

Peng Wei

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EDUCATION

Purdue University, West Lafayette, Indiana
Ph.D. in Aerospace Engineering, May 2013
Dissertation title: *Maximizing algebraic connectivity in air transportation networks*

Stony Brook University, Stony Brook, New York
M.S. in Electrical and Computer Engineering, August 2009

Tsinghua University, Beijing, China
B.S. in Information Science and Control Theory, July 2007

HONORS

Panelist, 74th Annual Meeting of the SBPC (Sociedade Brasileira para o Progresso da Ciencia)	2022
Keynote Speaker, 3rd International Symposium on Air Traffic Management for Civil Aviation	2022
Keynote Speaker, 2nd International Symposium on Air Traffic Management for Civil Aviation	2020
Honoree, Stony Brook University 40 Under Forty	2019
Keynote Speaker, SITRAER XVIII - Brazil Air Transportation Symposium	2019

AWARDS

Best Paper Award, Air Traffic Control Association (ATCA) Tech Symposium	2023
GW-SEAS Engineers' Council Professor of the Year Award	2023
GW SEAS Outstanding Early Career Researcher Award	2022
NSF CAREER Award	2021
GW-SEAS Engineers' Council Professor of the Year Award	2021
Best Paper Award, IEEE/CSAA Guidance, Navigation and Control Conference (GNCC)	2018
Best Paper Award, International Conference for Research in Air Transportation (ICRAT)	2018
Black and Veatch Faculty Fellow at Iowa State University College of Engineering	2017
Purdue College of Engineering Outstanding Graduate Student Research Award	2013

RESEARCH INTERESTS

By contributing to the intersection of control, optimization, machine learning, and artificial intelligence, I develop autonomy and certification tools for aviation, aeronautics and aerial robotics. My current focus is on safety, efficiency, robustness, and scalability of decision making systems in complex, uncertain and dynamic environments. Recent applications include: Air Traffic Control/Management (ATC/M), Airline Operations, UAS Traffic Management (UTM), eVTOL Urban Air Mobility (UAM), Aircraft Battery Prognostics and Aviation Weather.

ACADEMIC EXPERIENCE

Associate Professor, Department of Mechanical and Aerospace Engineering, George Washington University Sept. 2022 - Onward

Visiting Professor, Department of Electrical Engineering and Computer Sciences, University of California, Berkeley Aug. 2023 - Nov. 2023

Assistant Professor, Department of Mechanical and Aerospace Engineering, George Washington University Jan. 2020 - Aug. 2022

Assistant Professor, Department of Aerospace Engineering, Iowa State University Jan. 2015 - Dec. 2019

Research Assistant, School of Aeronautics and Astronautics, Purdue University Jan. 2010 - May 2013

MAJOR PROJECTS

Principal Investigator, *Safe and Scalable Learning-based Control for Autonomous Air Mobility* Sept. 2021 - Onward
Budget to date: ~\$500K.

The objectives of this **NSF CAREER** project are to: (1) design scalable multi-agent aircraft autonomy to support flight separation assurance and conflict resolution, (2) provide online and offline safety enhancements to the aircraft autonomy and prepare for certification, and (3) design a collaborative airspace management under uncertainties framework to achieve flexible and efficient coordination between flight operators and the airspace service provider.

Principal Investigator, *In-Time Learning-Based Safety Management for Scalable AAM Operations* Mar. 2021 - Onward
Budget to date: ~\$2.5M.

In this **NASA** project our research team will design, develop and demonstrate an in-time learning-based aviation safety management system (ILASMS) for scalable heterogeneous advanced air mobility (AAM) operations. Working with NASA, we will address three types of hazards: (1) adverse weather such as winds, (2) eVTOL vehicle and component level faults/degradation, and (3) AAM corridor/track incursion by non-cooperative aircraft.

Principal Investigator, *Provably Safe and Robust Multi-Agent Reinforcement Learning with Applications in Urban Air Mobility* Jun. 2023 - Onward

Budget to date: ~\$1.2M.

This **NSF** project aims at designing theories and algorithms for multi-agent learning-based planning and control to support safety-critical autonomous eVTOL aircraft in high-throughput, uncertain and dynamic environments. The research thrusts are focused on safety and robustness of single agent reinforcement learning, multi-agent reinforcement learning, and the transition from simulation training to real world flight tests and deployment.

Principal Investigator, *Intelligent Low-Altitude Air Traffic Management System* Aug. 2017 - Aug. 2021

Budget to date: ~\$1M.

The objective of this **NSF** project is to develop a system prototype to support the increasing autonomy in low-altitude airspace among other manned/unmanned air traffic. This project explores novel strategies of coordinating and managing the air traffic to ensure low-altitude airspace safety and efficiency in near future.

Principal Investigator, *Safe Autonomous Urban Air Mobility* June 2017 - May 2018

Budget to date: ~\$133K.

In order to enable on demand air transportation in an urban setting, we have been working with **Airbus** teams on new concept of operations, modeling and simulation, and algorithm design and analysis to provide safe, efficient, sustainable and intelligent solutions for urban air operations..

Principal Investigator, *Aviation Weather Impact on Flight Operations* Nov. 2015 - Oct. 2017

Budget to date: ~ \$65K.

We have been working with **Collins Aerospace** Advanced Technology Center to study the flight en route time variation under different convective weather events. Machine learning algorithms are being developed and analyzed by mining the large-scale nationwide flight data sets (AOTP) and meteorology data sets (ASOS, HRRR, NEXRAD). The resulted predictive model is expected to provide estimation for aircraft en route time before departure given weather forecast, which is critical for decision makings in both airline operations and air traffic management.

Principal Investigator, *Passenger Direct Share Forecast* May 2017 - Oct. 2018

Budget to date: ~ \$30K.

The objective of this **FAA** project is to build machine learning based predictive models to forecast the direct passenger ratios for all the origin-destination airport pairs in the United States. The result is a macro-level indicator of passenger's trip itinerary preference. More importantly, the newly developed model is expected to replace the current FAA forecasting model.

