

Dr. Clifton Forlines – Curriculum Vitae

Address:
119 Chandos Dr
Kitchener, ON N2A3Z5

email: cforlines@gmail.com
tel: (382) 889-3090

Employment History

- 2024-present* **Assistant Professor,**
Department of Computer Science, University of Toronto, Toronto, ON.
- Provide leadership and manage the newly established Partnership Office within the Department.
 - Strengthen and cultivate existing and new industrial relations in Canada and internationally.
 - Connect CS faculty members with industry partners to foster new collaborations.
 - Facilitate industrial engagement.
 - Identify and pursue funding opportunities to support research endeavors.
- 2021-2024* **Associate Research Professor**
(full time) **Khoury College and Roux Institute, Northeastern University, Portland, ME.**
- 2024-present* **2024-present**
(1/4 time)
- Collaborates with Roux partnership team as academic liaison to forge connections with industry, government, and academic partners.
 - Identifies government and industry funding opportunities for self and other members of the institute.
 - PI on ~10M and key investigator on an additional >100M of proposals.
 - PI on awarded ~3M DARPA seedling and ~11M DARPA program in collaboration with industry partner STR.
 - Industry partners include STR, Meta, GSK, Jackson Laboratory, Rogue Space Systems, and MIT's Lincoln Laboratory. Government partners include DARPA, AMNOW, and the NSF.
 - Conducts original research in the field of Human-Computer Interaction and prepares manuscripts for publication at academic conferences and journals.
 - Advises students and visiting interns on their research and career development.
- 2012-2021* **Founder, CTO, Member of the Board of Directors**
Tactical Labs Co.
- Collaborated with the CEO and executive team to provide technical, research, and business direction for the company.
 - Responsible for overall technical direction and execution of the company as it develops next-generation body-sensing technology.
 - Designed software architecture linking OS middleware to hardware components that accelerate touch interaction.
 - Designed and implemented sensor visualizations for development and presentation of company technology.
 - Designed and implemented machine learning algorithms to interpret sensor data.
 - Authored and filed patent applications in conjunction with the software and hardware teams. Company-wide portfolio includes 101 issued and allowed US patents (76 international) and 67 pending US patents (125 international).
 - Directly managed seven group/division leaders and oversees the company's engineering staff (up to 65 engineers in total).
 - Interfaced with external vendors on the development and delivery of key system components.
 - Successfully raised ~21M in A and B rounds.
 - Raised an additional ~13M in C round convertible debt.

- Facilitated and oversaw multiple Tier-1 OEM engagements, including ~15M of NRE-funded research and development.
- Built and facilitated a 3M asset sale of PPE mask technology in 2020.
- Advised UoT MScAC student who interned with the company. Helped guide the student through the MITACS Accelerate proposal process and program.
- Industry partner on OCE VIP II project run in conjunction with UoT.

2013-2017 Adjunct Professor

Department of Computer Science, University of Toronto, Toronto, ON.

- Advised a number of PhD, MSc, and Postdoctoral students on their research and career development.
- Conducted original research in the field of Human-Computer Interaction and prepared manuscripts for publication at academic conferences.

2011-present Expert Consultant and Trial Witness

- Performs expert consulting for organizations involved in HCI, multi-touch input, and interaction design patent litigation.
- Produces expert, prior-art, and patent validity reports.
- Deposition and trial testimony experience in various domestic and international venues, including Federal Court and the International Trade Commission.

**2010-2013 Principal Software Engineer & Human-Centered Engineering Group Leader
Draper Laboratory, Cambridge, MA.**

- Group leader for the Human-Centered Engineering group. Responsible for employee recruitment, matching group members with lab programs, and mentoring group members and visiting students.
- Technical director and proposal author for a 5.6M program on predictive analytics, forecast elicitation, and decision-support systems. Collaborated closely with academic partners at MIT, UIUC.
- Conducted contextual interviews with sponsor organizations to identify gaps in existing tool sets and to design improvements to organizational processes.
- Designed and evaluated user interfaces for device configuration and data analysis.
- Collaborated with program managers to identify funding opportunities and authored proposals. Awarded grants include a 5.6M research and development program on predictive analytics, a 700K program on measuring the effectiveness of interactive tutoring systems on combating cognitive bias, and an 800K program on designing interactive tools to control complex analytic algorithms.
- Led software team on 3.4M program to design and develop a multi-device system that includes desktop and embedded components. The system's configuration GUI is now used as a model for similar programs, and the program resulted in a fielded system.
- Performed Contextual Inquiry, user interface, and system/software architecture design for a mobile navigation and communication system for the US Air Force. The designed system is now fielded.

**2001-2010 Research Scientist, Research Associate, HCI Consultant
Mitsubishi Electric Research Laboratories, Cambridge, MA.**

- Designed and evaluated novel user interfaces employing multi-touch input, multi-display workspaces, tabletop computing, large-display interaction, voice-input and information presentation methods.
- Authored and co-authored over 60 refereed conference and journal publications.
- Filed over 20 patent applications for original inventions in the fields of HCI and CS.

Dr. Clifton Forlines – Curriculum Vitae

April, 2025

Page 2

- Collaborated with MERL research teams to collect data from human subjects and conduct usability evaluations on laboratory programs, ranging from in-car interfaces to new display technologies to novel image capture devices to new methods of user input.
- Managed and co-managed eight doctoral-student interns, two of whom are now full professors, two of whom are now product managers at major IT firms, and one of whom is a research scientist at a top-tier industrial research and development lab.
- Collaborated with the company's business units to design functional specifications and interactive prototypes of new consumer products and new product features.

2000 Intern

Walt Disney Imagineering, Glendale, CA.

- Interned for Alan Kay in the Media Research Group.
- Designed and implemented improvements to Squeak, an open-source, platform-independent, media authoring environment designed to support exploration and learning in grade-school and high-school children.
- Designed improvements to Squeak's user interface and developed methods that allowed students using Squeak to share their work with classmates and friends on the Internet.

