MATTHEW BREHMER, PHD

CURRICULUM VITAE, DEC. 2018

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I am an expert in information visualization, which brings together data analysis, software development, user experience research, and design. I am currently a postdoctoral researcher at **Microsoft Research**, where I am a member of the **EPIC (Extended Perception, Interaction & Cognition)** and **Human Computer Interaction** groups, focusing on tools for **expressive information design** and **visualization for mobile devices**.

EXPERTISE

VISUALIZATION AND INTERFACE DESIGN

I design, develop, and deploy visualization tools and techniques for presenting and analyzing data, typically using technologies such as D3.js or R/Shiny.

EXAMPLE PROJECTS: Timeline Storyteller, Portfolio Sandbox, SoundConsensus, ShinyFork

RELATED PUBLICATIONS: C7, J8, J6, J5, T3

QUANTITATIVE HUMAN FACTORS RESEARCH

I design and conduct experiments as a way to understand human capabilities with respect to perception, attention, and interaction; the findings of these experiments often lead to actionable implications for interface and visualization design.

RELATED PUBLICATIONS: J8, C6, C4, T2, C3, T1

QUALITATIVE HUMAN FACTORS RESEARCH

I evaluate existing data analysis and communication processes, work-in-progress designs, and deployed visualization tools by way of work domain analyses, interviews, chauffeured walkthroughs, and field studies.

RELATED PUBLICATIONS: J5, J2, W3, W2, TR1, T2

APPLICATION DOMAINS

DATA JOURNALISM AND STORYTELLING

Journalists, educators, and storytellers require expressive tools for presenting information to their audience. I have designed, developed, and promoted the use of such tools in the journalism community while considering methodologies for their evaluation.

RELATED PUBLICATIONS: C7, J7, J6, C5, J4, W5, BC1

My PhD research included case studies of journalists who used the **Overview Project** to investigate large text document collections. Our findings provided transferable lessons for visualizing document collections and hierarchical data.

RELATED PUBLICATION: J2

RESOURCE MANAGEMENT AND CONSERVATION

My PhD research included the design of visualization prototypes for analyzing and monitoring energy usage in portfolios of buildings. I consulted with prospective stakeholders and users, envisioning and implementing designs for interactively locating patterns and anomalies.

RELATED PUBLICATION: J5

APPLICATION DOMAINS (CONT.)

PERSONAL HEALTH AND WELLNESS

My MSc pertained to the design and evaluation of **C-TOC**, a computerized cognitive assessment tool intended for early detection of dementia. I studied the use of C-TOC prototypes by healthy older adults and by adults with diagnosed mild cognitive impairments.
RELATED PUBLICATIONS: C4, J3, T2, W1

Prior to my MSc, I worked in the area of exercise video games: I studied the role of physical exertion on cognitive task performance. I also developed **GAIM**, an XNA/C# toolkit which allows players with different input devices to play active games together.
RELATED PUBLICATIONS: C2, C1, T1

EDUCATION

DOCTOR OF PHILOSOPHY, COMPUTER SCIENCE

2011 - 2016

University of British Columbia (UBC), Vancouver, Canada
THESIS: **Why Visualization? Task Abstraction for Analysis and Design**
SUPERVISORY COMMITTEE: Tamara Munzner (UBC Computer Science), Joanna McGrenere (UBC Computer Science), Ronald A. Rensink (UBC Psychology)
EXAMINING COMMITTEE: Jason Dykes (City University London), Alfred Hermida (UBC Journalism), Giuseppe Carenini (UBC Computer Science)
RELATED PUBLICATIONS: T3, J1, J2, J5, TR1, W2

MASTER OF SCIENCE, COMPUTER SCIENCE

2009 - 2011

Specialization in Human-Computer Interaction
University of British Columbia (UBC), Vancouver, Canada
THESIS: **Usability and the Effects of Interruption in C-TOC: Self-Administered Cognitive Testing on a Computer**
SUPERVISED BY: Joanna McGrenere (UBC Computer Science), Claudia Jacova (UBC Medicine)
THESIS READER: Peter Graf (UBC Psychology)
RELATED PUBLICATIONS: C4, J3, W1, T2

BACHELOR OF COMPUTING

2004 - 2009

Specialization in Cognitive Science with Professional Internship
Queen's University, Kingston, Canada
THESIS: **Assessing the Effect of Exercise Intensity on Cognitive Task Performance in an Exercise Video Game**
THESIS ADVISER: T.C. Nicholas Graham (Queen's School of Computing)
RELATED PUBLICATION: T1

EMPLOYMENT HISTORY

Postdoctoral Researcher

2016 - PRESENT

Microsoft Research
Redmond, USA

Graduate Research Assistant

2009 - 2016

University of British Columbia Department of Computer Science
Vancouver, Canada

EMPLOYMENT HISTORY (CONT.)

