Robert Xiao

CURRICULUM VITAE

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University of British Columbia
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EDUCATION

PhD in Human-Computer Interaction **2011 – 2018**
Carnegie Mellon University, Pittsburgh, PA
Thesis Defended: May 30, 2018
On-World Computing: Unleashing Computation on the World Around Us

Bachelor of Mathematics **2007 – 2011**
University of Waterloo, Waterloo, ON
Double Honours in Computer Science and Combinatorics & Optimization

POSITIONS AND APPOINTMENTS HELD

Assistant Professor, University of British Columbia **2019 – Present**
Assistant Professor in the Department of Computer Science.
Vancouver, BC, Canada

Research Consultant, Microsoft Research **2017**
Mentored by Julia Schwarz and Hrvoje Benko. Work focused on advancing interactions in augmented reality.
Redmond, WA, USA

Research Intern, Microsoft Research **2016**
Mentored by Andy Wilson and Hrvoje Benko. Work focused on advancing interactions in augmented reality.
Redmond, WA, USA

Research Intern, Microsoft Research **2015**
Mentored by Andy Wilson. Work focused on expanding the FoV of VR systems using sparse peripheral displays. Work resulted in the Sparse Peripheral Displays paper, which earned an honorable mention at CHI 2016.
Redmond, WA, USA

Software Architect, Qeexo, Co. **2013**
Summer internship with CMU spinoff. Work focused on engineering rich multitouch solutions for mobile devices.
Pittsburgh, PA, USA

Research Intern, Microsoft Research **2012**
Mentored by John Tang. Work focused on in-home physical proxies for video communication. HomeProxy publication resulted from this internship.
Redmond, WA, USA

Embedded Software Developer, Research in Motion **2011**
Development and validation of embedded radio firmware for 3G modems.
Waterloo, ON, Canada

Summer Research Student, University of Saskatchewan **2010**
Summer research with the Interaction Lab, Department of Computer Science, mentored by Carl Gutwin. Research funded by NSERC under the Undergraduate Student Research Award program.
Saskatoon, SK, Canada

Summer Research Student, University of Saskatchewan **2009**
Summer research with the Interaction Lab, Department of Computer Science, mentored by Regan Mandryk and Carl Gutwin. Research funded by NSERC under the Undergraduate Student Research Award program.
Saskatoon, SK, Canada

Summer Research Student, University of Saskatchewan **2008**
Summer research with the Imaging, Multimedia and Graphics Lab, Department of Computer Science, mentored by Mark Eramian. Research funded by NSERC under the Undergraduate Student Research Award program.
Saskatoon, SK, Canada

Database Analyst, University of Saskatchewan **2007**
Database analyst with the Centre for Continuing and Distance Education at the University of Saskatchewan.
Saskatoon, SK, Canada

HONOURS AND AWARDS

FUNDING

NSERC Research Tools and Instruments **2021 – 2022**
$89,838 for one year for non-optical motion tracking equipment; co-applicant with Dinesh K. Pai (PI), Helge Rhodin, and Kwang Moo Yi. Provided by the National Science and Engineering Research Council through a competitive application process

NSERC Discovery Launch Supplement **2019 – 2024**
$12,500 award for exceptional Early Career Researchers provided as a supplement to the Discovery Grant

NSERC Discovery Grant **2019 – 2024**
$195,000 over five years ($39,000 per year) provided by the National Science and Engineering Research Council through a competitive application process

Rogers 5G Partnership Grant **2019 – 2022**
$289,800 project grant for three years, provided by Rogers Canada for research in AR/VR interactions through a competitive granting process.

SCHOLARSHIPS & FELLOWSHIPS

NSERC Postgraduate Scholarship **2013 – 2015**
$63,000 award for three years, awarded to top Canadian graduates in their third year of a graduate program of study

Qualcomm Innovation Fellowship **2012**
$100,000 award for one year for a team of two students

NSERC Julie Payette Postgraduate Scholarship **2011**
$25,000 award for one year awarded to top Canadian students in their first year of a graduate program of study

NSERC Undergraduate Student Research Award **2008 – 2010**
Canadian federal fellowships to support academic research as an undergraduate student

Rene Descartes Scholarship **2007 – 2011**
Awarded to students with strong performance on Canadian national mathematics competitions

SELECTED HONOURS AND AWARDS

SIGCHI Outstanding Dissertation Award **2019**
Awarded for the most outstanding dissertations within the HCI community.

Fast Company Innovation by Design Experimental Finalist **2018**
Awarded for LumiWatch, recognizing an outstanding work of innovation. LumiWatch also earned an Honorable Mention in the Student category.