1999-2000 Research Programmer

Carnegie Mellon University, School of Computer Science, Pittsburgh, PA.

- Member of Randy Pausch's Stage3 User Interface Group.
- TA for three graduate/undergraduate courses.
- Acted as a substitute lecturer.
- Led design, development, and user testing of Alice99, an easy-to-use software application for authoring interactive 3D worlds on the WWW. Alice99 was downloaded ~100K times.
- Presented Alice99 authoring tool at SIGGRAPH99 3DWeb Roundup.
- Designed and implemented novel user interfaces and interaction techniques.
- Collaborated with a team of programmers, artists, and designers to create VR environments showcased at SIGGRAPH99.

Education

2008 Doctor of Philosophy in Computer Science

Department of Computer Science, University of Toronto

Thesis Title: User Interfaces that Improve Visual Search

Advisor: Dr. Ravin Balakrishnan

2001 Master of Human-Computer Interaction

School of Computer Science, Carnegie Mellon University

2001 Master of Entertainment Technology

School of Computer Science and College of Fine Arts, Carnegie Mellon University

1999 Bachelor of Fine Arts in Industrial Design

College of Fine Arts, Carnegie Mellon University

Trial/Expert Experience

- 2025 **Multifold International v. Google**
Multifold International v. Motorola Mobility
Declaration and deposition on claim constructions
- 2023 **Resonant Systems, Inc. v. Samsung Electronics**
Declaration and deposition on claim constructions
- 2021 **Samsung Electronics v. Kannuu Pty Ltd.**
Prior art search and expert report for five IPR proceedings
Retained by Quinn Emanuel Urquhart & Sullivan, LLP
- 2020 **Samsung Electronics v. Princeps Secundus LLC**
Prior art search and expert report for IPR proceedings
Retained by Quinn Emanuel Urquhart & Sullivan, LLP
- 2013 **Apple v. Samsung Electronics – Federal Court of Australia**
Depositions
Retained by Quinn Emanuel Urquhart & Sullivan, LLP (Contact: Aileen Kim)
- 2012 **Confidential Work – International Venue**
- 2012 **Apple v. Samsung – US District Court for the Northern District of California, San Jose Division, case no. 11-cv-01846**
Deposition and testimony at hearing
Retained by Quinn Emanuel Urquhart & Sullivan, LLP (Contacts: Aileen Kim, Mark Tung)
- 2012 **Apple v. HTC – US International Trade Commission, Washington DC, Investigation no. 337-TA-797**
Claim mapping, deposition, and testimony at hearing
Retained by Quinn Emanuel Urquhart & Sullivan, LLP (Contacts: Patrick Curran, Jim Glass)
- 2011 **HTC v. Apple – UK High Court of Justice**
Prior art search, claim mapping, and deposition
Retained by Powell Gilbert, LLP (Contact: Tom Oliver)

Student Supervision

- 2024 **Dr. Ghanahshyam Kshirsagar, Postdoctoral Research Fellow, Northeastern Univ.**
Co-advising Ghana with Dr. Saiph Savage as part of the IEAI Postdoc Cohort 3.
- 2023 **Xueyan Feng, Independent Study, Northeastern University**
Advising Xueyan as part of a Khoury program designed to provide CS masters students with an introduction to research so that they might pursue a PhD.
- 2022 **Yunan Wu, Summer Research Intern, Northwestern University**
See [RS. 22]. Yunan is a PhD candidate in the department of Computer Science.
- 2022 **Roxana Valdez, Summer Research Assistant, Bowdoin College**
See [RS. 22]. Roxana is presently an undergraduate student majoring in Computer Science and Sociology.
- 2013-2015 **Ricardo Jota, Postdoctoral Scholar, University of Toronto**
Advises and provides research direction. See [RF.44, RF.43]. Jota is presently a Research Scientist at Meta Research Labs.

Dr. Clifton Forlines – Curriculum Vitae

April, 2025

Page 4

- 2012 **Leslie Guelcher and Robert Bruzzi, Research Assistants, Mercyhurst University**
Supervised graduate research work on user study design and execution. See [RF.42].
- 2012 **Jordan Lynch, Summer Intern, US Naval Academy**
Co-advised intern at Draper Laboratory with John Irvine.
- 2011 **Jennifer Tsai, Research Intern, University of Illinois at Urbana-Champaign**
Co-advised intern at Draper Laboratory with Sarah Miller.
- 2007 **Peter Brandl, Research Intern, Upper Austria University of Applied Science**
Co-advised intern at Mitsubishi Electric Research Labs with Chia Shen and Daniel Wigdor. See [RF.36] Dr. Brandl is currently Director / Principal Product Management at Dynatrace.
- 2007 **Hao Jiang, Research Intern, Tsinghua University**
Co-advised intern at Mitsubishi Electric Research Labs with Chia Shen and Daniel Wigdor. See [RF.37, RF.38, RS.16].
- 2006-
2008 **Daniel Wigdor, Research Intern, University of Toronto**
Co-advised intern at Mitsubishi Electric Research Labs with Chia Shen. See [RF. 38, RF. 37, RF. 36, RF. 32, RF. 28, RF. 27, RF. 26, RF. 24, RF. 22, RF. 21, RF. 18, RS. 16, RS. 15, RS. 14]. Daniel is a Full Professor in the Department of Computer Science at the University of Toronto and Director of Research Science at Meta Reality Labs.
- 2006-
2007 **Ed Tse, Research Intern, University of Calgary**
Co-advised intern at Mitsubishi Electric Research Labs with Chia Shen. See [RF. 33, RF. 29, RF. 26, RF. 20, RF. 19].
- 2004 **Meredith Ringel Morris, Research Intern, Stanford University**
Co-advised intern at Mitsubishi Electric Research Labs with Chia Shen. See [RF. 14, RF. 7, RS. 5, RS. 3]. Merry is currently Director & Principal Scientist in the People + AI Research group at Google.
- 2004 **Mark Hancock, Research Intern, University of Calgary**
Co-advised intern at Mitsubishi Electric Research Labs with Chia Shen. See [RF. 26, RF. 10, RS. 7]. Mark is currently a Professor and Interim Chair of the Department of Management Sciences at the University of Waterloo.
- 2004 **Kate Everitt, Research Intern, University of Washington**
Co-advised intern at Mitsubishi Electric Research Labs with Chia Shen. See [RF. 26, RF. 25, RF. 15, RF. 14, RS. 11, RS. 10, RS. 8]. Kate is currently a program manager at Microsoft.
- 2003 **Mike Wu, Research Intern, University of Toronto**
Co-advised intern at Mitsubishi Electric Research Labs with Chia Shen. See [RF. 26, RF. 16, RS. 12]. Mike is currently CTO at Loupe.