Graduate Research Intern 2015
Microsoft Research
Redmond, USA

Mitacs Graduate Research Intern 2013 - 2014
Pulse Energy (now a division of EnerNOC)
Vancouver, Canada

Graduate Teaching Assistant 2009 - 2011
University of British Columbia Department of Computer Science
Vancouver, Canada

Research Assistant 2009
Queen's University School of Computing
Kingston, Canada

User Interface Design Intern 2007 - 2008
EMC Corporation (now Dell EMC)
Toronto, Canada

Information Technology Staff and Web Developer 2006
Killam Properties, Inc.
Halifax, Canada

PUBLICATIONS

Author copies of these publications are available at mattbrehmer.github.io/#pubs

J = journal article, C = conference proceedings, W = workshop paper, BC = book chapter, TR = technical report, T = thesis, P = poster. METRICS (where available): AR = acceptance rate, H5 = H5 index, CC = citation count (GOOGLE SCHOLAR, DEC. 2018). My current H index is 10.

PEER-REVIEWED JOURNAL AND CONFERENCE PAPERS

Timeline Storyteller: The Design & Deployment of an Interactive Authoring Tool for Expressive Timeline Narratives C7
Matthew Brehmer, Bongshin Lee, Nathalie Henry Riche, David Tittsworth, Kate Lytvynets, Darren Edge, and Christopher White.
To appear in *Proceedings of the 2019 Computation + Journalism Symposium*.

Visualizing Ranges over Time on Mobile Phones: A Task-Based Crowdsourced Evaluation J8
Matthew Brehmer, Bongshin Lee, Petra Isenberg, and Eun Kyoung Choe.
In Volume 25, Issue 1 (Jan. 2019) of *IEEE Transactions on Visualization and Computer Graphics* [H5: 63] (Presented at IEEE VIS 2018) [AR: 25%].

Charticulator: Interactive Construction of Bespoke Chart Layouts J7
Donghao Ren, Bongshin Lee, and Matthew Brehmer.
In Volume 25, Issue 1 (Jan. 2019) of *IEEE Transactions on Visualization and Computer Graphics* [H5: 63] (Appeared at IEEE VIS 2018) [AR: 25%].
BEST PAPER HONORABLE MENTION AWARD

What's the Difference?: Evaluating Variants of Multi-Series Bar Charts for Visual Comparison Tasks C6
Arjun Srinivasan, Matthew Brehmer, Bongshin Lee, and Steven Drucker.
In *Proceedings of the 2018 ACM Conference on Human Factors in Computing Systems (CHI)* [H5: 86] [AR: 26%] [CC: 2].

Timelines Revisited:
A Design Space and Considerations for Expressive Storytelling J6
Matthew Brehmer, Bongshin Lee, Benjamin Bach, Nathalie Henry Riche, and Tamara Munzner.
In Volume 23, Issue 9 (Sept. 2017) of *IEEE Transactions on Visualization and Computer Graphics* [H5: 63] (Presented at IEEE VIS 2017) [CC: 28].

ChartAccent: Annotation for Data-Driven Storytelling C5
Donghao Ren, Matthew Brehmer, Bongshin Lee, Tobias Höllerer, and Eun Kyoung Choe.
In *Proceedings of the 2017 IEEE PacificVis Symposium* [H5: 21] [CC: 9].

Matches, Mismatches, and Methods:
Multiple-View Workflows for Energy Portfolio Analysis J5
Matthew Brehmer, Jocelyn Ng, Kevin Tate, and Tamara Munzner.
In Volume 22, Issue 1 (Jan. 2016) of *IEEE Transactions on Visualization and Computer Graphics* [H5: 63] (Presented at IEEE VIS 2015) [AR: 21%] [CC: 15].