INDUSTRY EXPERIENCE

Operations Research Analyst , Operations Research Division, American Airlines	June 2013 - Dec. 2014
Research Intern , Aviation Systems Division, NASA Ames Research Center	May 2012 - Aug. 2012
Research Intern , Air Traffic Management Division, Intelligent Automation Inc.	May 2011 - Aug. 2011

TEACHING EXPERIENCE

MAE 6291 (GW) Machine Learning and Control	Fall 2021-2022
MAE 3134 (GW) Linear System Dynamics	Spring 2021-2023
MAE 6246 (GW) Electromechanical Control Systems (Linear Systems Theory)	Fall 2020
APSC 6212 (GW) Analytical Methods in Engineering II (Linear Algebra)	Spring 2020
AERE 504 (ISU) Reinforcement Learning and Autonomy	Fall 2017-2019
AERE 574 (ISU) Optimal Control	Spring 2019
AERE 563 (ISU) Introduction to Multidisciplinary Design Optimization (MDO)	Spring 2015-2016
AERE 461 (ISU) Modern Design Methodology with Aerospace Applications (Aircraft Design I)	Fall 2015-2016, 2018
AERE 462 (ISU) Design of Aerospace Systems (Aircraft Design II)	Spring 2017, 2019
AERE 362 (ISU) Aerospace Systems Integration	Spring 2018

PAST RESEARCH SUPERVISION

Past Ph.D. students

Wei Guo, Computer Science, GW (co-advise with Prof. Robert Pless) Ph.D. dissertation title: <i>Safe and Trustworthy Deep Reinforcement Learning for Aircraft Separation Assurance</i>	2023
Josh Bertram, Electrical and Computer Engineering, ISU (co-advise with Prof. Joseph Zambreno) Ph.D. dissertation title: <i>Applying FastMDP to Complex Aerospace-related Problems</i>	2022
Marc Brittain, Aerospace Engineering, ISU (co-advise with Prof. Leifur Leifsson) Ph.D. dissertation title: <i>Learning-based Decision Making for Safe and Scalable Autonomous Separation Assurance</i>	2021
Hao Sun, Mechanical and Aerospace Engineering, GW (co-advise with Prof. James Lee) Ph.D. dissertation title: <i>Modeling and Simulation of Tumor Growth by Finite Element and Machine Learning Methods</i>	2021
Syed Shihab, Aerospace Engineering, ISU (co-advise with Prof. Christina Bloebaum) Ph.D. dissertation title: <i>DeepARM: An Airline Revenue Management System for Dynamic Pricing and Seat Inventory Control using Deep Reinforcement Learning</i>	2020
Xuxi Yang, Aerospace Engineering, ISU Ph.D. dissertation title: <i>Learning-based Perception and Control with Adaptive Stress Testing for Safe Autonomous Air Mobility</i>	2020
Xufang Zheng, Aerospace Engineering, ISU Ph.D. dissertation title: <i>Air Transportation Direct Share Analysis and Forecasting</i>	2019
Guodong Zhu, Aerospace Engineering, ISU Ph.D. dissertation title: <i>Decision Making under Uncertainties for Air Traffic Flow Management</i>	2019
Priyank Pradeep, Aerospace Engineering, ISU Ph.D. dissertation title: <i>Arrival Management for eVTOL Aircraft in On-Demand Urban Air Mobility</i>	2019

Past postdoc researchers

Pouria Razzaghi, Mechanical and Aerospace Engineering, GW 2023
Project title: *A Verification Framework for Certifying Learning-Based Safety-Critical Aviation Systems*

Past M.S. students

Yue (Chelsea) Li, Data Science, GW 2023
M.S. project title: *Identifying Similar Weather Sequences for Airline Decision Making*

Josh Bertram, Electrical and Computer Engineering, ISU 2020
M.S. thesis title: *A new solution for Markov Decision Processes and its aerospace applications*

Mohammad Anwar Manjanoor, Electrical and Computer Engineering, ISU 2019
M.S. project title: *Autonomous Drone Racing Platform*

Daniel Zhou, Aerospace Engineering, ISU 2019
M.S. thesis title: *Airline Fleet Planning and Utilization Hours Comparison Studies*

Imke Kleinbekman, Aerospace Engineering, visiting from TU Delft (co-advise with Prof. Mihaela Mitici) 2019
M.S. thesis title: *eVTOL Arrival Sequencing and Scheduling for On-Demand Urban Air Mobility*

Abdullah Alnaqeb, Aerospace Engineering, ISU 2017
M.S. thesis title: *Online Prediction of Battery Discharge and Flight Mission Assessment for Electrical Rotorcraft*

CURRENT RESEARCH SUPERVISION

Abenezer Taye, Ph.D. candidate (GW MAE)
Shulu Chen, Ph.D. candidate (GW ECE, co-advise with Prof. Tian Lan)
Ellis Thompson, Ph.D. student (GW CS)
Binshuai (Derek) Wang, Ph.D. student (GW CS)
Amin Tabrizian, Ph.D. student (GW CS)

ACADEMIC SERVICE

Service to the GW Campus

Faculty Senate Standing Committee on Research 2020 - Onward
Faculty Senate Standing Committee on Athletics and Recreation 2020 - Onward

Service to GW School of Engineering and Applied Science

Faculty Advisor for GW AIAA DBF Team 2020 - Onward
Faculty Advisor for GW AIAA Student Branch 2021 - Onward
Faculty Search Committee for ECE Department on Artificial Intelligence Hardware 2022 - 2023
Faculty Search Committee for CS Department on Artificial Intelligence, Machine Learning and Security 2021 - 2022
Faculty Search Committee for EMSE Department on Human-Autonomy Teaming 2021 - 2022
Faculty Search Committee for ECE Department on Digital Hardware Systems and Autonomy 2019 - 2020

Service to GW Mechanical and Aerospace Engineering Department

Undergraduate Curriculum Committee Member 2021 - Onward
Faculty Search Committee for Robotics and Autonomy 2019 - 2020

