTS 2023 *Graph Attention Networks for Efficient Construction of Arc-Based Transportation Network Models.* The 14th Workshop on Computational Transportation Science. Shanghai, 09/2023.

AGIFORSOps 2022 *Machine Learning in Aircraft Recovery Problem with Dependent Connection Time.* Virtual AGIFORS Airline Operations & Aircraft Maintenance Conference. 05/2022.

INFORMS 2021 *Learning to Handling Connection based Turn Time in Flight Schedule Recovery Problem.* Virtual INFORMS Annual Meeting. 11/2021.

INFORMS 2019 *Optimal Transit Planning: Interactions with Ridehailing, Congestion and Passenger Choice.* INFORMS Annual Meeting. Seattle, WA, 11/2019.

INFORMS 2018 *Airline Timetable Development And Fleet Assignment Incorporating Passenger Choice.* INFORMS Annual Meeting. Phoenix, AZ, 11/2018.

INFORMS 2017 *Modeling and Quantifying Crew Itineraries and Delays.* INFORMS Annual Meeting. Houston, TX, 10/2017.

INFORMS 2017 *Integrated Timetable Development and Fleet Assignment Model Incorporating Passenger Choice.* INFORMS Annual Meeting. Houston, TX, 10/2017.

TSL 2017 *Airline Timetable Development and Fleet Assignment.* INFORMS Transportation and Logistics Society Conference. Chicago, IL, 07/2017.

INFORMS 2016 *Modeling and Understanding Crew Itineraries and Delays under Uncertainty.* INFORMS Annual Meeting. Nashville, TN, 11/2016.

INFORMS 2015 *Quantifying Delay Propagation Through Crew Connections.* INFORMS Annual Meeting. Philadelphia, PA, 11/2015.

CASE 2013 *Energy-efficient Dispatching Solution in an Automated Air Cargo Terminal.* IEEE International Conference on Automation Science and Engineering. Madison, WI, 07/2013.

INVITED TALKS

HKPolyU 2024 *Revolutionizing Aircraft Recovery: Graph Attention Networks for Efficient Transportation Network Modeling & Supervised Machine Learning Approach for Solution Space Reduction.* AAE Research seminar. Hong Kong, China, 01/2024.

SRIBD 2023 *Stochastic Nested Sales-Based Linear Program for Network Revenue Management Under Customer Choice.* Internal seminar. Shenzhen, China, 11/2023.

UT Arlington 2023 *Graph Attention Networks for Constructing Arc-Pair Dependent Connections Transportation Model.* Internal seminar. Arlington, TX, 01/2023.

Texas A&M 2022 *Model and Algorithmsfor Airline Planning- The case for Crew Pairing and Timetabling.* ETID seminar. College Station, TX, 09/2022.

SUFE 2020 *Planning and Endogeneity of Travelers Decisions in Congested Large-Scale Transportation Network.* Weekly Seminar. Virtually, 12/2020.

INFORMS 2020 *Schedule Planning and Endogeneity of Travelers Decisions in Congested Large-Scale Transportation Networks.* Virtual INFORMS Annual Meeting. 11/2020.

TSINGHUA 2019 *Modeling Crew Itineraries and Delayss in the National Air Transportation System.* Weekly Seminar. Beijing, CHN, 12/2019.

AGIFORS 2019 *Airline Timetable Development and Fleet Assignment Incorporating Passenger Choice.* The 59th AGIFORS Annual Symposium. Seatle, WA, 10/2019.

SABRE 2018 *Large Scale Fleet Assignment with Infeasibility Finder.* Sabre Airline Solutions. Dallas, TX, 08/2018.

AGIFORS 2017 *Modeling Crew Itineraries and Delays in the National Air Transportation System.* The 57th AGIFORS Annual Symposium. London, UK, 10/2017.

SKILLS

Languages	Chinese Mandarin (Native), English (Full Professional Proficiency)
Office Software	Git, Linux, CPLEX, LaTex, Vim

RELEVANT COURSEWORK

Core Courses
Foundation of Biostatistics I
Optimization Methods for Engineering Applications
Machine Learning and Statistical Data Analysis
Statistical Methods in Engineering
Operations Research
Topics in Probability: Game Theory
Probability Theory and Stochastic Processes
Data Structures and Algorithms
Discrete Mathematics
System Engineering

Other Courses
Communicating Science
Modern Control Theory
Decision-Making under Risk and Uncertainty
Advanced Topics in Machine Learning (*Audit*)
Workshop: Grammar in Academic Writing
Convex Optimization (*Audit*)
Java Programming
Mathematical Modeling
Databases
Object Oriented Programming

PROFESSIONAL EXPERIENCE

IN REVERSE CHRONOLOGICAL ORDER

Senior Operations Research Engineer, Civil Flight Services, CAE *Apr 2022 - Present*
Airline Aircraft Recovery Module (RMOPS) 🎓: Norbert Lingaya

- Delivery Aircraft recovery product to multiple airline in the world.
- Lead a operations research team in design, development and maintenance of decision support systems.
- Cooperate with sales, product and delivery team to support airline recovery product regularly.

