HEMANT SURALE, PH.D.

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SUMMARY

"Don't mode me in" - Larry Tesler. I feel deeply moved by what Larry has described as 'The Smalltalk Environment,' describing the modeless interface. In a similar vein, I want to contribute to that movement against modes (learning impediments) using empirical methods from the Human-Computer Interaction domain. My research focuses on designing, building, and evaluating user interfaces to enhance productivity by understanding the underlying mental models and motor control theories. Specifically, I investigate mode and mode-related issues in user interfaces that hinder task execution. One of my strengths is helping my team build confidence in decision-making through scientific investigations and communicating these results across XFN partners. I enjoy building proof-of-concept systems, designing and conducting formal experiments, and using modern data science techniques to address high-level goals.

EDUCATION

Postdoctoral Fellow, HCI Group — May 2020 - Aug 2020
University of Waterloo, Waterloo, Canada

Ph.D. in Computer Science, Advisor: Daniel Vogel — Sep 2015 - Apr 2020
Thesis: *Barehand Mode-Switching in Touch and Mid-Air Interfaces*
Committee: Nicolai Marquardt, Edward Lank, Edith Law, and James Wallace
University of Waterloo, Waterloo, Canada

M.E. in Software Systems, Advisor: Soumen Chakrabarti, Atish Kathpal — Jan 2011 - Dec 2012
Thesis: *Optimizing Ceph File System for Web-Scale Search Engines*
Birla Institute of Technology and Science, Pilani, India

B.E. in Computer Science, Advisor: Radhakrishna Naik — Aug 06 - May 2010
Thesis: *Design and Simulation of a Fault Tolerant Real Time Scheduler*
University of Pune, Pune, India

AWARDS AND HONORS

Computer Science Achievement Award, School of Computer Science, University of Waterloo. — 2018, 2019
Best Paper Nominations ACM CHI 2019, ACM ISS 2021 (top 5%) — 2019, 2021
Snap Research Fellow, Snap Inc, USA. (11 recipients worldwide) Media: 1 — Winter 2019
(3x) Cheriton Type II Scholarship, School of Computer Science (top 5%), University of Waterloo. — 2018, 2019, 2020
International Doctoral Student Award, School of Computer Science, University of Waterloo. — Fall 2015

SKILLS

Applied AI: Neural networks, classification, regression, computer vision (barehand gesture and object detection), sensor fusion, signal processing, feature extraction, and time-series (IMU, EMG, and Gaze) modelling.
Methods: Rapid prototyping, qualitative and quantitative analysis, usability studies, user interviewing, statistical analysis.
Languages: Python (seaborn, pandas, scipy, numpy), Java (android, processing), C (firmware programming), C#, R.
Devt. Tools: Visual Studio, GitHub, processing, unity, blender, TensorFlow, MySQL, Cmake, Cygwin, IPython.
Do It Yourself (DIY): Arduino, Ti MSP430, Rasberry Pi, building wireless wearable devices (BT & Wifi).
Sensors: IMU, Flex, BT-05/06, Wi-Fi modules, conductive threads, FSR, proximity, capacitive, haptics, IR (eye tracking).

EXPERIENCES

Research Scientist (IC5) — Meta Platform Inc. April 2022 - ongoing
FRL Team — Toronto, ON

- Defined and led a research program to characterize user expertise based on movement signals from wristbands and built-in eye trackers (kinetic-EMG, kinematic-IMU, and implicit-Gaze) to accelerate personalized learning.
- Led a team of SWEs and researchers w/ background in HCI, ML, and User Research to develop research prototypes, evaluate, and deliver product impact.
- Planned and managed software developer (SWE3) and intern recruitments. Also, I initiated and worked with academic partners on auxiliary research projects.
- Managed 7 interns working on text input, pressure input, and haptic feedback research areas and a team of SWEs to develop software tooling. Also, drove the outcomes to impact XFN programs and product vision.
- Filed **a patent** and published **a paper** (UIST'23) **within a year** of joining the research team.

