Curriculum Vitae

Tovi Grossman

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Citizenship: Canada

RESEARCH INTERESTS

My research lies in the general area of Human-Computer Interaction, with a primary focus on understanding and improving human learning in complex scenarios. In particular, I have been exploring how emerging trends and technologies, such as wearables, the Internet of Things, and gamification can be leveraged to enhance learning and knowledge sharing for both feature-rich software applications and real-world physical tasks. Topics include: video-based assistance, community-based assistance, context-aware assistance, software learning gamification, command recommender systems, and workflow capture and analysis.

My other main research interest is in the design of input and interaction for new forms of media and technology, covering a wide range of topics relevant to HCI. Typically, my work in these areas involve low level empirical studies to improve our understanding of the human factors associated with these technologies, and the design and implementation of novel techniques and interfaces to provide enhanced and compelling user experiences. Topics include: Interactive graphics and 3D modeling, sketch-based animation, interactive digital fabrication, wearable and implanted user interfaces, and gesture-based interaction.

In addition to this work leading to an extensive international publication record, I have a strong passion for pursuing ways in which my research can have real-world impact. I have been involved in a number of successful transfers of my research leading to new technologies and products used by millions of users, such as Autodesk Screencast, Autodesk ToolClip™ videos, and Autodesk Sketchbook Motion.

Research Interests: *3D User Interfaces; AR/VR Interaction, Wearable and Mobile Interaction; Technology-Assisted Learning; Sketch-Based Animation; Interactive Fabrication, Physical Crowdsourcing; Human-Robot Interaction.*

EDUCATION

Ph.D. in Computer Science. 2008.
Department of Computer Science, University of Toronto.
Thesis Title: "Interaction with Volumetric Displays".
Advisor: Ravin Balakrishnan

M.Sc. in Computer Science. 2004.
Department of Computer Science, University of Toronto.
Thesis Title: "Alternate User Interfaces for 3D Curve Creation and Manipulation".
Advisor: Ravin Balakrishnan

B.Sc. Honours. Computer Science Major, Math Minor, Philosophy Minor. 2002.
University of Toronto

EMPLOYMENT AND PROFESSIONAL EXPERIENCE

Current

2018 - Present — *Assistant Professor at University of Toronto, Department of Computer Science*

I currently hold a tenure-stream position in the Department of Computer Science at University of Toronto at the rank of Assistant Professor. The University of Toronto Department of Computer Science is ranked as the top CS department in Canada and 10th globally. Responsibilities include: pursuing innovative research at the highest international level; establishing a strong, externally funded independent research program; having a strong commitment to undergraduate and graduate teaching; and contributing to the enrichment of both undergraduate and graduate programs in the computer science department.

Past Appointments

2008 – 2018 — *Distinguished Research Scientist at Autodesk Research, Toronto, Canada.*
Group Directors: George Fitzmaurice, Gord Kurtenbach

Prior to becoming faculty at University of Toronto, I was a Distinguished Research Scientist within the Autodesk Research User Interface Research Group, leading research programs on software learnability, physical learning, and input and interaction for new technologies. These research programs led to an extensive publication record in top tier international venues. I also led and influenced the transfer of my research into a number of novel commercial technologies [C.22, C.25, C.65], and new standalone products [C.27, C.61], reaching millions of users worldwide. Finally, my role involved the management of the Autodesk Research Internship program for the User Interface Research Group, annually supervising 3-6 research interns, originating from top Canadian, American, and International institutions.

Jan-Apr 2007 — *Research Internship at Microsoft Research, Redmond, USA*
Research Advisors: Ken Hinckley, Patrick Baudisch. Group Manager: Eric Horvitz

Working within The Adaptive Systems and Interaction group, I designed *Handle Flags*, a new technique used to select and perform commands on ink strokes in pen-operated interfaces. The work was published at the Graphics Interface conference [C.21] and patented by Microsoft.

Jan-Apr 2005 — *Research Internship at Microsoft Research, Redmond, USA*
Research Advisor: Ken Hinckley. Group Manager: Eric Horvitz

This research internship was conducted within The Adaptive Systems and Interaction group. I designed *Hover Widgets*, a new technique for increasing the capabilities of pen-based interfaces, by

using short gestures while hovering above the display surface. This work was published in the ACM CHI Conference [C.7] and patented by Microsoft.

2000 - 2001 *Undergraduate Research Assistant at Alias|wavefront, Toronto, Canada.*
Research Advisors: Gord Kurtenbach, Ravin Balakrishnan, Group Manager: Bill Buxton

Working in the Interactive Graphics Research Group, run by Bill Buxton, I developed a large-display system for the authoring of 2D and 3D curves based on the "tape drawing" interaction commonly used in automotive design. The resulting work led to two peer-reviewed full conference papers, and is often cited for the numerous novel interactions for large screen displays and 3D environments which it introduced [C.1, C.2].

TEACHING AND SUPERVISION

Teaching Experience

Graduate Courses

Jan-Apr 2019 *CSC2524: CSC2524H Topics in Interactive Computing.*
Graduate Advanced Seminar Course. University of Toronto.
Primary Instructor. Fully responsible for course design and all course materials.

Undergraduate Courses

Jan-Apr 2019 *CSC428/2514: Human-Computer Interaction.*
Grad/Undergrad Course. University of Toronto.
Primary Instructor. Fully responsible for course design and all course materials.

Sep-Dec 2018 *CSC428/2514: Human-Computer Interaction.*
Grad/Undergrad Course. University of Toronto.
Primary Instructor. Fully responsible for course design and all course materials.

Sep-Dec 2007 *CSC428/2514: Human-Computer Interaction.*
Grad/Undergrad Course. University of Toronto.
Primary Instructor. Fully responsible for course design and all course materials.

Sep-Dec 2006 *CSC428/2514: Human-Computer Interaction.*
Grad/Undergrad Course. University of Toronto.
Primary Instructor. Fully responsible for course design and all course materials.

Sep-Dec 2005 *CSC428/2514: Human-Computer Interaction.*
Grad/Undergrad Course. University of Toronto.
Primary Instructor. Fully responsible for course design and all course materials.

Teaching Assistant

CSC 236: Introduction to the Theory of Computation. Sep-Dec 2004. Undergrad. University of Toronto.
CSC 236: Introduction to the Theory of Computation. May-Aug 2004. Undergrad. University of Toronto.
CSC 236: Introduction to the Theory of Computation. Sep-Dec 2003. Undergrad. University of Toronto.
CSC 238: Discrete Mathematics for Computer Science. May-Aug 2003. Undergrad. University of Toronto.

Supervision Experience

Career Student Numbers		
	In Progress	**Completed**
Masters	1	0
Doctoral	1	5
Postdoctoral Fellows	0	2
Research Interns – PhD	4	37
Research Interns – Masters	0	7
Undergraduate Research Assistants	0	5

Masters Students

2018-2019 *Bryan Wang. University of Toronto. Primary Supervisor.*
Thesis Topic TBD.

Doctoral Students

2018-2022 *Fengyuan Zhu. University of Toronto. Primary Supervisor.*
Thesis Topic TBD.