Service to ISU College of Engineering

Faculty Advisor for Iowa State AIAA DBF Team 2016 - 2019
Faculty Advisor for Iowa State Drone Racing Club 2017 - 2019
Faculty Advisor for AirOne Club 2018
Faculty Advisor for CyNest Club 2015 - 2017
Faculty Advisor for ISUAV Club 2015 - 2016

Service to ISU Aerospace Engineering Department

Founding Instructor for ISU Boeing AerosPACE program 2018 - 2019
Department Chair Search Committee 2018

Faculty Search Committee for Dynamics and Control	2017 - 2018
Faculty Search Committee for Intelligent Systems	2015 - 2016
Curriculum Committee	2017 - 2019
Academic Standards Committee	2015 - 2019
Faculty Advisor for ISU Airbus Fly Your Ideas	2017
Faculty Advisor for ISU Airbus Innovation Showdown	2016

PROFESSIONAL AFFILIATIONS

American Institute of Aeronautics and Astronautics (AIAA), Associate Fellow
 Institute of Electrical and Electronic Engineers (IEEE), Senior Member
 Institute for Operations Research and the Management Sciences (INFORMS), Member
 Airline Group of the International Federation of Operational Research Societies (AGIFORS), Member

PROFESSIONAL SERVICE

Advisory Board/Group

<i>Member, Advisory Board for A³ by Airbus</i>	2017 - 2018
<i>Member, Working Group for NASA UAS Traffic Management (UTM)</i>	2016 - 2018
<i>Member, Advisory Group for NASA Prognostics As A Service (PaaS)</i>	2018

Technical and Program Committees

<i>Chair, AIAA Air Transportation Systems Technical Committee</i>	2022 - present
<i>Vice Chair, AIAA Air Transportation Systems Technical Committee</i>	2019 - 2022
<i>Member, AIAA Air Transportation Systems Technical Committee</i>	2016 - 2019
<i>Member, TRB Standing Committee on Airfield and Airspace Capacity and Delay - AV060</i>	2016 - 2019, 2022 - present

Panels

Panelist, "UAS Traffic Management", AIAA Aviation, Demand for Unmanned Symposium, Washington D.C., June, 2016

Conference Organizer

<i>Program Co-Chair</i> "Air Traffic Operations, Management, and Systems" AIAA Aviation 2022, Chicago, IL	2021 - 2022
<i>Program Co-Chair</i> "Air Traffic Operations, Management, and Systems" AIAA Aviation 2021, Virtual Conference	2020 - 2021
<i>Program Co-Chair</i> "Air Traffic Operations, Management, and Systems" AIAA Aviation 2020, Reno, NV	2019 - 2020
<i>Program Co-Chair</i> "Air Traffic Operations, Management, and Systems" AIAA Aviation 2019, Dallas, TX	2018 - 2019

Conference Session Organizer

<i>Session Chair</i> "Surveillance" Digital Avionics Systems Conference, Portsmouth, VA	Sept. 2022
<i>Session Chair</i> "AI Safety and Security for Transportation Systems" INFORMS Conference on Security, Arlington, VA	Aug. 2022
<i>Session Chair</i> "Urban Air Mobility"	Nov. 2018

<i>INFORMS Annual Meeting, Phoenix, AZ</i>	
<i>Session Chair</i>	June 2018
“UAS in the NAS”	
<i>AIAA Aviation, Atlanta, GA</i>	
<i>Session Chair</i>	June 2018
“ATM/ATC/NEXTGEN”	
<i>AIAA Aviation, Atlanta, GA</i>	
<i>Committee Chair</i>	Oct. 2017
“INFORMS Aviation Applications Section (AAS) Best Student Presentation Competition”	
<i>INFORMS Annual Meeting, Houston, TX</i>	
<i>Session Chair</i>	June 2017
“UAS Traffic Management”	
<i>AIAA Aviation, Denver, CO</i>	
<i>Session Chair</i>	Nov. 2016
“UAS Traffic Management and Low-altitude Airspace Operations”	
<i>INFORMS Annual Meeting, Nashville, TN</i>	
<i>Session Chair</i>	Nov. 2016
“Air Traffic Management and Airline Operations”	
<i>INFORMS Annual Meeting, Nashville, TN</i>	
<i>Session Chair</i>	Nov. 2015
“Air Traffic Management and Airline Operations”	
<i>INFORMS Annual Meeting, Philadelphia, PA</i>	
<i>Session Chair</i>	Dec. 2011
“Aerospace IV”	
<i>IEEE Conference on Decision and Control and European Control Conference, Orlando, FL</i>	
<i>Session Chair</i>	Nov. 2011
“Transportation Science and Logistics”	
<i>INFORMS Annual Meeting, Charlotte, NC</i>	

Reviewer Activities

- *Editorial board*
 - Associate Editor for AIAA Journal of Aerospace Information Systems 2018-Onward

- *Book reviewer*
 - AIAA, “Aircraft Design: A Conceptual Approach, Sixth Edition” 2018
 - Elsevier, “Air Transport and Tourism” 2016

- *Journal referee*
 - Artificial Intelligence Review 2020 - 2021
 - Aerospace Science and Technology 2020 - 2021
 - AIAA Journal of Aerospace Information Systems 2017 - 2021
 - AIAA Journal of Air Transportation 2017 - 2023
 - AIAA Journal on Guidance, Control and Dynamics 2010 - 2012, 2016 - 2023
 - IEEE Transactions on Aerospace and Electronic Systems 2019
 - IEEE Transactions on Intelligent Transportation Systems 2010, 2014 - 2021
 - Transportation Research Part B 2011 - 2019
 - Transportation Research Part C 2015 - 2021
 - Journal of Aerospace Engineering Part G 2018
 - Journal of Air Transport Management 2020 - 2021
 - Journal of Optimization Theory and Applications 2017