Fast Company Innovation by Design Student Award **2016**
Awarded for EM-Sense, recognizing an outstanding work of innovation. A total of 15 awards were given out from a pool of 1700 nominations

Allen Newell Award for Research Excellence **2015**
Awarded w/ Scott Hudson to recognize outstanding body of work within the School of Computer Science at Carnegie Mellon University

Governor General's Silver Medal **2011**
Awarded to the individual with the highest academic average over all graduating students

Rising Stars of Research Honourable Mention **2010**
Awarded to outstanding posters in the national Rising Stars of Research Poster Competition

NSERC USRA Poster Competition First Prize **2009, 2010**
Awarded to the top poster presented at the University of Saskatchewan USRA Poster Fair

Putnam Mathematics Competition **2008**
110th place in North America (4th in U of Waterloo)

President's Scholarship of Distinction **2007**
Awarded to students with a 95% entrance average or higher

PUBLICATIONS

35. Yin, M. and **Xiao, R.** (2022). The Reward for Luck: Understanding the Effect of Random Reward Mechanisms in Video Games on Player Experience. To appear in *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (CHI '22). ACM, New York, NY, USA. 12 pages.

34. Straubinger, T., **Xiao, R.** and Rhodin, H. (2022). Learned Acoustic Reconstruction Using Synthetic Aperture Focusing. To appear in *Proceedings of the 2022 IEEE International Conference on Acoustics, Speech and Signal Processing* (ICASSP '22). Institute of Electrical and Electronics Engineers. 4 pages.

33. Unlu, A. E. and **Xiao, R.** (2021). PAIR: Phone as an Augmented Immersive Reality Controller. In *Proceedings of the 27th ACM Symposium on Virtual Reality Software and Technology* (*VRST '21*). Association for Computing Machinery, New York, NY, USA, Article 27, 1–6. DOI: https://doi.org/10.1145/3489849.3489878

32. Shakeri, H., Elbaggari, H., Bucci, P., **Xiao, R.** and MacLean, K.E. (2021). FoldMold: Automating Papercraft for Fast DIY Casting of Scalable Curved Shapes. To appear in *Proceedings of Graphics Interface '21*. 10 pages.

31. **Xiao, R.**, Mayer, S. and Harrison, C. (2020). VibroComm: Using Commodity Gyroscopes for Vibroacoustic Data Reception. In *Proceedings of the 22nd International Conference on Human-Computer Interaction with Mobile Devices and Services* (MobileHCI '20). ACM, New York, NY, USA. Article 5, 1–9. DOI: https://doi.org/10.1145/3379503.340354.

30. Kianzad, S., Huang, Y., **Xiao, R.** and MacLean, K.E. (2020). Phasking on Paper: Accessing a Continuum of PHysically Assisted SKetchING. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (CHI '20). ACM, New York, NY, USA. 12 pages. DOI: https://doi.org/10.1145/3313831.3376134.
Honourable Mention Award

29. Ahuja, K., Pareddy, S., **Xiao, R.**, Goel, M. and Harrison, C. (2019). LightAnchors: Appropriating Point Lights for Spatially-Anchored Augmented Reality Interfaces. In *Proceedings of the 32nd Annual Symposium on User Interface Software & Technology* (UIST '19). ACM, New York, NY, USA. 189-196.
DOI: https://doi.org/10.1145/3332165.3347884

28. Ahuja, K., Harrison, C., Goel, M. and **Xiao, R.** (2019). MeCap: Whole-Body Digitization for Low-Cost VR/AR Headsets. In *Proceedings of the 32nd Annual Symposium on User Interface Software & Technology* (UIST '19). ACM, New York, NY, USA. 453-462. DOI: https://doi.org/10.1145/3332165.3347889. **Honourable Mention Award**

27. **Xiao, R.**, Cao, T., Guo, N., Zhuo, J., Zhang, Y. and Harrison, C. (2018). LumiWatch: On-Arm Projected Graphics and Touch Input. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (CHI '18). Paper 95, 11 pages. DOI: https://doi.org/10.1145/3173574.3173669

26. **Xiao, R.**, Schwarz, J., Throm, N., Wilson, A. and Benko, H. (2018). MRTouch: Adding Touch Input to Head-Mounted Mixed Reality. In *IEEE Transactions on Visualization and Computer Graphics* (TVCG) Special Issue, Volume 24, Number 4, 1653-1660. DOI: https://doi.org/10.1109/TVCG.2018.2794222

25. **Xiao, R.**, Hudson, S.E. and Harrison, C. (2017). Supporting Responsive Cohabitation Between Virtual Interfaces and Physical Objects on Everyday Surfaces. In *Proceedings of the ACM on Human-Computer Interaction, Engineering Interactive Computing Systems* (EICS ’17). ACM, New York, NY, USA. Article 12. 17 pages. DOI: https://doi.org/10.1145/3095814

24. **Xiao, R.**, Laput, G., Zhang, Y. and Harrison, C. (2017). Deus EM Machina: On-Touch Contextual Functionality for Smart IoT Appliances. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (CHI '17). ACM, New York, NY, USA, 4000-4008. DOI: https://doi.org/10.1145/3025453.3025828