Senior Operations Research Engineer, Sabre Labs & Product Strategy *Sep 2019 - Mar 2022*
Airline Aircraft Recovery Module (RMOPS) 🎓: Sureshan Karichery

- Designed and implemented the operations research and machine learning techniques to improve the solution quality to serve more than +20 airlines in the world.

Airline Passenger Recovery Module (Reaccomm) 🎓: Sureshan Karichery

- Implement multiple constraints (Same Flight, Similar Flight and Max Co-terminal) to migrate schedule change product based on Passenger Recovery Product.

Research Assistant, Dartmouth College *Aug 2018 - Aug 2019*
Performance Improvement of Crew Trip (Pairing) Optimization for Airlines 🎓: Vikrant Vaze, Sujayandra Vaddagiri

- Designed a novelty solution approach to solve 1- month crew pairing problem (*14,888* Flights) in *85* mins with *0.06%* optimally gap.
- Implemented and tested the solution approach in Java with Cplex solver
- Cooperated with *Laminaar Aviation InfoTech* to disucss project details, wrote mid-term and final reports, delivered code and algorithm details.

Operations Research Intern, Sabre Airline Solutions *May 2018 - Aug 2018*
Large Scale Fleet Assignment with Infeasibility Finder 🎓: Xiaodong Luo

- Designed and implemented the operations research techniques to improve the solution quality and solution time of Sabre's flagship fleet assignment module (*34,651* Flights)
- Addressed numerical difficulties in Cplex which cann't be solved before
- Productized the Fleet Assignment module in Java for Alaska Airline

Research Assistant, Dartmouth College *Sep 2014 - Dec 2016*
Analyzing Flight Delay Propagation due to Crew Scheduling Constraints 🎓: Vikrant Vaze

- Selected the factors that influence the extent of crew propagated delays and disruptions and incorporate these factors into a robust crew scheduling model.
- Built learning hyper-models to generate crew pairings that are similar to those in the real world crew pairing samples.
- Presented the general approach to estimate crew-related delays and disruptions for any given network under a variety of data availability scenarios.
- Tested results to demonstrate the accuracy and stability of proposed modeling framework and algorithms.

Project Officer, Nanyang Technological University *Aug 2012 - July 2013*
Energy-efficient Rail Guided Vehicle Routing 🎓: Jianfeng Mao, Wuhua Hu

- An MILP model for the RGV dispatching problem in an arbitrary static scenario
- Investigation of the effect of using differently capacited RGV and meanwhile show the computational complexity

PROFESSIONAL AND LEADERSHIP ACTIVITIES

INFORMS, AVIATION APPLICATIONS SECTION

- Chair and Member of the Best Student Presentation Competition Committee, 2021,2022
- Cluster Chair, 2021
- Session Chair, 2016-present

Air Transport Research Society China Chapter

- Liaison Committee Tongji University, 2023 - 2026

Reviewer Ad hoc referee for *Transportation Science*,*Transportation Research B and C, Computers & Industrial Engineering*, *OR Spectrum*, *Journal of Big Data Analytics in Transportation*, AGIFORS Anna Valicek Award (2022,2023),

Membership: Institute for Operations Research and the Management Sciences (INFORMS), Airline Group of the Int. Fed. of Operational Research Societies (AGIFORS)

MEDIA COVERAGE

- "*Optimizing transportation scheduling for a win, win, win situation for all*", ORMS Today, May 21, 2021.

- "*Research Shows Millions of Dollars Saved Daily When Transit Schedules Align with Commuter Preferences* Dartmouth College, JUL 20, 2021.
- "*Featured Article* ", AAS Newsletter, MAY 2021.
- "*Dartmouth Receives Eight 2020 CASE Awards* ", Dartmouth News, JAN 2021.
- "*Flying In The Face of Danger Keji Wei Th'19 is re-designing the technology of Airline travel*", Dartmouth Engineer Magazine, Summer 2020.
- "*No flights when you want them? Throw some math at the problem!* ", ConcordMonitor, FEB 03, 2020.
- "*Thayer Engineers and MIT Create New Airline Scheduling Tools*", Dartmouth College, JAN 24, 2020.
- "*Xi'an Jiaotong University Alumni Honored with Airline Research Award* ", Xi'an Jiaotong University, OCT 18, 2019.
- "*Dartmouth Engineering Student Honored with Airline Research Award* ", Dartmouth College, OCT 4, 2019.
- "*Engineering PhD Student Wins Anna Valicek Bronze Medal* ", Dartmouth College, JAN 17, 2018.
- "*Airlines and Passengers Save Billions through Crew Planning*", ScienceDaily, JUN 6, 2018 .

PERSONAL

Citizenship:	Chinese
Interests:	Tennis, Frisbee, Ski, Swimming, History

EXTRACURRICULAR ACTIVITIES

Upper Valley Frisbee League, NH *May 2015 - 2019*
Frisbee training twice a week and play summer league (3rd in 6 teams)
After School Science & Engineering, Lyme, NH *May 2016 - 2019*
Help lead fun, hands-on science activities with elementary school students
Dartmouth Admissions Ambassador Program, Dallas, TX *Nov 2019 - Present*
The primary responsibility is as an interviewer to communicate with applicants, and Dartmouth.