- *Conference referee*
 - ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD) 2020 - 2022
 - AIAA Aviation 2015 - 2023
 - AIAA Conference on Guidance, Control and Dynamics 2011 - 2013
 - SESAR Innovation Days 2017 - 2020
 - American Control Conference (ACC) 2011-2013, 2019 - 2020
 - IEEE Conference on Decision and Control (CDC) 2010 - 2014, 2020
 - IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2020
 - IEEE International Conference on Intelligent Transportation Systems 2018 - 2020
 - Transportation Research Board (TRB) Annual Meeting 2016 - 2019, 2022 - 2023

- *Other*
 - INFORMS Aviation Applications Section (AAS) Best Paper Award 2020
 - INFORMS Aviation Applications Section (AAS) Best Ph.D. Dissertation Award 2017, 2021

- *Thesis committee member (outside of my own graduate students)*
 - Iowa State University, over 60 PhD and MS students 2015 - 2019

PUBLICATIONS

Journal Publications

Published, in press, accepted

1. S. Chen, A. Evans, M. Brittain and **P. Wei**, “Integrated Conflict Management for UAM with Strategic Demand Capacity Balancing and Learning-based Tactical Deconfliction”, accepted by *IEEE Transactions on Intelligent Transportation Systems*, Jan. 2024.
2. J. Bertram, J. Zambreno and **P. Wei**, “Efficient Unmanned Aerial Systems Navigation with Collision Avoidance in Dense Urban Environments”, accepted by *IEEE Transactions on Intelligent Transportation Systems*, Jun. 2023.
3. W. Guo, Y. Zhou and **P. Wei**, “Exploring Online and Offline Explainability in Deep Reinforcement Learning for Aircraft Separation Assurance”, *Frontiers in Aerospace Engineering*, Dec. 2022.
4. J. Hu, X. Yang, W. Wang, **P. Wei**, L. Ying and Y. Liu, “Obstacle Avoidance for UAS in Continuous Action Space Using Deep Reinforcement Learning”, accepted by *IEEE Access*, Aug. 2022.
5. P. Wu, X. Yang, **P. Wei** and J. Chen, “Safety Assured Online Guidance with Airborne Separation for Urban Air Mobility Operations in Uncertain Environments”, accepted by *IEEE Transactions on Intelligent Transportation Systems*, March 2022.
6. M. Brittain and **P. Wei**, “Scalable Autonomous Separation Assurance with Heterogeneous Multi-Agent Reinforcement Learning”, *IEEE Transactions on Automation Science and Engineering*, Feb. 2022.
7. J. Bertram, **P. Wei**, and J. Zambreno, “A Fast Markov Decision Process based Algorithm for Collision Avoidance in Urban Air Mobility”, *IEEE Transactions on Intelligent Transportation Systems*, Jan. 2022.
8. M. Brittain, X. Yang, and **P. Wei**, “A Deep Multi-Agent Reinforcement Learning Approach to Autonomous Separation Assurance”, *AIAA Journal of Aerospace Information Systems*, Aug. 2021.
9. S. A. M. Shihab and **P. Wei**, “A Deep Reinforcement Learning Approach to Seat Inventory Control for Airline Revenue Management”, *Journal of Revenue and Pricing Management*, Mar. 2021.
10. X. Yang and **P. Wei**, “Autonomous Free Flight Operations in Urban Air Mobility with Computational Guidance and Collision Avoidance”, *IEEE Transactions on Intelligent Transportation Systems*, Jan., 2021.
11. X. Zheng and **P. Wei**, “Air Transportation Direct Share Time Series Forecasting: A Hybrid Model”, *AIAA Journal of Aerospace Information Systems*, vol. 17, no. 12, Dec. 2020.
12. X. Yang and **P. Wei**, “Scalable Multi-Agent Computational Guidance with Separation Assurance for Autonomous Urban Air Mobility Operations”, *AIAA Journal of Guidance, Control, and Dynamics*, vol. 43, no. 8, Aug. 2020.
13. P. Pradeep and **P. Wei**, “Heuristic Approach for Arrival Management of eVTOLs in On-Demand Urban Air Mobility”, *AIAA Journal of Aerospace Information Systems*, accepted, 2020.
14. X. Zheng, C. Liu, and **P. Wei**, “Air Transportation Direct Share Analysis and Forecast”, *Journal of Advanced Transportation*, Article ID 8924095, 2020.
15. I.C. Kleinbekman, M. Mitici, and **P. Wei**, “A Rolling-horizon eVTOL Arrival Scheduling for On-demand Urban Air Mobility”, *AIAA Journal of Aerospace Information Systems*, vol. 17, no. 3, March 2020.
16. P. Pradeep and **P. Wei**, “Energy Efficient Arrival with RTA Constraint for Multicopter eVTOL in Urban Air Mobility”, *AIAA Journal of Aerospace Information Systems*, vol. 16, no. 7, July 2019.
17. C. Yang, J. Mao, X. Qian, and **P. Wei**, “Designing Robust Air Transportation Network via Minimizing Total Effective Resistance”, *IEEE Transactions on Intelligent Transportation Systems*, vol. 20, no. 6, pp. 2353-2366, Oct. 2018.
18. C. Yang, J. Mao, and **P. Wei**, “Air Traffic Network Optimization via Laplacian Energy Maximization”, *Aerospace Science and Technology*, vol.49, pp.26-33, 2016.
19. L. Du, S. Peeta, **P. Wei**, and D. Sun, “A Quantitative and Systematic Methodology to Investigate Energy Consumption Issues in Multimodal Intercity Transportation Systems”, *International Journal of Transportation Science and Technology*, vol.4, no.3, pp.229-256, December 2015.