Refereed Journal and Full Conference Paper Publications

- [RF. 47] Sidharth Sahdev, Clifton Forlines, Ricardo Jota, Bruno De Araujo, Braon Moseley, Jonathan Deber, Steven Sanders, Darren Leigh, and Daniel Wigdor. 2017. **GhostID: Enabling Non-Persistent User Differentiation in Frequency-Division Capacitive Multi-Touch Sensors**. In Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI '17). ACM, New York, NY, USA, 15-27.
- [RF. 46] Jonathan Deber, Bruno Araujo, Ricardo Jota, Clifton Forlines, Darren Leigh, Steven Sanders, and Daniel Wigdor. 2016. **Hammer Time!: A Low-Cost, High Precision, High Accuracy Tool to Measure the Latency of Touchscreen Devices**. In Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16). ACM, New York, NY, USA, 2857-2868.
- [RF. 45] Jonathan Deber, Ricardo Jota, Clifton Forlines, and Daniel Wigdor. 2015. **How Much Faster is Fast Enough?: User Perception of Latency & Latency Improvements in Direct and Indirect Touch**. In Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems (CHI '15). ACM, New York, NY, USA, 1827-1836.
- [RF. 44] Darren Leigh, Clifton Forlines, Ricardo Jota, Steven Sanders, and Daniel Wigdor. 2014. **High Rate, Low-Latency Multi-Touch Sensing with Simultaneous Orthogonal Multiplexing**. In *Proceedings of the 27th Annual ACM Symposium on User Interface Software and Technology* (Honolulu, Hawaii, USA, October 05 - 08, 2014). UIST '14. ACM, New York, NY.
- [RF. 43] Haijun Xia, Ricardo Jota, Benjamin McCanny, Zhe Yu, Clifton Forlines, Karan Singh, and Daniel Wigdor. 2014. **Zero-Latency Tapping: Using Hover Information to Predict Touch Locations and Eliminate Touchdown Latency**. In *Proceedings of the 27th Annual ACM Symposium on User Interface Software and Technology* (Honolulu, Hawaii, USA, October 05 - 08, 2014). UIST '14. ACM, New York, NY.
- [RF. 42] Clifton Forlines, Sarah Miller, Leslie Guelcher, and Robert Bruzzi. 2014. **Crowdsourcing the future: predictions made with a social network**. In *Proceedings of the 32nd annual ACM conference on Human factors in computing systems* (CHI '14). ACM, New York, NY, USA, 3655-3664.
- [RF. 41] Garrett Weinberg, Bret Harsham, Clifton Forlines, and Zeljko Medenica. 2010. **Contextual push-to-talk: shortening voice dialogs to improve driving performance**. In Proceedings of the 12th international conference on Human computer interaction with mobile devices and services (MobileHCI '10). ACM, New York, NY, USA, 113-122.
- [RF. 40] Clifton Forlines and Kent Wittenburg. 2010. **Wakame: sense making of multi-dimensional spatial-temporal data**. In Proceedings of the International Conference on Advanced Visual Interfaces (AVI '10), Giuseppe Santucci (Ed.). ACM, New York, NY, USA, 33-40.
- [RF. 39] Forlines, C. and Balakrishnan, R. 2009. **Improving visual search with image segmentation**. In Proceedings of the 27th international Conference on Human Factors in Computing Systems (Boston, MA, USA, April 04 - 09, 2009). CHI '09. ACM, New York, NY, 1093-1102. (best paper nominee)

