Richard E. L. Higgins

Updated October 16, 2025

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Education

University of Michigan

2019 – 2025 Ph.D. in Computer Science and Engineering — *Advisor: David Fouhey, Ph.D.*

2017 – 2019 M.S. in Computer Science and Engineering — *Mentor: Jia Deng, Ph.D.*

University of Maryland

2010 – 2014 B.S. in Neurobiology and Physiology — *Mentors: Elizabeth Quinlan, Ph.D.*

2010 – 2014 B.S. in Computer Science — *Karen Carleton, Ph.D.*

Work

2025 – Now **Softmax**, Research Scientist — San Francisco, CA
- Training team lead, developing new models for multi-agent reinforcement learning in coalition games.

2019 – 2025 **Fouhey AI Lab**, Graduate Researcher — Ann Arbor, MI → New York, NY
- Built a scene-editing system using latent-diffusion and composable "neural nouns and verbs."
- Used hand/camera motion as cues to train weakly-supervised segmentation from video systems.
- Trained cross-instrument UNets to predict the solar magnetic field from polarized light (IQUV's).

2023 **Meta FAIR**, Computer Vision Research Scientist Intern — Menlo Park, CA
- Made a transformer that estimates 3D hand pose from an RGB image.

2018 – 2019 **Vision & Learning Lab**, Graduate Researcher — Ann Arbor, MI
- Designed new neural networks to apply associative embeddings to scene graphs.

2018 – 2019 **Voxel 51**, Computer Vision Engineering Intern — Ann Arbor, MI
- Integrated object detection into a video platform analyzing dashcam footage.

2016 – 2018 **Gigster**, Software Engineering Consultant — San Francisco, CA
- Built+deployed a CNN-based style-transfer service processing millions of images/day for a large client.
- Built and productionized a GAN that performs face attribute transformation for a social media company.
- Built a CNN image system for a Fortune 500 company iOS app, designed systems for Fortune 500 clients.

2016 **Athey Bioinformatics Lab**, Postgraduate Research — Ann Arbor, MI
- Constructed TADs and analyzed RNA-seq data to identify differential gene expression.

2015 – 2016 **Unscan**, Founder — New York, NY
- Built a scanned-document OCR data extraction system using custom LSTMs.

2015 **Redspread**, First Engineer — San Francisco, CA
- Developed ML tools to automatically scale Kubernetes pods based on resource usage.
- Part of the founding team of a Y Combinator company eventually acquired by IBM.

2014 **Quinlan Neuroscience Lab**, Undergraduate Research — College Park, MD
- Detected seizures in mouse EEG recordings using max-margin techniques in MATLAB.

2011 – 2012 **Evolution of Visual Communication Lab**, Undergraduate Research — College Park, MD
- Created false-color images of colorful fish to see how cone opsins effect conspicuity.

Publications

2025 SELDOM: Scene Editing via Latent Diffusion with Object-centric Modifications
Richard E.L. Higgins and David F. Fouhey
S3DSGR, ICCV, 2025

2024 SuperSynthIA: Physics-ready Full-disk Vector Magnetograms from HMI, Hinode, and Machine Learning
Ruoyu Wang, David F. Fouhey, **Richard E.L. Higgins**, Spiro K. Antiochos, Graham Barnes, Todd Hoeksema, KD Leka, Yang Liu, Peter W. Schuck, Tamas I. Gombosi
The Astrophysical Journal, 2024 July; 970(2): 168

2023 Towards A Richer 2D Understanding of Hands at Scale
Tianyi Cheng, Dandan Shan, Ayda Hassen, **Richard E.L. Higgins**, David F. Fouhey
Advances in Neural Information Processing Systems 36, 2023

2023 MOVES: Manipulated Objects in Video Enable Segmentation
Richard E.L. Higgins and David F. Fouhey
Computer Vision and Pattern Recognition, 2023

2022 EPIC-KITCHENS VISOR Benchmark: VIdeo Segmentations and Object Relations
Ahmad Darkhalil*, Dandan Shan*, Bin Zhu*, Jian Ma*, Amlan Kar, **Richard E.L. Higgins**, Sanja Fidler, David F. Fouhey, Dima Damen
Advances in Neural Information Processing Systems 35, 2022

2022 Large-Scale Spatial Cross-Calibration of Hinode/SOT-SP and SDO/HMI
David F. Fouhey, **Richard E.L. Higgins**, Spiro K. Antiochos, Graham Barnes, Marc L. DeRosa, Todd Hoeksema, KD Leka, Yang Liu, Peter W. Schuck, Tamas I. Gombosi
The Astrophysical Journal Supplement Series, 2023 Feb; 264(2): 49
Hinode-15/IRIS-12 Conference, Poster 2022