20. **P. Wei**, G. Spiers, and D. Sun, “Algebraic Connectivity Maximization for Air Transportation Networks”, *IEEE Transactions on Intelligent Transportation Systems*, vol.15, no.2, pp.685-698, Apr. 2014.
21. **P. Wei**, L. Chen, and D. Sun, “Algebraic Connectivity Maximization of an Air Transportation Network: The Flight Routes’ Addition/Deletion Problem”, *Transportation Research Part E*, vol.61, pp.13-27, Jan. 2014.
22. H. Nagarajan, **P. Wei**, S. Rathinam and D. Sun, “Heuristics for Synthesizing Robust Networks with a Diameter Constraint”, *Mathematical Problems in Engineering*, Volume 2014, Article ID 326963, 11 pages, 2014.
23. **P. Wei**, T. Kim, S. Han, S. Landry, D. Sun, and D. DeLaurentis, “Optimal Metroplex Routing Paradigm and its Performance Analysis”, *AIAA Journal of Guidance, Control, and Dynamics*, vol.36, no.4, pp.1221-1225, 2013.
24. **P. Wei**, Y. Cao, and D. Sun, “Total Unimodularity and Decomposition Method for Large-Scale Air Traffic Cell Transmission Model”, *Transportation Research Part B*, vol.53, pp.1-16, July 2013.
25. S. Chu, **P. Wei**, X. Zhong, X. Wang and Y. Zhou, “Deployment of a Connected Reinforced Backbone Network with a Limited Number of Backbone Nodes”, *IEEE Transactions on Mobile Computing*, vol.12, issue 6, pp.1188-1200, 2012.

Conference Publications

Published, in press, accepted

1. A. Taye and **P. Wei**, “Flight Mission Feasibility Assessment of Urban Air Mobility Operations under Battery Energy Constraint”, AIAA SciTech, Orlando, FL, Jan. 2024.
2. B. Wang, J. Pinto and **P. Wei**, “Identifying Similar Thunderstorm Sequences for Airline Decision Support Using Optimal Transport Theory”, AIAA SciTech, Orlando, FL, Jan. 2024.
3. P. Krois, J. Block, P. Cobb, G. Chatterji, A. Louis-Ferdinand, S. Chen and **P. Wei**, “The Vertiport Human Automation Teaming Toolbox (V-HATT) for the Design and Evaluation of Urban Air Mobility Infrastructure”, AIAA SciTech, Orlando, FL, Jan. 2024.
4. W. Guo, M. Brittain and **P. Wei**, “Safety Validation for Deep Reinforcement Learning Based Aircraft Separation Assurance with Adaptive Stress Testing”, AIAA/IEEE Digital Avionics Systems Conference (DASC), Barcelona, Spain, Oct. 2023.
5. E. Thompson, Y. Xu and **P. Wei**, “One-Shot Strategically Deconflicted Route and Operational Volume Generation for Urban Air Mobility Operations”, IEEE International Conference on Intelligent Transportation Systems (ITSC), Bilbao, Spain, Sept. 2023.
6. K. Gogineni, Y. Mei, T. Lan, **P. Wei** and G. Venkataramani, “AccMER: Accelerating Multi-Agent Experience Replay with Cache Locality-aware Prioritization”, accepted by IEEE International Conference on Application-specific Systems, Architectures, and Processors (ASAP 2023), Jul. 2023.
7. K. Gogineni, **P. Wei**, T. Lan and G. Venkataramani, “Towards Efficient Multi-Agent Learning Systems”, ML for Computer Architecture and Systems (MLArchSys), International Symposium on Computer Architecture (ISCA), Jun. 2023.
8. E. Thompson, Y. Xu and **P. Wei**, “A Framework for Operational Volume Generation for Urban Air Mobility Strategic Deconfliction”, International Conference on Unmanned Aircraft Systems (ICUAS), Warsaw, Poland, Jun. 2023.
9. E. Thompson, A. Taye, J. Ashby, G. Fattah, **P. Wei**, T. Bonin, J. Jones, M. Quinones-Grueiro, and G. Biswas, “Probabilistic Evaluation for Flight Mission Feasibility of a Small Octocopter in the Presence of Wind”, AIAA Aviation, San Diego, CA, Jun. 2023.
10. Y. Mei, H. Zhou, T. Lan, G. Venkataramani and **P. Wei**, “MAC-PO: Multi-Agent Experience Replay via Collective Priority Optimization”, International Conference on Autonomous Agents and Multiagent Systems (AAMAS), London, United Kingdom, May 2023.
11. P. Krois, J. Block, P. Cobb, G. Chatterji, C. Kurian, S. Chen, and **P. Wei**, “Development of a Prototype Vertiport Human Automation Teaming Toolbox for Urban Air Mobility”, International Symposium on Aviation Psychology (ISAP), Rochester, NY, May 2023.
12. K. Gogineni, **P. Wei**, T. Lan and G. Venkataramani, “Scalability Bottlenecks in Multi-Agent Reinforcement Learning Systems”, FastPath 2023 - 10th International Workshop on Performance Analysis of Machine Learning Systems, Raleigh, NC, Apr. 2023.

