Zachary Karas

Internship Interests: Cognition, Deep Learning, Software Engineering, Code Comprehension
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Education

2022-now **Vanderbilt University**, School of Engineering GPA: 3.7
PhD Student in Computer Science

2013-2017 **New York University**, College of Arts & Sciences
Bachelor of Science Major in Neural Science, joint minor in Math and Computer Science

Research Experience

2022-now **Vanderbilt University,** Computer Science
PhD Student, Advisor: Dr. Yu Huang
Leading studies involving eye-tracking, neuroimaging, and usability testing, resulting in two accepted peer-reviewed publications, and two submissions under review.

- **Eye-tracking for Code Summarization** Collected 35 hours of gaze data on 156 Java methods to analyze fine-grained semantics of code reading
- **Work Environment** Mentoring one undergraduate student in the design and execution of a human study (30 participants) testing effects of aroma in work environment, with a forthcoming paper submission
- **Neuroimaging for Software Engineering** Designing experiments for naturalistic coding in MRI machine, eye-tracking usability, and fMRI resting-state analysis

2019-2022 **University of Michigan,** Computer Science & Engineering
Research Assistant, Advisor: Dr. Westley Weimer
Analyzed neuroimaging data for software engineering tasks. My three projects with this group resulted in three accepted peer-reviewed publications in top venues.

- **Functional Connectivity Analysis** Submission to top venue used my analyses of neural activity of code and prose writing
- **Eye Tracking for Formalism Comprehension** Collected and analyzed eye-tracking data (34 participants) to uncover strategies for error detection in formal proofs
- **Novice Neuroimaging** Wrote a mathematical analysis and alignment program that scaled to 2,700 data points in the final data analysis for 2020 publication

2021-2022 **University of Michigan,** Computational Medicine and Bioinformatics
Research Assistant, Advisor: Dr. Lana Garmire
Uncovered subtypes in intermediate stages of Alzheimer's Disease using computational techniques and machine learning for more targeted clinical interventions and research.

- **Metabolomics of Alzheimer's Patients** Integrated gene expression and metabolomics data from over 700 patients to uncover novel patient subtypes
- **Alzheimer's Gene Expression** Wrote original code and used open-source tools to apply advanced analyses (deconvolution, differential expression, gene set enrichment) to patient data
- **MRI of Alzheimer's Patients'** Preprocessed and analyzed structural MRI images from over 800 patients.

2019-2021 **University of Michigan,** Literature, Science, and the Arts
Research Assistant, Advisor: Dr. Ioulia Kovelman
Organized and analyzed neuroimaging data from over 500 human participants. Ran statistical analyses on processed data to determine significance and correlations.

- **Bilingualism Dataset** Wrote a program restructuring 24,000 data points for open dataset submission
- **Online Longitudinal Study** Created four online tasks being used to test over 400 human participants to assess hypotheses about language processing
- **Language Development** Adapted legacy code to reanalyze neuroimaging data and uncover new findings which are the primary results in manuscript under revision

Publications

ASE NIER — A Bansal, CY Su, **Z Karas**, Y Zhang, Y Huang, TJJ Li, C McMillan
Modeling Programmer Attention as Scanpath Prediction

IEEE TSE — A Bansal, Z Eberhart, **Z Karas**, Y Huang, C McMillan
Function Call Graph Context Encoding for Neural Source Code Summarization

ICSE 2023 27% acceptance — H Ahmad, **Z Karas**, K Diaz, A Kamil, JB Jeannin, W Weimer
How Do We Read Formal Claims? Eye-Tracking and the Cognition of Proofs about Algorithms

JSLHR — R Pasquinelli, AM Tessier, **Z Karas**, X Hu, I Kovelman
The Development of Left Hemisphere Lateralization for Sentence-Level Prosodic Processing

Data in Brief — X Sun, K Zhang, R Marks, **Z Karas**, R Eggleston, N Nickerson, C Yu, N Wagley, X Hu, V Caruso, T Chou, T Satterfield, T Tardif, I Kovelman
Morphological and phonological processing in English monolingual, Chinese-English bilingual, and Spanish-English bilingual children: An fNIRS neuroimaging dataset

FSE 2021 19% acceptance — **Z Karas,** A Jahn, W Weimer, Y Huang
Connecting the Dots: Rethinking the Relationship between Code and Prose Writing with Functional Connectivity

ICSE 2020 20% acceptance — M Endres, **Z Karas,** X Hu, I Kovelman, W Weimer
Relating Reading, Visualization, and Coding for New Programmers: A Neuroimaging Study

Under Review

IEEE TOSEM — **Z Karas,** A Bansal, Y Zhang, T Li, C McMillan, Y Huang
A Tale of Two Comprehensions? Studying Human Attention During Code Summarization

Relevant Coursework

Advanced Topics in Software Engineering, Advanced Topics in Computer Security, Statistics for the Behavioral Sciences, Advanced Topics in Deep Learning, Behavioral & Integrative Neuroscience, Development & Dysfunction of the Nervous System

Work Experience

2018-2022 **Adlai E. Stevenson High School**
Pole Vault & Assistant Cross Country Coach

- Taught pole vault and distance running fundamentals to over 200 athletes
- 2021 Livonia City Champions, four individual state qualifiers

2017-2018 **Hudson River Sloop Clearwater**
Educator/Deckhand
- Educated hundreds of schoolchildren and adults about environmental sciences and Hudson River history to cultivate an appreciation for local ecosystems
- Collaboratively crewed the 108' vessel and completed maintenance over the Winter

2013-2017 **New York University**
Captain, Four-Year Varsity Athlete, Cross Country, Indoor/Outdoor Track
- Qualified for 2016 NCAA Division lll Cross Country Championships

Awards & Honors

Russell G. Hamilton Scholar, Dean's Graduate Fellowship (Vanderbilt University), Engineering Graduate Fellowship (Vanderbilt University)

Skills

Programming Languages: Python, Matlab, R, Java
Other Languages: Proficient in French, Linux, LaTeX
Software Expertise: Microsoft Suite, Qualtrics, RedCap

References

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Full Professor
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Ioulia Kovelman, Ph.D.,
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