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# Keji Wei

*Last updated: June 2020*

## Senior Operations Research

Sabre Technology

Southlake, TX, 76092

📞 +1 (603) 277 0775

✉ keji.wei@sabre.com

🌐 <https://kejiwei.github.io/>

in in/keji-wei-6a26b345

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## EDUCATION

### Dartmouth College, Thayer School of Engineering

*Hanover NH*

Ph.D. in Operations Research

*2014 - 2019*

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, Amro Farid

### Xi'an Jiaotong University

*Xi'an China*

BEng in Automation with Best Undergraduate Thesis Award

*2007 - 2011*

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## APPOINTMENT

### Senior Operations Research Analyst

*Sep 2019- present*

Sabre Airline Solutions, Southlake, TX

### Operations Research Intern

*Summer 2018*

Sabre Airline Solutions, Southlake, TX

👤: Xiaodong Luo

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## RESEARCH INTERESTS

My interest lies at the intersection of transportation and 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 healthcare system, particularly in aviation area.

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## 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)*

- Held 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.

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## SELECTED JOURNAL PUBLICATIONS

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### IN REVERSE CHRONOLOGICAL ORDER

- [1] **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.
- [2] 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
- [3] **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*.
- [4] 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

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## WORK IN PROGRESS

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- Optimal Transit Planning: Interactions with Ride-hailing, Congestion and Passenger Choice (with Vikrant Vaze and Alexandre Jacquillat). Major Revision in *Transportation Science*.
- Urban Bike Lane Planning under Passenger Choice and Traffic Congestion (with Sheng Liu).

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## HONORS & AWARDS

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|---|------------------|
| • Anna Valicek Silver Medal for Innovative Research in Airline, AGIFORS | <i>Oct 2019</i>  |
| • Anna Valicek Bronze Medal for Innovative Research in Airline, AGIFORS | <i>Oct 2017</i>  |
| • Neukom Travel Grant, Dartmouth College                                | <i>July 2017</i> |
| • GSC Conference Travel Grant, Dartmouth College                        | <i>July 2017</i> |
| • Outstanding Bachelors Thesis (1%), Xian Jiaotong University           | <i>July 2011</i> |
| • Meritorious Winner, Mathematical Contest in Modeling (10%),           | <i>July 2010</i> |
| • Outstanding Student (10%), Xian Jiaotong University                   | <i>July 2009</i> |

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## CONFERENCE PRESENTATIONS

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### IN REVERSE CHRONOLOGICAL ORDER

- 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

- TSINGHUA 2019 *Modeling Crew Itineraries and Delays 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. Seattle, 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

<b>Computer Languages</b>	Java ★★★★★★	Cplex ★★★★★★	Matlab ★★★★★★	R ★★★★★☆
	SQL ★★★★★☆	C++ ★★★★★☆	Python ★★★★★☆	Arena ★★★★★☆
<b>Languages</b>	Chinese Mandarin (Native), English (Full Professional Proficiency)			
<b>Office Software</b>	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 Analyst, Sabre Airline Solutions**  
*Airline Aircraft Recovery Module (RMOPS)*

Sep 2019 - Present

🎓: Sureshan Karichery

- Designed and implemented the operations research 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.
- Migrate all schedule change functions into passenger recovery platform. Simulate and generate the large scale input data.

**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 discuss 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 can'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 capacitated RGV and meanwhile show the computational complexity

## PROFESSIONAL AND LEADERSHIP ACTIVITIES

Membership: Institute for Operations Research and the Management Sciences (INFORMS)

Reviewer for major academic journals, including *Transportation Research Part B: Methodological*, *Computers & Industrial Engineering*.

## MEDIA COVERAGE

- “*Flying In The Face of Danger Keji Wei Th’19 is re-designing the technology of Airline travel*”, Dartmouth Engineer Magazine, Summer 2020.

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- “No flights when you want them? Throw some math at the problem!”, ConcordMonitor, Feb 03, 2020.
  - “New Scheduling Tool Offers both Better Flight Choices and Increased Airline Profits”, ScienceCodex, Jan 17, 2020.
  - “Xi’an Jiaotong University Alumni Honored with Airline Research Award”, Xi’an Jiaotong University, October 18, 2019.
  - “Dartmouth Engineering Student Honored with Airline Research Award”, Dartmouth College, October 4, 2019.
  - “Engineering PhD Student Wins Anna Valicek Bronze Medal”, Dartmouth College, October 16, 2017.
  - “Airlines and Passengers Save Billions through Crew Planning”, ScienceDaily, June 6, 2018

## PERSONAL

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Citizenship: Chinese  
 Interests: Tennis, Frisbee, Ski, Swimming, History, Big Patriots Fan (*Go Patriots!!*)

## EXTRACURRICULAR ACTIVITIES

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

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## REFERENCES

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**Prof. Alexandre Jacquillat** (co-advisor)

Assistant Professor of Operations Research  
School of Management  
Massachusetts Institute of Technology, Cambridge, MA  
☎: +1 (857) 302-9781  
✉: alexjacq@mit.edu

**Dr. Xiaodong Luo**

Principal of Operations Research  
Sabre Airline Solutions Operations Research Team  
Sabre Corporation, Southlake, TX  
☎: +1 (972) 352-1738  
✉: Xiaodong.Luo@sabre.com

**Prof. Vikrant Vaze** (co-advisor)

Assistant Professor of Operations Research  
Thayer School of Engineering  
Dartmouth College, Hanover, NH  
☎: +1 (603) 646-9147  
✉: Vikrant.S.Vaze@dartmouth.edu

**Prof. Robert Shumsky**

Professor of Operations Management  
Tuck School of Business  
Dartmouth College, Hanover, NH  
☎: +1 (603) 646-8137  
✉: shumsky@dartmouth.edu