

Zachary Kaufman

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Education

Indiana University Bloomington | Luddy School of Informatics, Computing, and Engineering

Master of Science in Intelligent Systems Engineering
Concentration in Neuroengineering

May 2024

Bachelor of Science in Intelligent Systems Engineering
Concentration in Cyber-Physical Systems
Minor in Creative Technologies in Art & Design

July 2023

Work Experience

Luddy Living Learning Center

August 2023 - Current

Graduate Assistant

- Aid in the planning and execution of student engagement activities such as orientation and Welcome Week
- Serve in an advisory position to the Learning Center's freshman cohort and Executive Leadership Council
- Coordinate with the Associate Director on course development and student conduct cases

Socioneural Physiology Lab (SPLab) at Indiana University Bloomington

March 2023 - Current

Research Assistant

- Conduct research on neurophysiological mechanisms related to trust, deception, and stress
- Perform data processing, analysis, and study design for the Trusting AI project, in collaboration with labs across multiple universities, regarding how humans respond to and trust artificial intelligence
- Apply reinforcement learning, convolutional neural networks (CNNs), genetic algorithms, and high-performance computing systems to establish metrics of trust

R-House Human-Robot Interaction Lab at Indiana University Bloomington

September 2020 - Current

Research Assistant

- Develop studies, write IRB protocols and conference papers in LaTeX, and design research posters
- Facilitate human-subject studies with young children up to the elderly, as well as those with mental health disorders
- Integrate computer vision, wearable sensors, NFC, haptics, and CNNs into robot perception systems

University of Michigan Department of Robotics

May 2022 - July 2022

Intern

- Developed a web-interface for an educational omnidrive robot using React, Python, C++, LCM, and ROS, which included a Simultaneous Localization and Mapping visualization
- Aided in design of undergraduate curriculum for new robotics department

Luddy Office of Student Engagement and Success

December 2019 - January 2022

Student Engagement Committee Member

- Coordinated events for the Luddy School such as town hall meetings, outreach events, and new student orientation
- Designed and fabricated promotional material using 3D printers, laser cutters, and other Makerspace technologies
- Ran training, workshops, and outreach in the Makerspaces to attract prospective students and onboard new staff

Luddy Makerspaces

September 2019 - January 2022

Makerspace Technician

- Oversaw the operation of FDM and SLA 3D printers, laser cutters, soldering irons, as well as a variety of hand-tools and other fabrication and prototyping tools
- Coordinated teamwide efforts in equipment maintenance, conducted training for new students, and aided in marketing and outreach

Current Research Projects

Trusting AI

March 2023 - Current

SPLab

- Create data pipelines using Pandas and Numpy for use on haptic, visual, and gameplay data
- Train bots utilizing reinforcement learning and genetic algorithms capable of simulating a human player in game scenarios
- Develop a physiology-based metric of trust based on statistical models and deep-learning analysis of participants' facial action units, gameplay data, and ECG signals

Socially Assistive Robot Design for Major Depressive Disorder (MDD)

October 2022 - Current

R-House and Mississippi State University

- Design and conduct participatory design workshops to develop Therabot™, a Socially Assistive Robot prototype for at-home MDD patient support
- Managed the construction, maintenance, and operation of Therabot™ sensor modules for both lab and home-based studies spanning several weeks

Ecological Momentary Assessment (EMA)

December 2021 - Current

R-House

- Evaluate the use of EMA to establish a baseline of sensor data for studying interaction between humans and robotic pets
- Build and facilitate the use of the sensor apparatus during the study for participants as well as analyze the collected data

Previous Research Projects

Haru Engagement Tracking

April 2021 - May 2023

R-House and Honda Research Institute of Japan

- Developed an algorithm for a desktop robot named Haru to enable non-invasive engagement tracking to dynamically react to children's changing interests and engagement throughout activities and provide more meaningful interactions
- Researched, developed, and tested various non-invasive sensors and machine learning algorithms to use for determining Haru's behavior in response to participant's physiological response

QT Ikigai Study

January 2022 - December 2022

R-House and Toyota Research Institute (TRI)

- Used the LuxAI QT robot to assist older adults to discover their Ikigai, a Japanese concept meaning "reason for being"
- Programmed different interactive scenarios between QT and older adult participants using Blockly, Python, and ROS, as well as created and ran engagement algorithms on the data

Robot Appearance Study

June 2021 - December 2022

R-House

- Designed and conducted user-based studies to determine important physical characteristics of consumer robots
- Created 3D models in Blender of theoretical robots using the chosen characteristics from the user-based studies and created animated renders of those models to be presented to future groups for feedback

