

Richard E. L. Higgins

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I am a Computer Science and Engineering Ph.D. student at the University of Michigan, advised by David Fouhey. I am working on learning from motion and interaction in video. Previously, I have used convolutional neural networks to improve our estimates of the magnetic field on the surface of the sun.

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 Computer Science *Mentors: Elizabeth Quinlan, Ph.D.*
2010 – 2014 B.S. in Neurobiology and Physiology *Karen Carleton, Ph.D.*

WORK

- 2019 – **Fouhey AI Lab**, Graduate Researcher Ann Arbor, MI
 - I am using contrastive learning to semantically segment held-objects by unlabelled class.
 - 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.

MENTEES

- 2020 – Dichang Zhang, UM CSE Undergraduate student
 2019 – 2020 Yige Liu, UM CSE Undergraduate 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

- 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 – **Hackathon Mentorship**
 • I mentor both at hackathons and digitally through Facebook’s mentorship program.

CITATIONS

- 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

AWARDS

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