

# XIYUAN SHEN

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## EDUCATION

**Tsinghua University**, Beijing, China 2016.09 - 2021.07  
Bachelor in Creative Design and Intelligent Engineering, GPA=3.90/4.00, Ranking=2/13, With Honor  
**Tsinghua University**, Beijing, China 2021.09 - 2024.06  
Master in Computer Science and Technology, GPA=4.00/4.00, Ranking=1/65, With Honor  
**University of Washington**, Seattle, USA 2024.09 - Present  
Ph.D. student in Paul G. Allen School of Computer Science & Engineering

## RESEARCH EXPERIENCE

**ACE Lab, University of Washington** 2024.09 - Present  
• Advisors: Dr. Jacob Wobbrock  
• Develop multimodal sensing systems to measure driver cognitive load and design an adaptive user interface that dynamically adjusts to the user, thereby improving driving performance.

**Pervasive Interaction Lab, Tsinghua University** 2021.09 - 2024.06  
• Advisors: Dr. Chun Yu, Dr. Yuanchun Shi  
• Develop interactive systems, novel algorithms, and new wearable forms to support users interacting through subtle movements, including using EMG sensors to perceive teeth clenching for AR target selection and using smart rings to track finger movements to support always-available touchpad interactions.  
• Through hardware design and algorithm optimization, integrate interaction technologies such as ClenchClick and MouseRing into actual AR devices, supporting interaction in real-life scenarios.

**Makeability Lab, Washington University** 2020.06 - 2020.09  
• Advisors: Dr. Liang He, Dr. Jon E. Froehlich  
• Design the intelligent manufacturing process of tactile pavement using 3D printing technology. Implement a user-friendly GUI for *Indoor Space Tactile Pavement Planning and Design*. Design patterns for tactile pavement and write manufacturing process code.

**Future Lab, Tsinghua University** 2019.11 - 2020.06  
• Advisors: Dr. Jiaxiong Hu, Dr. Yingqing Xu  
• Recognize user emotions during conversations utilizing NLP methods. Develop online personalized chatbots that can effectively initiate questions based on users' emotions.

## PUBLICATIONS

**Xiyuan Shen**, Yukang Yan, Chun Yu, Yuanchun Shi. *ClenchClick: Hands-Free Target Selection Method Leveraging Teeth-Clench for Augmented Reality* (IMWUT 2022)

- We propose ClenchClick, a novel interaction method that uses teeth clenching to support target selection in AR, achieving a 99% selection accuracy rate and a lower task load compared to gesture interaction.
- We implement a robust clench detection algorithm and an ML-based calibration phase to improve personalized detection.
- We conduct user studies to investigate the usability of ClenchClick in real-world applications.

**Xiyuan Shen**, Chun Yu, Xutong Wang, Chen Liang, Yuanchun Shi. *MouseRing: Always-available Touchpad Interaction with IMU Rings* (CHI 2024, Honorable Mentioned Awards)

- We propose MouseRing, a ring-formed IMU device that supports always-available and accurate touchpad interactions on unmodified physical surfaces.
- We model human finger motility as a prior knowledge of finger-tracking and implement a fingertip-tracking algorithm that incorporates physical knowledge into machine learning methods.

Minghao Tu, Chun Yu, Zhi Zheng, **Xiyuan Shen**, Li Chen and Yuanchun Shi *TextOnly: A Unified Function Portal for Text-Related Functions on Smartphones* (CCHI 2024)

- We propose TextOnly, a unified function portal of the text box that can interpret user intentions from inputting text taking advantage of LLM, thereby enhancing the efficiency of smartphone function utilization.

Zhe He, Zixuan Wang, Chengwen Zhang, **Xiyuan Shen**, Yuanchun Shi. *WritingRing: Enabling Natural Handwriting Input with a Single IMU Ring* (CHI 2025)

- We propose using a single IMU ring to capture and interpret handwriting on flat surfaces, presenting a promising approach for character and word recognition using real-time data.

**Xiyuan Shen**, Seokhyun Hwang, Alexandre L. S. Filipowicz, Andrew Best, Jean M. Costa, Scott Carter, James Forgy, Jacob O. Wobbrock *Touchscreens in Motion: Quantifying the Impact of Cognitive Load on Distracted Drivers* (Under Review)

- We quantitatively study how varying cognitive loads affect drivers' touchscreen pointing performance and visual attention.
- We show how drivers adapt their visual attention to balance touchscreen interaction efficiency and driving safety.

Chen Liang, Chi Hsia, **Xiyuan Shen**, Ying Hu, Yuntao Wang, Chun Yu, Yuanchun Shi. *Compensating Visual Hand Tracking Artifacts with Wearable Inertial Sensors*(Under Review)

- We conduct a systematic analysis of visual artifacts by observing visual-inertial channel differences.
- We propose an FCN-based pinch recognition model and a visual-inertial filtering algorithm in optimizing both event detection and hand dynamics.

## INDUSTRY EXPERIENCE

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**Toyota Research Institute(TRI)**, Research Intern 2025.06 - 2025.09

- Develop cognitive load-aware AI agents to better support human driving performance under performance-driving conditions.

**Tencent, Xiaowei Cloud-computing Platform**, Product Management Intern 2019.06 - 2019.09

- Perform user data analysis and capture new requirements for Voice User Interface in smart speakers with millions of users.

**Global Product Project** 2018.08 - 2018.12

- Complete a functional prototype of an algae-based air purifier through 3D modeling, industrial design, and embedded system development.

**REMO AI**, Research Intern 2018.06 - 2018.08

- Understand user requirements for action cameras through user interviews. Optimize facial recognition algorithms to meet the tracking and shooting needs of street dance users.

## HONORS & AWARDS

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**Siebel Scholar of Class 2024** (Top 5 for outstanding academic performance and leadership) 2023.09

Tsinghua University Comprehensive Excellence Scholarship 2022.10

**Tsinghua University Excellent Graduate**(Top 5%) 2021.06

Tsinghua University Science and Technology Innovation Scholarship 2020.10

Tsinghua University Industrial and Commercial Bank Scholarship 2019.10

Tsinghua University Toyota Scholarship 2018.10

Tsinghua University Academic Excellence Scholarship 2017.10

## SERVICES

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**Reviewer** of The ACM Conference on Human Factors in Computing Systems (CHI) 2023

## COMPETITIONS

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RecSys 2022 Challenge **33rd place** 2022.06

NeurIPS 2018-Pommerman Reinforcement Learning AI Competition **9rd place** 2018.09

## SKILLS

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**Programming Languages:** Python, C/C++, Java, MATLAB, JavaScript, HTML, Processing, LATEX

**Tools & Platforms:** PyTorch, Linux, Arduino, Android SDK, Unity, Verilog

**3D Modeling & Design:** Solidworks, Keyshot, AutoCAD, 3D Printing, PS, AI, Lightroom, PR, AU

**Sensors:** IMU, EMG, Depth camera, OptiTrack, Pressure Sensors, EEG, Microphone, Eye-tracking

**Language:** Mandarin (Native), English (Toefl = 109, CET-4 = 654)