2017-2018 *Ruta Desai, Carnegie Mellon University. External Member of Supervisory Committee.*
Computational Design Tools for Accessible Robotics
Now Researcher at Facebook Reality Labs

2014-2018 *Madeline Gannon, Carnegie Mellon University. External Member of Supervisory Committee.*
Human-Centered Interfaces for Autonomous Fabrication Machines
Now Researcher at NVIDIA Robotics

2013-2017 *Anthony Chen, Carnegie Mellon University. External Member of Supervisory Committee.*
Making Fabrication Real: Fabrication for Real Usage, with Real Objects, by Real People
Now Assistant Professor at UCLA

2010-2013 *Parmit Chilana, University of Washington. External Member of Supervisory Committee.*
Supporting Users After Software Deployment through Selection-Based Crowdsourced Contextual Help
Now Assistant Professor at Simon Fraser University

2012 *Mathieu Nancel, Université Paris-Sud XI. Defense Jury Member.*
Designing and Combining Interaction Techniques in Large Display Environments
Now Research at INRIA

Postdoctoral Fellows

2015-2016 Michelle Annett [J.7, C.70, C.73]
2014-2015 Rubaiat Habib Kazi [C.64, C.79] (Now full time at Adobe Research)

Research Interns – Doctoral Students

Summer 2018	Sultan Alharthi	New Mexico State University
Summer 2018	Jun Gong	Dartmouth College
Summer 2018	Matt Whitlock	University of Colorado-Boulder
Summer 2018	Ariel Weingarten	University of California, San Diego
Winter 2018	Teng Han	University of Manitoba [C.101]
Winter 2018	Jeremy Warner	UC Berkeley [C.98]
Summer 2017	Xu Wang	Carnegie Melon University [C.92]
Summer 2017	Nora Willet	Princeton University [C.100]
Summer 2017	Ruta Desai	Carnegie Melon University (Now at Facebook Reality Labs)
Summer 2017	Volodymyr Dziubak	University of Manitoba [C.97]
Winter 2017	Rahul Arora	University of Toronto [C.93]

Summer 2016	Ailie Fraser	University of California, San Diego [C.87]
Summer 2016	Rahul Arora	University of Toronto [C.85]
Summer 2016	David Ledo	University of Calgary [C.86]
Winter 2016	Seongkook Heo	KAIST (Now Post-Doc at University of Toronto) [C.89]
Winter 2016	Barrett Ens	University of Manitoba (Now Asst. Prof. at Monash University) [C.88, c.3]
Winter 2016	Jun Xing	University of Hong Kong (Now Post-Doc at U. of Southern California [C.82]
Summer 2015	Raf Ramakers	Hasselt University (Now Asst. Prof. at Hasselt University) [C.78]
Summer 2015	Madeline Gannon	Carnegie Mellon University [C.75] (now at NVIDIA Robotics)
Winter 2015	Haijun Xia	University of Toronto [C.71]
Winter 2015	Barrett Ens	University of Manitoba (Now Asst. Prof. at Monash University) [C.69]
Summer 2014	Jarrod Knibbe	University of Bristol (Now Post-Doc at University of Copenhagen) [C.72]
Summer 2014	Madeline Gannon	Carnegie Mellon University (now at NVIDIA Robotics) [C.67]
Summer 2014	Fraser Anderson	University of Alberta (Now at Autodesk Research) [C.66]
Winter 2014	Valkyrie Savage	UC Berkeley [C.65]
Summer 2013	Anthony Chen	Carnegie Mellon University (Now Asst. Prof. at UCLA) [C.60, C.62]
Summer 2013	Rubaiat Habib Kazi	National University of Singapore (Now at Adobe Research) [C.61]
Summer 2013	Ben Lafreniere	University of Waterloo (Now at Autodesk Research) [C.59]
Winter 2013	Fraser Anderson	University of Alberta (Now at Autodesk Research) [C.54]
Winter 2013	Natalia Bogdan	York University [C.55]
Summer 2012	Tim Chen	National Tsing Hua U. (Now Asst. Prof. at U. of Technology Sydney) [C.58]
Summer 2012	Ben Lafreniere	University of Waterloo (Now at Autodesk Research) [C.48]
Winter 2012	Xing-Dong Yang	University of Alberta (Now Asst. Professor, Dartmouth College) [C.45]
Summer 2011	Christian Holz	Hasso Plattner Institute (Now Asst. Prof. at ETH Zurich) [C.42]
Summer 2011	Nicholas Kong	UC Berkeley (Now at Google) [C.29]
Winter 2011	Michelle Annett	University of Alberta [C.37]
Summer 2010	Parmit Chilana	Univ. of Washington (Now Asst. Professor, Simon Fraser Univ.) [C.29, c.1]
Summer 2010	Xing-Dong Yang	University of Alberta (Now Asst. Professor, Dartmouth College) [C.28]
Winter 2010	Xiaojun Bi	University of Toronto (Now Asst. Professor, Stony Brook University) [C.31]
Summer 2009	Hyunyoung Song	University of Maryland (Now at Google) [C.24]
Summer 2008	Hyunyoung Song	University of Maryland (Now at Google) [C.18]

Research Interns – Masters Students

Summer 2016	Nathaniel Hudson	University of Waterloo [C.95]
Summer 2012	Nikola Banovic	University of Toronto (Now Asst. Prof. at University of Michigan) [C.47]
Winter 2012	Nikola Banovic	University of Toronto (Now Asst. Prof. at University of Michigan) [C.44]
Summer 2011	Nikola Banovic	University of Toronto (Now Asst. Prof. at University of Michigan) [C.39]
Winter 2011	Jennifer Fernquist	University of British Columbia (Now at Google) [C.36]
Summer 2009	Julian Lepinski	Queen's University [C.23]
Summer 2009	Mike Rooke	Queen's University [C.33]

Undergraduate Research Assistants

Summer 2015	Steven Li	University of Waterloo [C.83]
Summer 2015	Nicholas Beirne	University of Guelph [C.83]
Summer 2008	Jessica Lo	University of Waterloo [C.19]
Summer 2005	Nicholas Kong	University of Toronto (Now at Google) [C.14]
Summer 2003	Vikas Jain	University of Toronto [J.1]

RESEARCH FUNDING AND AWARDS

Research Funding

2018 *Canada Foundation for Innovation (CFI) John R. Evans Leaders Fund*
$625,000 over 4 years. Co-Investigator with Syed Ishtiaque Ahmed (principal)
"Collaborative Mobile Interaction Workshop"

2018 *NSERC Discovery Grants Programs*
$265,000 over 5 years. Principal Investigator
"Real-Time Guidance for Large-Scale Construction and Assembly Tasks"

2018 *University of Toronto Start-Up Funds*
$400,000 over 5 years. Principal Investigator

Graduate Level Awards and Scholarships

2008 *Natural Sciences and Engineering Research Council of Canada*
Post-Doctorate Fellowship (PDF), $80,000 over two years (declined).

2007 *Microsoft Corporation*
Microsoft Research Fellowship, $40,000 over two years.

2005 *Natural Sciences and Engineering Research Council of Canada*
Canada Graduate Scholarship (CGS-D) Award for Ph.D. studies, $70,000 over two years.

2002 *Natural Sciences and Engineering Research Council of Canada*
Postgraduate Scholarship (PGS-A) Award for M.Sc. studies, $38,000 over two years.

Publication Awards

CHI 2016 *Honorable Mention Award (Top 5%)*
RetroFab: A Design Tool for Retrofitting Physical Interfaces using Actuators, Sensors and 3D Printing

CHI 2016 *Best Paper Award (Top 1%)*
The Effect of Visual Appearance on the Performance of Continuous Sliders and Visual Analogue Scales

CHI 2016 *Best Paper Award (Top 1%)*
Object-Oriented Drawing

CHI 2015 *Honorable Mention Award (Top 5%)*
Tactum: A Skin-Centric Approach to Digital Design and Fabrication.

CHI 2015 *Honorable Mention Award (Top 5%)*
Supporting Subtlety with Deceptive Devices and Illusory Interactions

CHI 2015 *Best Talk Award*
Supporting Subtlety with Deceptive Devices and Illusory Interactions

UIST 2014 *Best Talk Award*
Kitty: Sketching Dynamic and Interactive Illustrations

CHI 2014 *Honorable Mention Award (Top 5%)*
Draco: Bringing Life to Illustrations with Kinetic Textures

CHI 2014 *Best Talk Award*
Draco: Bringing Life to Illustrations with Kinetic Textures

CHI 2014 *Best Video Award*
Draco: Living Illustrations

CHI 2014 *Best Paper Award (Top 1%)*
Duet: Exploring Joint Interactions on a Smart Phone and a Smart Watch

CHI 2014 *Best Talk Award*
Duet: Exploring Joint Interactions on a Smart Phone and a Smart Watch

CHI 2014 *Honorable Mention Award (Top 5%)*
Investigating the Feasibility of Extracting Tool Demonstrations from In-Situ Video Content

IAAI 2014 *AAAI Innovative Application Award*
CommunityCommands: A Software Command Recommender System Case Study

GI 2013 *Best Student Paper Award*
A Model of Navigation for Very Large Data Views

CHI 2011 *Honorable Mention Award (Top 5%)*
Magic Desk: Bringing Multi-Touch Surfaces into Desktop Work