TimeLineCurator:
Interactive Authoring of Visual Timelines from Unstructured Text J4
Johanna Fulda, Matthew Brehmer, and Tamara Munzner.
In Volume 22, Issue 1 (Jan. 2016) of *IEEE Transactions on Visualization and Computer Graphics* [H5: 63] (Appeared at IEEE VIS 2015) [CC: 26].

C-TOC (Cognitive Testing on Computer):
Investigating the Usability and Validity of a Novel Self-administered Cognitive Assessment Tool in Aging and Early Dementia J3
Claudia Jacova, Joanna McGrenere, Hyunsoo S. Lee, William Wang, Sarah Le Huray, Emily F. Corenblith, Matthew Brehmer, Charlotte Tang, Sherri Hayden, B. Lynn Beattie, and Ging-Yuek R. Hsiung.
In *Alzheimer Disease and Associated Disorders (July 2015)* [CC: 5].

Overview: The Design, Adoption, and Analysis of a Visual Document Mining Tool For Investigative Journalists J2
Matthew Brehmer, Stephen Ingram, Jonathan Stray, and Tamara Munzner.
In Volume 20, Issue 12 (Dec. 2014) of *IEEE Transactions on Visualization and Computer Graphics* [H5: 63] (Presented at IEEE VIS 2014) [AR: 23%] [CC: 57].

A Multi-Level Typology of Abstract Visualization Tasks J1
Matthew Brehmer and Tamara Munzner.
In Volume 19, Issue 12 (Dec. 2013) of *IEEE Transactions on Visualization and Computer Graphics* [H5: 63] (Presented at IEEE VIS 2013) [AR: 25%] [CC: 275] [NOTE: THE MOST CITED IEEE INFOVIS PAPER SINCE 2013].

Investigating Interruptions in the Context of Computerized Cognitive Testing for Older Adults C4
Matthew Brehmer, Joanna McGrenere, Charlotte Tang, and Claudia Jacova.
In *Proceedings of the 2012 ACM Conference on Human Factors in Computing Systems (CHI)* [H5: 86] [AR: 23%] [CC: 9].

The Haptic Crayola Effect:
Exploring the Role of Naming in Learning Haptic Stimuli C3
Inwook Hwang, Karon MacLean, Matthew Brehmer, Jeff Hendy, Andreas Sotirkopoulos, and Seungmoon Choi.
In *Proceedings of the 2011 IEEE World Haptics Conference* [CC: 9].

Activate Your GAIM: A Toolkit for Input in Active Games C2
Matthew Brehmer, Nicholas Graham, and Tadeusz Stach.
In *Proceedings of the 2010 ACM Future Play Conference* [CC: 12].

Classifying Input for Active Games C1
Tadeusz Stach, Nicholas Graham, Matthew Brehmer and Andreas Hollatz.
In *Proceedings of the 2009 ACM Conference on Advances in Computer Entertainment Technology (ACE)* [CC: 13].

PEER-REVIEWED WORKSHOP PAPERS

Reflecting on the Evaluation of Visualization Authoring Systems W5
Donghao Ren, Bongshin Lee, Matthew Brehmer, and Nathalie Henry Riche.
In the *Proceedings of the 2018 BELIV Workshop: Evaluation and Beyond - Methodological Approaches for Visualization*.

Data Visualization on Mobile Devices W4
Bongshin Lee, Matthew Brehmer, Eun Kyoung Choe, Petra Isenberg, Ricardo Langer, and Raimund Dachselt.
In *Extended Abstract Proceedings of the 2018 ACM Conference on Human Factors in Computing Systems (CHI)* [CC: 1].

Visualizing Dimensionally-Reduced Data: Interviews with Analysts and a Characterization of Task Sequences W3
Matthew Brehmer, Michael Sedlmair, Stephen Ingram, and Tamara Munzner.
In *Proceedings of the 2014 ACM BELIV Workshop: Beyond Time and Errors - Novel Evaluation Methods for Visualization* [CC: 44].

Pre-Design Empiricism for Information Visualization: Scenarios, Methods, and Challenges W2
Matthew Brehmer, Sheelagh Carpendale, Bongshin Lee, and Melanie Tory.
In *Proceedings of the 2014 ACM BELIV Workshop: Beyond Time and Errors - Novel Evaluation Methods for Visualization* [CC: 19].

