

Exponent®
Engineering & Scientific Consulting

Evan Cesanek, Ph.D.

Managing Scientist | User Sciences
New York
+1-212-895-8153 | ecesanek@exponent.com

Professional Profile

Dr. Evan Cesanek is an expert in human-subjects research, analytics, and software services across industries including consumer electronics, biotech, healthcare, manufacturing, and litigation. He specializes in running user studies with advanced technical needs such as capturing biometric data from diverse populations, or leveraging cloud infrastructure for decentralized studies. His proficiency extends to database engineering, exploratory data analysis (EDA), user experience (UX) design, and artificial intelligence (AI).

Dr. Cesanek has significant experience with augmented and virtual reality (AR and VR) applications for head-mounted displays (HMDs). He is an expert on human interaction with 3D environments, emphasizing user health and safety, visual comfort, and privacy.

As a data scientist, Dr. Cesanek helps clients harness data sets of any size for predictive analytics and machine learning (ML). He is knowledgeable about statistical learning theory and experienced with deep learning techniques including multimodal embedding models and large language models (LLMs) like GPT and Llama 2. He also focuses on data retrieval, digital forensics, and anomaly detection, often diving deep into device and server logs to analyze timestamps, geolocation data, and network traffic.

In the lab, Dr. Cesanek develops custom data acquisition systems using advanced sensors like high-speed cameras, inertial measurement units (IMUs), and force/torque transducers. His background in human movement science spans from wearables and motion capture systems to convolutional and recurrent neural networks (CNNs and RNNs) to biosignals including EEG and EMG. He has analyzed many user behaviors from full-body locomotion to subtle movements of the eyes, face, hands, and fingers.

As a software developer, Dr. Cesanek has worked with algorithms for signal processing, spatial computing, and statistical modeling (e.g., Kalman filters, image stabilization, digital twins, hierarchical Bayesian models, Monte Carlo simulations). He has experience with web, native, and cloud development stacks including React Native and AWS and with programming languages including Python, JavaScript, SQL, MATLAB, and C++. He is also adept with 3D graphics, modeling, and game design using Blender and Unity.

Academic Credentials & Professional Honors

Ph.D., Cognitive Science, Brown University, 2019

B.A., Cognitive Science, Vassar College, 2013

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2022 Fellow (Neuroscience), The Italian Academy for Advanced Studies in America, Columbia University

Professional Affiliations

ACM Member

ACM Special Interest Group on Computer-Human Interaction (SIGCHI) Member

IEEE Member

IEEE Consumer Technology Society Member

Society for the Neural Control of Movement Member

Publications

Kemp, J. T., Cesanek, E., & Domini, F. (2023). Perceiving depth from texture and disparity cues: Evidence for a non-probabilistic account of cue integration. Journal of Vision, 23(7):13, 1-24.

Cesanek, E., Flanagan, J. R., & Wolpert, D. M. (2023). Memory, perceptual, and motor costs affect the strength of categorical encoding during motor learning of object properties. Scientific Reports, 13, 8619.

Zhang, Z., Cesanek, E., Ingram, J. N., Flanagan, J. R., & Wolpert, D. M. (2023). Object weight can be rapidly predicted, with low cognitive load, by exploiting learned associations between the weights and locations of objects. Journal of Neurophysiology, 129(2), 285-297.

Cesanek, E., Zhang, Z., Ingram, J. N., Wolpert, D. M., & Flanagan, J. R. (2021). Motor memories of objects are categorically organized. eLife, 10, e71627.

Cesanek, E.*, Deeb, A.*, & Domini, F. (2021). Newtonian predictions are integrated with sensory information in 3D motion perception. Psychological Science, 32(2), 280-291.

Cesanek, E., Taylor, J.A., & Domini, F. (2021). Persistent grasping errors produce depth cue reweighting in perception. Vision Research, 178, 1-11.