CHI 2010 *Honorable Mention Award (Top 5%)*
ToolClips: An Investigation of Contextual Video Assistance for Functionality Understanding

CHI 2010 *Honorable Mention Award (Top 5%)*
MouseLight: Bimanual Interactions on Digital Paper Using a Pen and a Spatially-Aware Mobile Projector

CHI 2009 *Honorable Mention Award (Top 5%)*
A Survey of Software Learnability: Metrics, Methodologies and Guidelines

CHI 2005 *Best Paper Award (Top 1%)*
The Bubble Cursor: Enhancing Target Acquisition by Dynamic Resizing Of the Cursor's Activation Area

UIST 2004 *Best Paper Award (Top 1%)*
Multi-Finger Gestural Interaction with 3D Volumetric Displays

PUBLICATIONS

Career Publication Count	
Scholarly Books (authored)	0
Scholarly Books (edited)	0
Chapters in Books	3
Papers in refereed journals	7
Papers in refereed conferences	104
Major Invited Conferences	0
Other conference abstracts/ posters /contributions	5
Patents	77
Other publications	0

Journal Articles

[J.7] Michelle Annett, Tovi Grossman, Daniel Wigdor, George Fitzmaurice. 2018 (in press). Workshops for the 21st Century: Exploring the Role of Space and Environment in Personal Fabrication Processes. *ACM Transactions on Computer-Human Interaction*. 37 pages.

[J.6] Jonathan Lazar, Elizabeth F. Churchill, **Tovi Grossman**, Gerrit Van der Veer, Philippe Palanque, John "Scooter" Morris, Jen Mankoff. 2017. Making the Field of Computing More Inclusive. *Communications of the ACM*. 60(3), 50-59.

[J.5] **Tovi Grossman**, Fanny Chevalier, Rubaiat Habib Kazi. 2016. Bringing research articles to life with animated figures. *ACM Interactions*. 23, 4 (June 2016), 52-57.

[J.4] **Tovi Grossman** and George Fitzmaurice. 2015. An Investigation of Metrics For the in-situ Detection of Software Expertise. *Human Computer Interaction*. 30, 1 (January 2015), 64-102.

[J.3] Wei Li, Justin Matejka, **Tovi Grossman**, Joe Konstan and George Fitzmaurice. 2011. Design and Evaluation of a Command Recommendation System for Software Applications. *ACM Transactions on Computer-Human Interaction*. 18, 2 (June 2011), Article 6, 6:1-6:35.

[J.2] Lode Vanacken, **Tovi Grossman** and Karin Coninx. 2009. Multimodal Selection Techniques for Dense and Occluded 3D Virtual Environments. *International Journal of Human-Computer Studies.* 67, 3 (March 2009), 237-255.

[J.1] **Tovi Grossman** and Ravin Balakrishnan. 2005. A Probabilistic Approach to Modeling Two-Dimensional Pointing. *ACM Transactions on Computer-Human Interaction*, 12(3). p. 435-459.

Conference Full Papers (Fully Refereed)

[C.101] Teng Han, Fraser Anderson, Pourang Irani, **Tovi Grossman**. (2018). HydroRing: Supporting Mixed Reality Haptics Using Liquid Flow. *ACM symposium on user interface software and technology*. 913-925. [21% acceptance rate]

[C.100] Nora Willett, Rubaiat Habib Kazi, Michael Chen, George Fitzmaurice, Adam Finkelstein, **Tovi Grossman**. (2018). A Mixed-Initiative Interface for Animating Static Pictures. *ACM symposium on user interface software and technology*. 649-661. [21% acceptance rate]

[C.99] Ben Lafreniere, **Tovi Grossman**. (2018). Blocks-to-CAD: A Cross-Application Bridge from Minecraft to 3D Modeling. *ACM symposium on user interface software and technology*. 637-648. [21% acceptance rate]

[C.98] Jeremy Warner, Ben Lafreniere, George Fitzmaurice, **Tovi Grossman**. (2018). ElectroTutor: Test-Driven Physical Computing Tutorials. *ACM symposium on user interface software and technology*. 435-446. [21% acceptance rate]

[C.97] Volodymyr Dziubak, Ben Lafreniere, **Tovi Grossman**, Andrea Bunt, George Fitzmaurice. (2018). Maestro: Designing a System for Real-Time Orchestration of 3D Modeling Workshops. *ACM symposium on user interface software and technology*. 287-298. [21% acceptance rate]

[C.96] Xiang 'Anthony' Chen, Ye Tao, Guanyun Wang, Runchang Kang, **Tovi Grossman**, Stelian Coros, Scott Hudson. 2018. Forte: User-Driven Generative Design. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems.* Paper No. 496. 12 Pages. [25% Acceptance Rate]

[C.95] Nathaniel Hudson, Ben Lafreniere, Parmit Chilana, and **Tovi Grossman**. 2018. Investigating How Online Help and Learning Resources Support Children's Use of 3D Design Software. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems.* Paper No. 257. 14 Pages. [25% Acceptance Rate]

[C.94] Justin Matejka, Michael Glueck, Erin Bradner, Ali Hashemi, **Tovi Grossman**, and George Fitzmaurice. 2018. Dream Lens: Exploration and Visualization of Large-Scale Generative Design Datasets. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems.* Paper No. 369. 12 Pages. [25% Acceptance Rate]

[C.93] Rahul Arora, Rubaiat Habib Kazi, **Tovi Grossman**, George Fitzmaurice, and Karan Singh. 2018. SymbiosisSketch: Combining 2D & 3D Sketching for Designing Detailed 3D Objects in Situ. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems.* Paper No. 185. 15 Pages. [25% Acceptance Rate]

[C.92] Xu Wang, Ben Lafreniere, and **Tovi Grossman**. 2018. Leveraging Community-Generated Videos and Command Logs to Classify and Recommend Software Workflows. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems.* Paper No. 285. 13 Pages. [25% Acceptance Rate]

[C.91] Fraser Anderson, **Tovi Grossman**, George Fitzmaurice. 2017. Trigger-Action-Circuits: Leveraging Generative Design to Enable Novices to Design and Build Circuitry. *ACM symposium on user interface software and technology*. 331-342. [23% Acceptance Rate]

[C.90] Rubaiat Habib Kazi, **Tovi Grossman**, Hyunmin Cheong, Ali Hashemi, George Fitzmaurice. 2017. DreamSketch: Early Stage 3D Design Explorations with Sketching and Generative Design. *ACM symposium on user interface software and technology*. 401-414. [23% Acceptance Rate]

[C.89] Seongkook Heo, Michelle Annett, Ben Lafreniere, **Tovi Grossman**, George Fitzmaurice. 2017. No Need to Stop What You're Doing: Exploring No-Handed Smartwatch Interaction. *Proceedings of Graphics Interface.* 107-116. [50% Acceptance Rate]

[C.88] Barrett Ens, Fraser Anderson, **Tovi Grossman**, Michelle Annett, Pourang Irani, George Fitzmaurice. 2017. Ivy: Exploring Spatially Situated Visual Programming for Authoring and Understanding Intelligent Environments. *Proceedings of Graphics Interface.* 156-163. [50% Acceptance Rate]

[C.87] Ailie Fraser, **Tovi Grossman**, George Fitzmaurice. 2017. WeBuild: Automatically Distributing Assembly Tasks Among Collocated Workers to Improve Coordination. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems.* 1817-1830. [25% Acceptance Rate]

[C.86] David Ledo, Fraser Anderson, Ryan Schmidt, Lora Oehlberg, Saul Greenberg, **Tovi Grossman**. 2017. Pineal: Bringing Passive Objects to Life with Embedded Mobile Devices. 2017. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems*. 2583-2593. [25% Acceptance Rate]

[C.85] Rahul Arora, Rubaiat Habib Kazi, Fraser Anderson, **Tovi Grossman**, Karan Singh, George Fitzmaurice. 2017. Experimental Evaluation of Sketching on Surfaces in VR. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems*. 5643-5654. [25% Acceptance Rate]

[C.84] Lauren Vasey, Long Nguyen, **Tovi Grossman**, Heather Kerrick, Danil Nagy, Evan Atherton, David Thomasson, Nicholas Cote, Tobias Schwinn, David Benjamin, Maurice Conti, George Fitzmaurice, Achim Menges. 2016. Collaborative Construction: Human and Robot Collaboration Enabling the Fabrication and Assembly of a Filament-Wound Structure. *Proceedings of the 36th Annual Conference of the Association for Computer Aided Design in Architecture.* 184-195.

