Baosheng (James) Hou

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PROFILE

I am a PhD student in Human-Computer Interaction (HCI) at Lancaster University, part of the GEMINI project team, supervised by Professor Hans Gellersen. I apply machine learning and signal processing to model human behaviour as context for interaction. Using an experimental approach, I prototype and explore various interface technologies, including eye tracking, extended reality, EOG, and EEG, and have co-authored papers in *CHI*, *ETRA*, *IEEE VR*, *INTERACT*, and *COGAIN*.

Skills: eye tracking, virtual reality, brain-computer interface, experiment, machine (deep) learning, signal processing.

Software languages: Python, C#, Unity, C++.

PROFESSIONAL EXPERIENCE

Research Intern | *Google* Jan 2024 - Oct 2024

- Prototyped novel features and conducted user studies.
- Designed real-time algorithms and system architecture to improve user experience in extended reality.
- Collaborated with research scientists and software engineers to facilitate the transfer of prototype to production.
- Supervisors: Mar Gonzalez-Franco and Lucy Abramyan

Research Assistant | *Technical University of Denmark* Oct 2020 - Jan 2021

- Developed smart visual aids in extended reality.
- Analysed eye tracking data to improve calibration.
- Implemented eye tracking experiment in Unity.
- Conducted clinical experiment with 20+ visually impaired patients.
- Collaborated with neuro-psychologist, computer scientists, and occupational therapists.
- Presented at Tech Expo events.
- Supervisors: Fiona Bríd Mulvey and Per Bækgaard

Research Assistant | *Auckland Bioengineering Institute* Nov 2013 - Feb 2014

- Tracked and animated shoulder movement using motion sensors.
- Supervisors: Kumar Mithraratne and Ted Yeung

Research Assistant | *Auckland Bioengineering Institute* Nov 2012 - Feb 2013

- Trained machine learning models to predict tissue deformation.
- Supervisor: Duane Malcolm

EDUCATION

PhD, Computer Science Jan 2021 - Current

Lancaster University

Thesis:

- Apply signal processing and machine learning to develop eye-head-based interaction techniques in virtual reality.
- Developed and evaluated ML classifiers that distinguish gaze-driven from gestural head movement.
- Presented research at the premier conference in the field (*CHI*).
- Supervisor: Hans Gellerson

MSc, Medicine and Technology Sep 2015 - Dec 2019

Technical University of Denmark

Thesis:

- Combined eye tracking and brain-computer interface to enable hands-free target acquisition.
- Implemented deep learning to classify motor-imagery inputs.

- Analyzed pupil data to infer mental load.
- Supervisors: Sadasivan Puthusserypady and John Paulin Hansen

BEng (Hons), Biomedical Engineering Mar 2012 - July 2015

University of Auckland

Thesis:

- Computational fluid dynamics modelling of the human vocal tract.
- Supervisors: Richard Clarke and John Cater

PEER-REVIEWED CONFERENCE PAPERS

Hou, B. J., Newn, J., Sidenmark, L., Khan, A. A., & Gellersen, H. (2024, June). **GazeSwitch: Automatic Eye-Head Mode Switching for Optimised Hands-Free Pointing**. In Proceedings of the ACM on Human-Computer Interaction, 8(ETRA) (pp. 1-20).

Chiossi F., Gruenefeld U., **Hou B. J.**, Newn J., Ou C., Liao R., Welsch R., Mayer S. **Understanding the impact of the reality-virtuality continuum on visual search using fixation-related potentials and eye tracking features**. In Proceedings of ACM on Human-Computer Interaction, 8 (MHCI) (pp. 1-33).

Newn, J., Quesada, S., **Hou, B. J.**, Khan, A. A., Weidner, F., & Gellersen, H. (2023, August). **Exploring Eye Expressions for Enhancing EOG-Based Interaction**. In IFIP Conference on Human-Computer Interaction (pp. 68-79). Cham: Springer Nature Switzerland.

