# 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 **depth estimation**. I am particularly interested in how deep learning can drive **scalable AI systems** that integrate diverse data modalities for advanced computer vision 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

**Computer Vision Research Scientist** **2021-Present**
DZYNE Technologies Inc. *Fairfax, VA*

- Led research efforts in **multi-modal fusion** [1, 2], **pose estimation** [2], **generative image synthesis** [3], and **depth estimation**, advancing AI-driven models for **multi-modal learning**, **contextual representation**, 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.

**Computer Vision Researcher** **2020-2021**
Johns Hopkins University Applied Physics Laboratory *Laurel, MD*

- Designed neural network bias reduction methods for skin disease classification and segmentation [4, 7].
- Developed methods for optimizing multi-agent swarm control systems based on computational neuroscience [5, 6].
- Integrated geospatial products into artificial neural networks for high resolution building damage classification, structure localization, and green house gas regression [9].

**Research Assistant** **2018-2020**
UK Computer Vision Lab *Lexington, KY*

- Advised by Professor Nathan Jacobs.
- Designed multi-modal neural networks [8, 10] 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 [11].

**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 [12] 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

### Conferences


[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 Dismer, 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.

### Journals

[1] 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.

[2] 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.

### Workshops

[1] 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.

[2] 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.

[3] 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

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| Programming Languages | Python, C/C++, Verilog, Java, LaTeX, Assembly, Shell script |
| Deep Learning Frameworks | PyTorch, Scikit-Learn, Keras, Tensorflow |
| Operating Systems | Unix/Linux, Windows, OSX, Android |
| Development Environments & Tools | Linux Toolchain, Slurm, PyCharm, Visual Studio, Android Studio, Xilinx |

## 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.