[C.83] Benjamin Lafreniere, **Tovi Grossman**, Fraser Anderson, Justin Matejka, Heather Kerrick, Danil Nagy, Lauren Vasey, Evan Atherton, Nicholas Beirne, Marcelo Coelho, Nicholas Cote, Steven Li, Andy Nogueira, Long Nguyen, Tobias Schwinn, James Stoddart, David Thomasson, Ray Wang, Thomas White, David Benjamin, Maurice Conti, Achim Menges, George Fitzmaurice. 2016. Crowdsourced Fabrication. *Proceedings of the ACM UIST Symposium on User Interface Software and Technology.* 15-28. [21% Acceptance Rate]

[C.82] Jun Xing, Rubaiat Habib, **Tovi Grossman**, Li-Yi Wei, Jos Stam, George Fitzmaurice. 2016. Energy-Brushes: Interactive Tools for Illustrating Stylized Elemental Dynamics. *Proceedings of the ACM UIST Symposium on User Interface Software and Technology.* 755-766. [21% Acceptance Rate]

[C.81] Xiang 'Anthony' Chen, Jeeeun Kim, Jennifer Mankoff, **Tovi Grossman**, Stelian Coros, Scott E. Hudson. 2016. Reprise: A Design Tool for Specifying, Generating, and Customizing 3D Printable Adaptations on Everyday Objects. *Proceedings of the ACM UIST Symposium on User Interface Software and Technology.* 29-39. [21% Acceptance Rate]

[C.80] Rubaiat Habib, **Tovi Grossman**, Nobuyuki Umetani, George Fitzmaurice. 2016. Motion Amplifiers: Sketching Dynamic Illustrations Using the Principles of 2D Animation. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems.* 4599-4609. [23% Acceptance Rate]

[C.79] Rubaiat Habib, **Tovi Grossman**, Cory Mogk, Ryan Schmidt, George Fitzmaurice. 2016. ChronoFab: Fabricating Motion. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems.* 908-918. [23% Acceptance Rate]

[C.78] Raf Ramakers, Fraser Anderson, **Tovi Grossman**, George Fitzmaurice. 2016. RetroFab: A Design Tool for Retrofitting Physical Interfaces using Actuators, Sensors and 3D Printing. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems.* 409-419. [23% Acceptance Rate]
CHI 2016 Best Paper Honorable Mention Award (Top 5%)

[C.77] Justin Matejka, Michael Glueck, **Tovi Grossman**, George Fitzmaurice. 2016. The Effect of Visual Appearance on the Performance of Continuous Sliders and Visual Analogue Scales. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems.* 5421-5432. [23% Acceptance Rate]
CHI 2016 Best Paper Award (Top 1%)

[C.76] Ben Lafreniere, Carl Gutwin, Andy Cockburn, **Tovi Grossman**. 2016. Faster Command Selection on Touchscreen Watches. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems.* 4663-4674. [23% Acceptance Rate]

[C.75] Madeline Gannon, **Tovi Grossman**, George Fitzmaurice. 2016. ExoSkin: On-Body Fabrication. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems.* 5996-6007. [23% Acceptance Rate]

[C.74] Haijun Xia, Bruno De Araujo, **Tovi Grossman**, Daniel Wigdor. 2016. Object-Oriented Drawing. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems.* 4610-4621. [23% Acceptance Rate]
CHI 2016 Best Paper Award (Top 1%)

[C.73] Michelle Annett, Matthew Lakier, Franklin Li, Daniel Widgor, **Tovi Grossman**, George Fitzmaurice. 2016. The Living Room: Exploring the Haunted and Paranormal to Transform Design and Interaction. *Proceedings of the ACM SIGCHI Conference on Designing Interactive Systems.* 1328-1340. [26% Acceptance Rate]

[C.72] Jarrod Knibbe, **Tovi Grossman** and George Fitzmaurice. 2015. Smart Makerspace: An Immersive Instructional Space for Physical Tasks. *Proceedings of the ACM Interanational Conference on Interactive Tabletops and Surfaces.* 83-92. [24% Acceptance Rate]

[C.71] Haijun Xia, **Tovi Grossman** and George Fitzmaurice. 2015. NanoStylus: Enhancing Input on Ultra-Small Displays with a Finger-Mounted Stylus. *Proceedings of the ACM UIST Symposium on User Interface Software and Technology.* 447-456. [24% Acceptance Rate]

[C.70] Michelle Annett, **Tovi Grossman**, Daniel Wigdor and George Fitzmaurice. 2015. MoveableMaker: Facilitating the Design, Generation, and Assembly of Moveable Papercraft. *Proceedings of the ACM UIST Symposium on User Interface Software and Technology.* 565-574. [24% Acceptance Rate]

[C.69] Barrett Ens, **Tovi Grossman**, Fraser Anderson, Justin Matejka and George Fitzmaurice. 2015. Candid Interaction: Revealing Hidden Mobile and Wearable Computing Activities. *Proceedings of the ACM UIST Symposium on User Interface Software and Technology.* 467-476. [24% Acceptance Rate]

[C.68] **Tovi Grossman**, Xiang Anthony Chen and George Fitzmaurice. 2015. Typing on Glasses: Adapting Text Entry to Smart Eyewear. *Proceedings of the ACM MobileHCI Conference on Human-Computer Interaction with Mobile Devices and Services*. 144-152. [27% Acceptance Rate]

[C.67] Madeline Gannon, **Tovi Grossman** and George Fitzmaurice. 2015. Tactum: A Skin-Centric Approach to Digital Design and Fabrication. *Proceedings of the ACM CHI 2015 Conference on Human Factors in Computing Systems*. 1779-1788. [23% Acceptance Rate]
CHI 2015 Best Paper Honorable Mention Award (Top 5%)

[C.66] Fraser Anderson, **Tovi Grossman**, Daniel Wigdor and George Fitzmaurice. 2015. Supporting Subtlety with Deceptive Devices and Illusory Interactions. *Proceedings of the ACM CHI 2015 Conference on Human Factors in Computing Systems*. 1489-1498. [23% Acceptance Rate]
CHI 2015 Best Paper Honorable Mention Award (Top 5%)
CHI 2015 Best Talk Award

[C.65] Valkyrie Savage, Ryan Schmidt, **Tovi Grossman**, George Fitzmaurice and Björn Hartmann. 2014. A Series of Tubes: Adding Interactivity to 3D Prints Using Internal Pipes. *Proceedings of the ACM UIST Symposium on User Interface Software and Technology*. 3-12. [22% Acceptance Rate]

[C.64] Rubaiat Habib, Fanny Chevalier, **Tovi Grossman** and George Fitzmaurice. 2014. Kitty: Sketching Dynamic and Interactive Illustrations. *Proceedings of the ACM UIST Symposium on User Interface Software and Technology*. 395-405. [22% Acceptance Rate]
UIST 2014 Best Talk Award

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[C.60] Xiang Anthony Chen, **Tovi Grossman**, Daniel Wigdor and George Fitzmaurice. 2014. Duet: Exploring Joint Interactions on a Smart Phone and a Smart Watch. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems*. 159-168. [23% Acceptance Rate]
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[C.52] Michael Glueck, **Tovi Grossman** and Daniel Wigdor. 2013. A Model of Navigation for Very Large Data Views. *Proceedings of the Graphics Interface Conference.* 8 pages. [33% Acceptance Rate]
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[C.51] Abhijit Karnik, **Tovi Grossman** and Sriram Subramanian. 2013. Comparison of User Performance in Mixed 2D-3D Multi-Display Environments. *Proceedings of the IFIP Conference on Human-Computer Interaction.* 260-277. [31% Acceptance Rate]

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[C.32] Justin Matejka, **Tovi Grossman** and George Fitzmaurice. 2011. Ambient Help. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems*. 2751-2760. [27% Acceptance Rate]