13. S. Chen, **P. Wei**, P. Krois, J. Block, P. Cobb, G. Chatterji and C. Kurian, "Arrival Management for High-density Vertiport and Terminal Airspace Operations", Air Traffic Control Association (ATCA) Tech Symposium, Atlantic City, NJ, Apr. 2023.
14. Z. Zhao, J. Lee, Z. Li, C. Park and **P. Wei**, "Vision-based Perception with Safety Awareness for UAS Autonomous Landing", AIAA SciTech, Jan. 2022.
15. W. Guo and **P. Wei**, "Explainable Deep Reinforcement Learning for Aircraft Separation Assurance", AIAA/IEEE Digital Avionics Systems Conference (DASC), Portsmouth, VA, Sept. 2022.
16. S. Chen, **P. Wei**, A. D. Evans and M. E. Nova, "Estimating Airspace Resource Capacity for Advanced Air Mobility Operations", AIAA Aviation, Chicago, IL, June 2022.
17. A. G. Taye, J. R. Bertram, C. Fan and **P. Wei**, "Reachability based Online Safety Verification for High-Density Urban Air Mobility Trajectory Planning", accepted by AIAA Aviation, Chicago, IL, June 2022.
18. A. Baheri, H. Ren, B. Johnson, P. Razzaghi and **P. Wei**, "A Verification Framework for Certifying Learning-Based Safety-Critical Aviation Systems" accepted by AIAA Aviation, Chicago, IL, June 2022.
19. E. L. Thompson, A. G. Taye, W. Guo, **P. Wei**, M. Quinones-Grueiro, I. Ahmed, G. Biswas, J. Quattrociochi, S. Carr, U. Topcu, J. Jones and M. Brittain, "A Survey of eVTOL Aircraft and AAM Operation Hazards", accepted by AIAA Aviation, Chicago, IL, June 2022.
20. W. Guo, M. Brittain, and **P. Wei**, "Safety Enhancement for Deep Reinforcement Learning in Autonomous Separation Assurance", IEEE International Conference on Intelligent Transportation Systems (ITSC), Indianapolis, IN, Sept. 2021.
21. M. Brittain, J. Nagawkar, **P. Wei** and L. Leifsson, "Multifidelity Aerodynamic Flow Field Prediction Using Conditional Adversarial Networks", AIAA Aviation, Virtual Conference, Aug. 2021.
22. J. Bertram and **P. Wei**, "An Efficient Algorithm for Multiple-Pursuer-Multiple-Evader Pursuit/Evasion Game", AIAA SciTech, Virtual Conference, Jan. 2021.
23. J. Bertram, J. Zambreno and **P. Wei**, "Scalable FastMDP for Pre-departure Airspace Reservation and Strategic Deconflict", AIAA SciTech, Virtual Conference, Jan. 2021.
24. M. Brittain and **P. Wei**, "One to Any: Distributed Conflict Resolution with Deep Multi-Agent Reinforcement Learning and Long Short-Term Memory", AIAA SciTech, Virtual Conference, Jan. 2021.
25. Z. Wang, **P. Wei** and L. Sun, "Optimal Cruise, Descent, and Landing of eVTOL Vehicles for Urban Air Mobility using Convex Optimization", AIAA SciTech, Virtual Conference, Jan. 2021.
26. X. Yang, M. Murphy, M. Brittain, and **P. Wei**, "Computer Vision for Small UAS Onboard Pedestrian Detection", AIAA Aviation, Reno, NV, June 2020.
27. J. Hu, X. Yang, W. Wang, **P. Wei**, L. Ying, and Y. Liu, "UAS Conflict Resolution in Continuous Action Space Using Deep Reinforcement Learning", AIAA Aviation, Reno, NV, June 2020.
28. S. Shihab, **P. Wei**, J. Shi, and N. Yu, "Optimal eVTOL Fleet Dispatch with Power Grid Compensation and Battery Degradation Cost", AIAA Aviation, Reno, NV, June 2020.
29. X. Yang, M. Egorov, A. Evans, S. Munn, and **P. Wei**, "Stress Testing of UAS Traffic Management Decision Making Systems", AIAA Aviation, Reno, NV, June 2020.
30. J. Bertram, and **P. Wei**, "An Efficient Algorithm for Self-Organized Terminal Arrival in Urban Air Mobility", AIAA SciTech, Orlando, FL, Jan. 2020.
31. J. Bertram, and **P. Wei**, "Distributed Computational Guidance for High-Density Urban Air Mobility with Cooperative and Non-Cooperative Collision Avoidance", AIAA SciTech, Orlando, FL, Jan. 2020.
32. X. Yang, L. Deng, J. Liu, **P. Wei**, and H. Li, "Multi-Agent Autonomous Operations in Urban Air Mobility with Communication Constraints", AIAA SciTech, Orlando, FL, Jan. 2020.
33. M. Brittain, J. Bertram, X. Yang, and **P. Wei**, "Prioritized Sequence Experience Replay", Deep Reinforcement Learning Workshop, Neural Information Processing Systems (NeurIPS), Vancouver, Canada, Dec. 2019.
34. M. Brittain and **P. Wei**, "Autonomous Separation Assurance in An High-Density En Route Sector: A Deep Multi-Agent Reinforcement Learning Approach", IEEE Intelligent Transportation Systems Conference (ITSC), Auckland, New Zealand, Oct. 2019.

35. M. Brittain and **P. Wei**, “Autonomous Air Traffic Control: A Deep Multi-Agent Reinforcement Learning Approach”, Workshop on Reinforcement Learning for Real Life, International Conference on Machine Learning (ICML), Long Beach, CA, June 2019.
36. S.A.M Shihab, C. Logemann, D.G Thomas, and **P. Wei**, “Autonomous Airline Revenue Management: A Deep Reinforcement Learning Approach to Seat Inventory Control and Overbooking”, Workshop on Reinforcement Learning for Real Life, International Conference on Machine Learning (ICML), Long Beach, CA, June 2019.
37. J. Bertram, X. Yang and **P. Wei**, “Online Flight Planner with Dynamic Obstacles for Urban Air Mobility”, AIAA Aviation, Dallas, TX, June 2019.
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39. X. Yang and **P. Wei**, “Multi-Agent Autonomous On-Demand Free Flight Operations in Urban Air Mobility using Monte Carlo Tree Search”, AIAA Aviation, Dallas, TX, June 2019.
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41. S.A.M. Shihab, **P. Wei**, D. Jurado, R.M. Arango and C. Bloebaum, “By Schedule or On Demand? - A Hybrid Operation Concept for Urban Air Mobility”, AIAA Aviation, Dallas, TX, June 2019.
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43. G. Hunter and **P. Wei**, “Service-Oriented Separation Assurance for Small UAS Traffic Management”, Integrated Communication, Navigation and Surveillance technologies (ICNS) Conference, Herndon, VA, Apr. 2019.
44. N. Polaczyk, E. Trombino, **P. Wei** and M. Mitici, “A Review of Current Technology and Research in Urban On-Demand Air Mobility Applications”, 8th Biennial Autonomous VTOL Technical Meeting & 6th Annual Electric VTOL Symposium, Mesa, AZ, Jan. 2019.
45. G. Zhu, **P. Wei**, R. Hoffman, and B. Hackney, “Risk-hedged Multistage Stochastic Programming Model for Setting Flow Rates in Collaborative Trajectory Options Programs (CTOP)”, AIAA SciTech, San Diego, CA, Jan. 2019.
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48. I.C. Kleinbekman, M. Mitici and **P. Wei**, “eVTOL Arrival Sequencing and Scheduling for On-Demand Urban Air Mobility”, AIAA/IEEE Digital Avionics Systems Conference (DASC), London, England, UK, Sept. 2018.
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51. M. Brittain and **P. Wei**, “Towards Autonomous Air Traffic Control for Sequencing and Separation - A Deep Reinforcement Learning Approach”, AIAA Aviation, Atlanta, GA, June 2018.
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55. M. Brittain and **P. Wei**, “Autonomous Aircraft Sequencing and Separation with Hierarchical Deep Reinforcement Learning”, International Conference on Research in Air Transportation (ICRAT), Barcelona, Spain, June 2018.