23. **Xiao, R.**, Hudson, S.E. and Harrison, C. (2016). CapCam: Enabling Quick, Ad-Hoc, Position-Tracked Interactions Between Devices. In *Proceedings of the 2016 International Conference on Interactive Surfaces & Spaces* (ISS '16). ACM, New York, NY, USA, 169-178. DOI: https://doi.org/10.1145/2992154.2992182

22. **Xiao, R.**, Hudson, S.E. and Harrison, C. (2016). DIRECT: Making Touch Tracking on Ordinary Surfaces Practical with Hybrid Depth-Infrared Sensing. In *Proceedings of the 2016 International Conference on Interactive Surfaces & Spaces* (ISS '16). ACM, New York, NY, USA, 85-94. DOI: https://doi.org/10.1145/2992154.2992173

21. Laput, G., **Xiao, R.** and Harrison, C. (2016). ViBand: High-Fidelity Bio-Acoustic Sensing Using Commodity Smartwatch Accelerometers. In *Proceedings of the 29th Annual Symposium on User Interface Software & Technology* (UIST '16). ACM, New York, NY, USA, 321-333. DOI: https://doi.org/10.1145/2984511.2984582.
Best Paper Award

20. Zhang, Y., **Xiao, R.** and Harrison, C. (2016). Advancing Hand Gesture Recognition with High Resolution Electrical Impedance Tomography. In *Proceedings of the 29th Annual Symposium on User Interface Software & Technology* (UIST '16). ACM, New York, NY, USA, 843-850. DOI: https://doi.org/10.1145/2984511.2984574

19. **Xiao, R.**, Benko, H. Augmenting the Field-of-View of Head-Mounted Displays with Sparse Peripheral Displays. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (CHI '16). ACM, New York, NY, USA, 1221-1232. DOI: https://doi.org/10.1145/2858036.2858212. **Honourable Mention Award**

18. **Xiao, R.**, Schwarz, J. and Harrison, C. (2015). Estimating 3D Finger Angle on Commodity Touchscreens. In *Proceedings of the 2015 International Conference on Interactive Tabletops & Surfaces* (ITS '15). ACM, New York, NY, USA, 47-50. DOI: https://doi.org/10.1145/2817721.2817737

17. Guo, A., **Xiao, R.** and Harrison, C. (2015). CapAuth: Identifying and Differentiating User Handprints on Commodity Capacitive Touchscreens. In *Proceedings of the 2015 International Conference on Interactive Tabletops & Surfaces* (ITS '15). ACM, New York, NY, USA, 59-62. DOI: https://doi.org/10.1145/2817721.2817722

16.  Chatterjee, I., **Xiao, R.** and Harrison, C. (2015). Gaze+Gesture: Expressive, Precise and Targeted Free-Space Interactions. In *Proceedings of the 2015 International Conference on Multimodal Interaction* (ICMI '15). ACM, New York, NY, USA, 131-138. DOI: http://dx.doi.org/10.1145/2818346.2820752. **Best Paper Award**

15.  Laput, G., Yang, C., **Xiao, R.**, Sample, A. and Harrison, C. (2015). EM-Sense: Touch Recognition of Uninstrumented, Electrical and Electromechanical Objects. In *Proceedings of the 28th Annual ACM Symposium on User Interface Software & Technology* (UIST '15). ACM, New York, NY, USA, 157-166. DOI: https://doi.org/10.1145/2807442.2807481. **Best Talk Award**

14. Laput, G., Lasecki, W.S., Wiese, J., **Xiao, R.**, Bigham, J.P. and Harrison, C. (2015). Zensors: Adaptive, Rapidly Deployable, Human-Intelligent Sensor Feeds. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (CHI '15). ACM, New York, NY, USA. 1935-1944. DOI: https://doi.org/10.1145/2702123.2702416

13. Laput, G., **Xiao, R.**, Chen, X., Hudson, S.E., Harrison, C. (2014). Skin Buttons: Cheap, Small, Low-Powered and Clickable Fixed-Icon Laser Projectors. In *Proceedings of the 27th Annual ACM Symposium on User Interface Software and Technology* (UIST '14). ACM, New York, NY, USA. 389-394. DOI: https://doi.org/10.1145/2642918.2647356

12. **Xiao, R.**, Lew, G., Marsanico, J., Hariharan, D., Hudson, S.E., Harrison, C. (2014). Toffee: Enabling Ad Hoc, Around-Device Interaction with Acoustic Time-of-Arrival Correlation. In *Proceedings of the 16th International Conference on Human-Computer Interaction with Mobile Devices and Services* (MobileHCI '14). ACM, New York, NY, USA. 67-76. DOI: http://dx.doi.org/10.1145/2628363.2628383