Dr. Clifton Forlines – Curriculum Vitae

April, 2025

Page 6

- [RF. 38] Wigdor, D., Jiang, H., Forlines, C., Borkin, M., Shen, C. **The WeSpace: The Design, Development and Deployment of a Walk-Up and Share Multi-Surface Visual Collaboration System**. In Proceedings of the 27th international Conference on Human Factors in Computing Systems (Boston, MA, USA, April 04 - 09, 2009). CHI '09. ACM, New York, NY, 1093-1102.
- [RF. 37] Jiang, H., Wigdor, D., Forlines, C., Shen, C. **System design for the WeSpace: Linking personal devices to a table-centered multi-user, multi-surface environment**. Horizontal Interactive Human Computer Systems, 2008. TABLETOP 2008. 3rd IEEE International Workshop on, Amsterdam, The Netherlands, October 1-3, 2008, 97-104.
- [RF. 36] Brandl, P., Forlines, C., Wigdor, D., Haller, M., and Shen, C. 2008. **Combining and measuring the benefits of bimanual pen and direct-touch interaction on horizontal interfaces**. In Proceedings of the Working Conference on Advanced Visual interfaces (Napoli, Italy, May 28 - 30, 2008). AVI '08. ACM, New York, NY, 154-161.
- [RF. 35] Forlines, C. 2008. **Content aware video presentation on high-resolution displays**. In Proceedings of the Working Conference on Advanced Visual interfaces (Napoli, Italy, May 28 - 30, 2008). AVI '08. ACM, New York, NY, 57-64.
- [RF. 34] Forlines, C. and Balakrishnan, R. 2008. **Evaluating tactile feedback and direct vs. indirect stylus input in pointing and crossing selection tasks**. In Proceeding of the Twenty-Sixth Annual SIGCHI Conference on Human Factors in Computing Systems (Florence, Italy, April 05 - 10, 2008). CHI '08. ACM, New York, NY, 1563-1572.
- [RF. 33] Tse, E., Greenberg, S., Shen, C., Forlines, C., and Kodama, R. 2008. **Exploring true multi-user multimodal interaction over a digital table**. In Proceedings of the 7th ACM Conference on Designing interactive Systems (Cape Town, South Africa, February 25 - 27, 2008). DIS '08. ACM, New York, NY, 109-118.
- [RF. 32] Wigdor, D., Forlines, C., Baudisch, P., Barnwell, J., and Shen, C. 2007. **Lucid touch: a see-through mobile device**. In Proceedings of the 20th Annual ACM Symposium on User interface Software and Technology (Newport, Rhode Island, USA, October 07 - 10, 2007). UIST '07. ACM, New York, NY, 269-278.
- [RF. 31] Cao, X., Forlines, C., and Balakrishnan, R. 2007. **Multi-user interaction using handheld projectors**. In Proceedings of the 20th Annual ACM Symposium on User interface Software and Technology (Newport, Rhode Island, USA, October 07 - 10, 2007). UIST '07. ACM, New York, NY, 43-52.
- [RF. 30] Zwicker, M., Yea, S., Vetro, A., Forlines, C., Matusik, W., and Pfister, H. 2007. **Display pre-filtering for multi-view video compression**. In Proceedings of the 15th international Conference on Multimedia (Augsburg, Germany, September 25 - 29, 2007). MULTIMEDIA '07. ACM, New York, NY, 1046-1053.
- [RF. 29] Tse, E., Shen, C., Greenberg, S., and Forlines, C. 2007. **How pairs interact over a multimodal digital table**. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (San Jose, California, USA, April 28 - May 03, 2007). CHI '07. ACM Press, New York, NY, 215-218.

- [RF. 28] Forlines, C., Wigdor, D., Shen, C., and Balakrishnan, R. 2007. **Direct-touch vs. mouse input for tabletop displays**. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (San Jose, California, USA, April 28 - May 03, 2007). CHI '07. ACM Press, New York, NY, 647-656.
- [RF. 27] Wigdor, D., Shen, C., Forlines, C., and Balakrishnan, R. 2007. **Perception of elementary graphical elements in tabletop and multi-surface environments**. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (San Jose, California, USA, April 28 - May 03, 2007). CHI '07. ACM Press, New York, NY, 473-482.
- [RF. 26] Shen, C., Ryall, K., Forlines, C., Esenther, A., Vernier, F. D., Everitt, K., Wu, M., Wigdor, D., Morris, M. R., Hancock, M., and Tse, E. 2006. **Informing the Design of Direct-Touch Tabletops**. IEEE Comput. Graph. Appl. 26, 5 (Sep. 2006), 36-46.
- [RF. 25] Ryall, K., Esenther, A., Forlines, C., Shen, C., Shipman, S., Morris, M. R., Everitt, K., and Vernier, F. D. 2006. **Identity-Differentiating Widgets for Multiuser Interactive Surfaces**. IEEE Comput. Graph. Appl. 26, 5 (Sep. 2006), 56-64.
- [RF. 24] Wigdor, D., Leigh, D., Forlines, C., Shipman, S., Barnwell, J., Balakrishnan, R., and Shen, C. 2006. **Under the table interaction**. In Proceedings of the 19th Annual ACM Symposium on User interface Software and Technology (Montreux, Switzerland, October 15 - 18, 2006). UIST '06. ACM Press, New York, NY, 259-268.
- [RF. 23] Forlines, C., Vogel, D., and Balakrishnan, R. 2006. **HybridPointing: fluid switching between absolute and relative pointing with a direct input device**. In Proceedings of the 19th Annual ACM Symposium on User interface Software and Technology (Montreux, Switzerland, October 15 - 18, 2006). UIST '06. ACM Press, New York, NY, 211-220.
- [RF. 22] Forlines, C., Shen, C., Wigdor, D., and Balakrishnan, R. 2006. **Exploring the effects of group size and display configuration on visual search**. In Proceedings of the 2006 20th Anniversary Conference on Computer Supported Cooperative Work (Banff, Alberta, Canada, November 04 - 08, 2006). CSCW '06. ACM Press, New York, NY, 11-20.
- [RF. 21] Wigdor, D., Shen, C., Forlines, C., Balakrishnan, R., (2006). **Table-centric interactive spaces for real-time collaboration: solutions, evaluation, and application scenarios**. Proceedings of CollabTech 2006, July 2006. p. 9-15.
- [RF. 20] Tse, E., Shen, C., Greenberg, S., and Forlines, C. 2006. In Proceedings of the 27th international Conference on Human Factors in Computing Systems (Boston, MA, USA, April 04 - 09, 2009). CHI '09. ACM, New York, NY, 1093-1102. (best paper nominee). In Proceedings of the Working Conference on Advanced Visual interfaces (Venezia, Italy, May 23 - 26, 2006). AVI '06. ACM, New York, NY, 336-343.
- [RF. 19] Tse, E., Greenberg, S., Shen, C., and Forlines, C. 2007. **Multimodal multiplayer tabletop gaming**. Computers in Entertainment 5, 2 (Apr. 2007), 12.
- [RF. 18] Wigdor, D., Shen, C., Forlines, C., and Balakrishnan, R. 2006. **Effects of display position and control space orientation on user preference and performance**. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (Montréal, Québec, Canada, April 22 - 27, 2006). R. Grinter, T. Rodden, P. Aoki, E. Cutrell, R. Jeffries, and G. Olson, Eds. CHI '06. ACM, New York, NY, 309-318.

