

# Ravin Balakrishnan

## Curriculum Vitae

### **Contact information**

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### **Education**

- Ph.D. Computer Science, University of Toronto, Canada. Feb 2001.  
Thesis: "Issues in Bimanual Interaction for Computer Graphics."  
Advisor: Prof. Bill Buxton  
Advisory Committee: Prof. Mark Chignell, Prof. Eugene Fiume, Prof. Scott MacKenzie
- M.Sc. Computer Science, University of Toronto, Canada. Jan 1997.  
Thesis: "The Evolution and Evaluation of a 3D Input Device."  
Advisor: Prof. Bill Buxton
- B.Sc. (1st Class Honours), Computer Science, University of New Brunswick, Canada. May 1993.

### **Employment**

- Chair, Department of Computer Science, University of Toronto, 2015 – 2019.
- Professor (tenured), Department of Computer Science, University of Toronto, 2011 – present.  
Canada Research Chair (CRC-Tier II) in Human-Centred Interfaces, Department of Computer Science, University of Toronto, March 2006 – 2016.
- Associate Professor (tenured), Department of Computer Science, University of Toronto, 2006- 2011.  
Canada Research Chair (CRC-Tier II) in Human-Centred Interfaces, Department of Computer Science, University of Toronto, March 2006 – 2016.
- Associate Chair, Research and Industrial Relations, Department of Computer Science, University of Toronto. July 1, 2008 – June 30, 2010.
- Assistant Professor (tenure-track), Department of Computer Science, University of Toronto, 2001 –2006. Appointed as Full Member of the Graduate Faculty in 2001.
- Researcher, User Interface Research Group, Alias|wavefront (now Autodesk), Aug 1996 – July 2001.  
Conducted basic and applied research on interfaces for interactive 3D graphics, alternate multi degree-of-freedom input devices, two-handed input, haptic feedback interfaces, tablet based input, and large scale displays. Some of the ideas and interaction techniques developed in this research have been incorporated into Alias|wavefront's market leading software products for 3D design, modeling, and animation.
- Instructor, Dept. of Computer Science, University of Toronto, May 1995 – Aug 2000, on a per course basis.  
Lectured and took complete responsibility, including managing several teaching assistants, for various undergraduate courses (listed in section entitled "Teaching" below).
- Teaching Assistant, Dept. of Computer Science, University of Toronto. Sep 1993 - Dec 1996.  
Conducted tutorials and marked assignments, tests, and exams for various courses (listed in section entitled "Teaching" below).

Research Assistant, Human Computer Interaction Laboratory, University of New Brunswick, May - Sept 1993.  
Worked with Prof. Colin Ware on empirical research into the effects of lag in fishtank virtual reality environments. Also helped design, build, and evaluate a haptic feedback input/output device.

Programmer Analyst, Indigo Software Ltd, Ottawa, Canada. Sep - Dec 1990, May - Aug 1991, Jan - May 1992.

### ***Visiting and consulting activities***

Visiting researcher, HPLabs Bangalore, India. Feb 2009.

Visiting researcher, Microsoft Research - Redmond, Beijing, Bangalore and Cambridge labs. July 2007 – June 2008.

Visiting professor, Laboratoire de Recherche en Informatique (LRI), Université Paris-Sud. France. June-July, 2006

Visiting researcher, Mitsubishi Electric Research Lab (MERL), Cambridge, MA, USA. Feb 2005 – Mar 2007.

Expert witness for Sony through Kirkland and Ellis LLP. Plaintiff: Bot M8. 2020 – ongoing.

Expert witness for Facebook on several cases, through Cooley LLP. 2019 – ongoing.

Expert witness for Polaris PowerLED Technologies Ltd., through Feinberg Day. Defendants: Vizio. 2019 -- ongoing.

Expert witness for NexStep Inc. through Kramer Levin LLP. Defendant: Comcast. 2019 – ongoing.

Expert witness for iTools Media Inc., through Gilberts LLP. Plaintiffs: Caps Group Inc., and CASLCure Inc. 2019. Prepared one report. Case settled.

Expert witness for Polaris PowerLED Technologies Ltd., through Dentons and Feinberg Day. Defendants: Samsung. 2018 – 2019. Prepared several reports. One deposition. Case settled in 2019.

