Zachary Karas

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Education

2022-now	**Vanderbilt University**, School of Engineering **PhD Student** in Computer Science	GPA: 3.76
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 neuroimaging and eye-tracking, resulting in ten accepted peer-reviewed publications, and two submissions under review.
- **Neuroimaging for Software Engineering** Running experiments for naturalistic coding in MRI machine, and analyzed fMRI resting-state data from 150 participants
- **Eye-tracking for Code Summarization** Collected 80+ hours of gaze data on Java code to analyze fine-grained semantics of code reading and project-level comprehension patterns
- **Mentorship** Have mentored five undergraduate students on projects on machine learning for eye-tracking, visual behavior on call graphs, and neuroimaging

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, resulting in one submission under review.
- **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

1. **ASE 2025** — **ACM SIGSOFT Distinguished Paper**
   S McLoughlin, **Z Karas**, R Wallace, A Bansal, C McMillan, Y Huang
   Programmers' Visual Attention on Function Call Graphs During Code Summarization

2. **FSE-IVR 2025** — Y Zhang, C Huang, **Z Karas**, DT Nguyen, K Leach, Y Huang
   Enhancing Code LLM Training with Programmer Attention

3. **ICSE 2025** — **Z Karas**, B Gold, V Zhou, N Reardon, T Polk, C Chang, Y Huang
   Studying Programmers Without Programming: Investigating Expertise Using Resting State fMRI

4. **IEEE TOSEM** — **Z Karas**, A Bansal, Y Zhang, TJJ Li, C McMillan, Y Huang
   A Tale of Two Comprehensions? Analyzing Student Programmer Attention during Code Summarization

5. **FSE 2024** (21% acceptance) — Y Zhang, J Li, **Z Karas**, A Bansal, TJJ Li, C McMillan, K Leach, Y Huang
   EyeTrans: Merging human and machine attention for neural code summarization

6. **IEEE TSE** — A Bansal, R Wallace, **Z Karas**, N Tang, Y Huang, TJJ Li, C McMillan
   Programmer visual attention during context-aware code summarization

7. **ICPC 2024** — J Li, Y Zhang, **Z Karas**, C McMillan, K Leach, Y Huang
   Do machines and humans focus on similar code? exploring explainability of large language models in code summarization

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

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

10. **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

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

12. **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

13. **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

14. **ICSE 2020** (20%) — M Endres, **Z Karas**, X Hu, I Kovelman, W Weimer

acceptance Relating Reading, Visualization, and Coding for New Programmers: A Neuroimaging Study

Under Review

TOSEM **Z Karas**, D Page, M Maciel-Seidman, Z Sharafi, Y Huang
The Influence of Environmental Odors on Student Programmers During Code Comprehension and Code Writing

ICSE NIER 2026 S Mohamed, **Z Karas**, Y Zhang, A Bansal, C McMillan, Y Huang
Discerning Code Comprehension Quality from Programmer Visual Attention

Relevant Coursework

Advanced Topics in Software Engineering, Advanced Topics in Computer Security, Statistics for the Behavioral Sciences, Advanced Topics in Deep Learning, Analysis of Functional Magnetic Resonance Imaging, Behavioral & Integrative Neuroscience

Awards & Honors

-ACM SIGSOFT Distinguished Paper (ASE 2025)

-Invited Tech Demonstration at Vanderbilt Undergraduate Research Symposium

-Invited Talk at LIVE IGNITE Seminar (Vanderbilt University)

-LIVE Ignite Tech Development Grant (Vanderbilt University)

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

-Engineering Graduate Fellowship (Vanderbilt University)

Skills

Programming Languages: Python, MATLAB, R, Java
Other Languages: Linux, LaTeX
Software Expertise: Microsoft Suite, Qualtrics, RedCap

References

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Westley Weimer, Ph.D.,
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