A Tale of Two Studies: Investigating the Impact of Interruptions on Task Performance in Older Adults W1
Matthew Brehmer, Charlotte Tang, Joanna McGrenere, and Claudia Jacova.
In the *Work-In-Progress Proceedings of the the 2011 GRAND NCE AGM*.

OTHER PUBLICATIONS: BOOK CHAPTERS, TECHNICAL REPORTS, POSTERS, THESES

Evaluating Data-Driven Stories & Storytelling Tools BC1
Fereshteh Amini*, Matthew Brehmer*, Gordon Bolduan, Christina Elmer, and Benjamin Wiederkehr (* contributed equally).
In *Data-Driven Storytelling*, edited by Sheelagh Carpendale, Nicholas Diakopoulos, Christophe Hurter, Nathalie Henry Riche (CRC Press, 2018).

Demonstrating the Value of Visualization: Highlights from the 2017 PacificVis Visual Data Storytelling Contest P1
Matthew Brehmer, Kyungwon Lee, Ivan Viola, Jinwook Seo, and Bongshin Lee.
In *Poster Proceedings of the 2017 IEEE VIS Conference*.

Why Visualization? Task Abstraction for Analysis and Design T3
Matthew Brehmer.
University of British Columbia PhD Dissertation (April, 2016).

Dimensionality Reduction in the Wild: Gaps and Guidance TR1
Michael Sedlmair, Matthew Brehmer, Stephen Ingram, and Tamara Munzner.
University of British Columbia Technical Report TR-2012-03 (2012) [CC: 27].

Usability and the Effects of Interruption in C-TOC: Self-Administered Cognitive Testing on a Computer T2
Matthew Brehmer.
University of British Columbia MSc Thesis (2011) [CC: 3].

Assessing the Effect of Exercise Intensity on Cognitive Task Performance in an Exercise Video Game T1
Matthew Brehmer.
Queen's University B.Comp Thesis (2009).

TALKS

Slides from these talks are available at mattbrehmer.github.io/#talks.
Talks with video recordings are indicated with the ▶ icon.

Visualizing Ranges over Time on Mobile Phones — 2018 / 10 / 24
IEEE VIS 2018 (Berlin, Germany) ▶
RELATED PUBLICATION: J8

Tools for Expressive Information Visualization Design — 2018 / 08 / 01
Microsoft Vancouver Data Visualization Symposium (Vancouver, Canada)

Timeline Storyteller, from Visualization Design Space to Deployment — 2018 / 06 / 18
The University of Calgary Data Empowerment Speaker Series (Calgary, Canada)

Data-Driven Storytelling at Microsoft — 2017 / 10 / 24
UBC School of Journalism Course on Special Topics in Contemporary Journalism: Data Viz (JRNL 520H) (Vancouver, Canada)

Timelines Revisited: A Design Space and Considerations for Expressive Storytelling — 2017 / 10 / 03
IEEE VIS 2017 (Phoenix, USA)
RELATED PUBLICATION: J6

Expressive Storytelling With Timelines — 2017 / 08 / 31
Uber Visualization Night: A Journey Through Space and Time (Seattle, USA)

Timelines Revisited: Considerations for Expressive Storytelling — 2017 / 07 / 11
King's College London Department of Informatics (London, UK)

Timelines Revisited: Considerations for Expressive Storytelling — 2017 / 07 / 10
City University London giCentre (London, UK)

The Timeline Storyteller Custom Visual for Power BI — 2017 / 06 / 13
Microsoft Data Insights Summit BI Power Hour (Seattle, USA) ▶

Timelines Revisited: Considerations for Expressive Storytelling — 2017 / 04 / 28
Northeastern University NUVis Visualization Consortium (Boston, USA)

Timelines Revisited: Considerations for Expressive Storytelling — 2017 / 04 / 27
Bentley University RealViz talk series (Waltham, USA) ▶

What Story Does Your Timeline Tell? — 2017 / 04 / 24
OpenVisConf 2017 (Boston, USA) ▶

Timelines Revisited: Considerations for Expressive Storytelling — 2016 / 12 / 08
Radcliffe Institute at Harvard University (Cambridge, USA)

Why Visualization? Task Abstraction for Analysis and Design — 2016 / 03 / 23
Dissertation Defence (Vancouver, Canada)
RELATED PUBLICATION: T3

TALKS (CONT.)

