

# Armin Hadzic

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## Research Interests

I am interested in developing unsupervised learning methods to address challenges in **open vocabulary segmentation** and **latent information representation**, with a focus on multi-modal learning (e.g., imagery, text, and point clouds). My research centers on **multi-modal fusion**, generative models for **image synthesis**, and **localization**. I am particularly interested in how deep learning can drive **scalable** AI systems that integrate diverse data modalities for advanced machine perception and AI-driven decision making applications.

## Education

### University of Kentucky

2018-2020

*Master of Science in Computer Science, GPA – 4.0*

*Advisor: Nathan Jacobs*

Thesis: Estimating Free-Flow Speed with LiDAR and Overhead Imagery

### University of Kentucky

2016

*Bachelor of Science in Computer Engineering, GPA – 3.8*

Graduated Magna Cum Laude

### University of Kentucky

2009-2013

*Bachelor of Science in Electrical Engineering, GPA – 3.8*

Graduated Magna Cum Laude, Minor in Computer Science

## Professional Experience

### Research.....

#### AI Research Scientist

2021-Present

DZYNE TECHNOLOGIES INC.

*Fairfax, VA*

- Led research efforts in **multi-modal fusion** [1], **pose estimation**, **localization**, **depth estimation**, and **image synthesis** [3], advancing AI-driven models for multi-modal learning, contextual representation [2], and scalable perception systems.
- Developed and implemented scalable supervised and unsupervised learning algorithms for multi-modal data integration and contextual understanding, enabling advanced applications in autonomous systems, interactive AI, and real-time simulations.
- Contributed to 9 successful proposals (SBIR, STTR, BAA), securing **\$3M in funding** from IARPA and NGA, driving innovation in advanced AI technologies.

#### AI Research Scientist

2020-2021

JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY

*Laurel, MD*

- Designed neural network bias reduction methods for skin disease classification and segmentation [4, 9].
- Developed methods for optimizing multi-agent swarm control systems based on computational neuroscience [5, 8].
- Integrated geospatial products into artificial neural networks for high resolution building damage classification, structure localization, and green house gas regression [11].

#### Research Assistant

2018-2020

UK COMPUTER VISION LAB

*Lexington, KY*

- Advised by Professor Nathan Jacobs.
- Designed multi-modal neural networks [10, 12] to leverage point clouds and satellite imagery to estimate free-flow speeds of roads from a birds-eye-view.
- Developed Natural Language Processing (NLP) temporal convolutional and attention-based neural network models to estimate firm economic performance using public SEC text reports.

#### Machine Perception Intern

2019

JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY

*Laurel, MD*

- Advised by Ryan Mukherjee and Dr. Gordon Christie.
- Developed methods for regressing population of displaced communities for disaster relief efforts, utilizing overhead imagery and deep neural networks [6].

## Volunteer Machine Learning Research Assistant

2017-2018

UK COMPUTER VISION LAB

Lexington, KY

- Automated the US Road Assessment Program (usRAP) road safety assessment using a deep convolutional neural network [7] to directly estimate roadway safety based on street-level panorama images, reducing evaluation time to milliseconds per image.
- Integrated the roadway safety estimator into a GPS vehicle routing system to enhance navigation with the capability to identify a balanced, safe and fast, driving route.

## Industry.....

### Software Development Engineer

2017-2018

BELCAN ENGINEERING GROUP INC.

Lexington, KY

- Developed, maintained, and tested a jet engine diagnostic and fault resolution system, saving over \$100,000 by automating engine maintenance diagnostics.
- Integrated and streamlined a legacy cross-platform build system with modern development tools, mitigating build errors and reducing development time.

### Embedded Software Engineer

2016-2017

BELCAN ENGINEERING GROUP INC.

Lexington, KY

- Streamlined the user interface and reduced diagnostic time of jet engines by identifying, isolating, and purging Onboard Maintenance System inefficiencies and defects.

### Software Test Engineer

2015-2016

BELCAN ENGINEERING GROUP INC.

Lexington, KY

- Designed and implemented Control and Diagnostic System Verification and Validation Tests for 4 P&W Turbofan Jet Engines.
- Discovered mission critical control logic, software, and documentation defects through root-cause analysis, informal testing, regression testing and system testing; leading to best in class, safe, and high performance jet engines.

### Software Engineering Co-op

2013-2014

TEMPUR SEALY INTERNATIONAL INC

Lexington, KY

- Pioneered and developed a GUI and 3D topography mapping application to visually analyze large datapoint datasets, generating streamlined product testing, seamless user experience, and refined product quality.

### Software Engineering Intern

2012

JOHNSON CONTROLS INC

Florence, KY

- Designed and implemented a software algorithm for streamlined Automated Guided Vehicle (AGV) routing, saving \$57,000 per year in scrap reduction and transportation costs.