2022 On Identifying and Mitigating Bias in Inferred Measurements for Solar Vector Magnetic-Field Data
K.D. Leka, Eric L. Wagner, Ana Belén Griñón-Marín, Véronique Bommier, **Richard E.L. Higgins**
Solar Physics, 2022 Sep; 297(9): 1-29

2021 COHESIV: Contrastive Object and Hand Embeddings for Segmentation In Video
Richard E.L. Higgins*, Dandan Shan*, and David F. Fouhey
Advances in Neural Information Processing Systems 34, Poster 2021

2021 SynthIA: A Synthetic Inversion Approximation for the Stokes Vector Fusing SDO and Hinode into a Virtual Observatory
Richard E.L. Higgins, David F. Fouhey, Spiro K. Antiochos, Graham Barnes, Todd Hoeksema, KD Leka, Yang Liu, Peter W. Schuck, Tamas I. Gombosi
The Astrophysical Journal Supplement Series, 2022 Mar; 259(1): 24
Invited Speaker at the SDO Science Seminar, November 2021

2021 Fast and Accurate Emulation of the SDO/HMI Stokes Inversion with Uncertainty Quantification
Richard E.L. Higgins, David F. Fouhey, Dichang Zhang, Spiro K. Antiochos, Graham Barnes, Todd Hoeksema, KD Leka, Yang Liu, Peter W. Schuck, Tamas I. Gombosi
The Astrophysical Journal, 2021 Apr; 911(2): 130
COSPAR2021, Workshop on ML for Space Sciences, Talk 2021
AGU, ML in Space Weather, Poster 2020

2017 Network Reconstruction Reveals that Valproic Acid Activates Neurogenic Transcriptional Programs in Adult Brain Following Traumatic Injury
Gerald A. Higgins, Patrick Georgoff, Vahagn Nikolian Ari Allyn-Feuer, Brian Pauls, **Richard E. L. Higgins**, Brian D. Athey, and Hasan E. Alam
Pharmaceutical Research, 2017 Aug; 34(8): 1658-1672

2016 Matrix Metalloproteinase-9 Regulates Neuronal Circuit Development and Excitability
Sachiko Murase, Crystal Lantz, Eunyoung Kim, Nitin Gupta, **Richard E. L. Higgins**, Mark Stopfer, Dax A. Hoffman, and Elizabeth M. Quinlan
Journal of Molecular Neurobiology, 2016 Jul; 53(5): 3477–3493

Mentees

2024 – 2025	Varun Deliwala, NYU CS Masters student	
2024 – 2025	Siddhartha Reddy Potu, NYU CS Masters student	
2022 – 2023	Tianyi Cheng, UM CSE Undergraduate student	*Next: CMU Masters Student*
2022 – 2023	Ayda Sultan, Addis Ababa CS Undergraduate student	*Next: KAUST Research Assistant*
2022 – 2025	Ruoyu Wang, UM CSE Undergraduate student	*Next: NYU CS PhD Student*
2020 – 2021	Dichang Zhang, UM CSE Undergraduate student	*Next: Stony Brook CS PhD Student*
2019 – 2020	Yige Liu, UM CSE Undergraduate student	*Next: Stanford CS Masters Student*

Teaching

2018 Winter **EECS 442: Computer Vision**, Graduate Student Instructor, University of Michigan

2014 Spring **BSCI 440: Mammalian Physiology**, Teaching Assistant, University of Maryland

Outreach & Service

2022 – 2024 **CSE Graduate Student Organization**, Officer, University of Michigan
- I was the student liaison to the faculty hiring committee and broadly a CSEG officer for two years.

2020 – 2021 **AI Lab Blog**, Co-Editor, University of Michigan
- I solicited and edited blog posts for the University of Michigan AI Lab Blog.

2019 + 2020 **AI4ALL**, Instructor, University of Michigan
- I taught high schoolers an introductory AI course across two-week summer camps.

2019 **Discover Engineering**, Volunteer, University of Michigan
- I volunteered at a summer program teaching children about Computer Science.

2014 – 2019 **Hackathon Mentorship**
- I mentored both at hackathons and digitally through Facebook's mentorship program.

2011 – 2013 **Co-op Housing UMD**, Housing Chair, Finance Manager
- I found and arranged housing for the co-operative, as well as handled house finances.

Achievements

2022	Best Poster, AI Symposium, University of Michigan
2013	Finalist, HackMIT
2012	Citation in Life Sciences, University of Maryland
2010	Presidential Scholarship (Merit), University of Maryland
2010	National AP Scholar - 14 AP Courses - 100th percentile of AP Tests (<1,172 in 1,845,006 students)