- [RF. 17] Sidner, C. L., Lee, C., Morency, L., and Forlines, C. **The effect of head-nod recognition in human-robot conversation.** In Proceeding of the 1st ACM SIGCHI/SIGART Conference on Human-Robot interaction (Salt Lake City, Utah, USA, March 02 - 03, 2006). HRI '06. ACM Press, New York, NY, 290-296.
- [RF. 16] Wu, M., Shen, C., Ryall, K., Forlines, C., Balakrishnan, R., **Gesture Registration, Relaxation, and Reuse for Multi-Point Direct-Touch Surfaces,** in First IEEE International Workshop Proceedings of the Horizontal Interactive Human-Computer Systems, 2006. TableTop 2006. (Adelaide, South Australia, 2006), pp 183-190.
- [RF. 15] Everitt, K., Shen, C., Ryall, K., Forlines, C., **MultiSpace: Enabling Electronic Document Micro-mobility in Table-Centric, Multi-Device Environments** , in First IEEE International Workshop Proceedings of the Horizontal Interactive Human-Computer Systems, 2006. TableTop 2006. (Adelaide, South Australia, 2006), pp. 27-34.
- [RF. 14] Ryall, K., Ringel Morris, M., Everitt, K., Forlines, C., Shen, C., **Experiences With and Observations of Direct-Touch Tables,** in First IEEE International Workshop Proceedings of the Horizontal Interactive Human-Computer Systems, 2006. TableTop 2006. (Adelaide, South Australia, 2006), pp 89-96.
- [RF. 13] Forlines, C., Balakrishnan, R., Beardsley, P., Baar, J.v. and Raskar, R., **Zoom-and-pick: facilitating visual zooming and precision pointing with interactive handheld projectors.** in Proceedings of the 18th annual ACM symposium on User interface software and technology, (Seattle, WA, USA, 2005), ACM Press, 73-82.
- [RF. 12] P.H., Harsham, B., Forlines, C., Leigh, D., Yerazunis, W., Shipman, S., Schmidt-Nielsen, B. and Ryall, K., **DT controls: adding identity to physical interfaces.** in Proceedings of the 18th annual ACM symposium on User interface software and technology, (Seattle, WA, USA, 2005), ACM Press, 245-252.
- [RF. 11] Forlines, C., Schmidt-Nielsen, B., Raj, B., Wittenburg, K. and Wolf, P., **A Comparison Between Spoken Queries and Menu-Based Interfaces for In-car Digital Music Selection.** in Proceedings of Human-Computer Interaction - INTERACT 2005: IFIP TC13 International Conference, (Rome, Italy, 2005), 536-549.
- [RF. 10] Hancock, M. S., Shen, C., Forlines, C., and Ryall, K. 2005. **Exploring non-speech auditory feedback at an interactive multi-user tabletop.** In Proceedings of the 2005 Conference on Graphics interface (Victoria, British Columbia, 2005). ACM International Conference Proceeding Series, 41-50.
- [RF. 9] Beardsley, P., Van Baar, J., Raskar, R., Forlines, C., **Interaction Using a Handheld Projector,** IEEE Computer Graphics and Applications, Volume 25 , Issue 1 (January 2005), pp. 39-43.
- [RF. 8] Ryall, K., Forlines, C., Shen, C., and Morris, M. R. 2004. **Exploring the effects of group size and table size on interactions with tabletop shared-display groupware.** In Proceedings of the 2004 ACM Conference on Computer Supported Cooperative Work (Chicago, Illinois, USA, November 06 - 10, 2004). CSCW '04. ACM Press, New York, NY, 284-293.

- [RF. 7] Shen, C., Vernier, F. D., Forlines, C., and Ringel, M. 2004. **DiamondSpin: an extensible toolkit for around-the-table interaction**. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (Vienna, Austria, April 24 - 29, 2004). CHI '04. ACM Press, New York, NY, 167-174.
- [RF. 6] Forlines, C., Marks, J., Schmidt-Nielsen, B.: **Digi-Koi: A Game for Cell Phones**. In: Proceedings of 2nd International Conference on Application and Development of Computer Games (ADCOG 2003).
- [RF. 5] Raskar, R., van Baar, J., Beardsley, P.A., Willwacher, T., Rao, S., and Forlines, C., **iLamps: Geometrically Aware and Self-Configuring Projectors**, ACM Transactions on Graphics (TOG), Volume 22, Issue 3, pp. 809-818.
- [RF. 4] Wittenburg, K., Forlines, C., Lanning, T., Esenther, A., Harada, S. and Miyachi, T., **Rapid serial visual presentation techniques for consumer digital video devices**. in Proceedings of the 16th annual ACM symposium on User interface software and technology, (Vancouver, Canada, 2003), ACM Press, 115-124.
- [RF. 3] Blaine, T., and Forlines, C., **JAM-O-WORLD: Evolution of the Jam-O-Drum Multi-player Musical Controller into the Jam-O-Whirl Gaming Interface**. in Proceedings of the 2002 Conference on New Instruments for Musical Expression (NIME-02), Dublin, Ireland, May 24-26, 2002.
- [RF. 2] Shen, C., Lesh, N. B., Vernier, F., Forlines, C., and Frost, J. **Sharing and building digital group histories**. In Proceedings of the 2002 ACM Conference on Computer Supported Cooperative Work (New Orleans, Louisiana, USA, November 16 - 20, 2002). CSCW '02. ACM Press, New York, NY, 324-333.
- [RF. 1] Sidner, C.L., and Forlines, C., **Subset Languages for Conversing with Collaborative Interface Agents**, International Conference on Spoken Language Processing (ICSLP), September 2002.

