Thaddeus Czuba

Research & Data Scientist :: 3D Vision

Contact

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512–380–1673
Austin, TX
www.visualstimul.us

Skills

- Experimental Design
- Software Engineering
- Statistical Analysis
- Eye Tracking
- Display & Optical Systems Design
- Machine Learning
- Matlab / Python / Git
- Tensorflow / Linux
- Data Visualization
- Scientific Communication

Applied Fields

- Quantitative Research
- Psychophysics
- Eye Tracking
- Optical Systems Dev.
- Biological Signal Processing
- 3D Visual Perception
- Behavioral Neuroscience
- Electrophysiology
- Hardware & Software Infrastructure Dev.

Senior Research Engineer with 10+ years of experience developing complex hardware & software systems for research in 3D visual perception. Extensive knowledge of binocular visual processing and the perception of 3D visual motion & space.

Diverse skillset spans behavioral & perceptual psychophysics to neurophysiology, with advanced statistical & analytical skills for distilling information from noisy behavioral & biological datasets. Capable of shepherding novel solutions from idea creation, through design & fabrication, to final hardware & software implementation.

Enjoys creative problem solving, and opportunities to work at the intersection of cutting-edge research & user-focused design to tackle complex problems. Excellent scientific communication skills to create compelling data visualizations & presentations that are accessible to expert & non-expert audiences alike.

EDUCATION

Ph.D. **Psychology: Sensory Neuroscience** *The University of Texas, Austin, TX* 2012
Thesis: Binocular mechanisms underlying the processing of 3D motion

B.S. **Psychology** *Indiana University, Bloomington, IN* 2006
Focus: Visual psychophysics Minors: Studio Art & Chemistry

EXPERIENCE

2024–Pres. Vision Science Consultant, Indep. Contract (Jan– , 2024)

Developed data analysis methods & pipeline for psychophysical assessment of visual sensitivity across patient population.

2016–2022 Senior Scientist, Univ. of Texas, Center for Perceptual Systems

Psychophysical & neurophysiology research on binocular mechanisms of visual perception in dynamic 3D environments.

Trained and mentored graduate & postdoctoral researchers on effective experimental design & coding, behavioral training, data analysis, and scientific problem-solving

Notable outputs:

3D ViewDist System: Completely custom large-format 3D display system, research-grade binocular eye tracking, & computer-controlled motorized positioning system

PLDAPS: comprehensive software package for behavioral & neurophysiology experiments; incl. real-time eye tracking interaction, 3D stimulus generation, multi-modal data syncing

Kilosort "ks25": GPU-accelerated ML algorithm & interface for neural spike sorting, heavily refactored from the original for use with non-chronic multi-channel electrodes

Developed integrative approach to custom cranial implants for neurophysiology using anatomical neuroimaging (MRI) & rapid prototyping via 3D printing

2012–2016 Postdoctoral Researcher, Einstein College of Medicine

Trained in advanced electrophysiology techniques & experimental design using multi-electrode array recordings in non-human primates

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Designed research projects & novel methodologies for visual neuroscience research and decoding of adapted neural populations

SELECT PROJECTS & RESEARCH OUTPUTS

Full academic CV: *www.visualstimul.us*

Supporting Docs

3D ViewDist System: Large-format 3D projection system with binocular eye tracking & robotic viewing distance manipulation

Rear-projection passive-3D stereo display rendering with full projective geometry at 120 Hz *per-eye*, computer-controlled motorized z-axis gantry, and 1 kHz binocular eye tracking

Designed & built custom engineered experimental control & rendering software capable of dynamically updating eye tracking & binocular projection geometry to match physical viewing distance changes

Functional Architecture and Mechanisms for 3D Direction & Distance in Middle Temporal Visual Area

New dimensions of functional organization revealed in cortical area responsible for visual motion perception

Novel discoveries made possible by 'ViewDist System'

Decoding Visual Information From Adapted Neural Populations

Machine learning classifiers (SVM) trained to perform fine discrimination task on adapted neural populations

Increased variability —more so than responsivity— accounted for information deficits following adaptation

Area MT Encodes Three-Dimensional Motion

On-the-fly functional binocular alignment for 3D stimulus presentation achieved through simultaneous multi-area recordings

Revealed distinct neuronal selectivity for 3D motion in a cortical area previously thought to process only 2D motion

Results highlighted in *Nature Reviews Neuroscience*