Huy T. Tran

Curriculum Vitae

November 10, 2022

Address: Department of Aerospace Engineering
University of Illinois at Urbana-Champaign
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Appointments

Assistant Professor 2021-
University of Illinois at Urbana-Champaign, Urbana, IL
Department of Aerospace Engineering (100%)
Illinois Applied Research Institute (0%)
Affiliates: *Coordinated Science Laboratory, Center for Autonomy, Intelligent Robotics Laboratory, Smart Transportation Infrastructure Initiative*
Research: *AI and autonomy for multi-agent systems, robotics, autonomous vehicles, and intelligent transportation systems*

Research Assistant Professor 2017-2021
University of Illinois at Urbana-Champaign, Urbana, IL

Fellow in the AFRL Summer Faculty Fellowship Program 2018
The Air Force Institute of Technology, Wright-Patterson AFB, OH

Sr. Multi-disciplinary Systems Engineer 2016-2017
The MITRE Corporation, Bedford, MA

Education

Ph.D. in Aerospace Engineering 2010-2015
Georgia Institute of Technology, Atlanta, GA
Dissertation: *A Complex Networks Approach to Designing Resilient System-of-Systems*
M.S. Special Topic: *Investigation of Decentralized and Centralized Command and Control Strategies with Agent-Based Modeling*
Advisor: Dimitri N. Mavris

M.S. in Mechanical Engineering 2008-2010
University of Wisconsin-Madison, Madison, WI
Thesis: *Investigation of fuel property and biodiesel effects in a highly dilute low temperature combustion regime with a light-duty diesel engine*
Advisor: David Foster

B.S. in Mechanical Engineering 2004-2008
North Carolina State University, Raleigh, NC
Magna Cum Laude

Awards

Recipient of the Engineering Council Outstanding Advisor Award	2020
Fellow in the 2018 AFRL Summer Faculty Fellowship Program	2018
Faculty advisor for the 1st place team in the AIAA 2017/2018 Undergraduate Team Aircraft Design Competition	2018
Included on the List of Teachers Ranked as Excellent by Their Students	2017
Best Paper Award: Theoretical (Complex Adaptive Systems Conference)	2016
Undergraduate Energy-Related Research Award (NC State University)	2007-2008
Jesse S. Doolittle Endowed Scholarship (NC State University)	2006-2008

Funding

Research Grants

Cumulative awards: ~$983,078 my portion ($3,640,106 total)

Robust and Adaptive Autonomy for Multi-agent Maneuvers (RAAMM) 07/2020-06/2022
Source: ARL
Role: Co-PI
Award: $143,718 my portion ($865,755 total)

Explainable AI for Mission Planning and Execution with Interpretable Courses of Action 04/2020-03/2023
Source: ONR
Role: PI
Award: $274,193 my portion ($899,069 total)

Spatiotemporal Models for Predicting Delays in Transportation Networks during Extreme Weather Events 08/2019-05/2021
Source: ZJU-UIUC Institute Research Program
Role: PI
Award: $68,500 my portion ($75,000 total)

Reliable Autonomy In Denied Environments (RAIDE) 06/2019-06/2021
Source: US Army Construction Engineering Research Laboratory (CERL)
Role: Co-PI
Award: ~$155,428 my portion ($1,124,152 total)

Forecasting Infrastructure Impacts for Socially-aware Community Resilience with Heterogeneous Data 01/2019-12/2019
Source: Institute for Sustainability, Energy, and Environment (iSEE)
Role: Co-PI
Award: $15,000 my portion ($30,000 total)

Agile AI-assisted Architecture Assessment 10/2018-09/2020
Source: The MITRE Corporation
Role: PI
Award: $95,786 my portion ($95,786 total)

A Demonstration Platform for Dynamic Mission Planning with Multi-domain Autonomous Systems 09/2018-12/2020
Source: DARPA
Role: PI
Award: ~$230,452 my portion ($550,344 total)

Consulting

Network-theoretic Methods for Scaling MBSE Practices for SoS Applications 02/2017-09/2017
Source: The MITRE Corporation
Role: Consultant
Award: 5% of time charged during 2017

Publications [Google Scholar]

* Indicates student advised at UIUC

† Indicates presenting author

Pending Publications (available upon request)

1. J. Heglund* and H. T. Tran, "Graph Neural Networks for Predicting Delays in Air Transportation Networks" (under review).
2. K. Thompson*, W. Dimon*, M. Cotter, and H. T. Tran, "Discovery of design patterns in system architecture graphs with deep learning" (in preparation).