Refereed Short Journal, Conference, and Workshop Paper Publications

- [RS. 22] Wu, Y., Valdez, R., Forlines, C. (2023). **Cognitive and Emotional Monitoring with Inexpensive Wrist-Worn Consumer-Grade Wearables**. *2023 IEEE International Conference on Pervasive Computing and Communications Workshops (PerCom Workshops)*. In Press.
- [RS. 21] Forlines, C., Miller, S., Prakash, S., and Irvine, J. (2012). **Heuristics for Improving Forecast Aggregation**. *Machine Aggregation of Human Judgment: AAAI-12 Fall Symposium*. Arlington, Virginia, November 2-4, 2012.
- [RS. 20] Miller, S., Forlines, C., and Regan, J. (2012) **Exploring the Relationship Between Topic Area Knowledge and Forecasting Performance**. In *Proceedings of the 56th Annual Meeting of the Human Factors and Ergonomics Society*.
- [RS. 19] Poore, J., Regan, J., Miller, S., Forlines, C., and Irvine, J. (2012) **Fine Distinctions Within Cognitive Style Predict Forecasting Accuracy**. In *Proceedings of the 56th Annual Meeting of the Human Factors and Ergonomics Society*.

Dr. Clifton Forlines – Curriculum Vitae

April, 2025

Page 10

- [RS. 18] Forlines, C. and Lilien, R. 2008. **Adapting a single-user, single-display molecular visualization application for use in a multi-user, multi-display environment.** In *Proceedings of the Working Conference on Advanced Visual interfaces* (Napoli, Italy, May 28 - 30, 2008). AVI '08. ACM, New York, NY, 367-371.
- [RS. 17] Matusik, W., Forlines, C., and Pfister, H. 2008. **Multiview user interfaces with an automultiscopic display.** In *Proceedings of the Working Conference on Advanced Visual interfaces* (Napoli, Italy, May 28 - 30, 2008). AVI '08. ACM, New York, NY, 363-366.
- [RS. 16] Jiang, H., Wigdor, D., Forlines, C., Borkin, M., Kauffmann, J., and Shen, C. 2008. **LivOlay: interactive ad-hoc registration and overlapping of applications for collaborative visual exploration.** In *Proceeding of the Twenty-Sixth Annual SIGCHI Conference on Human Factors in Computing Systems* (Florence, Italy, April 05 - 10, 2008). CHI '08. ACM, New York, NY, 1357-1360.
- [RS. 15] Forlines, C., Esenther, A., Shen, C., Wigdor, D., and Ryall, K. 2006. **Multi-user, multi-display interaction with a single-user, single-display geospatial application.** In *Proceedings of the 19th Annual ACM Symposium on User interface Software and Technology* (Montreux, Switzerland, October 15 - 18, 2006). UIST '06. ACM, New York, NY, 273-276.
- [RS. 14] Wigdor, D., Shen, C., Forlines, C., Balakrishnan, R. (2006). **Table-centric interactive spaces for real-time collaboration.** In *Proceedings of the 2006 International Working Conference on Advanced Visual Interfaces*. p. 103-107.
- [RS. 13] Forlines, C. and Shen, C. 2005. **DTLens: multi-user tabletop spatial data exploration.** In *Proceedings of the 18th Annual ACM Symposium on User interface Software and Technology* (Seattle, WA, USA, October 23 - 26, 2005). UIST '05. ACM Press, New York, NY, 119-122.
- [RS. 12] Forlines, C., Shen, C., Vernier, F. and Wu, M., **Under My Finger: Human Factors in Pushing and Rotating Documents Across the Table.** in *Proceedings of Human-Computer Interaction - INTERACT 2005: IFIP TC13 International Conference*, (Rome, Italy, 2005), 994-997.
- [RS. 11] Ryall, K., Esenther, A., Everitt, K., Forlines, C., Morris, M.R., Shen, C., Shipman, S. and Vernier, F., **iDwidgets: Parameterizing Widgets by User Identity** *Proceedings of Human-Computer Interaction - INTERACT 2005: IFIP TC13 International Conference*. in, (Rome, Italy, 2005), pp. 1124-1128.
- [RS. 10] Everitt, K., Shen, C., Ryall, K. and Forlines, C., **DocuBits and Containers: Providing e-Document Micro-mobility in a Walk-Up Interactive Tabletop Environment.** in *Proceedings of Human-Computer Interaction - INTERACT 2005: IFIP TC13 International Conference*, (Rome, Italy, 2005), 998-1001.
- [RS. 9] Forlines, C. Shen, C., and Buxton, B. **Glimpse: a novel input model for multi-level devices.** In *CHI '05 Extended Abstracts on Human Factors in Computing Systems* (Portland, OR, USA, April 02 - 07, 2005). CHI '05. ACM Press, New York, NY, 1375-1378.