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[C.23] G. Julian Lepinski, **Tovi Grossman** and George Fitzmaurice. 2010. The Design and Evaluation of Multitouch Marking Menus. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems*. 2233-2242. [22% Acceptance Rate]

[C.22] Justin Matejka, Wei Li, **Tovi Grossman** and George Fitzmaurice. 2009. CommunityCommands: Command Recommendations for Software Applications. *Proceedings of the ACM UIST Symposium on User Interface Software and Technology*. 193-202. [18% Acceptance Rate]

[C.21] **Tovi Grossman**, Patrick Baudisch and Ken Hinckley. 2009. Handle Flags: Efficient And Flexible Selections For Inking Applications. *Proceedings of Graphics Interface 2009*. 167-174. [36% Acceptance Rate]

[C.20] **Tovi Grossman**, George Fitzmaurice and Ramtin Attar. 2009. A Survey of Software Learnability: Metrics, Methodologies and Guidelines. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems*. 649-658. [25% Acceptance Rate]
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[C.14] **Tovi Grossman**, Nicholas Kong and Ravin Balakrishnan. 2007. Modeling Pointing At Targets of Arbitrary Shapes. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems*. 463-472. [22% Acceptance Rate]

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[C.12] Jeremy Birnholtz, **Tovi Grossman**, Clarissa Mak and Ravin Balakrishnan. 2007. An Exploratory Study of Input Configuration and Group Process in a Negotiation Task Using a Large Display. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems*. 91-100. [22% Acceptance Rate]

[C.11] Raghavendra Kattinakere, **Tovi Grossman** and Sriram Subramanian. 2007. Modeling Steering Within Above-The-Surface Interaction Layers. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems*. 317-326. [22% Acceptance Rate]

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[C.7] **Tovi Grossman**, Ken Hinckley, Patrick Baudisch, Maneesh Agrawala and Ravin Balakrishnan. 2006. Hover Widgets: Using the Tracking State to Extend the Capabilities of Pen-Operated Devices. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems*. 861-870. [24% Acceptance Rate]

[C.6] **Tovi Grossman** and Ravin Balakrishnan. 2005. The Bubble Cursor: Enhancing Target Acquisition By Dynamic Resizing Of The Cursor's Activation Area. *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems*. 281-290. [25% Acceptance Rate]
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[C.1] **Tovi Grossman**, Ravin Balakrishnan, Gordon Kurtenbach, George W. Fitzmaurice, Azam Khan and William Buxton. 2001. Interaction Techniques for 3D Modeling On Large Displays. *Proceedings of ACM I3D 2001 Symposium on Interactive 3D Graphics.* 17-23. [20% Acceptance Rate]

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[c.3] Barrett Ens, Fraser Anderson, **Tovi Grossman**, Michelle Annett, Pourang Irani, George Fitzmaurice. 2017 – in press. Won by a Head: A Platform Comparison of Smart Object Linking in Virtual Environments. *Proceedings of the International Conference on Artificial Reality and Telexistence & Eurographics Symposium on Virtual Environments*. 4 pages.

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[B.3] Marcelo Coelho and **Tovi Grossman**. 2017. Crowd-Driven Pattern Formation. Architectural Design, Special issue S. Tibbits (Ed.). In *Autonomous Assembly: Designing for a new era of collective construction*. Wiley. Volume 87, Issue 4. ISBN: 978-1-119-10235-9.

[B.2] Christian Holz, **Tovi Grossman**, George Fitzmaurice and Anne Agur. 2014. Interaction with Implanted Devices through Implanted User Interfaces. In *Implantable Bioelectronics*. Evgeny Katz (ed.). Wiley. ISBN: 978-3-527-33525-1.

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[ea.5] Lauren Vasey, **Tovi Grossman**, Heather Kerrick, and Danil Nagy. 2016. The hive: a human and robot collaborative building process. In *ACM SIGGRAPH 2016 Talks*. ACM, New York, NY, USA, Article 83, 2 pages.

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[P.77] Techniques for designing interactive objects with integrated smart devices. **Tovi Grossman**, Fraser ANDERSON, Ryan Michael SCHMIDT, Saul GREENBERG, David LEDO. Filed: 2018-01-05. Patent No. US2018196889A1.

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[P.75] Banded sliders for obtaining values from users. Justin Frank Matejka, Michael Glueck, **Tovi Grossman**, George Fitzmaurice. Filed: 2016-09-27. Patent No. US2018088790A1.

[P.74] Techniques for generating dynamic effects animations. Jun XING, Rubaiat Habib KAZI, **Tovi Grossman**, Li-Yi Wei, Jos Stam, George Fitzmaurice. Filed: 2017-02-23. Patent No. US2018082460A1.

[P.73] No-handed smartwatch interaction techniques. Seongkook Heo, George Fitzmaurice, Benjamin LAFRENIERE, **Tovi Grossman**. Filed: 2017-07-14. Patent No. US2018024642A1.

[P.72] Three dimensional visual programming interface for a network of devices. Barrett Ens, Fraser ANDERSON, George Fitzmaurice, **Tovi Grossman**. Filed: 2017-06-28. Patent No. US2018004393A1.

[P.71] Techniques for processing and viewing video events using event metadata. Justin Frank Matejka, George Fitzmaurice, **Tovi Grossman**. Filed: 2017-05-08. Granted: 2018-02-27. Patent No. US20170243614A1.

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[P.68] Automated supervision of construction operations in an intelligent workspace. **Tovi Grossman**, George Fitzmaurice, Anderson Nogueira, Nick Beirne, Justin Frank Matejka, Danil Nagy, Steven Li, Benjamin Lafreniere, Heather Kerrick, Thomas White, Fraser Anderson, Evan Atherton, David Thomasson, Arthur Harsuvanakit, Maurice Ugo Conti. Filed: 2016-11-22. Patent No. US20170148116A1.

[P.67] Automated techniques for designing programmed electronic devices. **Tovi Grossman**, George Fitzmaurice, Fraser Anderson. Filed: 2016-10-11. Patent No. US20170147718A1.

[P.66] Sharing computer application activities. **Tovi Grossman**, George Fitzmaurice, Justin Frank Matejka, Barrett Ens, Fraser Anderson. Filed: 2016-06-15. Patent No. US20170034228A1.

[P.65] Enhancing input on small displays with a finger mounted stylus. **Tovi Grossman**, George Fitzmaurice, Haijun Xia. Filed: 2016-05-06. Patent No. US20170031469A1.

[P.64] Techniques for generating dynamic illustrations using principles of animation. Rubiait Habib, **Tovi Grossman**, Nobuyuki Umetani, George Fitzmaurice. Filed: 2016-04-19. Patent No. US20170301127A1.

[P.63] Techniques for generating dynamic illustrations using principles of animation. Rubiait Habib, **Tovi Grossman**, Nobuyuki Umetani, George Fitzmaurice. Filed: 2016-04-19. Granted: 2016-04-19. Patent No. US20170301126A1.

[P.62] Smart tools and workspaces for do-it-yourself tasks. **Tovi Grossman**, George Fitzmaurice, Jarrod Knibbe. Filed: 2015-12-14. Patent No. US20160171845A1.

[P.61] Skin-based approach to virtual modeling. Madeline Gannon, **Tovi Grossman**, George Fitzmaurice. Filed: 2015-12-14. Patent No. US20160171126A1.

[P.60] Techniques for interacting with wearable devices. **Tovi Grossman**, Xiang Anthony Chen, George Fitzmaurice. Filed: 2015-08-21. Patent No. US20170052700A1.

[P.59] Techniques for generating motion scuplture models for three-dimensional printing. **Tovi Grossman**, Ryan Michael Schmidt, Rubaiat Habib, Cory Mogk, George Fitzmaurice. Filed: 2015-07-28. Patent No. US20170028643A1.

[P.58] Generating tubes within three-dimensional models. Valkyrie Savage, **Tovi Grossman**, George Fitzmaurice, BjÃ¶rn Hartmann, Ryan Michael Schmidt. Filed: 2015-06-19. Patent No. US20150370926A1.