Hou, B. J., Newn, J., Sidenmark, L., Ahmad Khan, A., Bækgaard, P., & Gellersen, H. (2023, April). **Classifying Head Movements to Separate Head-Gaze and Head Gestures as Distinct Modes of Input**. In Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems (pp. 1-14).

Mulvey, F. B., Mikitovic, M., Sadowski, M., **Hou, B. J.**, Rasamoel, N. D., Paulin Hansen, J. P., & Bækgaard, P. (2021, May). **Gaze interactive and attention aware low vision aids as future smart glasses**. In ACM Symposium on Eye Tracking Research and Applications (pp. 1-4).

PEER-REVIEWED WORKSHOP PAPERS

Hou, B. J., Y. Abdrabou, F. Weidner and H. Gellersen (2024, March). **Unveiling Variations: A Comparative Study of VR Headsets Regarding Eye Tracking Volume, Gaze Accuracy, and Precision**. In 2024 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (VRW). (pp. 650-655)

Hou, B. J., Hansen, J. P., Uyanik, C., Bækgaard, P., Puthusserypady, S., Araujo, J. M., & MacKenzie, S. (2022, June). **Feasibility of a Device for Gaze Interaction by Visually-Evoked Brain Signals**. In 2022 Symposium on Eye Tracking Research and Applications (pp. 1-7). (*COGAIN'22*)

Hou, B. J., Bækgaard, P., MacKenzie, S., Hansen, J. P. P., & Puthusserypady, S. (2020, June). **GIMIS: Gaze input with motor imagery selection**. In ACM Symposium on Eye Tracking Research and Applications (pp. 1-10). (*COGAIN'20*)

AWARDS

Best Paper Award | *COGAIN '20* 2020

- GIMIS: Gaze Input with Motor Imagery Selection

First place, start-up weekend | *Future Entrepreneur of Denmark* May 2017

Gold medal, synthetic biology competition | *International Genetically Engineered Machine (iGEM)* Nov 2016

- Served as a bioinformatics programmer and modeller on the Technical University of Denmark's student synthetic biology team. Conducted software prototyping and metabolic modelling.
- Advisor: Christopher Workman

DTU Blue Dot Project Diploma | *Technical University of Denmark* Oct 2016

- University award for great contribution and extraordinary skills demonstrated in student-driven, cross-disciplinary projects aimed at solving real-world engineering problems.

TEACHING ACTIVITY

Advisorship

Lancaster University, co-advisor with Hans Gellersen and Joshua Newn

- Sophia Quesada, BSc Final Year Project 2022
- Darie Gheorghe, BSc Final Year Project 2022

Teaching Assistant | *Lancaster University* Sep 2022 - Present

- **Human-Computer Interaction**: Led weekly 30-person seminars for undergraduate students. Facilitated in-class discussions, marked coursework, and provided feedback. (2022/23, 2023/24)

Professional Development | *Lancaster University*

- **Associate Teaching Programme (Associate fellow of the HEA)** 2022/23
- **Introduction to Teaching at Lancaster** 2022

Teaching Assistant | *Technical University of Denmark* Sep 2016 - Dec 2016

- **Introduction to Systems Biology**: Explained postgraduate-level concepts and assisted with in-class exercises.

PROFESSIONAL SERVICE

Scientific Conference Proceedings Reviewer

- **CHI:** ACM CHI Conference on Human Factors in Computing Systems '24 '23
- **ETRA:** ACM Symposium of Eye Tracking Research & Applications (Short papers commitee member) '24
- **MuC:** Mensch und Computer Conference '24
- **COGAIN:** Symposium on Communication by Gaze Interaction '23
- **NordiCHI:** ACM Nordic Conference on Human-Computer Interaction '22

Student Volunteer

- **CHI:** ACM CHI Conference on Human Factors in Computing Systems '23
- **ETRA:** ACM Symposium of Eye Tracking Research & Applications '23