QISONG WANG

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RESEARCH INTERESTS

Perception and adaptive interaction in virtual and mixed reality; psychophysical methods for XR interface design; cross-modal sensory integration; computational approaches to user modelling and personalised XR experiences.

EDUCATION

Ph.D. in Engineering 2017–2026
University of Cambridge, Department of Engineering
Thesis: *Enhancing Virtual Reality Interactions through Force Feedback: Perception, Tools, and Therapeutic Applications*
(defended December 2025; degree conferred May 2026; open access in Apollo repository)
Supervisor: Professor Per Ola Kristensson

M.Phil. in Advanced Computer Science 2016–2017
University of Cambridge, Department of Computer Science and Technology
Coursework: Machine Learning and Data Mining; Computer Vision; Biomedical Information Processing; Principles of Data Science; Affective Computing

B.Eng. (Hons) in Electronics & Electrical Engineering, First Class 2013–2016
University of Edinburgh, School of Engineering
Coursework: Signal and Communication Systems; Digital System Design; Engineering Mathematics; Control and Instrumentation

RESEARCH EXPERIENCE

Study 1: Psychophysical Investigation of Stiffness Perception in Haptic VR

- Conducted psychophysical experiments with 23 participants, using adaptive staircase procedures and psychometric curve fitting to measure stiffness discrimination thresholds with force-feedback gloves in VR.
- Measured virtual stiffness JNDs of 26%–48%, significantly above bare-finger baselines of 8%–22%. Weber fractions varied significantly with reference stiffness (1.8:1 ratio), violating Weber's Law, and workspace location significantly affected discrimination accuracy. These findings provide perceptual constraints for adaptive haptic interaction design.
- Built experimental platform in Unity/C# with force-feedback glove integration.

Study 2: User Behaviour and Force Feedback in Virtual Tool Manipulation

- Conducted a controlled between-subjects experiment with 52 participants on force feedback during precision grasping with virtual tweezers.
- Force feedback reduced over-gripping prevalence from 73% to 4% of users and mean applied force by 12%–13.2%, but did not improve task speed and increased cognitive load.
- Cluster analysis identified three user strategies (optimal 48%, over-grippers 38%, variable 13%), showing force feedback effects are user-dependent and motivating adaptive, user-tailored XR interaction.

Study 3: Iterative Design of a Force-Feedback VR Rehabilitation System

- Designed and implemented a VR rehabilitation system combining force-feedback gloves with game mechanics for home-based hand therapy.
- Conducted two iterative user studies (7 + 14 participants), reducing simulator sickness by 49% between iterations; validated the system with 3 physical therapists. Published at IEEE VR 2022.

PUBLICATIONS

[1] **Q. Wang** and P. O. Kristensson. Stiffness Discrimination Thresholds of Force-Feedback Gloves for Volumetric Data Exploration in Virtual Reality. *IEEE Transactions on Visualization and Computer Graphics (TVCG)*, 2026. Presented at *IEEE VR 2026*, Daegu, South Korea. doi:10.1109/TVCG.2026.3680713

[2] **Q. Wang** and P. O. Kristensson. Investigating How Force Feedback Affects User Behavior in Virtual Tool Manipulation. Manuscript in preparation.

[3] **Q. Wang**, B. Kang, and P. O. Kristensson. Supporting Playful Rehabilitation in the Home using Virtual Reality Headsets and Force Feedback Gloves. *IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR)*, pp. 504–511, 2022. Cited 19 times. doi:10.1109/VR51125.2022.00070

[4] **Q. Wang**, B. Kang, and P. O. Kristensson. Supporting Physical and Mental Health Rehabilitation at Home with Virtual Reality Headsets and Force Feedback Gloves. *IEEE VR Abstracts and Workshops (VRW)*, pp. 685–686, 2021. Cited 15 times. doi:10.1109/VRW52623.2021.00225

TECHNICAL SKILLS

Programming:	Python (NumPy, SciPy, Scikit-Learn, PyTorch), R, C#, C/C++
VR/MR Systems:	Unity, force-feedback device integration, Meta Quest
Tools:	Git, Linux, LaTeX

AWARDS

- First Prize, Citadel/Citadel Securities Datathon (UK Region), 2017
- First Prize, ABB (China) University Innovation Contest, 2015
- Horsburgh Prize for Engineering Mathematics, University of Edinburgh, 2014

PROFESSIONAL ACTIVITIES

- Paper presentations at IEEE VR 2022 and IEEE VR 2026
- Peer reviewer for IEEE VR