## Publications

### Conference Papers.....

- [1] Connor Greenwell, Jon Crall, Matthew Purri, Kristin Dana, Nathan Jacobs, Armin Hadzic, Scott Workman, and Matt Leotta. "WATCH: Wide-Area Terrestrial Change Hypercube". In: *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)*. 2024, pp. 8277–8286.
- [2] Scott Workman and Armin Hadzic. "Probabilistic Image-Driven Traffic Modeling via Remote Sensing". In: *European Conference on Computer Vision (ECCV)*. 2024.
- [3] Scott Workman, Armin Hadzic, and M. Usman Rafique. "Handling Image and Label Resolution Mismatch in Remote Sensing". In: *IEEE Winter Conference on Applications of Computer Vision (WACV)*. January 2023.
- [4] Haolin Yuan, John Aucott, Armin Hadzic, William Paul, Marcia Villegas de Flores, Philip Mathew, Philippe Burlina, and Yinzhi Cao. "EdgeMixup: Embarrassingly Simple Data Alteration to Improve Lyme Disease Lesion Segmentation and Diagnosis Fairness". In: *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*. October 2023, pp. 374–384.
- [5] Elise Buckley, Joseph D Monaco, Kevin M Schultz, Robert Chalmers, Armin Hadzic, Kechen Zhang, Grace M Hwang, and M Dwight Carr. "An interdisciplinary approach to high school curriculum development: Swarming Powered by Neuroscience". In: *Proceedings 2022 IEEE Integrated STEM Education Conference (ISEC)*. **Best Paper Award**. March 2022.
- [6] Armin Hadzic, Gordon Christie, Jeffrey Freeman, Amber Dismar, Stevan Bullard, Ashley Greiner, Nathan Jacobs, and Ryan Mukherjee. "Estimation Displaced Populations from Overhead". In: *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*. September 2020.

[7] Weilian Song, Scott Workman, Armin Hadzic, Xu Zhang, Eric Green, Mei Chen, Reginald Souleyrette, and Nathan Jacobs. "FARSA: Fully Automated Roadway Safety Assessment". In: *IEEE Winter Conference on Applications of Computer Vision (WACV)*. March 2018.

Journal Articles.....

[8] Armin Hadzic, Grace M Hwang, Kechen Zhang, Kevin M Schultz, and Joseph D Monaco. "Bayesian optimization of distributed neurodynamical controller models for spatial navigation". In: *Array* (2022), p. 100218.

[9] William Paul, Armin Hadzic, Neil Joshi, Fady Alajaji, and Philippe Burlina. "TARA: Training and Representation Alteration for AI Fairness and Domain Generalization". In: *Neural Computation* (2022), pp. 1–38.

Workshop Papers.....

[10] Mei Chen, Armin Hadzic, Weilian Song, and Nathan Jacobs. "Applications of Deep Machine Learning to Highway Safety and Usage Assessment". In: *Transportation Research Board Workshop*. (oral). January 2021.

[11] Ryan Mukherjee, Derek Rollend, Gordon Christie, Armin Hadzic, Sally Matson, Anshu Saksena, and Marisa Hughes. "Towards Indirect Top-Down Road Transport Emissions Estimation". In: *IEEE/ISPRS Workshop: Large Scale Computer Vision for Remote Sensing Imagery (EARTHVISION)*. **Best Paper Award**. June 2021.

[12] Armin Hadzic, Hunter Blanton, Weilian Song, Mei Chen, Scott Workman, and Nathan Jacobs. "RasterNet: Modeling Free-Flow Speed using LiDAR and Overhead Imagery". In: *IEEE/ISPRS Workshop: Large Scale Computer Vision for Remote Sensing Imagery (EARTHVISION)*. June 2020.

Technical Skills

Languages & Frameworks	<b>Python</b> , C/C++, Java, Verilog, $\LaTeX$ , Shell, <b>PyTorch</b> , Scikit-Learn, Keras
Artificial Intelligence	<b>Multimodal Fusion, Transformers</b> , LLMs, Reinforcement Learning, SSL
Computer Vision	Generative AI, Segmentation, 3D, Localization, Pose, Depth, Remote Sensing
Infrastructure	Data Processing, Distributed Training, Slurm, Docker, Optimization, Evaluation
Auxiliary	Research, Metrics, Presentation, Technical Writing, Publication, Mentorship

Service & Recognition

Technical Committee.....

- 2021 University of Maryland Honor’s program Gemstone thesis defense.

Program Committee/Reviewing.....

- CVPR: 2023, 2024, 2025
  - Outstanding Reviewer 2024
- ECCV: 2022, 2024
- ICCV: 2023
- ICLR: 2024
- NeurIPS: 2023, 2024
- WACV Round 1 and 2: 2023, 2024, 2025
- CVPR Workshop EARTHVISION: 2022, 2023

Awards.....

- Computer Science Outstanding MS Student 2020.
- Dean’s List Fall 2010 to Spring 2013.