11. **Xiao, R.**, Laput, G., Harrison, C. (2014). Expanding the Input Expressivity of Smartwatches with Physical Pan, Twist, Tilt and Click. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 2014* (CHI '14). ACM, New York, NY, USA. 193-196. DOI: https://doi.org/10.1145/2556288.2557017

10. Schwarz, J., **Xiao, R.**, Mankoff, J., Hudson, S.E., Harrison, C. (2014). Probabilistic Palm Rejection Using Spatiotemporal Touch Features and Iterative Classification. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 2014* (CHI '14). ACM, New York, NY, USA. 2009-2012. DOI: https://doi.org/10.1145/2556288.2557056

9. Harrison, C., **Xiao, R.**, Schwarz, J., Hudson, S.E. (2014). TouchTools: Leveraging Familiarity and Skill with Physical Tools to Augment Touch Interaction. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 2014* (CHI '14). ACM, New York, NY, USA. 2913-2916.
DOI: https://doi.org/10.1145/2556288.2557012

8. **Xiao, R.**, Harrison, C., Hudson, S.E. (2013). Lumitrack: High Speed, High Precision, Low-Cost Tracking with Projected m-Sequences. In *Proceedings of the 26th Annual ACM Symposium on User Interface Software and Technology* (UIST '13). ACM, New York, NY, USA. 3-12. DOI: http://dx.doi.org/10.1145/2501988.2502022

7. **Xiao, R.**, Harrison, C., Hudson, S.E. (2013). WorldKit: Rapid and Easy Creation of Ad-hoc Interactive Applications on Everyday Surfaces. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 2013* (CHI '13). ACM, New York, NY, USA. 879-888. DOI: https://doi.org/10.1145/2470654.2466113

6. Tang, J., **Xiao, R.**, Hoff, A., Venolia, G., Therien, P., Roseway, A. (2013). HomeProxy: Exploring a Physical Proxy for Video Communication in the Home. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 2013* (CHI '13). ACM, New York, NY, USA. 1339-1342.
DOI: https://doi.org/10.1145/2470654.2466175

5. Bateman, S., Mandryk, R.L., Gutwin, C., **Xiao, R.** (2013). Analysis and Comparison of Target Assistance Techniques for Relative Ray-Cast Pointing. In *International Journal of Human-Computer Studies* (IJHCS), Volume 71, Issue 5, 511-532.
DOI: http://dx.doi.org/10.1016/j.ijhcs.2012.12.006

4. Harrison, C., **Xiao, R.**, Hudson, S.E. (2012). Acoustic Barcodes: Passive, Durable and Inexpensive Notched Identification Tags. In *Proceedings of the 25th Annual ACM Symposium on User Interface Software and Technology* (UIST '12). ACM, New York, NY, USA, 563-568. DOI: https://doi.org/10.1145/2380116.2380187

3. **Xiao, R.**, Nacenta, M., Mandryk, R.L., Cockburn, A., Gutwin, C. (2011). Ubiquitous Cursor: A Comparison of Direct and Indirect Pointing Feedback in Multi-Display Environments. In *Proceedings of Graphics Interface 2011* (GI '11). Canadian Human-Computer Communications Society, Waterloo, Ontario, Canada, 135-142.
Best Student Paper Award

2. Bateman, S., Doucette, A., **Xiao, R.**, Gutwin, C., Mandryk, R.L., Cockburn, A. (2011). Effects of view, input device, and track width on video game driving. In *Proceedings of Graphics Interface 2011* (GI '11). Canadian Human-Computer Communications Society, Waterloo, Ontario, Canada, 207-214.

1. Gutwin, C., Schneider, O., and **Xiao, R.** (2011). Chalk Sounds: Using Synthesized Audio to Improve Workspace Awareness in Distributed Groupware. In *Proceedings of the 2011 Conference on Computer Supported Cooperative Work* (CSCW '11). ACM, New York, NY, USA, 85-94. DOI: https://doi.org/10.1145/1958824.1958838

PATENTS

26. Harrison, C., **Xiao, B.R.** (2021). Inertial measurement units as vibroacoustic data receivers. Patent Application US20220011113A1, filed June 23, 2021. Patent pending.

25. Ahuja, K., Pareddy, S., **Xiao, B.R.**, Harrison, C., Goel, M. (2020). System and method using light sources as spatial anchors. Patent Application US20200357182A1, filed May 6, 2020. Patent pending.

24. Agarwal, Y., Harrison, C., Laput, G., Boovaraghavan, S., Chen C., Hota, A., **Xiao, B.R.**, Zhang, Y. (2020). Virtual sensor system. Patent Application US20200033163A1, filed January 30, 2020. Patent pending.

23. Stone, J. D., Chen, Y., Dorbala, S. P., **Xiao, B.R.** (2019). Managing activity states of an application processor in relation to touch or hover interactions with a touch sensitive device. **US Patent** 10942603, filed May 6, 2019 and granted March 9, 2021.