Expert witness for Charter., through Quinn Emanuel. Plaintiff: Sprint Communications. 2018 – ongoing.

Expert witness for Immersion Corp, through Morrison and Foerster. Defendants: Motorola Mobility and Samsung. 2017 – 2019. Prepared several reports, several depositions. Cases settled in 2019.

Expert witness for 3Shape Inc. through Buchanan Ingersoll & Rooney. Plaintiff: Align Technology, Inc. IPR proceedings. Prepared one report. One deposition. 2018 – 2019.

Expert witness for Rovi Corp, through Gilberts LLP then Lencner Slaght. Plaintiffs, Videotron, Bell, Telus. 2017 – ongoing.

Expert witness for Phillips, through Fitzpatrick, Cella, Harper and Scinto. Plaintiff: HTC corp. IPR proceedings. Prepared report. 2017 – 2018.

Expert witness for Rovi Corp, through Ropes and Gray. Plaintiff: Comcast Corp. IPR proceedings for several patents. 2017 – 2018. Prepared several reports, two depositions.

Expert witness for Rovi Guides Inc. through McKool Smith. Plaintiff: Comcast Corp. in Rovi Guides Inc., et al. v. Comcast Corp., et al., No. 2:16-cv-321 (EDTX); Rovi Guides Inc. v. Comcast Corp., et al., No. 2:16-cv-322 (EDTX); Certain Digital Video Receivers and Hardware and Software Components Thereof, Inv. No. 337-TA-1001 (ITC); Comcast Corp., et al. v. Rovi Corp., et al., No. 1:16-cv-03852 (SDNY). 2016 – ongoing. Testified at ITC hearing.

Expert witness for Oculus and Palmer Luckey through Cooley, LLP, in a trade secret action at the US District Court for the Northern District of California. Plaintiff: Total Recall Technologies. Case No. 3:2015cv02281. 2016 – ongoing.

Expert witness for Nuance Communications through Weil Gotshal and Manges LLP, in an IPR proceeding at the US Patent Office. 2016. Draft report prepared. Case terminated.

Expert witness for Oculus, Facebook and Palmer Luckey through Cooley, LLP, in a trade secret action at the US District Court for the Northern District of Texas. Plaintiff: ZeniMax Media Inc. and ID Software LLC. Case No. 3:14-cv-01849-P. 2015-2016. Several reports and depositions. Testified at trial.

Expert consultant for ZTE through Upshaw PLLC. 2015. Did some preliminary prior art research.

Expert witness for Apple through O'Melveny & Myers, LLP, in a patent infringement action at the US District Court for the District of Northern California. Plaintiff: OpenTV, Inc. and Nagravision, SA. Case No: 14-CV-1622. Case settled. Retained for the case but no work done.

Expert witness for Mojo Media Inc. through Morrison Foerster LLP, in a patent interference action. Interference No. 106,005, Mojo Media, Inc. v. Snapchat, Inc. 2014 – 2015. Prepared several reports. Case terminated in 2015.

Expert witness for Queens University and PARTEQ Research and Development Innovations (plaintiff) through Susman Godfrey LLP, and Sterne, Kessler, Goldstein & Fox in a patent infringement action at the US District Court for the Eastern District of Texas and an IPR proceedings at the US Patent office. Case: 2:14-cv-53. Defendant: Samsung. 2014-2016 . Prepared several reports, two depositions.

Expert witness for Greenwood Publishing Group, Inc. d/b/a Heinemann (defendant) through Wilmer Hale in a patent infringement action at the US District Court for the Southern District of New York. Case: 1:13-cv-02687-LTS-RLE. Plaintiff: Amplify Education Inc. 2014. Prepared one declaration on claim construction. Case settled in 2014.

Expert witness for Microsoft (defendant) through Sidley Austin LLP, in a patent infringement action at the US District Court for the District of Maine. Case: 2:12-cv-333-DBH. Plaintiff: SurfCast Inc. 2013 – 2014. Prepared several reports, one deposition.

Expert witness for VMware (defendant) through Morrison Foerster, LLP, in a patent infringement action at the US District Court for the District of Delaware. Case: 13-cv-116. Plaintiff: UbiComm LLC. 2013. Prepared several declarations.