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57. X. Yang and **P. Wei**, "Autonomous On-Demand Free Flight Operations in Urban Air Mobility using Monte Carlo Tree Search", International Conference on Research in Air Transportation (ICRAT), Barcelona, Spain, June 2018.
58. P. Pradeep, S.G. Park and **P. Wei**, "Trajectory Optimization of Multirotor Agricultural UAVs", IEEE Aerospace Conference, Big Sky, MT, Mar. 2018.
59. P. Pradeep and **P. Wei**, "Energy Efficient Arrival with RTA Constraint for Urban eVTOL Operations", AIAA SciTech, Kissimmee, FL, Jan. 2018.
60. A. Alnaqeb, Y. Li, Y.H. Lui, P. Pradeep, J. Wallin, C. Hu, S. Hu, and **P. Wei**, "Online Prediction of Battery Discharge and Flight Mission Assessment For Electrical Rotorcraft", AIAA SciTech, Kissimmee, FL, Jan. 2018.
61. P. Pradeep and **P. Wei**, "Predictability, Variability and Operational Feasibility Aspect of CDA", IEEE Aerospace Conference, Big Sky, MT, Mar. 2017.
62. G. Zhu, and **P. Wei**, "Low-Altitude UAS Traffic Coordination with Dynamic Geofencing", AIAA Aviation, Washington DC, June 2016.
63. L. Du, S. Peeta, **P. Wei**, and D. Sun, "A Quantitative and Systematic Methodology to Investigate Energy Consumption in Multimodal Transportation Systems", Transportation Research Board 93rd Annual Meeting, Jan. 2014.
64. **P. Wei**, B. Sridhar, N. Chen, and D. Sun, "Vertical Grid Shifting Approach to the Development of Contrail Reduction Strategies with Sector Capacity Constraints", AIAA Conference on Guidance, Navigation and Control, Boston, MA, Aug. 2013.
65. J. Ponton, **P. Wei**, and D. Sun, "Weighted clustering coefficient maximization in the Air Transportation Network", European Control Conference, Zurich, Switzerland, July 2013.
66. **P. Wei**, Q. Gu, and D. Sun, "Wireless sensor network data collection by connected cooperative UAVs", American Control Conference, Washington DC, June 2013.
67. C. Surakitbanharn, **P. Wei**, S. Landry, and D. Sun, "Evaluation of Stream Air Traffic Operations by Adapting Dynamic Density Complexity Measure", 12th AIAA Aviation Technology, Integration, and Operations (ATIO) Conference, Indianapolis, IN, Sept. 2012.
68. G. Spiers, **P. Wei**, and D. Sun, "Algebraic Connectivity Optimization of Large Scale and Directed Air Transportation Network", 13th IFAC Symposium on Control in Transportation Systems, Sofia, Bulgaria, Sept. 2012.
69. **P. Wei**, B. Sridhar, N. Chen and D. Sun, "A Linear Programming Approach to the Development of Contrail Reduction Strategies Satisfying Operationally Feasible Constraints", AIAA Conference on Guidance, Navigation and Control, Minneapolis, MN, Aug. 2012.
70. G. Spiers, **P. Wei** and D. Sun, "Algebraic Connectivity Optimization of the Air Transportation Network", American Control Conference, Montreal, Canada, June 2012.
71. **P. Wei**, T. Kim, S. Landry, D. Sun and D. DeLaurentis, "An Optimal Routing Paradigm For Flexible Flights", American Control Conference, Montreal, Canada, June 2012.
72. **P. Wei**, A. Meksoub and D. Sun, "Optimal Sequential Backward Flow Saturation For Cell Transmission Model", American Control Conference, Montreal, Canada, June 2012.
73. H. Nagarajan, **P. Wei**, S. Rathinam and D. Sun, "Air transportation network robustness optimization under limited legs itinerary constraint", the 5th International Conference on Research in Air Transportation (ICRAT 2012), Berkeley, CA, May 2012.
74. **P. Wei**, C. Surakitbanharn, S. Landry and D. Sun, "Workload Comparison Between Sectorized Air Traffic Control and Stream Management", Integrated Communications, Navigation, and Surveillance (ICNS) Conference, Herndon, VA, Apr. 2012.
75. **P. Wei** and D. Sun, "Total Unimodularity and Degeneracy-Aware Dantzig-Wolfe Decomposition for Large-Capacity Cell Transmission Model", the 50th IEEE Conference on Decision and Control and European Control Conference, Orlando, FL, Dec. 2011.

76. **P. Wei** and D. Sun, “Weighted Algebraic Connectivity: An Application to Air Transportation Network”, 18th IFAC World Congress 2011, Milan, Italy, Aug. 2011.
77. **P. Wei**, J. Chen, D. Andrisani and D. Sun, “Routing Flexible Traffic into Metroplex”, AIAA Conference on Guidance, Navigation and Control, Portland, OR, Aug. 2011.
78. **P. Wei**, S. Chu, X. Wang and Y. Zhou, “Deployment of a Reinforcement Backbone Network with Constraints of Connection and Resources”, IEEE International Conference on Distributed Computing Systems, Genoa, Italy, June 2010.

Technical Reports

1. X. Yang, G. Zhu and P. Wei, “Flight Planning, Trajectory Prediction and Collision Resolution for Urban Air Mobility Operations”, *A³* by Airbus, 2018.
2. G. Zhu and P. Wei, “En Route Flight Time Prediction Under Convective Weather Events”, Rockwell Collins, 2017.