22. Harrison, C., **Xiao, B.R.**, Hudson, S.E. (2017). Hybrid depth and infrared image sensing and method for enhanced touch tracking on ordinary surfaces. Patent Application US20190302963A1, filed May 31, 2017. Patent pending.

21. **Xiao, B.R.**, Harrison, C., Hudson, S.E. (2017). System and Process for Enabling Secure, Instant, and Anonymous Communication Between Physically Touching Devices. **US Patent** 10942550, filed April 20, 2017 and granted March 9, 2021.

20. Agarwal, Y., Harrison, C., Laput, G., Boovaraghavan, S., Chen C., Hota, A., **Xiao, B.R.**, Zhang, Y. (2018). Virtual sensor system. **US Patent** 10436615, filed April 24, 2018 and granted October 8, 2019.

19. Schwarz, J., **Xiao, B.R.**, Benko, H., Wilson, A. (2017). Virtual object user interface display. **US Patent** 10290152, filed April 3, 2017 and granted May 14, 2019.

18. Schwarz, J., Benko, H., Wilson, A.D., Pengelly, R.C.J., **Xiao, B.R.** (2016). Interactive virtual objects in mixed reality environments. Patent Application US20180173300A1, filed December 19, 2016. Patent pending.

17. Harrison, C., **Xiao, R.**, Laput, G. (2016). Method and System for Interacting with a Wearable Electronic Device. Patent Application US20190129508, filed June 23, 2016. Patent pending.

16. Harrison, C., **Xiao, R.**, Laput, G. (2016). A System for Enabling Rich Contextual Applications for Interface-Poor Smart Devices. Patent Application US20190101992, filed April 21, 2016. Patent pending.

15. Benko, H., **Xiao, R.B.** (2016). Peripheral display for head mounted display device. **US Patent** 10175487, filed March 29, 2016 and granted January 8, 2019.

14. Yang, C., Laput, G., **Xiao, R.**, Harrison, C., Sample, A. (2015). Automatic object detection and state estimation via electronic emissions sensing. **US Patent** 9881273, filed October 28, 2015 and granted January 30, 2018.

13. Harrison, C., Schwarz, J., **Xiao, R.B.** (2015). Determining pitch for proximity sensitive interactions. **US Patent** 10564761, filed July 1, 2015 and granted February 18, 2020.

12. Laput, G., Harrison, C., Bigham, J.P., Lasecki, W.S., **Xiao, R.B.**, Wiese, J. System and method for adaptive, rapidly deployable, human-intelligent sensor feeds. **US Patent** 10657385, filed March 25, 2015 and granted May 19, 2020.

11. Harrison, C., Schwarz, J., **Xiao, R.** (2015). Method and apparatus for classifying finger touch events on a touchscreen. **US Patent** 9864454, filed February 2, 2015 and granted January 9, 2018.

10. **Xiao, R.**, Schwarz, J., Harrison, C. (2014). Method and apparatus for addressing touch discontinuities. **US Patent** 10095402, filed October 1, 2014 and granted October 9, 2018.

9. Schwarz, J., **Xiao, R.B.**, Harrison, C. (2014). Method and apparatus for classifying contacts with a touch sensitive device. US Patent Application 20160299515A1, filed September 25, 2014. Patent pending.

8. Harrison, C., **Xiao, R.B.**, Hudson, S.E., Poupyrev, I., Willis, K.D.D. (2014). System and method for tracking objects with projected m-sequences. **US Patent** 10126123, filed September 19, 2014 and granted November 13, 2018.

7. Harrison, C., Schwarz, J., **Xiao, R.B.** (2014). Method and apparatus for resolving touch screen ambiguities. **US Patent** 10096502, filed September 15, 2014 and granted October 9, 2018.

6. **Xiao, R.B.**, Lew, G., Schwarz, J., Harrison, C. (2014). Using Capacitive Images for Touch Type Classification. US Patent Application 20150242009, filed February 26, 2014. Patent pending.

5. Harrison, C., Schwarz, J., **Xiao, R.B.** (2014). Determining pitch and yaw for touchscreen interactions. **US Patent** 9778783, filed February 12, 2014 and granted October 3, 2017.

4. Harrison, C., Schwarz, J., **Xiao, R.B.** (2013). Capture of Vibro-Acoustic Data Used to Determine Touch Types. US Patent Application 20150035759, filed August 2, 2013. Patent pending.

3. Harrison, C., Schwarz, J., **Xiao, R.B.** (2013). Using Finger Touch Types to Interact with Electronic Devices. **US Patent** 10599250, filed May 6, 2013 and granted March 24, 2020.

2. Harrison, C., Schwarz, J., **Xiao, R.B.**, Hudson, S.E. (2013). Virtual Tools for Use with Touch-Sensitive Surfaces. **US Patent** 10082935, filed April 15, 2013 and granted September 25, 2018.