[P.57] Graphical interface for editing an interactive dynamic illustration. Rubaiat Habib Kazi, **Tovi Grossman**, George Fitzmaurice, Fanny Chevalier. Filed: 2015-06-19. Patent No. US20150370468A1.

[P.56] Preloading and switching streaming videos. Justin Frank Matejka, George Fitzmaurice, **Tovi Grossman**. Filed: 2015-06-03. Patent No. US20160360262A1.

[P.55] Chronological event information for multimedia content. Justin Frank Matejka, **Tovi Grossman**, George Fitzmaurice. Filed: 2015-06-03. Patent No. US20160358626A1.

[P.54] Generating informative viewpoints based on editing history. Hsiang-Ting Chen, **Tovi Grossman**, Wei Li-Yi, Ryan Michael Schmidt, Bjoern Hartmann, George Fitzmaurice, Maneesh Agrawala. Filed: 2015-04-27. Granted: 2017-09-05. Patent No. US9754421B2.

[P.53] Flip-up stereo viewing glasses. **Tovi Grossman**, George Fitzmaurice, Natalia Bogdan. Filed: 2015-02-13. Patent No. US20150237338A1.

[P.52] Techniques for cut-away stereo content in a stereoscopic display. **Tovi Grossman**, George Fitzmaurice, Natalia Bogdan. Filed: 2015-02-13. Granted: 2018-05-29. Patent No. US20150235409A1.

[P.51] Techniques for integrating different forms of input with different forms of output when interacting with an application. **Tovi Grossman**, George Fitzmaurice, Natalia Bogdan. Filed: 2015-02-12. Patent No. US20150245005A1.

[P.50] Techniques for animating transitions between non-stereoscopic and stereoscopic imaging. **Tovi Grossman**, George Fitzmaurice, Natalia Bogdan. Filed: 2015-02-12. Patent No. US20150228102A1.

[P.49] In-product micro-blogging for design sharing. Wei H. Li, **Tovi Grossman**, Justin Frank Matejka, George Fitzmaurice. Filed: 2015-02-02. Granted: 2017-02-21. Patent No. US20150149576A1.

[P.48] Extracting demonstrations from in-situ video content. Benjamin Lafreniere, **Tovi Grossman**, Justin Frank Matejka, George Fitzmaurice. Filed: 2014-12-04. Patent No. US20150160836A1.

[P.47] Techniques for authoring view points, view paths, and view surfaces for 3d models. Hsiang-Ting Chen, **Tovi Grossman**, Wei Li-Yi, Ryan Michael Schmidt, Bjoern Hartmann, George Fitzmaurice, Maneesh Agrawala. Filed: 2014-12-04. Patent No. US20150160796A1.

[P.46] Techniques for interacting with handheld devices. Xiang Anthony Chen, **Tovi Grossman**, Daniel Wigdor, George Fitzmaurice. Filed: 2014-12-04. Patent No. US20150153928A1.

[P.45] Animating sketches via kinetic textures. **Tovi Grossman**, George Fitzmaurice, Rubaiat Habib Kazi, Fanny Chevalier, Shengdong Zhao. Filed: 2014-11-25. Patent No. US20150154785A1.

[P.44] Techniques for viewing and searching documents from collections of documents. Justin Frank Matejka, George Fitzmaurice, **Tovi Grossman**. Filed: 2014-11-14. Patent No. US20150154188A1.

[P.43] Recommendation system for protecting user privacy. Wei Li, Justin Frank Matejka, **Tovi Grossman**, George Fitzmaurice. Filed: 2014-07-16. Granted: 2016-12-27. Patent No. US9530024B2.

[P.42] Reflection-based target selection on large displays with zero latency feedback. Fraser Anderson, **Tovi Grossman**, Justin Frank Matejka, George Fitzmaurice. Filed: 2014-06-26. Patent No. US20150098143A1.

[P.41] Enhancing movement training with an augmented reality mirror. Fraser Anderson, **Tovi Grossman**, Justin Frank Matejka, George Fitzmaurice. Filed: 2014-06-26. Patent No. US20150099252A1.

[P.40] Always-available input through finger instrumentation. Xing-Dong Yang, **Tovi Grossman**, Daniel Wigdor, George Fitzmaurice. Filed: 2013-10-02. Granted: 2018-03-20. Patent No. US20140098067A1.

[P.39] Adapting video annotations to playback speed. George Frank Fitzmaurice, **Tovi Grossman**, Justin Frank Matejka. Filed: 2013-07-25. Patent No. US20150033108A1.

[P.38] Techniques for representing and comparing workflows. **Tovi Grossman**, Maneesh Agrawala, Nicholas KONG, George Fitzmaurice. Filed: 2013-05-02. Granted: 2018-06-12. Patent No. US20130311927A1.

[P.37] Server-side video screen capture. **Tovi Grossman**, George Fitzmaurice. Filed: 2013-04-26. Patent No. US20140297716A1.

[P.36] Community enhanced tutorials: improving tutorials with multiple demonstrations. Benjamin Lafreniere, **Tovi Grossman**, George Fitzmaurice. Filed: 2013-04-16. Granted: 2017-05-30. Patent No. US20140310596A1.

[P.35] Real-time scrubbing of videos using a two-dimensional grid of thumbnail images. Justin Frank Matejka, **Tovi Grossman**, George Fitzmaurice. Filed: 2013-04-10. Granted: 2017-08-15. Patent No. US20140310601A1.

[P.34] Implanted devices and related user interfaces. **Tovi Grossman**, George Fitzmaurice, Anne Agur, Christian Holz. Filed: 2012-12-14. Patent No. US20130176207A1.

[P.33] Web-based system for capturing and sharing instructional material for a software application. **Tovi Grossman**, George Fitzmaurice, Justin Frank Matejka, Thomas White, Ara Danielyan, Ruslana Steininger, Michael Chen, Anderson Nogueira. Filed: 2012-12-05. Patent No. US20130174028A1.

[P.32] Enhanced target selection for a touch-based input enabled user interface. **Tovi Grossman**, George Fitzmaurice, Xing-Dong Yang, Pourang Polad IRANI. Filed: 2012-10-12. Patent No. EP2766793A1.

[P.31] Proximity-aware multi-touch tabletop. Michelle Annett, **Tovi Grossman**, Daniel Wigdor, George Fitzmaurice. Filed: 2012-10-12. Granted: 2015-03-10. Patent No. US20130093708A1.

[P.30] Computer-implemented tutorial for visual manipulation software. Jennifer Fernquist, **Tovi Grossman**, Mark Davis, George Fitzmaurice. Filed: 2012-10-12. Granted: 2017-10-31. Patent No. US9805482B2.

[P.29] Real-time scrubbing of online videos. Justin Frank Matejka, **Tovi Grossman**, George Fitzmaurice. Filed: 2012-10-12. Patent No. US20130097508A1.

[P.28] Computer-implemented tutorial for visual manipulation software. Jennifer Fernquist, **Tovi Grossman**, Mark Davis, George Fitzmaurice. Filed: 2012-10-12. Granted: 2017-10-31. Patent No. US20130100159A1.

[P.27] In-product questions, answers, and tips. Justin Frank Matejka, **Tovi Grossman**, George Fitzmaurice. Filed: 2012-10-11. Granted: 2015-09-22. Patent No. US9141253B2.

[P.26] Displaying resources based on shared contexts. George Fitzmaurice, **Tovi Grossman**, Justin Frank Matejka, Wei Li. Filed: 2012-09-05. Granted: 2014-05-06. Patent No. US20130006907A1.

[P.25] Systems and methods for visualizing relationships between publications. Justin Frank Matejka, **Tovi Grossman**, George Fitzmaurice. Filed: 2012-06-21. Patent No. US20130346900A1.

[P.24] Hierarchical display and navigation of document revision histories. **Tovi Grossman**, Justin Frank Matejka, George Fitzmaurice. Filed: 2012-04-17. Patent No. WO2012145324A1.

[P.23] Method of providing instructional material while a software application is in use. Justin Frank Matejka, **Tovi Grossman**, George Fitzmaurice. Filed: 2012-04-05. Patent No. WO2013006221A1.

[P.22] Context-aware search. Michael D. Ekstrand, Wei Li, **Tovi Grossman**, Justin Frank Matejka, George Fitzmaurice. Filed: 2012-03-16. Patent No. WO2012151005A1.