Cesanek, E., Taylor, J.A., & Domini, F. (2020). Sensorimotor adaptation and cue reweighting compensate for distorted 3D shape information, accounting for paradoxical perception-action dissociations. Journal of Neurophysiology, 123, 1407-1419.

Cesanek, E. & Domini, F. (2019). Depth cue reweighting requires altered correlations with haptic feedback. Journal of Vision, 19(14):3, 1-13.

Cesanek, E. & Domini, F. (2018). Transfer of adaptation reveals shared mechanism in grasping and manual estimation. Neuropsychologia, 117, 271-277.

Cesanek, E., Campagnoli, C., Taylor, J.A., & Domini, F. (2018). Does visuomotor adaptation contribute to illusion-resistant grasping? Psychonomic Bulletin & Review, 25(2), 827-845.

Kopiske, K., Cesanek, E., Campagnoli, C., & Domini, F. (2017). Adaptation effects in grasping the Müller-Lyer illusion. Vision Research, 136, 21-31.

Cesanek, E. & Domini, F. (2017). Error correction and spatial generalization in human grasp adaptation. Neuropsychologia, 106, 112-122.

Presentations

Cesanek, E., Shivkumar, S., Ingram, J.N., & Wolpert, D.M. (2023). Ouvrai: Opening access to remote VR studies of movement. Interactive demo and poster presented at the 32nd Annual Meeting of the Society for the Neural Control of Movement. https://ouvrai.com.

Cesanek, E., Zhang, Z., Ingram, J.N., Wolpert, D.M., & Flanagan, J.R. (2021). The dynamics of manipulable objects are represented categorically, as families or individuals. Talk presented at the 30th Annual Meeting of the Society for the Neural Control of Movement.

Cesanek, E. & Domini, F. (2018). When visuomotor adaptation fails, 3D perception changes. Talk presented at the 18th Annual Meeting of the Vision Sciences Society. https://doi.org/ 10.1167/18.10.1229.

Cesanek, E., Campagnoli, C., & Domini, F. (2016). One-shot correction of sensory prediction errors produces illusion-resistant grasping without multiple object representations. Talk presented at the 16th Annual Meeting of the Vision Sciences Society. https://doi.org/ 10.1167/16.12.20.

Cesanek, E., Campagnoli, E., Walker, C., & Domini, F. (2015). Online vision of the hand supports accurate grasp performance in illusory contexts. Talk presented at the 15th Annual Meeting of the Vision Sciences Society. https://doi.org/10.1167/15.12.185.

Andrews, J., Livingston, K., Goldberg, A., Cesanek, E., & Herts, J. (2011). Effects of category learning: An event-related potential study. Poster presented at the 33rd Annual Conference of the Cognitive Science Society. Boston, MA. https://escholarship.org/uc/item/85r8v8cd

Project Experience

Developed laboratory system that synchronizes VR HMDs with robotic interfaces to provide real-time force feedback (haptics) in behavioral experiments. Performed calibration and validation of position, force, and timing data. Consulted on installation and research applications with two laboratories in the US and Canada.

Created end-to-end software solution supporting online VR studies that collect HMD data remotely. Performed validation studies of data quality and efficiency of remote VR studies with crowdsourced participants. Conducted qualitative UX research with test users; wrote and maintained detailed online documentation.

Designed and ran user studies with over 200 participants to analyze the dynamics of human grasping in VR, AR, and normal conditions. Combined techniques from 3D graphics, human and computer vision, sensor fusion, and kinesiology to create stimuli, analyze data, and draw conclusions about interface and interaction design.

Collaborated on “visual electromyogram (EMG)” computer vision prototype that used a supervised CNN + RNN approach to predict muscle activities from stereo videos of arm movements.

Peer Reviews

Journal of Neurophysiology

Journal of Experimental Psychology

Human Perception and Performance

Journal of Cognitive Neuroscience

Experimental Brain Research

NeuroImage

Frontiers in Psychology

PLoS ONE