Haru Interactive Accessories

September 2020 - May 2021

R-House and Honda Research Institute of Japan

- Designed interactive accessories for the Haru desktop robot that use Near Field Communication (NFC) technology to allow Haru and child participants to engage together in various activities using unique methods of interaction

Special Training and Certificates

Higher Education Mental Health First Aid Training

August 2023

Textline Crisis Counselor Training

June 2023

QPR Suicide Prevention Training

June 2023

Publications

Workshop Papers

Khoo, Weslie, Long-Jing Hsu, Kyrie Jig Amon, Pranav Vijay Chakilam, Wei-Chu Chen, **Zachary Kaufman**, Agness Lungu, et al. "Spill the Tea: When Robot Conversation Agents Support Well-Being for Older Adults." In *Companion of the 2023 ACM/IEEE International Conference on Human-Robot Interaction*, 178–82. HRI '23. New York, NY, USA: Association for Computing Machinery, 2023. <https://doi.org/10.1145/3568294.3580067>.

Competition Papers

Kamino, Waki, **Zach Kaufman**, Arinah Karim, and Swapna Joshi. "A 'Pop'ular 'Corn'panion to Making Your Movie Experience 'Butter' Together." In *Companion of the 2021 ACM/IEEE International Conference on Human-Robot Interaction*, 618–19. HRI '21 Companion. New York, NY, USA: Association for Computing Machinery, 2021. <https://doi.org/10.1145/3434074.3446943>.

Won "Most Creative" prize in the 2021 HRI Student Design Competition

Conference Presentations

Zachary Kaufman, Arinah Karim, Leigh Levinson. "Reactive Human Robot Interaction." Presenter, Midwest Undergraduate Cognitive Science Conference, April 2022, Bloomington, Indiana.

Skills

Technical Skills

Machine Learning: PyTorch, Numpy, OpenCV, Pandas, Pygame, Tensorflow, Scipy, Matplotlib
Robotics: ROS, rospy, roscpp, SLAM, occupancy grids
Web Development: JavaScript, HTML, CSS, ReactJS, P5.js, jQuery
Programming Languages: Python, C++, C, R, Java, MatLab, C#

Research Skills

Writing: IRB, conference papers, conference workshop papers, recruiting material, study documentation
Data Collection: Designing and implementing data collection protocols, conducting surveys and interviews, performing observational studies, developing and administering questionnaires, identifying and addressing potential biases in data collection
Data Analysis: Statistical analysis using Python, R, and MatLab, machine learning and deep learning models for data analysis, qualitative analysis techniques such as behavioral coding
Study Development: Developing research questions and hypotheses, conducting literature reviews, designing study protocols and methodologies, recruiting study participants and managing scheduling, identifying and addressing potential ethical considerations in study development

Creative Skills

Softwares: Blender, Maya, Unity, Adobe Premiere Pro, Adobe Illustrator, Adobe Photoshop
Fabrication: FDM/SLA 3D Printers, Laser Cutters, Soldering, Waterjet Cutter, Vinyl Cutter

Volunteer Experience

Crisis Text Line, **Crisis Counselor** June 2023 - Current
Kate's Kart, **Volunteer** January 2017 - July 2019
Parkview Regional Medical Center, **Patient Care Volunteer** February 2017 - May 2018

Extracurricular Activities

PADI Open Water Diver, **OW and EANx Certified, Advanced OW in Progress** January 2023 - Current
Bloomington Indiana Grotto (National Speleological Society), **Member** April 2022 - Current
IEEE Indiana University Student Branch, **Founder, Former President, Member** July 2021 - Current
Creative Coding Club, **President** September 2021 - May 2023
Luddy Makerspace Club, **Founder, President** August 2020 - May 2023
Indiana University Luddy Living Learning Community, **Member** August 2019 - May 2020

References

- Selma Sabanovic, PhD** *Professor and Associate Dean of Faculty Affairs at the Luddy School, Indiana University*
Employer, Research Advisor
• Email: selmas@indiana.edu
- Gregory Lewis, PhD** *Assistant Professor of Intelligent Systems Engineering, Assistant Research Scientist - Kinsey Institute*
Employer, Research Advisor
• Email: lewigr@iu.edu
- Tiana Iruoje** *Director of the Luddy Office of Student Engagement and Success, Indiana University*
Employer
• Email: tiruoje@indiana.edu
- Nichole Mitchell** *Associate Director of the Luddy Living Learning Center, Indiana University*
Supervisor
• Email: nmitch@iu.edu
- Chad Jenkins, PhD** *Associate Chair of Undergraduate Studies, Department of Robotics, University of Michigan*
Former Employer
• Email: ocj@umich.edu