[P.21] Multi-touch integrated desktop environment. **Tovi Grossman**, Justin Frank Matejka, George Fitzmaurice, Xiaojun Bi. Filed: 2012-01-05. Patent No. EP2661671A1.

[P.20] Visualizing user interfaces. **Tovi Grossman**, George William Fitzmaurice, Michael Rooke. Filed: 2011-09-01. Granted: 2016-08-09. Patent No. US9411482B2.

[P.19] Multiscale three-dimensional orientation. **Tovi Grossman**, Azam Khan, Michael Glueck, James Mccrae. Filed: 2011-07-29. Patent No. WO2012016220A1.

[P.18] Hierarchical display and navigation of document revision histories. **Tovi Grossman**, Justin Frank Matejka, George Fitzmaurice. Filed: 2011-04-19. Granted: 2013-09-10. Patent No. US8533594B2.

[P.17] Hierarchical display and navigation of document revision histories. **Tovi Grossman**, Justin Frank Matejka, George Fitzmaurice. Filed: 2011-04-19. Granted: 2014-04-15. Patent No. US20120272153A1.

[P.16] Hierarchical display and navigation of document revision histories. **Tovi Grossman**, Justin Frank Matejka, George Fitzmaurice. Filed: 2011-04-19. Granted: 2013-09-10. Patent No. US8533593B2.

[P.15] Hierarchical display and navigation of document revision histories. **Tovi Grossman**, Justin Frank Matejka, George Fitzmaurice. Filed: 2011-04-19. Granted: 2013-09-10. Patent No. US20120272192A1.

[P.14] Multi-touch marking menus and directional chording gestures. George Fitzmaurice, **Tovi Grossman**, Gerard Julian Lepinski. Filed: 2011-03-25. Patent No. EP2553559A1.

[P.13] Bimanual interactions on digital paper using a pen and a spatially-aware mobile projector. Hyunyoung Song, Francois V. Guimbretiere, **Tovi Grossman**, George Fitzmaurice. Filed: 2011-03-03. Granted: 2015-09-08. Patent No. US20110216091A1.

[P.12] Multi-Touch Integrated Desktop Environment. **Tovi Grossman**, Justin Frank Matejka, George Fitzmaurice, Xiaojun Bi. Filed: 2011-01-05. Granted: 2017-03-21. Patent No. US20120169598A1.

[P.11] Multi-Touch Integrated Desktop Environment. **Tovi Grossman**, Justin Frank Matejka, George Fitzmaurice, Xiaojun Bi. Filed: 2011-01-05. Granted: 2015-03-24. Patent No. US20120169623A1.

[P.10] Multi-touch integrated desktop environment. **Tovi Grossman**, Justin Frank Matejka, George Fitzmaurice, Xiaojun Bi. Filed: 2011-01-05. Granted: 2016-02-16. Patent No. US9262005B2.

[P.9] Method and system for providing data-related information and videos to software application end-users. **Tovi Grossman**, George Fitzmaurice. Filed: 2010-10-25. Granted: 2017-05-16. Patent No. US20110099475A1.

[P.8] Method and System for Providing Software Application End-Users with Contextual Access to Text and Video Instructional Information. **Tovi Grossman**, George Fitzmaurice. Filed: 2010-08-03. Patent No. US20110099474A1.

[P.7] Method and System for Providing Custom Tooltip Messages. George Fitzmaurice, **Tovi Grossman**, Wei Li, Justin Frank Matejka. Filed: 2010-06-21. Patent No. US20110314415A1.

[P.6] Spatially-aware projection pen display. Hyunyoung Song, **Tovi Grossman**, George Fitzmaurice, Francois V. Guimbretiere, Azam Khan, Ramtin ATTAR, Gordon Kurtenbach. Filed: 2009-08-06. Granted: 2016-04-26. Patent No. US9323422B2.

[P.5] Multi-finger mouse emulation. Justin Frank Matejka, **Tovi Grossman**, Jessica Lo, George Fitzmaurice. Filed: 2009-06-29. Granted: 2013-06-11. Patent No. US20100328227A1.

[P.4] Parallel computation of computationally expensive parameter changes. Jeff Kowalski, Mark Davis, Jose Madeira de Freitas Garcia, **Tovi Grossman**, George Fitzmaurice. Filed: 2009-03-24. Granted: 2012-08-21. Patent No. US20100128061A1.

[P.3] Handle flags. **Tovi Grossman**, Patrick M. Baudisch, Kenneth P. Hinckley, William A.S. Buxton, Raman Sarin. Filed: 2008-09-03. Patent No. WO2009045675A2.

[P.2] Representing animation as a static image on a graphical user interface. Daniel C Robbins, Desney S Tan, George G Robertson, Kenneth P Hinckley, Maneesh Agrawala, Patrick M Baudisch, Steven M Drucker, **Tovi Grossman**. Filed: 2006-01-04. Granted: 2013-07-16. Patent No. US8487937B2.

[P.1] Hover widgets: using the tracking state to extend capabilities of pen-operated devices. **Tovi Grossman**, Kenneth Hinckley, Patrick Baudisch, Maneesh Agrawala. Filed: 2005-10-07. Granted: 2005-10-07. Patent No. US20060267966A1.

INVITED TALKS

Digitizing the Master-Apprentice Relationship
[p.31] TEDxUofT. University of Toronto. November 2017.

On the future of 3D modeling software
[p.30] **Invited Keynote:** Carnegie Mellon University. CMU 3D Printing Summit. January 2017.

Instrumented and Connected: Designing Next-Generation Learning Experiences
[p.29] **Invited Keynote:** SS2 Studio Summit. Toronto. October 2017.
[p.28] University of Michigan. Interactive and Social Computing Seminar Series. October 2017.
[p.27] University of California Berkeley, School of Information. March 2017.
[p.26] University of California Berkeley, Department of Electrical Engineering and Computer Sciences. March 2017.
[p.25] University of Toronto. February 2017.
[p.24] University of Waterloo. February 2017.
[p.23] University of British Columbia. February 2017.
[p.22] Carnegie Mellon University. HCII Seminar Series. January 2017.
[p.21] Carnegie Mellon University. August 2016.

Tackling the User Interface Challenges of Today and Tomorrow
[p.20] Toronto User Experience Speaker Series

Leveraging Wearables and the Internet of Things for Learning and Task Performance
[p.19] Dartmouth College. February 2016.

Overview of HCI Research at Autodesk Research
[p.18] KAIST. April 2015.

Input, Interaction, and Learning at Autodesk Research
[p.17] University of Waterloo. November 2013.

Understanding and Improving the Learnability of Software Applications
[p.16] Stanford University. June 2012.
[p.15] Massachusetts Institute of Technology. March 2012.
[p.14] University of Waterloo. July 2010.

Interaction design based on human capabilities for contemporary and emerging technologies
[p.13] Microsoft Research, Redmond. April 2008.
[p.12] Brown University. March 2008.
[p.11] Queen's University. March 2008.
[p.10] University of Ontario Institute of Technology. March 2008.
[p.9] Georgia Institute of Technology. March 2008.
[p.8] Florida International University. February 2008.
[p.7] University of Minnesota. February 2008.
[p.6] Cornell University. February 2008.
[p.5] Harvard University. February 2008.
[p.4] University of Washington. February 2008.
[p.3] Adobe Systems Inc., San Jose. January 2008.

Designing and encouraging usage of interaction accelerators
[p.2] University of Washington. January 2008.

Interaction with volumetric displays
[p.1] University of California, Berkeley. February 2007.

SERVICE

Organization Recognitions

2018 *ACM Senior Member*

The Senior Members Grade recognizes those ACM members with at least 10 years of professional experience and 5 years of continuous Professional Membership who have demonstrated performance through technical leadership, and technical or professional contributions.