1. Harrison, C., Schwarz, J., **Xiao, R.B.** (2013). Method and system for activating different interactive functions using different types of finger contacts. **US Patent** 9013452, filed March 25, 2013 and granted April 21, 2015.

POSTERS

4. **Xiao, R.**, Harrison, C. (2012). Synthetic Sensors and Displays. Presented at the Qualcomm Innovation Winner's Day, September 2012.

3. **Xiao, R.**, Nacenta, M., Cockburn, A., Mandryk, R., Gutwin, C. (2010). Ubiquitous Cursor: Filling in the Space Between Displays. Presented at the University of Saskatchewan USRA Poster Fair, August 2010. **First Prize**.

2. **Xiao, R.** (2010). Ubiquitous Cursor. Presented at the University of British Columbia Rising Stars of Research poster competition. **Honorable Mention**.

1. **Xiao, R.**, Bateman, S., Mandryk, R., Gutwin, C. (2009). Enhancing the Effectiveness of Remote Pointing. Presented at the University of Saskatchewan USRA Poster Fair, August 2009. **First Prize**.

SELECTED INVITED PRESENTATIONS

10. UW Dub Seminar. Seattle, USA, November 25, 2020 (presented virtually).

9. Huawei HMI Lab. Shenzhen, China, July 14, 2020 (presented virtually).

8. CNU Information Engineering Seminar. Beijing, China, April 26, 2019.

7. DFP @ UBC Seminar Series. Vancouver, Canada, March 13, 2019.

6. "MRTouch: Adding Touch Input to Head-Mounted Mixed Reality." SIGGRAPH. Vancouver, Canada, August 12, 2018.

5. UMN CSE Colloquium. Minnesota, USA, April 9, 2018.

4. MIT CSAIL HCI Seminar Series. Boston, USA, March 19, 2018.

3. UCSB Computer Science. Santa Barbara, USA, January 18, 2018.

2. "CapCam: Enabling Quick, Ad-Hoc, Position-Tracked Interactions Between Devices." Engadget Live. New York City, USA, October 29, 2015.

1. "Evolving the Human-Computer Interface." Co-Keynote presentation with Sir Tim Berners Lee. "WE: Way to Evolve" summit. Tencent. Shenzhen, China, November 10, 2013.

SECURITY ADVISORIES

2. Corwin de Boor and Robert Xiao. CVE-2019-2684 "Vulnerability in RMI Registry bind/unbind/rebind", found in Oracle Corporation's Java Standard Library. Published April 16, 2019.

1. Robert Xiao. LocationSmart API Vulnerability. Published May 17, 2018.

SELECTED PRESS COVERAGE

LocationSmart, 2018

In May of 2018, I discovered a significant security vulnerability which disclosed real-time location data for a majority of mobile phone subscribers in North America.

Original coverage:

- https://apnews.com/a60b6c98a1ff434883313469f4487639 "Website flaw exposes real-time locations of US cellphones" (May 17, 2018; syndicated to NYTimes, Washington Post, and 300 other news outlets)
- https://www.zdnet.com/article/cell-phone-tracking-firm-exposed-millions-of-americans-real-time-locations/

- http://money.cnn.com/2018/05/18/technology/cell-phone-location-data-breach-locationsmart/index.html
- Interviewed for WTAE evening broadcast TV news, May 19, 2018.
- Interviewed for “This Week in IT” radio show, June 8, 2018.

Follow-up coverage:

- https://www.reuters.com/article/us-usa-mobile-privacy/fcc-investigating-website-flaw-that-exposed-mobile-phone-locations-idUSKCN1IJ2F0
- http://triblive.com/business/technology/13777194-74/verizon-to-end-some-sale-of-phone-location-data-in-wake-of-cmu “Verizon, AT&T to end location data sales to brokers in wake of CMU hack”
- https://www.wsj.com/articles/verizon-to-cut-off-data-providers-that-gave-up-customer-locations-1529423758 “Verizon, AT&T, Sprint to Cut Off Data Providers After Customer Locations Were Revealed”

LumiWatch, 2018

https://www.cnet.com/news/lumiwatch-projector-smartwatch-turns-your-arm-into-a-touchscreen/
https://gizmodo.com/the-worlds-first-working-projector-smartwatch-turns-you-1825518454

MRTouch, 2018

https://www.tomshardware.com/news/mrtouch-hololens-tactive-touch-interaction,36956.html
https://www.digitaltrends.com/computing/microsoft-research-hololens-virtual-touchscreen-mrtouch/

Desktopography, 2017

http://www.dailymail.co.uk/sciencetech/article-4650346/Fancy-turning-DESK-touchscreen.html
http://www.popularmechanics.com/technology/gadgets/a27124/desk-touchscreen-projector/