- [RS. 8] Everitt, K., Shen, C., Ryall, K., and Forlines, C. 2005. **Modal spaces: spatial multiplexing to mediate direct-touch input on large displays**. In *CHI '05 Extended Abstracts on Human Factors in Computing Systems* (Portland, OR, USA, April 02 - 07, 2005). CHI '05. ACM Press, New York, NY, 1359-1362.
- [RS. 7] Shen, C., Hancock, M. S., Forlines, C., and Vernier, F. D., **CoR²Ds: Context-Rooted Rotatable Draggables for Tabletop Interaction**. In *CHI '05 Extended Abstracts on Human Factors in Computing Systems*, (Portland, OR, USA, April 02 - 07, 2005). CHI '05. ACM Press, New York, NY, 1781-1784.
- [RS. 6] Divakaran, A., Forlines, C., Lanning, T., Shipman, S., and Wittenburg, K., **Augmenting Fast-forward and Rewind for Personal Digital Video Recorders**, International Conference on Consumer Electronics (ICCE), January 2005.
- [RS. 5] Ringel Morris, M., Ryall, K., Shen, C., Forlines, C., and Vernier, F. 2004. **Beyond "social protocols": multi-user coordination policies for co-located groupware**. In *Proceedings of the 2004 ACM Conference on Computer Supported Cooperative Work* (Chicago, Illinois, USA, November 06 - 10, 2004). CSCW '04. ACM Press, New York, NY, 262-265.
- [RS. 4] Divi, V., Forlines, C., van Gemert, J. V., Raj, B., Schmidt-Nielsen, B., Wittenburg, K., Woelfel, J., Wolf, P.; and Zhang, F. **A Speech-In List-Out Approach to Spoken User Interfaces**. In *Proceedings of Human Language Technology Conference (HLT 2004)* (Boston, Massachusetts May 2-7, 2004). Association for Computational Linguistics, 2004, 113-116.
- [RS. 3] Ringel, M., Ryall, K., Shen, C., Forlines, C., and Vernier, F. 2004. **Release, relocate, reorient, resize: fluid techniques for document sharing on multi-user interactive tables**. In *CHI '04 Extended Abstracts on Human Factors in Computing Systems* (Vienna, Austria, April 24 - 29, 2004). CHI '04. ACM Press, New York, NY, 1441-1444.
- [RS. 2] Wittenburg, K., Lanning, T., Forlines, C., & Esenther, A. (2003) **Rapid serial visual presentation techniques for visualizing a third data dimension**. In *Proceedings of HCI International 2003* (June, Crete, GREECE), Lawrence Erlbaum, Vol. 4, pp. 810-814.
- [RS. 1] Pausch, R. and Forlines, C., **Alice: Model, Paint and Animate - Easy-to-use Interactive Graphics for the Web**. *ACM SIGGRAPH Computer Graphics*, vol 34, no. 2, May 2000. pp. 42-43.

US Patents

- 11,460,951** **Transmitting And Receiving System And Method For Bidirectional Orthogonal Signaling Sensors** (with Darren Leigh)
- 11,112,905** **Vehicular Components Comprising Sensors** (with Robert Alack, Darren Leigh, Braon Moseley, and Adam Landa)
- 11,068,105** **System and method for performing hit testing in a graphical user interface** (with Bruno Rodrigues De Araujo, Jonathan Deber, Ricardo Costa, and Daniel Wigdor)

- 11,068,068 **Toroidal sensor** (with Darren Leigh, Braon Moseley, Rob Alack, and Adam Landa)
- 11,029,843 **Touch sensitive keyboard** (with David Holman, Stephen Dennis, Ricardo Costa, Steven Sanders, Clark Wilkinson, Braon Moseley, and Bruno De Araujo)
- 11,009,994 **System and method for timing input sensing, rendering, and display to minimize latency** (with Bruno Rodrigues De Araujo and Ricardo Costa)
- 10,969,875 **Toroidal Sensor** (with Darren Leigh, Braon Moseley, Robert Alack, Jr., and Adam Landa)
- 10,871,855 **Area filtering for low-latency and high-latency input event paths from a single touch sensor** (with Bruno Rodrigues De Araujo, Ricardo Costa, and Steven Sanders)
- 10,845,897 **Touch Surfaces using Stylus and Touch**
- 10,712,880 **Signal infusion to enhance appendage detection and characterization** (with Darren Leigh, Braon Moseley, and Robert Alack, Jr.)
- 10,691,279 **Dynamic assignment of possible channels in a touch sensor** (with Darren Leigh, Daniel Wigdor, and Steven Sanders)
- 10,691,251 **Orthogonal signaling touch user, hand and object discrimination systems and methods** (with Darren Leigh, Ricardo Costa, Daniel Wigdor, and Steven Sanders)
- 10,620,746 **Decimation supplementation strategies for input event processing** (with Ricardo Costa, Daniel Wigdor, Steven Sanders, and Bruno De Araujo)
- 10,620,737 **Differential transmission for reduction of cross-talk in projective capacitive touch sensors** (with Darren Leigh)
- 10,592,050 **Systems and methods for using hover information to predict touch locations and reduce or eliminate touchdown latency** (with Ricardo Costa, Daniel Wigdor, Karan Singh, and Haijun Xia)
- 10,572,088 **Vehicular components comprising sensors** (with Rob Alack, Darren Leigh, Braon Moseley, and Adam Landa)
- 10,572,036 **Transmitting and receiving system and method for bidirectional orthogonal signaling sensors** (with Darren Leigh)
- 10,558,293 **Pressure informed decimation strategies for input event processing** (with Daniel Wigdor)
- 10,551,985 **Fast multi-touch noise reduction** (with Darren Leigh, Daniel Wigdor, and Steven Sanders)
- 10,528,201 **Toroidal sensor** (with Darren Leigh, Braon Moseley, Rob Alack, and Adam Landa)
- 10,423,273 **Differential transmission for reduction of cross-talk in projective capacitive touch sensors** (with Darren Leigh)