Refereed Publications

1. M. V. Gasparino*, A. N. Sivakumar, Y. Liu, A. E. B. Velasquez, V. A. H. Higuti, J. Rogers, H. T. Tran, and G. Chowdhary, "WayFAST: Traversability Predictive Navigation for Field Robots", *IEEE Robotics and Automation Letters*, **Early Access**, (2022).
2. W. Dimon*, N. Chase*, N. Van Stralen*, R. Nigam*, M. Lembeck, and H. T. Tran, "D-AnoGAN: Anomaly Detection in Disconnected Data Manifolds with Generative Adversarial Networks", *2022 International Joint Conference on Neural Networks (IJCNN)*, Padua, Italy (2022).
3. N. Van Stralen*, S. Kim*, H. T. Tran, and G. Chowdhary, "Feature Specialization and Clustering Improves Hierarchical Sub-task Learning", *Proc. of the Adaptive and Learning Agents Workshop (ALA 2022)*, Virtual (2022).
4. S. Kim*, N. Van Stralen*, G. Chowdhary, and H. T. Tran, "Disentangling Successor Features for Coordination in Multi-agent Reinforcement Learning", *Proc. of the 21st International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2022)*, Virtual (2022).
5. A. Markina-Khusid, R. Jacobs, L. Antul, L. Cho, and H. T. Tran, "A Complex Network Framework for Validated Assessments of Robustness in Systems of Systems", *IEEE Systems Journal*, **16(1)**, p. 1092-1102 (2022).
6. J. Heglund*, K. Hopkinson, and H. T. Tran, "Social Sensing: Towards Social Media as a Sensor for Resilience in Power Systems and Other Critical Infrastructures", *Sustainable and Resilient Infrastructure*, **6(1-2)**, p. 94-106 (2021). **Invited submission.**

7. A. Wong*, S. Tan*, K. R. Chandramouleeswaran*, and H. T. Tran, "Data-driven Analysis of Resilience in Airline Networks", *Transportation Research Part E: Logistics and Transportation Review*, **143**, (2020).
8. K. Thompson* and H. T. Tran, "Operational Perspectives into the Resilience of the U.S. Air Transportation Network Against Intelligent Attacks", *IEEE Transactions on Intelligent Transportation Systems*, **21(4)**, p. 1503-1513 (2020).
9. N. Napier*, S. Sriraman, H. T. Tran, and K. James, "An Artificial Neural Network Approach to Generating High-Resolution Designs in Topology Optimization", *Journal of Mechanical Design*, **142(1)**, p. 011402 (2020).
10. N. Van Stralen*†, S. Kim*, H. T. Tran, and G. Chowdhary, "Evaluating Adaptation Performance of Hierarchical Deep Reinforcement Learning", *2020 International Conference on Robotics and Automation (ICRA)*, Virtual (2020).
11. J. Heglund*†, P. Taleongpong, S. Hu, and H. T. Tran, "Railway Delay Prediction with Spatial-Temporal Graph Convolutional Networks", *2020 IEEE Intelligent Transportation Systems Conference (ITSC)*, Virtual (2020).
12. H. T. Tran, J. C. Domerçant, and D. N. Mavris, "Parametric Design of Resilient Complex Networked Systems", *IEEE Systems Journal*, **13(2)**, p. 1496-1504 (2019).
13. K. Thompson*† and H. T. Tran, "Application of a Defender-Attacker-Defender Model to the U.S. Air Transportation Network", *2018 IEEE International Symposium on Technologies for Homeland Security*, Woburn, MA (2018).
14. K. R. Chandramouleeswaran* and H. T. Tran†, "Data-driven Resilience Quantification of the US Air Transportation Network", *2018 Annual IEEE International Systems Conference (SysCon)*, Vancouver, CA (2018).
15. L. Antul, S. Ricks, L. Cho, M. Cotter, R. B. Jacobs†, A. Markina-Khusid, J. Kamenetsky, J. Dahmann, and H. T. Tran, "Toward Scaling Model-Based Engineering for Systems of Systems", *2018 IEEE Aerospace Conference*, Big Sky, MT (2018).
16. H. T. Tran, M. Balchanos, J. C. Domerçant, and D. N. Mavris, "A framework for the quantitative assessment of performance-based system resilience", *Reliable Engineering and System Safety*, **158**, p. 73-84 (2017).
17. H. T. Tran†, J. C. Domerçant, and D. N. Mavris, "Designing Resilient System-of-Systems Networks", *2017 Annual IEEE International Systems Conference (SysCon)*, Montreal, CA (2017).
18. H. T. Tran†, J. C. Domerçant, and D. N. Mavris, "A Network-based Cost Comparison of Resilient and Robust System-of-Systems", *In Procedia Computer Science*, **95**, p. 126-133, Complex Adaptive Systems Conference, Los Angeles, CA (2016). **Best Paper Award: Theoretical.**
19. H. T. Tran, J. C. Domerçant, and D. N. Mavris, "Evaluating the Agility of Adaptive Command and Control Networks from a Cyber Complex Adaptive Systems Perspective", *Journal of Defense Modeling and Simulation*, **12(4)**, p. 405-422 (2015).
20. M. Balchanos†, J. C. Domerçant, H. T. Tran, and D. N. Mavris, "Metrics-based Analysis and Evaluation Framework for Engineering Resilient Systems", *2014 7th International Symposium on Resilient Control Systems (ISRCS)*, Denver, CO, p. 1-7 (2014).