Deus EM Machina, 2017

https://www.engadget.com/2017/05/09/deus-em-machina-electromagnetic-emissions-sensing/
https://techcrunch.com/2017/05/09/how-a-tap-could-tame-the-smart-home/

ViBand, 2016

https://techcrunch.com/2016/11/21/overclocked-smartwatch-sensor-uses-vibrations-to-sense-gestures-objects-and-locations/
https://www.theverge.com/circuitbreaker/2016/11/2/13463312/carnegie-mellon-lg-smartwatch-hack-gesture-accelerometer-viband-project

SparseLight, 2016

https://www.theverge.com/2016/4/26/11512820/sparselight-ar-vr-led-hack-microsoft-hololens
https://arstechnica.com/gaming/2016/05/how-side-mounted-leds-can-help-fix-vrs-tunnel-vision-and-nausea-problems/

EM-Sense, 2015

http://www.wired.com/2015/11/em-sense-enabled-smartwatch-can-detect-when-you-touch-a-doorknob/
http://www.nbcnews.com/tech/innovation/disney-smartwatch-knows-what-youre-touching-tells-you-what-do-n461741
https://www.fastcodesign.com/product/em-sense

Zensors, 2015

http://www.pcworld.com/article/2914552/zensors-app-lets-you-crowdsource-live.html

http://gizmodo.com/one-old-android-phone-could-make-all-your-dumb-things-s-1699362305

3D Finger Angle, 2015
http://gizmodo.com/a-touchscreen-that-knows-the-angle-of-your-finger-is-wa-1742667522
http://www.digitaltrends.com/mobile/qeexo-fingerangle-news/

Skin Buttons, 2014
http://phys.org/news/2014-10-skin-icons-smartwatch.html
http://www.fastcodesign.com/3036985/this-smartwatch-projects-laser-buttons-onto-your-skin
https://www.nytimes.com/2014/11/21/style/international/researchers-look-at-ways-to-fit-technology-in-confined-spaces.html
Interview on CBC Radio "Misener on Tech", October 21, 2014.

TouchTools, 2014
http://gizmodo.com/what-life-would-be-like-if-skeuomorphism-ruled-our-ipad-1570806039
http://www.engadget.com/2014/05/01/touchtools-user-interface-manipulating-objects/

6DOF Physical Smartwatch, 2014
http://www.newscientist.com/article/dn25482-tilting-smartwatch
http://www.engadget.com/2014/04/30/concept-smartwatch-joystick/

WorldKit, 2013
Work featured as segment on "Stephen Hawking's Science of the Future", Episode 4, December 6, 2013
http://www.reuters.com/video/2013/06/12/researcher-gives-new-meaning?videoId=243310701
http://www.foxnews.com/tech/2013/07/08/projector-turns-everything-into-touchscreen/

TEACHING EXPERIENCE

CPSC 554X "Signal Processing and Machine Learning" **2019 – 2020**
Principal instructor for a graduate course on signal processing, with applications to machine learning and computer vision in the Department of Computer Science at UBC. Sessions taught: Sept-Dec 2019 (2019W1), Sept-Dec 2020 (2020W1).

CPSC 213 "Introduction to Computer Systems" **2019 – 2020**
Principal instructor for an undergraduate course on computer systems, in the Department of Computer Science at UBC. Sessions taught: Jul-Aug 2019 (2019S2), Jan-Apr 2020 (2019W2), Jan-Apr 2021 (2020W2).

Lab Instructor **2014**
Lab Instructor for the Programming Usable Interfaces Prototype Lab, in the Human-Computer Interaction Institute at Carnegie Mellon University, during the September-December 2014 academic term.

Teaching Assistant **2014**
Teaching Assistant for an introductory course on Applied Gadgets, Sensors and Activity Recognition, taught by Scott E. Hudson, in the Human-

Computer Interaction Institute at Carnegie Mellon University, during the January-April 2014 academic term.

Tutoring and TAing **2008-2010**
Various tutoring and TA positions with the Tutorial Center and Tutoring in Residence programs (four semester-long appointments total), Faculty of Mathematics, University of Waterloo

MATH 227 TA (Calculus 3 for Honours Physics) **2009**
Received outstanding evaluation from MATH 227 professor for TA work

MATH 146 TA (Advanced Linear Algebra) **2009**
Received outstanding evaluation from MATH 146 professor for TA work

CS 116 Tutor (Intro to Computer Science 2) **2009**
Developed and maintained entirely new version of the automatic grading system (used by nearly 1000 students per semester). Department of Computer Science, University of Waterloo, Waterloo, ON, Canada.

