Zhaobo Zheng | CV

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Expertise

- Six years experience in machine learning, multimodal data collection, robotics and virtual reality
- Extensive project experiences with human machine interaction, software programming, hardware design and modeling
- Four years experiences leading and coordinating complex projects with medical and educational professionals, university staff, fellow engineers and researchers

Education

Vanderbilt University   **Nashville, USA**
Doctor of Philosophy in Mechanical Engineering (Advisor: Prof. Nilanjan Sarkar)   *Aug.2015 – Nov 2021*

Xi'an Jiaotong University   **Xi'an, China**
Bachelor of Mechanical Engineering   *Sep.2011 – Jul.2015*

Research Experience

Machine Learning to Predict Imminent Problem Behaviors: ***Oct 2018 – Present***

- Designed wearable data capture system of physiological, motion, facial expression data
- Trained state of art machine learning model to predict imminent problem behaviors with 98.51% accuracy
- Integrated real-time sensor-to-decision behavior prediction with less than 200ms delay

Multisensory Data Capture and Stimulation for Early Autism Pattern: ***Aug 2015 – Aug 2019***

ABC News: https://abcnews.go.com/Health/scientists-robot-gadgets-advance-autism-research-young-children/story?id=46175570

- Landed machine learning on ASD risk prediction with average accuracy over 83 percent
- Designed a multisensory stimulation and data capture system of physiological, eye gaze and EEG signals
- Implemented a comfortable, safe and MRI-compatible tactile stimulator for autistic infants

Personal Hygiene Coaching System for Children: ***June 2019 – Present***

Demo: https://drive.google.com/file/d/1zVl-DoHwjzFJqdsFqdu2YNREKE78HDiM/view?usp=sharing

- Constructed AR based gamified system to coach autistic children proper tooth-brushing skills
- Captured body movements with Kinect. Projected virtual objects with real-life surroundings
- Developed virtual tasks with instructions and feedback in audio, visual and avatars

Fine Motor Skills Training System for Children with Autism: ***Jan.2016 – Jan 2017***

Demo: https://drive.google.com/file/d/1Egerwbd6QccwNDAepIJjypqpXfWWJccg/view?usp=sharing

- Designed a gripper with tactile sensing on a haptic device
- Composed virtual games for fine motor skills in Unity

Active Socially Assistive Robot for Older Adults with Dementia: ***Sep 2016 – Jun 2019***

- Designed inner skeleton of robot. Integrated image processing, tactile sensors, servo motors.
- Developed Finite State Machine (FSM) for older adults with a GUI

Awarded Grants

NSF 21-530: Enhanced detection of impending problem behavior in people with intellectual and developmental disabilities through multimodal sensing and machine learning $1103997

CYSHCNet: Development of a patient-facing mobile health app to track family access and engagement with early intervention services in under-served communities $49813

Pending Patents

Zhaobo K. Zheng, John Staubitz, Amy Weitlauf, Zachary Warren, Nilanjan Sarkar, "Multimodal data collection system to predict imminent precursor of problematic behaviors", Patent Application VU20026P1

Zhaobo K. Zheng, Nilanjan Sarkar, Nandan Sarkar, Amy Weitlauf, Amy Swanson, "Augmented Reality System for Toothbrushing Skill Coaching", Patent Application VU22018

Selected Publications

- **Zheng, Zhaobo K.**, John E. Staubitz, Amy S. Weitlauf, Johanna Staubitz, Marney Pollack, Lauren Shibley, Michelle Hopton et al. "A Predictive Multimodal Framework to Alert Caregivers of Problem Behaviors for Children with ASD (PreMAC)." Sensors 21, no. 2 (2021): 370.
- **Zhaobo K. Zheng**, Nandan Sarkar, Amy Swanson, Amy Weitlauf, Zachary Warren, Nilanjan Sarkar "CheerBrush: A Novel Interactive Augmented Reality Coaching System for Toothbrushing Skills in Children with Autism Spectrum Disorder", Accepted by ACM Transactions of Accessible Computing
- **Zhaobo K. Zheng**, John Staubitz, Joshua Jessel, Tess Frutchman, and Nilanjan Sarkar "Validating a Computerized Program for Supporting Visual Analysis during Functional Analysis: The Problem Behavior Multilevel Interpreter (PB.MI)", Accepted by the Journal of Behavioral Analysis
- **Zhaobo K. Zheng**, Dayi Bian, Amy Swanson, Amy Weitlauf, Zachary Warren, Nilanjan Sarkar "Soft-Brush: A Novel Tendon Driven Tactile Stimulator for Affective Touch in Children with Autism", International Conference on Applied Human Factors and Ergonomics, 15-22, July. 2018.
- **Zhaobo K. Zheng**, Jing Fan. James Zhu, Nilanjan Sarkar "Rassle: A Novel Active Socially Assistive Robot for Elder with Dementia", IEEE RO-MAN, Aug. 2018.
- **Zhaobo K. Zheng** and Nandan Sarkar "Design and Validation of a Tremor Stabilizing Handle for Patients with Parkinson Disease and Essential Tremor." In International Conference on Human-Computer Interaction, pp. 274-283. Springer, Cham, 2019.
- **Zhaobo K. Zheng**, John Staubitz, Joshua Jessel, Tess Fruchtman, Nilanjan Sarkar, "Validating a Computerized Program for Supporting Visual Analysis during Functional Analysis: The Problem Behavior Multilevel Interpreter (PB.MI)", Under Review
- Zhao, Huan, **Zhaobo Zheng**, Amy Swanson, Amy Weitlauf, Zachary Warren, and Nilanjan Sarkar. "Design of a Haptic-Gripper Virtual Reality System (Hg) for Analyzing Fine Motor Behaviors in Children with Autism." ACM Transactions on Accessible Computing (TACCESS) 11, no. 4 (2018): 1-21.
- Huan Zhao, **Zhaobo K. Zheng**, Amy Swanson, Amy Weitlauf, Zachary Warren, Nilanjan Sarkar "Design of a Haptic Virtual System for Improving Fine Motor Skills in Children with Autism", International Conference on Applied Human Factors and Ergonomics, 204-216, July 2017"
- Dayi Bian, **Zhaobo K. Zheng**, Amy Swanson, Amy Weitlauf, Tiffany Woynaroski, Carissa J Cascio, Alexandra P Key, Zachary Warren, Nilanjan Sarkar, "A Novel Multisensory Stimulation and Data Capture System (MADCAP) for Investigating Sensory Trajectories in Infancy", IEEE Trans on Neural Systems and Rehabilitation Engineering,Pg 1526-1534, 2018

Teaching/Leadership Experience

Conference and Media Presentations: Oral presentations in major conferences

Teaching Assistant of ME 4271 Intro to Robotics: Lecturing, Homework and Solution Composition, Term Projects

Students Mentoring: Tutored undergraduates and interns for senior design projects and research

Team Leader of Vanderbilt UAV Team: Led the payload team in 2017 Microsoft UAV contest

Core Courses

Machine Learning: Advanced Machine Learning, Pattern Recognition

System Modeling: Modeling and Simulation of Dynamics Systems, Electromechanical Systems Design, Linear Control

Robotics: Robotic Manipulator, Introduction to Robotics, Intelligent System and Robotics, Design of Drones

Research Techniques and Skills

Data Science Toolbox: scikit-learn, scipy, numpy, pandas, matplotlib, tensorflow, keras, PyTorch

Engineering: CAD, Signal Processing, Circuit Design, Sensor Integration, System Testing

Programming Languages: Python, C#, C++, Matlab, C, Java