XIAOFEI HUANG

Electrical and Computer Engineering Department, Northeastern University
Room 555, 805 Columbus Ave, Boston, MA 02120
Email: xhuang@ece.neu.edu ⋄ Phone: (+1) 8572724336

EDUCATION

PhD, Electrical and Computer Engineering *2019 - 2024 (expected)*
Northeastern University, Boston, MA, USA
Augmented Cognition Lab (ACLab), Advisor: Prof. Sarah Ostadabbas

Master of Science, Electrical and Computer Engineering *2015 - 2017*
Northeastern University, Boston, MA, USA

Master of Science, Mechanical Manufacture and Automation *2010 - 2013*
Wuhan University of Technology, Wuhan, China

Bachelor of Science, Electronic Information Engineering *2006 - 2010*
Wuhan University of Technology, Wuhan, China

TECHNICAL & THEORETICAL SKILLS

- **Computer Vision and Signal/Image Processing**
- **Machine Learning and Artificial Intelligence**
- **Augmented/Virtual Reality Environment Development**
- **Human-Computer Interaction**

COMPUTER SKILLS

Programming: Python, MATLAB, C#, C/C++, Java, HTML, JavaScript
Software: PyCharm, Matlab, Unity, Blender, IntelliJ IDEA, LabView, Visual Studio, MySQL, Git

SELECTED COURSES

- Machine Learning
- Digital Signal Processing
- Data Mining Techniques
- Linear System Analysis
- Applied Probability & Stochastic Process
- Advanced Computer Vision

PUBLICATION

Journals

- Mak J, Kocanaogullari D, **Huang X**, Mullen K, Grattan SE, Ostadabbas S, Wittenberg GF, Akcakaya M. A Scalable EEG-Based Spatial Neglect Detection System in Augmented Reality for Stroke Patients. *Neurorehabilitation and Neural Repair*, 2024.
- Zhu S, Hosni S, **Huang X**, Wan M, Borgheai S, McLinden J, Shahriari Y, Ostadabbas S. A Dynamical Graph-based Feature Extraction Approach to Enhance Mental Task Classification in Brain-Computer Interfaces. *Computers in Biology and Medicine*, 2023.

- Liu S, **Huang X**, Fu N, Li C, Su Z, Ostadabbas S. Simultaneously-Collected Multimodal Lying Pose Dataset: Enabling In-Bed Human Pose Monitoring. *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2022.
- **Huang X**, Mak J, Kocanaogullari D, Kersey J, Shih M, Skidmore E, Wittenberg G, Ostadabbas S, Akcakaya M. Detection of Stroke-Induced Visual Neglect and Target Response Prediction Using Augmented Reality and Electroencephalography. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 2022.
- Hosni SM, Borgheai SB, McLinden J, Zhu S, **Huang X**, Ostadabbas S, Shahriari Y. A Graph-Based Nonlinear Dynamic Characterization of Motor Imagery Toward an Enhanced Hybrid BCI. *Neuroinformatics*, 2022.

Conferences/Workshops

- **Huang X**, Hatamimajoumerd E, Ostadabbas S. Infant Action Generative Modeling. *Neural Information Processing Systems (NeurIPS)*, 2024. (Under Review)
- Hatamimajoumerd E, Daneshvar KP, **Huang X**, Luan L, Amraee S, Ostadabbas S. Challenges in Video-Based Infant Action Recognition: A Critical Examination of the State of the Art. *Winter Conference on Applications of Computer Vision (WACV) Workshop on Computer Vision with Small Data: A Focus on Infants and Endangered Animals*, 2024.
- **Huang X**, Luan L, Hatamimajoumerd E, Wan M, Daneshvar KP, Obeid R, Ostadabbas S. Posture-based Infant Action Recognition in the Wild with Very Limited Data. *CVPR Workshop on Learning with Limited Labelled Data for Image and Video Understanding*, 2023.
- Wan M, **Huang X**, Tunik B, Ostadabbas S. Automatic Assessment of Infant Face and Upper-Body Symmetry as Early Signs of Torticollis. *International Conference on Automatic Face and Gesture Recognition (FG) Workshop on Artificial Intelligence for Automated Human Health-care and Monitoring*, 2023.
- **Huang X**, Wan M, Luan L, Tunik B, Ostadabbas S. Computer Vision to the Rescue: Infant Postural Symmetry Estimation from Incongruent Annotations. *IEEE Winter Conference on Applications of Computer Vision (WACV)*, 2023.
- **Huang X**, Liu S, Wan M, Fu N, Modayur B, Pino D, Ostadabbas S. Appearance-Independent Pose-Based Posture Recognition in Infants. *Towards a Complete Analysis of People: From Face and Body to Clothes (T-CAP) International Workshop at ICPR*, 2022.
- **Huang X**, Mak J, Wears A, Price R, Akcakaya M, Ostadabbas S, Woody M. Using Neurofeedback from Steady-State Visual Evoked Potentials to Target Affect-Biased Attention in Augmented Reality. *International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, 2022.
- Wan M, Zhu S, Luan L, Gulati P, **Huang X**, Schwartz-Mette R, Hayes M, Zimmerman E, Ostadabbas S. InfAnFace: Bridging The Infant–adult Domain Gap in Facial Landmark Estimation in The Wild. *International Conference on Pattern Recognition (ICPR)*, 2022. (**Best Paper Award**)
- **Huang X**, Fu N, Liu S, Ostadabbas S. Invariant Representation Learning for Infant Pose Estimation with Small Data. *IEEE International Conference on Automatic Face and Gesture Recognition (FG)*, 2021.
- Kocanaogullari D, **Huang X**, Mak J, Shih M, Skidmore E, Wittenberg G, Ostadabbas S, Akcakaya M. Fine-tuning and Personalization of EEG-based Neglect Detection in Stroke Patients. *International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, 2021.
- Zhu S, Hosni S, **Huang X**, Borgheai S, McLinden J, Shahriari Y, Ostadabbas S. A Graph-Based Feature Extraction Algorithm Towards A Robust Data Fusion Framework for Brain-Computer Inter-