Expert witness for Hockeyline Inc. (plaintiff) through Freitas Tseng & Kaufmann LLP, in a patent infringement action at the US District Court for the Southern District of New York. Case: 1:13-cv-01446-CM. Defendant: STATS LLC. 2013 – 2015. Prepared one report. Case terminated in 2015.

Expert witness for Pixcir Microelectronics (defendant) through Nixon Peabody LLP, in a patent infringement action at the US District Court for the District of Nevada. Case: 2:10-cv-00014-GMN-PAL. Plaintiff: Elan Microelectroics. 2013. Prepared one report. Case settled in 2013.

Expert witness for Nuance (complainant) through Weil, Gotshal & Manges, LLP, in a patent infringement action at the ITC. Investigation No. 337-TA-785. Respondent: Cootek. Several reports and one deposition. Case settled in 2013.

Expert witness for Yahoo (defendant) through Morrison Foerster, LLP, in a patent infringement action. Plaintiff: Interval. 2012. Retained, but no work done..

Expert witness for Immersion (complainant) through Morrison Foerster, LLP, in a patent infringement action at the ITC, Investigation No: 337-TA-834 and in the District Court for the District of Delaware. Respondent: HTC. 2012-ongoing. Several reports, two depositions. ITC case terminated in 2012, District court case settled in 2015.

Expert witness for Apple (plaintiff) through Freehills in a patent infringement action in Australia. Defendant: Samsung. 2012-2013. Prepared several reports and testified at trial.

Expert witness for Apple (plaintiff) through Freshfields Bruckhaus Deringer in a patent infringement action in the UK. Defendant: HTC. 2012. Several reports. Case settled in Nov 2012.

Expert witness for Apple (plaintiff) through Freshfields Bruckhaus Deringer in a patent infringement action in the Netherlands. Defendant: Samsung. Prepared one declaration and attended injunction hearing.

Expert witness for Apple (plaintiff) through Gibson Dunn, LLP, in a patent infringement action at the US District Court for the Northern District of California. Defendant: Samsung. Case No. 12-cv-00630-LHK. 2012. Judge: Hon. Lucy Koh. One report, one deposition for preliminary injunction.

Expert witness for Apple (complainant) through Feinberg Day, LLP, in a patent infringement action at the ITC. Respondent: HTC. Investigation No. 337-TA- 797. 2011-2012. ALJ: Hon. E. James Gildea. Several expert reports, one deposition, testified at trial.

Expert witness for Apple (defendant) through O'Melveny & Myers, LLP, in a patent infringement action at the US District Court for the District of Delaware. Plaintiff: MobileMedia Ideas LLC. Case No: 10-258-SLR. 2011-2016. Judge: Hon. Sue Robinson. Several reports, several depositions, testified at two trials.

Expert witness for Apple (respondent) through Wilmer Hale, LLP, in a patent infringement action at the ITC. Complainant: Samsung. Investigation No. 337-TA- 794. 2011-2012. ALJ: Hon. E. James Gildea. Several expert reports, one deposition, testified at trial.

Expert witness for Apple (plaintiff) through Morrison & Foerster, LLP, in a patent infringement action at the US District Court for the Northern District of California. Defendant: Samsung. Case No. 11-cv-01846 LHK. 2011-2013. Judge: Hon. Lucy Koh. Several reports, several depositions, testified at technology tutorial and three trials.

Expert witness for Apple (complainant) through Morrison & Foerster, LLP, in a patent infringement action at the ITC. Respondent: Samsung. Investigation No. 337-TA- 796. 2011-2012. ALJ: Hon. Thomas Pender. Several reports, one deposition, testified at technology tutorial and at trial.

Expert witness for Apple (complainant) through Weil, Gotshal & Manges, LLP, in a patent infringement action at the ITC. Respondent: Motorola. Investigation No. 337-TA- 750. 2011. ALJ: Hon. Theodore Essex. Several reports, one deposition, testified at trial.

Expert witness for Apple (defendant) through Weil, Gotshal & Manges, LLP, in a patent infringement action in the US District Court for the Northern District of California. Plaintiff: Elan Microelectronics. Case No. 5:09-cv-01531-RS (N.D. Cal) 2010-2012. Judge: Hon. Richard Seeborg. Several declarations. Case settled in 2012.