Conference Chairing and Management

ACM CHI Conference on Human Factors in Computing Systems, Steering Committee (2016-present)
ACM CHI Conference on Human Factors in Computing Systems, Awards Chair (2019)
ACM CHI Conference on Human Factors in Computing Systems, Subcommittee Chair (2018)
ACM ISS International Conference on Interactive Surfaces and Spaces, Program Chair (2017)
ACM CHI Conference on Human Factors in Computing Systems, Subcommittee Chair (2017)
ACM UIST Symposium on User Interface Software and Technology, Program Chair (2015)
ACM CHI Conference on Human Factors in Computing Systems, Technical Program Chair (2014)
ACM CHI Conference on Human Factors in Computing Systems, Subcommittee Chair (2013)
ACM CHI Conference on Human Factors in Computing Systems, alt.chi Chair (2010)
ACM CHI Conference on Human Factors in Computing Systems, alt.chi Chair (2009)

Conference Program Committees

ACM CHI Conference on Human Factors in Computing Systems (2016)
ACM UIST Symposium on User Interface Software and Technology (2014)
ACM CHI Conference on Human Factors in Computing Systems (2012)
ACM UIST Symposium on User Interface Software and Technology (2011)
ACM CHI Conference on Human Factors in Computing Systems (2011)
IEEE 3DUI Symposium on 3D User Interfaces (2011)
ACM UIST Symposium on User Interface Software and Technology (2010)
ACM International Conference on Interactive Tabletops and Surfaces (2010)
ACM CHI Conference on Human Factors in Computing Systems (2010)
IEEE 3DUI Symposium on 3D User Interfaces (2010)
ACM UIST Symposium on User Interface Software and Technology (2009)
ACM International Conference on Interactive Tabletops and Surfaces (2009)
IEEE 3DUI Symposium on 3D User Interfaces (2009)
ACM UIST Symposium on User Interface Software and Technology (2008)
IEEE International Workshop on Tabletops and Interactive Surfaces (2008)

Conference Paper Reviewing

ACM CHI Conference on Human Factors in Computing Systems
ACM Graphics Interface Conference
ACM ITS Conference on Interactive Tabletops and Surfaces
ACM SIGGRPAH Conference on Computer Graphics and Interactive Techniques
ACM SIGGRAPH ASIA Conference on Computer Graphics and Interactive Techniques in Asia
ACM UIST Symposium on User Interface Software and Technology
Eurographics Annual Conference of the European Association for Computer Graphics
Eurographics Joint Virtual Reality Conference
IEEE Symposium on 3D User Interfaces
IEEE Information Visualization Conference
IEEE International Workshop on Tabletops and Interactive Surfaces

Journal Paper Reviewing

ACM Transactions on Computer-Human Interaction
Elsevier International Journal of Human-Computer Studies
IEEE Computer Graphics and Applications
IEEE Pervasive Computing
IEEE Transactions on Visualization and Computer Graphics
Taylor & Francis Human-Computer Interaction

Grant Reviewing

Natural Sciences and Engineering Research Council of Canada (NSERC) (2018)

Institutional Project Reviews

INRIA Project Review Seminar – Interaction and Visualization (2018)

INDUSTRY TECHNOLOGY TRANSFER

2016 *Autodesk Sketchbook Motion [C.61]*
Draco is a new system that allows users to add rich animation effects to illustrations, using a sketch-based interface. Originally published at ACM CHI 2014, a technology preview was subsequently demonstrated at the SIGGRAPH 2014 Studio. The system has now been released as a standalone product, branded as Autodesk Sketchbook Motion. The product has been downloaded over 200 000 times and was featured on the iTunes App Store. I served as the supervisor for the research project, and a design consultant for the productization effort.

2014 *Meshmixer Tubes [C.65]*
Our work published at ACM UIST 2014 explored the digital fabrication of interactive and electronic 3D models. We introduced a general technique for routing internal pipes through the interior of 3D models. Our path routing algorithm utilizes a physics-based simulation to minimize pipe bending energy, allowing easy insertion of media post-print. The work has now been released as an official feature of Autodesk Meshmixer 2.6. I served as the supervisor for the research project

2014 *Autodesk Screencast [C.27]*
My research on the Chronicle system, originally published at ACM UIST 2010, was developed and released by Autodesk Research as a technology preview called "Project Chronicle". The project is a community driven learning system that allows users to capture video and workflow meta-data, and share the content on a web-based system. The web player receives an upload and automatically generates a video tutorial, with an interactive timeline marked up with all the commands, settings, and products which were used in the workflows. In 2014 the system was officially launched as a product, branded as Autodesk Screencast. The web system has received over 3 000 000 site visitors, and has generated over 100 000 tutorial videos generated by the user community. I was the lead researcher for the project, and the lead designer for the productization.

2010 *Autodesk ToolClip™ Videos [C.25]*
ToolClips are short videos embedded within software tooltips that provide real-time contextual assistance. My research, published at ACM CHI 2010, demonstrated that they offered significant advantages for the purpose of learning to use new software tools and functionality. Subsequent to publication, ToolClips were developed as a multi-product Autodesk component. ToolClip videos are now a registered trademark of Autodesk and can be found in all of Autodesk's major software applications, including AutoCAD, Revit, 3DSMax, Inventor, and Maya. I was the lead researcher for the project, and the lead designer for the productization.

2010 *CommunityCommands [J.3, C.22, C.56]*

The CommunityCommands research project was originally published at the ACM UIST 2009 conference. This system applies recommender system technology to the domain of software learning. Collaborative filtering algorithms are used to suggest new commands for users to try, based on their personalized usage patterns. Subsequent to its publication, the system was developed into a fully-functional plug-in for Autodesk AutoCAD, and released as a technology preview to the public. A research paper describing the deployment received the AAAI 2014 Innovative Application Award for its use of artificial intelligence technology within a deployed system. I was a research collaborator for the research project, and a design consultant for its productization.

SELECTED MEDIA AND PRESS

U of T and Autodesk researchers design 2D-3D software for augmented reality drawing, *U of T News*, April 2018.
The Scientist Who Is Making 3D Printing More Human, *Popular Scienc*e, September 2015.
'Tactum' By MadLabs & Autodesk lets you design 3D printed wearables directly on your body, *3ders.org*, June 2015.
Design 3-D Printed Accessories Using Your Arm As The Interface *Fast Company*, June 2015.
'Tactum' By MadLabs — Create 3D Printable Designs Using The Human Body As The Interface , *3DPrint.com*, April 2015.
What if We Could Design Wearables Right on Our Skin?, *Wired*, March 2015.
PipeDream - Autodesk Working on Way to Integrate Tubes for Electronic Components within 3D Prints, *3DPrint.com*, Oct 2014.
Autodesk's Draco Lets You Animate An Illustration In Seconds, *Fast Company*, May 2014.
Draco: Bringing Illustration to Life with Kinetic Textures. *HOW Design*, April 2014.
Create Training Videos with Project Chronicle, *Cadalyst*, February 2014.
Magic Finger device suggests new day for calling up content. *Phys.org*, October 2012.
'Magic Finger' Swipes Smartphone Remotely. *Discovery News*, October 2012.
Here's a real close call: Implanting your mobile phone under your skin. *Metro UK*, June 2012.
Implanted User Interfaces Television Interview. *The Discovery Channel's Daily Planet*, May 2012.
Gadgets work under your skin – but are you ready? *NewScientist*, May 2012.
Implanted User Interfaces: I've Got You Under My Skin. *TXCHNOLOGIST*, May 2012.
Researchers Push Implanted User Interfaces. *Slashdot*, May 2012.
Implanted User Interface Gives Patients New Options. *InformationWeek*, May 2012.
Under Your Skin: The First Sub-Dermal Implants Get Tested. *Tested*, May 2012.
User Interface Gets Under Your Skin. *Engineering On The Edge*, May 2012.
HoverWidgets: Improving the Functionality of Pen-based interfaces. *Mobile Enterprise*, June 2006.
Once More, With Volume. *MIT Tech Review*, Feb 2005.
ShapeTape Curve Editing Television Demo. *CityPulse24 Interview*, May 2003.
ShapeTape Curve Editing Television Demo. *Discovery Channel Daily Planet*, September 2003.
The changing shape of software. *University of Toronto Magazine*, July 2003.
Team designs twist on software. *Science Daily*, 16 Apr 2003
Gazing into the crystal ball. *The Toronto Star*, 20 Jan 2003.
Shaping the future of 3-D. *Varsity*, 24 Sep 2002.

REFERENCES

Available upon request.