- 10,402,009 **System and method for timing input sensing, rendering, and display to minimize latency** (with Bruno De Araujo and Ricardo Costa)
- 10,289,256 **Dynamic assignment of possible channels in a touch sensor** (with Darren Leigh, Daniel Wigdor, and Steven Sanders)
- 10,241,760 **System and method for performing hit testing in a graphical user interface** (with Bruno De Araujo, Jonathan Deber, Ricardo Costa, and Daniel Wigdor)
- 10,241,620 **Area filtering for low-latency and high-latency input event paths from a single touch sensor** (with Bruno De Araujo, Ricardo Costa, and Steven Sanders)
- 10,241,612 **Decimation supplementation strategies for input event processing** (with Ricardo Costa, Daniel Wigdor, Steven Sanders, and Bruno De Araujo)
- 10,222,952 **Hybrid systems and methods for low-latency user input processing and feedback** (with Daniel Wigdor, Steven Sanders, and Ricardo Costa)
- 10,216,602 **Tool to measure the latency of touchscreen devices** (with Jonathan Deber, Bruno De Araujo, Ricardo Costa, Darren Leigh, Steven Sanders, and Daniel Wigdor)
- 10,191,579 **Transmitting and receiving system and method for bidirectional orthogonal signaling sensors** (with Darren Leigh)
- 10,168,849 **Fast multi-touch noise reduction** (with Darren Leigh, Daniel Wigdor, and Steven Sanders)
- 10,133,400 **Pressure informed decimation strategies for input event processing (with Daniel Wigdor)**
- 10,088,952 **Systems and methods for using hover information to predict touch locations and reduce or eliminate touchdown latency** (with Ricardo Costa, Daniel Wigdor, Karan Singh, and Haijun Xia)
- 10,019,125 **Fast multi-touch noise reduction** (with Darren Leigh, Daniel Wigdor, and Steven Sanders)
- 9,990,696 **Decimation strategies for input event processing** (with Ricardo Costa, Daniel Wigdor, Steven Sanders, and Bruno De Araujo)
- 9,971,443 **System and method for timing input sensing, rendering, and display to minimize latency** (with Bruno De Araujo and Ricardo Costa)
- 9,946,398 **System and method for timing input sensing, rendering, and display to minimize latency** (with Bruno De Araujo and Ricardo Costa)
- 9,933,880 **Orthogonal signaling touch user, hand and object discrimination systems and methods** (with Darren Leigh, Ricardo Costa, Daniel Wigdor, and Steven Sanders)
- 9,927,959 **Hybrid systems and methods for low-latency user input processing and feedback** (with Daniel Wigdor, Steven Sanders, and Ricardo Costa)

- 9,870,112 **Frequency conversion in a touch sensor** (with Darren Leigh, Daniel Wigdor, and Steven Sanders)
- 9,846,920 **Decimation strategies for input event processing** (with Ricardo Costa, Daniel Wigdor, and Steven Sanders)
- 9,841,839 **System for Measuring Latency on a Touch Device** (with Darren Leigh, Daniel Wigdor, and Steven Sanders)
- 9,836,313 **Low-latency visual response to input via pre-generation of alternative graphical representations of application elements and input handling on a graphical processing unit** (with Daniel Wigdor, Steven Sanders, and Ricardo Costa)
- 9,830,014 **Reducing control response latency with defined cross-control behavior** (with Benjamin McCanny and Daniel Wigdor)
- 9,811,214 **Fast multi-touch noise reduction** (with Darren Leigh, Daniel Wigdor, and Steven Sanders)
- 9,710,116 **Frequency conversion in a touch sensor** (with Darren Leigh, Daniel Wigdor, and Steven Sanders)
- 9,632,615 **Reducing control response latency with defined cross-control behavior** (with Benjamin McCanny and Daniel Wigdor)
- 9,507,500 **Hybrid systems and methods for low-latency user input processing and feedback** (with Daniel Wigdor, Steven Sanders, and Ricardo Costa)
- 7,773,099 **Context aware image conversion method and playback system** (with Anthony Vetro)
- 7,640,518 **Method and system for switching between absolute and relative pointing with direct input devices** (with Ravin Balakrishnan)
- 7,526,725 **Context aware video conversion method and playback system**
- 7,486,274 **Method for stabilizing and precisely locating pointers generated by handheld direct pointing devices** (with Ravin Balakrishnan)
- 7,441,202 **Spatial multiplexing to mediate direct-touch input on large displays** (with Chia Shen, Kate Everitt, and Kathy Ryall)
- 7,327,376 **Multi-user collaborative graphical user interfaces** (with Chia Shen and Frederic Vernier)
- 7,292,269 **Context aware projector** (with Ramesh Raskar and Paul Beardsley)
- 7,179,171 **Fish breeding toy for cellular telephones** (with Joseph Marks)
- 7,139,006 **System and method for presenting and browsing images serially** (with Alan Esenther, Thomas Lanning, and Kent Wittenburg)
- 6,764,185 **Projector as an Input and Output Device** (with Paul Beardsley, Dirk Brinkman, and Ramesh Raskar)

Professional Service

Program Committees	ACM SIGGRAPH: Emerging Technologies (2021) ACM CHI: Program Committee (2009, 2012, 2014) <i>Human Factors in Computing Systems</i> ACM UIST: Program Committee (2012, 2014) <i>User Interface Software & Technology</i> ACM TIS: Program Committee (2013) <i>Tabletops and Interactive Surfaces</i> ACM TEI: Program Committee (2008) <i>Tangible, Embedded and Embodied Interaction</i> ACM UIST: Posters (2006) <i>User Interface Software & Technology</i>
Invited Reviews	ACM CHI: Papers & Notes (2003-2018) <i>Human Factors in Computing Systems</i> ACM UIST: Papers & Notes (2003-2018) <i>User Interface Software & Technology</i> ACM TEI: Papers & Notes (2008-2016) <i>Tangible, Embedded and Embodied Interaction</i> IEEE ISS: (2022) ACM MobileHCI (2022) ACM TOCHI: Papers (2012) <i>Transactions on Computer-Human Interaction</i> ACM CSCW: Papers & Notes (2004- 2010) <i>Computer Supported Collaborative Work</i> ACM SIGGRAPH: Papers & Notes (2008) <i>Computer Graphics</i> IEEE INFOVIS: Papers & Notes (2008) <i>Information Visualization</i> IEEE VIS: Papers & Notes (2008) <i>Visualization</i> ACM IUI: Papers (2006) <i>Intelligent User Interfaces</i> Graphics Interface: Papers (2004,2005,2006) IEEE Journal of Computer Graphics & Applications Journal of HCI Handbook of Research on User Interfaces Design and Evaluation for Mobile Technology IEEE CG&A (2006) <i>IEEE Computer Graphics and Applications</i>
Organization	IEEE ISS (2022), Sponsorship Chair ACM UIST (2009-11,13-14) Proceedings Chair IEEE Tabletop (2009) Tutorials Co-chair ACM ICMI (2009) Local-arrangements Chair IEEE Tabletop (2008) Finance Chair IEEE Tabletop (2007) General Co-chair