Expert witness for Apple (respondent) through Weil, Gotshal & Manges, LLP, in a patent infringement action at the ITC. Complainant: Elan Microelectronics. Investigation No. 337-TA-714. 2010-2011. CALJ: Hon. Paul Luckern. Several reports, two depositions, testified at Markman hearing and at trial.

Expert witness for Nintendo (respondent) through Covington and Burling, LLP, in a patent infringement action at the ITC. Complainant: Hillcrest Laboratories. Investigation No. 337-TA-658. 2008-2009. CALJ: Hon. Paul Luckern. Several reports, two depositions, testified at trial.

### ***Entrepreneurial Activities***

Co-founder, Conceptualiz [www.conceptualiz.com](http://www.conceptualiz.com). Developing surgical planning technology.

Co-founder, Arcestra [www.arcestra.com](http://www.arcestra.com) (formerly Sketch2 Corp). Developing software for designing 3D building interior layouts. The concept grew out of research conducted in my lab with my colleague Prof. Karan Singh and graduate students Steven Tsang and Abhishek Ranjan.

Co-founder, Bump Technologies Inc. [www.bumptop.com](http://www.bumptop.com). Acquired by Google in May, 2010. Developed a physically realistic desktop user interface system, which grew out of research conducted in my lab with graduate student Anand Agarawala.

## **Research endeavours**

Human-computer interaction, computer mediated human-human interaction, data visualization, information and communications technology for development.

### **Specific research interests:**

Input devices, sensing technologies, interaction techniques. In particular, gestural, sketching, and multi degree-of-freedom interaction, interfaces to small and/or mobile computers, interfaces to displays of the future.

User interfaces and interaction techniques for data visualization.

Empirical evaluation of user interfaces including associated metrics and predictive models of human performance.

Ambient, pervasive, and ubiquitous computing.

Computer supported collaborative work (CSCW).

Interfaces and systems for educational and healthcare applications in developing economies.

## **Awards, fellowships, scholarships**

Dean's Excellence Award, Faculty of Arts and Science, University of Toronto. 2016.

10-year impact award at the ACM Interactive Tabletops and Surfaces conference 2016 for paper published in 2006.

Two best paper honorable mention awards at the ACM CHI 2016 Conference on Human Factors in Computing Systems.

Best paper honorable mention award at the ACM CHI 2013 Conference on Human Factors in Computing Systems.

Elected to the ACM CHI Academy in 2011.

Dean's Excellence Award, Faculty of Arts and Science, University of Toronto. 2010.

Best paper award at the ACM CHI 2010 Conference on Human Factors in Computing Systems.

Best paper honorable mention award at the ACM CSCW 2010 Conference on Computer Supported Cooperative Work.

Dean's Excellence Award, Faculty of Arts and Science, University of Toronto. 2009.

Best paper honorable mention award at the ACM CHI 2009 Conference on Human Factors in Computing Systems.

Dean's Excellence Award, Faculty of Arts and Science, University of Toronto. 2008.

Best paper honorable mention award at the ACM CHI 2008 Conference on Human Factors in Computing Systems.

Alfred P. Sloan Research Fellowship. 2007-2009. US\$45,000.

Dean's Excellence Award, Faculty of Arts and Science, University of Toronto. 2007.

Canada Research Chair (CRC-Tier II) in Human-Centred Interfaces, University of Toronto, March 2006 – 2016.

Dean's Excellence Award, Faculty of Arts and Science, University of Toronto. 2006.

Best paper honorable mention award at the ACM CSCW 2006 Conference on Computer Supported Cooperative Work.

Best student paper award at the ACM UIST 2006 Symposium on User Interface Software and Technology.

Best paper award at the Graphics Interface 2005 Conference.

Dean's Excellence Award, Faculty of Arts and Science, University of Toronto. 2005.

Best paper award at the ACM CHI 2005 Conference on Human Factors in Computing Systems.

Best paper award at the ACM UIST 2004 Symposium on User Interface Software and Technology.

Dean's Excellence Award, Faculty of Arts and Science, University of Toronto. 2004.

Ontario Premier's Research Excellence Award (PREA). 2003. \$100,000.

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