Non-refereed Publications and Presentations

1. K. Thompson*† and H. T. Tran, "Modeling Multi-modal Transportation for Improved Resilience of the US Air Transportation Network", *Resilience Week 2018*, Denver, CO (2018). Student competition (extended abstract).
2. K. R. Chandramouleeswaran*, D. Krzemien, K. Burns, and H. T. Tran†, "Machine Learning Prediction of Airport Delays in the US Air Transportation Network", *2018 AIAA Aviation Forum*, Atlanta, GA (2018).
3. H. T. Tran†, J. C. Domerçant, and D. N. Mavris, "A System-of-Systems Approach for Assessing the Resilience of Reconfigurable Command and Control Architectures", *AIAA Infotech Aerospace*, *AIAA SciTech Forum*, Kissimmee, FL (2015).
4. H. T. Tran†, J. C. Domerçant, and D. N. Mavris, "Trade-offs Between Command and Control Architectures and Force Capabilities Using Battlespace Awareness", *19th International Command and Control Research and Technology Symposium (ICCRTS)*, Alexandria, VA (2014).
5. H. T. Tran†, C. Hutchins†, and X. Wang, "Measuring Electrical Contact Resistance between Gas Diffusion Layers and Bipolar Plates in PEM Fuel Cells", poster presented at the 2007 Michigan Space Grant Consortium, MI (2007).

Teaching

- AE 199 - Aerospace Computing (Spring 2020, Fall 2020)
  - Developed new course
- AE 202 - Aerospace Flight Mechanics (Fall 2018, Fall 2019, Fall 2021)
- AE 370 - Aerospace Numerical Methods (Spring 2022, Fall 2022)
  - Integrated new computing content
- AE 442 - Aerospace Systems Design I (Fall 2017)
- AE 443 - Aerospace Systems Design II (Spring 2018)
  - **1st place AIAA 2017/208 Undergraduate Team Aircraft Design Competition**
- AE 498 CSE/CSO - Computational Systems Engineering (Spring 2017, Spring 2019)
  - Developed new course
  - **List of Teachers Ranked as Excellent (2017)**
- Collins Scholar graduate - engineering education program (Spring 2017)

Student Advising

Graduate Students

N. Parikh: *TBD*	Ph.D.	2022-
M. Yuasa: *Towards Verifiable Reinforcement Learning for Autonomous Safety-critical Systems*	Ph.D.	2021-
R. Nigam: *Cognitive Models for Customizable Autonomous Teammates*	Ph.D.	2020-
J. Heglund: *Reinforcement Learning for multi-agent autonomous systems*	Ph.D.	2020-
H. Kweon: *Multi-agent Reinforcement Learning for Traffic Light Control*	M.S.	2020-