faces.*International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, 2021.

- **Huang X**, Rezaei B, Ostadabbas S, AH-CoLT: An AI-Human Co-Labeling Toolbox to Augment Efficient Groundtruth Generation. *IEEE International Workshop on Machine Learning for Signal Processing (MLSP)*, 2019.
- **Huang X**, Martens A, Zimmerman E, Ostadabbas S. Infant Contact-less Non-Nutritive Sucking Pattern Quantification via Facial Gesture Analysis. *CVPR Workshop on Augmented Human*, 2019.
- Rezaei B, **Huang X**, Yee J, Ostadabbas S. Long-Term Non-Contact Tracking of Caged Rodents. *42nd IEEE International Conference on Acoustics (ICASSP)*, 2017.

Patents

- Ostadabbas S, Wan M, **Huang X**, Luan L. Computer Vision based Assessment of Infant Face and Body Symmetry. *Invention Disclosure, INV-23028, Sep. 2022.*
- Ostadabbas S, **Huang X**. Clinical application of AR-guided EEG-based Attention Modification to prevent Depression (CREAM Depression). *Invention Disclosure, INV-23007, Aug. 2022.*
- Ostadabbas S, **Huang X**. AR-Based EEG-Guided Neglect Detection System (AREEN). *Invention Disclosure, INV-22101, May 2022.*
- Ostadabbas S, Zimmerman E, **Huang X**, Wan W. Infant Facial Landmark Estimation. *Invention Disclosure, INV-22104, May 2022.*
- Ostadabbas S, Liu S, **Huang X**, Fu N. 3D Human Pose Estimation System. *US Patent App. 2022-0051437, Feb. 2022.*
- Ostadabbas S, **Huang X**, Fu N, Liu S. A Robust Infant 2D Pose Estimation and Posture Detection System. *Invention Disclosure, INV-21102, Apr. 2021.*

RESEARCH PROJECTS

Developing infant static and dynamic pose generative models for data augmentation
Jun 2023 - Present

- Proposed a posture-guided infant static pose generative model, based on a conditional variational autoencoder simulator directed by posture information. This model facilitates the creation of infant image datasets featuring more realistic poses and controllable posture distributions.
- Developed an infant dynamic pose motion generative model to produce sequential infant pose data, improving the synthesis of dynamic movement representations.

Developing an infant action recognition model with limited data
Nov 2022 - May 2023

- Proposing a novel infant action recognition algorithm that deals with data limitations by representing each infant action as a sequence of a start posture state to a transition state to an end posture state.
- Presenting a video segmentor to detect the onset and offset of the transition state and then using the segmentation results and the frame-wise posture-based probabilities, the action label can be determine.
- Creating the first-ever infant action dataset comprised of 200 infant videos, called InfAct, with accurate posture state and transition segment annotations.

Implementing invariant representation learning of infant behaviors towards developmental milestone estimation and tracking *June 2021 - Nov 2022*

- Proposing a novel deep neural network classifier of infant posture, based on an input 2D or 3D poses. The use of appearance-independent poses rather than pixel-level features as input allows for privacy-respecting and bandwidth-efficient applications.
- Developing a computer vision based infant symmetry assessment system leveraging 2D/3D human pose estimation for infants.
- Establishing a vision-based AI-guided infant motor function monitoring and assessment system to enable unobtrusive tracking behavior markers in infant development.

