# Huy T. Tran

## Curriculum Vitae

April 8, 2022

Address: Department of Aerospace Engineering
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## Appointments

**Assistant Professor** 2021-
University of Illinois at Urbana-Champaign, Urbana, IL
Department of Aerospace Engineering (100%)
Applied Research Institute (0%)
Affiliates: *Coordinated Science Laboratory, Center for Autonomy, Intelligent Robotics Laboratory, Smart Transportation Infrastructure Initiative*
Research: *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

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|---|---|
| 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. 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" (under review).
3. 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", arXiv (under review).
4. 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. 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).
2. 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).
3. 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).
4. 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.**

5. 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).
6. 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).
7. 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).
8. 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).
9. 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).
10. 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).
11. 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).
12. 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).
13. 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).
14. 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).
15. 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).
16. 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.**
17. 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).
18. 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)
  - 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

| | | |
|---|---|---|
| J. Heglund: *Reinforcement Learning for multi-agent autonomous systems* | Ph.D. | 2020- |
| R. Nigam: *Cognitive Models for Customizable Autonomous Teammates* | Ph.D. | 2020- |
| H. Kweon: *Multi-agent Reinforcement Learning for Traffic Light Control* | M.S. | 2020- |
| S. Kukke: *Autonomous Landing in Dynamic and Uncertain Environments* | M.S. | 2020- |
| M. Yuasa: *Towards Verifiable Reinforcement Learning for Autonomous Safety-critical Systems* | M.S. | 2021- |

### Alumni

* Indicates M.S. Independent Study

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|---|---|---|
| J. Heglund: *Statistical and Machine Learning Models for Critical Infrastructure Resilience* (placement at UIUC as Ph.D. student) | M.S. | 2018-2020 |
| W. Dimon: *Unsupervised Anomaly Detection in Multi-class Datasets using Generative Adversarial Networks* (co-advised; placement at MITRE for machine learning) | M.S. | 2020-2022 |
| N. Van Stralen: *Hierarchical Reinforcement Learning for Adaptive and Autonomous Decision-making in Robotics* (co-advised; placement at UIUC as Research Engineer) | M.S. | 2018-2020 |
| N. Chase: *Generative Adversarial Networks for Anomaly Detection in Disconnected Data Manifolds* (co-advised; placement at Ford) | 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 |
| N. Napier: *Machine Learning Prediction of Weather-related Flight Delays* (placement at Lockheed Martin for machine learning) | M.S.* | 2017-2018 |

### Undergraduate Students

ALERT Program: L. Lalumandier (2022); B. Cadee (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)

AE 298: Research Seminar Mentoring: A. Rihani (2021)

AE 497: Independent Study: M. Taylor (2021); 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

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| 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**

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|---|---|
| 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)