COMMUNITY SERVICE

Program Committee Member, multiple conferences **2017 – 2020**
Served as an invited program committee member for 13 conferences:

- ACM Human Factors in Computing Systems - CHI (2018, 2019, 2020, 2021)
- ACM User Interface Software and Technology - UIST (2019, 2020, 2021)
- ACM Designing Interactive Systems - DIS (2019, 2020)
- ACM Virtual Reality Software and Technology - VRST (2018)
- ACM Intelligent User Interfaces - IUI (2018, 2020)
- Graphics Interface - GI (2019, 2020)

Contributing Writer, Crash Course Computer Science **2017**
Invited contributing writer for 19 episodes of the Complexly & PBS Digital Studios “Crash Course Computer Science” educational video series.

Student Volunteer, UIST 2017 **2017**
Student volunteer at the program committee meeting and main conference for the 30th Annual ACM Symposium on User Interface Software & Technology (UIST 2017).

Session Chair, UIST 2015 **2015**
Chair of the “Hands and Fingers” papers session at the 28th Annual ACM Symposium on User Interface Software & Technology (UIST 2015).

Regular Conference Paper Reviewer
Reviewer for over 100 submitted papers across several conferences, including CHI, UIST, UbiComp, DIS, CSCW, ITS/ISS and MobileHCI. Annual reviewer for CHI and UIST since 2013.
4 "*Excellent Reviewer*" distinctions received at CHI.

Journal Paper Reviewer
Reviewer for over 10 journal articles, including articles submitted to IJHCS, IEEE Computer and IEEE Photonics.

ADDITIONAL HONOURS AND AWARDS

Second place, DEF CON 28 CTF **August 2020**
Competed with the CMU PPP team at annual DEFCON CTF, held virtually.

First place, DEF CON 27 CTF **August 2019**
Competed with the CMU PPP team at annual DEFCON CTF in Las Vegas.

First place, Google Capture the Flag Quals **June 2018**
Online team computer security competition; qualified to final competition held at Google.

Second place, NSA Codebreaker Challenge 2017 **September 2017**
Individual cryptography/reverse engineering competition held online with over 3000 participating students.

First place, DEFCON 25 CTF **July 2017**
Competed with the CMU PPP team at annual DEFCON CTF in Las Vegas.

First place individual, Cambridge 2 Cambridge Challenge **July 2017**
In-person computer security competition held in Cambridge, UK, among over 100 prequalified contestants. £3000 prize for first place individual.

First place team, Cambridge 2 Cambridge Challenge **July 2017**
In-person computer security competition held in Cambridge, UK, among 22 teams of 5 prequalified people each. £9000 prize for first place team.

First place, DEFCON Quals CTF **May 2017**
Online team computer security competition; qualified to final competition in Las Vegas, NV.

First place, NSA Codebreaker Challenge 2016 **December 2016**
Individual cryptography/reverse engineering competition held online with over 3000 participating students.

First place, DEFCON 24 CTF **August 2016**
Competed with the CMU PPP team at annual DEFCON CTF in Las Vegas.

First place, Codegate CTF **May 2016**
Four-person team, computer security competition held in Seoul, S. Korea. 30,000,000 KRW ($25,000 USD) prize.

Second place, 0CTF Finals **April 2016**
Four-person team, attack-defense style computer security competition held in Shanghai, China. 20000 RMB ($3000 USD) prize.

Fifth place, Microsoft College Puzzle Challenge **April 2016**
Four-person team, ranked fifth nationally and first at CMU.

First place, Microsoft Build the Shield Competition **March 2016**
Four-person team computer security competition held in Seattle, Washington with over 40 participating teams.

First place, Codegate Quals CTF **March 2016**
Online team computer security competition; qualified to final round in Seoul, S. Korea.

First place, Tsinghua University BCTF **March 2016**
Online team computer security and cryptography competition, over 500 participating teams.

Fourth place, 0CTF Qualification Round **March 2016**
Online team computer security competition with over 800 participating teams; qualified to final round in Shanghai, China.

Third place, Boston Key Party CTF **March 2016**
Online team computer security and cryptography competition, over 750 participating teams.

Top 25, NSA Codebreaker Challenge 2015 **December 2015**
Individual cryptography/reverse engineering competition held online.

Fifth place, HITCON 2015 Final CTF **December 2015**
Four-person team computer security competition held in Taipei, Taiwan.

First place, HITCON 2015 Quals CTF **October 2015**
Online team computer security competition, qualification for final round.

Second place, DEFCON 23 CTF **August 2015**
Participated in this team computer security competition in Las Vegas.

First place, Microsoft Code Hunt **August 2015**
Individual programming competition held on the Microsoft campus and open to all employees.

Third place, SECCON 2014 Final CTF **February 2015**
Four-person team computer security competition held in Tokyo, Japan.

First place, CMU-Citadel Programming Challenge **January 2015**
Individual competition hosted by Citadel LLC.

Third place, Microsoft College Puzzle Challenge **April 2014**
Four-person team, ranked third in national standings.

Invited participant of the USA Mathematics Olympiad **2007**

Pythagoras Contest Canadian Champion **2001**

REFERENCES

DR. CHRIS HARRISON
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