Richard E. L. Higgins

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I am working on learning from motion and interaction in video. I previously trained CNNs to predict the solar magnetic field using spectra recorded by sun-observing satellites.

Education

University of Michigan

2019 – 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

2019 – **Fouhey AI Lab**, Graduate Researcher — Ann Arbor, MI
- I am using motion and human-object interaction to train systems that can segment video.
- I used person and object motion in video to perform weakly-supervised segmentation.
- I trained a UNet to predict the solar magnetic field using polarized light (IQUV's).

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

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

2016 – 2018 **Gigster**, Software Engineering Consultant — San Francisco, CA
- I built a style-transfer service that processed millions of images/day.
- I built a GAN that performs face attribute transformation for a social media company.
- I built a CNN backend to provide object recognition in a Fortune 500 company iOS app.
- I designed many CNN computer vision systems for Fortune 500 clients across industries.

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

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

2015 **Redspread**, First Engineer — San Francisco, CA
- I 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

• I detected seizures in mouse EEG recordings using max-margin techniques in MATLAB.

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

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

Publications

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

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

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

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

2021 **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
Fast and Accurate Emulation of the SDO/HMI Stokes Inversion with Uncertainty Quantification
The Astrophysical Journal, 2021 Apr; 911(2), 130
AGU, ML in Space Weather, Poster 2020
COSPAR2021, Workshop on ML for Space Sciences, Talk 2021

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

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

Mentees

2022 –	Ayda Sultan, Addis Ababa CS Undergraduate student	
2022 –	Ruoyu Wang, UM CSE Undergraduate 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 – **CSE Graduate Student Organization**, Officer, University of Michigan
- I am a student liaison to the faculty hiring committee and generally a CSEG officer.

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.

Awards

2013	Finalist, HackMIT
2012	Citation in Life Sciences, University of Maryland
2010	Presidential Scholarship (Merit), University of Maryland