Alumni

W. Dimon: *Unsupervised Anomaly Detection in Multi-class Datasets using Generative Adversarial Networks* (placement at MITRE for machine learning)	M.S.	2020-2022
J. Heglund: *Statistical and Machine Learning Models for Critical Infrastructure Resilience* (placement at UIUC as Ph.D. student)	M.S.	2018-2020
N. Van Stralen: *Hierarchical Reinforcement Learning for Adaptive and Autonomous Decision-making in Robotics* (placement at UIUC as Research Engineer)	M.S.	2018-2020
K. Thompson: *Data-driven Modeling for Resilient Networked Systems* (placement at Spark Insights for data science)	M.S.	2017-2019
K. R. Chandramouleeswaran: *Data-driven Modeling and Analysis of the U.S. Air Transportation Network and its Resilience to Extreme Events* (placement at Front End Analytics for data science)	M.S.	2017-2018

Undergraduate Students

ALERT Program: L. Lalumandier (2022); B. Cadee (2022); V. Thatte (2022); P. Baffoe (2022)

Researchers Initiative Program: S. Bangaru (2019-2020); S. Sharma (2019-2020); A. Jain (2018-2019); A. Sehgal (2018-2020); J. Xue (2018-2019); D. Mulye (2018-2019); D. Yang (2018-2019)

ISGC Undergraduate Research Opportunities Program: O. Upalekar (2022)

AE 397/497: Independent Study: O. Upalekar (2022); M. Taylor (2021-2022); A. Wong (2018-2019)

Other: S. Kim (2018-2020); A. Li (2019-2020); A. Yaraneri (2019); P. Dhurve (2018-2019); S. Tan (2018-2019); Z. Gleason (2017-2018); K. Burns (2017-2018); K. Joshi (2017-2018); D. Krzemien (2017-2018)

Professional Activities

Invited Talks

Invited speaker presentation at the IROS 2022 Decision making in Multi-agent Systems Workshop: *On Utilities for Cooperative Multi-agent RL*	2022
Research seminar presented at the GE Probabilistics Seminar Series: *Learning with Inductive Biases for Autonomous Decision-making*	2021
Research seminar presented at the University of Illinois at Urbana-Champaign: *Learning with Inductive Biases for Autonomous Decision-making*	2021
Research seminar presented at Purdue University: *Harnessing Data for Resilient Systems: Resilience through data-driven modeling and machine intelligence*	2019
Research seminar presented at the Air Force Institute of Technology: *Towards Understanding Patterns in Critical Infrastructures with Social Media and Public Operational Data*	2018
Welcoming remarks at the Complex Adaptive Systems Conference: *Moving Applied Complexity Science Forward*	2016
Research seminar presented at the University of Illinois at Urbana-Champaign: *A Complex Networks Approach to Designing Resilient System-of-Systems*	2016
Research seminar presented at The MITRE Corporation *Improving the Resilience of Networked System-of-Systems with Reconfiguration*	2015

Conference Organization

Organizer and Session Co-Chair: *Annual Allerton Conference on Communication, Control and Computing - Learning and Planning in Adversarial Environments* (Monticello, IL)	2019
Organizing Committee: *Complex Adaptive Systems Conference* (Chicago, IL)	2018
Session Chair: *2018 Annual IEEE International Systems Conference (SysCon) - Transportation Systems* (Vancouver, Canada)	2018
Session Chair: *2017 Annual IEEE International Systems Conference (SysCon) - Complex Systems Issues II* (Montréal, Canada)	2017
Organizing Committee and Session Chair: *Complex Adaptive Systems Conference - Cyber Physical Systems: Architectures* (Los Angeles, CA)	2016

Reviewer

- Robotics: Science and Systems
- IEEE International Joint Conference on Neural Networks (IJCNN)
- IEEE Transactions on Intelligent Transportation Systems
- IEEE Intelligent Transportation Systems Conference
- Journal of Aerospace Information Systems

- Journal of Mechanical Design
- Reliability Engineering and Systems Safety
- IEEE Systems Journal
- Risk Analysis
- Sustainable and Resilient Infrastructure
- Sustainable Cities and Society
- Systems Engineering Journal

Professional Memberships

- Member, American Institute of Aeronautics and Astronautics (AIAA)
- Member, Institute of Electrical and Electronics Engineers (IEEE)