Designing an augmented reality (AR)-based EEG-guided neglect (AREEN) detection, assessment and rehabilitation system *Sep 2019 - Aug 2023*

- Designing hardware and software of AREEN system to record EEG signals as a user views randomly appearing and disappearing targets on the head-mounted Microsoft HoloLens display.
- Proposing a time correction method to correct timestamp of EEG signal markers in real time.
- Developing EEG-guided neglect detector calibration/training and multimodal feedback for neglect rehabilitation.

Designing a neurofeedback training protocol for the adolescent attention to emotion study (AAES) *June 2021 -June 2022*

- Designing hardware and software of AAES training system to serve as independent or adjunctive preventative or early intervention treatment for adolescent major depressive disorder (MDD).
- Employing a custom EEG-based AR modality to deliver neurofeedback when AR headset Microsoft displays visual stimuli.

Developing a time- and data-efficient transfer learning approach to learn a pose estimator adapting to infant pose data *Mar 2020 - June 2021*

- Generating synthetic infant pose images dataset (SyRIP) by fitting a 3D skinned multi-infant linear (SMIL) body model into different feasible poses and then rendering them with various textures, backgrounds, and poses.
- Proposing a fine-tuned domain-adapted infant pose (FiDIP) model built upon a two-stage training paradigm.
- Synthesizing infant images/videos with variant poses and postures by rigging and animating an infant avatar in Blender.

Collecting and annotating data for Simultaneously-collected multimodal Lying Pose (SLP) dataset *Sep 2018 - May 2019*

- Conducting data collection and annotation to create a dataset including 13,770 pose samples for home setting and 945 samples for hospital setting 4 imaging modalities: RGB, IR, depth, and pressure map.

Developing an AI-Human Co-Labeling Toolbox (AH-CoLT) *Feb 2019 - May 2019*

- Proposing a three-stage annotation pipeline to efficiently generate ground truth for unlabeled images/videos.
- Employing the state-of-the-art pose estimation technologies (Hourglass, Faster R-CNN) to assist toolbox for producing initial labels.

Implementing 2D and 3D face landmarks detection and tracking for analyzing infant's non-nutritive sucking patterns from observation video *Feb 2019 - May 2019*

- Applying HOG+SVM based face detector to detect faces.

- Adopting 3D Morphable face model fitting to predict 68 3D landmarks of infant faces.
- Extracting infant's non-nutritive sucking patterns from specific landmark's movement by signal processing.

Simulating x-ray scattering of rigid protein in solution *Aug 2017 - Jan 2018*

- Employing VMD and NAMD to simulate x-ray scattering of rigid protein in solution.
- Evaluating simulated scattering patterns in SAXS and WAXS regions.
- Assisting in optimizing scattering patterns simulation program and developing GUI application of this program.

Implementing non-contact object tracking and behaviors monitoring of caged rodents from observation video *Aug 2016 - Dec 2016*

- Applying background subtraction methods to detect a rodent (i.e. vole) in the video.
- Adopting spatial-temporal filter to track the trajectory of the vole in video.

TEACHING & MENTORING EXPERIENCE

IEEE Signal Processing Society

- One of the main organizers of the IEEE Video and Image Processing Cup (VIP Cup) Competition: Privacy-Preserving In-Bed Human Pose Estimation. *Summer 2021*

ECE Department, Northeastern University

- Being the TA for the course Computer Vision with about 60 students. *Spring 2021*
- Mentoring a graduate student for her MS thesis on infant pose estimation topic. *Spring 2021*
- Mentoring one Capstone undergraduate team for implementing the "Augmented Reality for Parkinson's Disease" project. *Fall 2019*
- Mentoring high school students for Northeastern Young Scholar's Program (YSP). *Summer 2019*

WORK EXPERIENCE

Chinese Culture Connection, Inc., Malden, MA, USA *Mar 2018 - Nov 2018*

- Employing HTML, CSS and JavaScript to build the organization's website www.chineseculturecconnection.org via WIX web development platform.

Yichang Li Dao Crane Machinery Co., Ltd, Yichanag, China *Apr 2011 - Mar 2013*

- Carrying out research on the recovery and utilization of gravitational energy in tire crane.
- Analyzing energy exchange relationship and designed scheme of electrical control unit.
- Implementing dynamic excitation motor control based on microcontroller ATmega16.

HONORS & DISTINCTIONS

- Lux. Veritas. Virtus. Society of Distinction, Northeastern , 2024.
- ECE Excellence in Research Award, Northeastern University, 2022.
- Among top three graduate students of the ECE Department nominated for the Microsoft Ada Lovelace Fellowship, Northeastern University, 2020.
- Invention Patent for the Mixed Power Plant of Tire Arm Crane Sewing Mechanism, China, 2012.

- Excellent Student Scholarship, Wuhan University of Technology, Wuhan, China, 2012.
- National Scholarship, Ministry of Education of the People's Republic of China, China, 2008.