Doctoral Thesis

- P. Wei, “*Maximizing algebraic connectivity in air transportation networks*”, Ph.D. dissertation, School of Aeronautics and Astronautics, Purdue University, May 2013.

RESEARCH GRANTS

Grants and donations obtained as a sole PI

1. *National Science Foundation*, FY 21-26 \$500K
Project title: "CAREER: Safe and Scalable Learning-based Control for Autonomous Air Mobility"
2. *Amazon AWS Research Credits*, FY 19-20 \$2.4K
Project title: "Advancements for Priority Experience Replay"
3. *NVIDIA GPU Grant*, FY 18-19 \$1.5K
Project title: "Hierarchical Deep Reinforcement Learning for Autonomous Air Traffic Control"
4. *Airbus A³*, FY 17-18 \$133K
Project title: "Safe Integration of Autonomous Aircraft to National Airspace"
5. *Rockwell Collins*, FY 16-17 \$65K
Project title: "Convective Weather Impact on Flight En Route Time"
6. *National Science Foundation*, FY 16-18 \$175K
Project title: "Towards an Intelligent Low-Altitude UAS Traffic Management System"
7. *Federal Aviation Administration*, FY 17-18 \$30K
Project title: "Passenger Direct Share Forecast"

Grants obtained as the PI for a multiple investigator grant

1. *National Science Foundation*, FY 23-26 \$1.2M
Project title: "Provably Safe and Robust Multi-Agent Reinforcement Learning with Applications in Urban Air Mobility"
Co-Investigators: Prof. Mengdi Wang (Princeton), Prof. Quanquan Gu (UCLA)
2. *National Aeronautics and Space Administration*, FY 20-23 \$2.5M
Project title: "Demonstration of the In-Time Learning-Based Safety Management for Scalable AAM Operations"
Co-Investigators: Prof. Gautam Biswas (Vanderbilt University), Prof. Ufuk Topcu (University of Texas at Austin), Dr. James Jones (MIT Lincoln Lab), Dr. Marc Brittain (MIT Lincoln Lab)
3. *National Science Foundation*, FY 17-19 \$1M
Project title: "Intelligent Low-Altitude Air Traffic Management System"
Co-Investigators: Prof. Kristin Rozier (Iowa State), Prof. Thomas Schnell (University of Iowa), Prof. Ella Atkins (University of Michigan), Dr. George Hunter (Mosaic ATM)

Grants obtained as a co-PI on multiple investigator grants

1. *National Aeronautics and Space Administration*, FY 24-27 \$6M
Project title: "Mobility-Energy-Coordinated Platform for Infrastructure Planning to Support AAM Aircraft Operations"
Co-investigators: Prof. Liang Sun, PI (New Mexico State University, NMSU), Prof. Son Tran (NMSU), Prof. Fengyu Wang (NMSU), Prof. Houbing Song (UMBC), Prof. Daniel Pack (University of Tennessee, Chattanooga), Prof. Zhenbo Wang (University of Tennessee, Knoxville, UTK), Prof. Kai Sun (UTK), Susan Babinec (Argonne National Laboratory), Dr. Noah Paulson (Argonne), Dr. Jeffery Saunders (Aurora Flight Sciences), Dr. Lu Yang (Aurora Flight Sciences), Laura Morejon Ramirez (Whisper Aero)
2. *National Aeronautics and Space Administration*, FY 24-26 \$830K
Project title: "Vertiport Human Automation Teaming Toolbox (Phase II)"
Co-investigators: Dr. Paul Krois, PI (Crown Consulting), Joseph Block (Crown Consulting)
3. *National Aeronautics and Space Administration*, FY 24-25 \$150K
Project title: "Explainable Artificial Intelligence (XAI) for Air Traffic Management"
Co-investigators: Dr. Jimmy Krozel, PI (The Innovation Laboratory)
4. *National Aeronautics and Space Administration*, FY 23-24 \$150K
Project title: "Vertiport Human Automation Teaming Toolbox (Phase I)"
Co-investigators: Dr. Paul Krois, PI (Crown Consulting), Joseph Block (Crown Consulting)

5. *National Science Foundation*, FY 21-24 \$500K
 Project title: “SHF: Small: High-Performance Multi-Agent Reinforcement Learning”
 Co-investigators: Prof. Guru Venkataramani, PI (GW), Prof. Tian Lan (GW)
6. *National Aeronautics and Space Administration*, FY 20-21 \$125K
 Project title: “UAM Demand Capacity Modeling through Ensemble Learning (Phase I)”
 Co-investigators: Dr. Sricharan Ayyalasomayajula, PI (Intelligent Automation Inc.)
7. *Federal Aviation Administration*, FY 21-23 \$400K
 Project title: “Safety Verification Framework for Learning-Based Aviation Systems (SVF-LAS)”
 Co-investigators: Prof. Ali Baheri, PI (West Virginia University), Dr. Hao Ren (Honeywell Aerospace)
8. *Virginia Commonwealth Cyber Initiative*, FY 20-21 \$200K
 Project title: “Smart City Infrastructures for Safeguarding Autonomous Vehicles Against Cyber Attacks”
 Co-investigators: Prof. Felix Lin, PI (University of Virginia), Prof. Lance Sherry (George Mason University)
9. *National Science Foundation*, FY 17-21 \$2.4M
 Project title: “Cyber-based Decision Support Strategies to Achieve Consensus for FEW System Sustainability using Incentive and Policy Structures”
 Co-investigators: Prof. Christina Bloebaum, PI (Iowa State), Prof. James Oliver (Iowa State), Prof. Clark Wolf (Iowa State), Prof. Amy Kaleita (Iowa State), Prof. Ali Abbas (University of Southern California)
10. *Federal Aviation Administration*, FY 16 \$46K
 Project title: “Airport Safety Database and Analysis”
 Co-investigators: Prof. Halil Ceylan, PI (Iowa State), Michael Dorneich (Iowa State)