Senior Research Scientist — Huawei R&D Canada Fall 2020 - 2022
HCI Team — Toronto, ON

- Built an efficient eye-tracking system to track user gaze from a distance of 4m, 3m, and less. Partnered w/ the software, hardware, and ML team to deliver the system. This initiative draws on the experience of both the HCI and AI teams.
- Ran empirical studies to uncover insights, iterate on the eye-tracking system and developed application demos.
- Built productivity-focused mixed reality input and haptic feedback techniques for a virtual office in Unity.
- Worked on driver distraction and drowsiness detection for in-car interfaces using gaze behavior analytics.
- Managed an ML engineer and an SWE.

HCI Research Intern — Snap Research Fall 2019
HCI Team — Santa Monica, CA

- Collaborated with Jonathan Rodriguez, Rajan Vaish, Brian Smith, Yu Jiang, and Andrés Monroy-Hernández on a Spectacles AR glasses project. This project was a joint effort between a prototyping team from SnapLabs (Snap's hardware division) led by Jonathan Rodriguez and the Snap research team.
- Built the Proof-of-Concept (POC) Augmented Reality (AR) system using Snap Spectacles and iOS smartphone.
- Filed **3 patents** at the end of the internship.
- Published a **full paper** at AHs 2022.

HCI Research Intern — Microsoft Research + AI Summer 2019
EPIC: **Extended Perception, Interaction & Cognition** — Redmond, WA

- Worked on the *Society of Devices* project with Ken Hinckley, Michel Pahud, and Bill Buxton. This project was a joint effort between the database group led by Jonathan Goldstein and the HCI group led by Ken Hinckley.
- Published a **full paper** at UIST 2020.

HCI Research Intern — Google/North Canada Spring & Fall 2018
HCI Team — Kitchener, CA

- Led the project to enable discreet input interactions for upcoming AR glasses using advanced eye and head tracking.
- Worked with Gabriel Reyes, Antonio Gomes, Melodie Vidal, and Evangelos Niforatos.
- Conducted user studies (mixed methods), analyzed the data, and presented the findings in the all-hands.
- Followed iterative development of hardware and software prototypes.

Entrepreneur — IoTBLR Apr 2013 - Dec 2014
Research and Devt. Team — Bangalore, IN

- Responsible for conducting workshops, talks, and seminars on open-source hardware platforms like Arduino and Tinkerforge.
- Along with the team, I helped to establish INDIA's first IOTLAB in Bangalore.
- Gave a talk on *Gesture Recognition Technologies* at all INDIA ERocks'13 conference (Ft. 1, News: 2, 3).

Software Developer 2 — ORACLE Corp. Dec 2012 - Feb 2014
MySQL: **Enterprise Backup Team** — Bangalore, India

- Developed the core feature, Single Step Restore, in the MySQL-MEB 3.9 release, which reduced disk space and computation time required to perform backup, apply-log, and restore operation on the fly by **50%**.
- **Promoted** to SDE-2 position within a year for outstanding performance.
- Introduced four new commands to the MySQL server. These commands are used by millions of users around the globe.

Database Research Intern NetApp Corp. Summer 2012, Fall 2012
***ATG:* Advanced Technology Group** Bangalore, India

- Worked with Soumen Chakrabarti from IIT-Powai, Mumbai and Atish Kathpal from NetApp Research Bangalore.
- This investigative project was aimed to modify **Ceph-DFS** (Distributed File System) capabilities to handle real-time indexing, searching operations & I/O performance. This project had two objectives: firstly, direct I/O operations to a specific set of OSD (Object Store Devices) to avoid possible interference of read and write operations resulting in better performance, and second, to monitor inter OSD traffic to verify as well as monitor the data placement.
- Optimized Open Source Distributed File System for Web-Scale Search engines in terms of time required to ingest high volume of data (**50%** improvement) and data retrieval (**36%** improvement) operations.

PUBLICATIONS

Most work in HCI is published as conference papers, among which CHI and UIST are the premiere venues.

C10. **Hemant Surale**, Rahul Arora, Lizhe Chen, Ricardo Jota, Bruno De Araujo, Chris Collins, and Mike Glueck. **User Expertise Classification using Gaze Metrics**. *Under submission, Proc. of **ETRA'24***. 8 + 2 p.

C9. Taejun Kim, Amy Karlson, Aakar Gupta, Tovi Grossman, Parastoo Abtahi, Jason Wu, Chris Collins, Mike Glueck, and **Hemant Surale**. **STAR: Smartphone-analogous Typing in Augmented Reality**. *In Proceedings of The ACM Symposium on User Interface Software and Technology, Proc. of **UIST'23***. 10 + 3 p.

C8. Ken Pfeuffer, Yanfei Hu Fleischhauer, **Hemant Surale**, Hans Gellersen. **Gaze-based Mode-Switching to Enhance Interaction with Menus on Tablets**. *In Proceedings of the ACM Symposium of Eye Tracking Research & Applications Proc. of **ETRA'23***. 10 + 3 p.

C7. **Hemant Surale**, Yu Jiang, Jonathan Rodriguez, Brian Smith, Rajan Vaish. **ARcall: AR-based communication method for smartglasses**. *In Proceedings of the ACM International Conference on Augmented Humans. Proc. of **AH'22***. 10 + 2 p.

C6. Nalin Chhibber, **Hemant Surale**, Fabrice Matulic, Daniel Vogel. **Typealike: Typing-Friendly Command Postures**. *In Proceedings of the ACM International Conference on Interactive Surfaces and Spaces Conference Proc. of **ISS'21***. 10 + 3 p. ***Best Paper Honorable Mentions Award***

C5. **Hemant Surale** with Microsoft Research Collective. **SurfaceFleet: Exploring Distributed Interactions Unbounded from Device, Application, User, and Time**. *In Proceedings of the ACM Symposium on User Interface Software and Technology. Proc. of **UIST'20***. 10 + 4 p.

C4. **Hemant Surale**, Aakar Gupta, Mark Hancock, Daniel Vogel. **TabletInVR: Exploring the Design Space for Using a Multi-Touch Tablet in Virtual Reality**. *Proc. of **CHI'19**, the 37th Conference on Human Factors in Computing Systems.* 10 + 2 p.

C3. **Hemant Surale**, Fabrice Matulic, Daniel Vogel. **Experimental Analysis of Bare-hand Mid-air Mode Switching Techniques in Virtual Reality**. *Proc. of **CHI'19**, the 37th Conference on Human Factors in Computing Systems.* 10 + 3 p. ***Best Paper Honorable Mentions Award***

C2. *Jeremy Hartmann, ***Hemant Surale**, Aakar Gupta, Daniel Vogel. **Using Conformity to Probe Interaction Challenges in XR Collaboration**. ***CHI'18** Workshop paper.* (* equal contribution) 4 p.

C1. **Hemant Surale**, Fabrice Matulic, Daniel Vogel. **Experimental Analysis of Mode Switching Techniques in Touch-based User Interfaces**. *Proc. of **CHI'17**, the 35th Conference on Human Factors in Computing Systems.* 10 + 4 p.

SUPERVISION/MANAGING

Yanfei Hu Fleischhauer (w/Ken pfeuffer), Graduate Student, Bundeswehr University Munich, Germany	2020 - 2021
Christian Geßner (w/Ken pfeuffer), Graduate Student, Bundeswehr University Munich, Germany	2020 - 2020
Futian Zhang, Graduate Student, University of Waterloo	2019 - 2021
Nalin Chhibber, Graduate Student, University of Waterloo (now at Amazon Canada)	2018 - 2019
Edmund Liu, Graduate Student, University of Waterloo (now at Tubular Labs)	2017 - 2018
Harshal Agrawal, Undergrad Student, BITS Pilani (now at UoWashington)	2011 - 2012
Zheng Liu (Computer Vision Engineer, Huawei R&D Canada)	2020 - 2021
Taejun Kim (Research Scientist Intern, Meta Canada)	2022 - 2023

Shanaa Modchalingam (Research Scientist Intern, Meta Canada)	2022 - 2023
Di (Laura) Chen (Research Scientist Intern, Meta Canada)	2022 - 2023
Lisa Elkin (Research Scientist Intern, Meta Canada)	2023 - 2024
Junxiao Shen (Research Scientist Intern, Meta Canada)	2023 - 2024
Myada Roshdi (Senior Software Engineer, Huawei R&D Canada)	2021 - 2022
Lizhe Chen (SDE-3, Meta Canada)	2022 - 2023