Storytelling with Timeline Data 2016 / 02 / 11
Data-Driven Storytelling Dagstuhl Seminar (Wadern, Germany)

Why Visualization? Task Abstraction for Analysis and Design 2016 / 02 / 01
Microsoft Research (Redmond, USA)

Matches, Mismatches, and Methods: Multiple-View Workflows for Energy Portfolio Analysis 2015 / 10 / 28
IEEE VIS 2015 (Chicago, USA)
RELATED PUBLICATION: J5

Multiple-View Workflows for Energy Portfolio Analysis 2015 / 09 / 04
University of Washington (Seattle, USA)

The Future of Data and Design ... In Visualization Research 2015 / 05 / 19
Vancouver Data Visualization Meetup (Vancouver, Canada)

Overview: The Design, Adoption, and Analysis of a Visual Document Mining Tool For Investigative Journalists 2014 / 11 / 14
IEEE VIS 2014 (Paris, France)
RELATED PUBLICATION: J2

Visualizing Dimensionally-Reduced Data: Interviews with Analysts and a Characterization of Task Sequences 2014 / 11 / 10
ACM BELIV 2014 (Paris, France)
RELATED PUBLICATION: W3

Pre-Design Empiricism for Information Visualization 2014 / 11 / 10
ACM BELIV 2014 (Paris, France)
RELATED PUBLICATION: W2

Visualization Task Abstraction from Multiple Perspectives 2014 / 11 / 08
IEEE VIS Doctoral Colloquium 2014 (Paris, France)

A Multi-Level Typology of Abstract Visualization Tasks 2013 / 10 / 15
IEEE VIS 2013 (Atlanta, USA)
RELATED PUBLICATION: J1

Investigating Interruptions in the Context of Computerized Cognitive Testing for Older Adults 2012 / 05 / 10
ACM CHI 2012 (Austin, USA)
RELATED PUBLICATION: C4

The Impact of Interruptions on Task Performance in Older Adults 2011 / 05 / 14
GRAND NCE AGM 2011 (Vancouver, Canada)
RELATED PUBLICATION: W1

ACADEMIC COMMUNITY SERVICE

ORGANIZING COMMITTEE: IEEE VIS 2018 (Co-Chair: VisInPractice), the Data Visualization on Mobile Devices Workshop at CHI 2018, IEEE PacificVis 2017-2018 (Co-Chair, Visual Data Storytelling Contest)

PROGRAM COMMITTEE: IEEE InfoVis (2017, 2018), EuroVis State of the Art Reports (2017), IEEE PacificVis (2017, 2018), FAT*: Conf. on Fairness, Accountability, Transparency (2018), The Art of Networks III (2018), VIS Arts Program (2018), Information+ (2018), BELIV: Evaluation and Beyond - Methodological Approaches for Visualization (2018), Computation + Journalism (2019)

WORKSHOP PARTICIPANT: Restructuring IEEE VIS For the Future (BIRS, 2018), Data Visualization on Mobile Devices (CHI, 2018), Data-Driven Storytelling (Dagstuhl, 2016), ACM BELIV Workshop (IEEE VIS, 2014), Evaluation of Visual Analytics Workshop (UCSD, 2014)

REVIEWER: IEEE InfoVis (2013 - 2016), IEEE VAST (2015), IEEE PacificVis (2017, 2019), IEEE TVCG (2015 - 2018), EuroVis (2014 - 2018), ACM CHI (2013 - 2019), ACM TOCHI (2013), Sage *Information Visualization* (2015 - 2016), ACM SIGGRAPH Asia (2012), GRAND NCE ACM (2012)

CONTRIBUTOR: The Harvard University / Sloan Foundation Timeline Consortium (2016 - present)

STUDENT VOLUNTEER: ACM CHI Conference (2011, 2013, 2015, 2016)

UNIVERSITY SERVICE

UNIVERSITY OF BRITISH COLUMBIA DEPARTMENT OF COMPUTER SCIENCE: Graduate Admissions and Recruitment Committee (2013-2015), Guest Lecturer (CPSC 547: Information Visualization, 2014-2017), Curriculum Development (CPSC 444: Advanced Human Computer Interaction Methods, 2010-2011), Teaching Assistant (CPSC 444: Advanced Human Computer Interaction Methods, 2010; CPSC 344: Introduction to Human Computer Interaction Methods, 2009)

UNIVERSITY OF BRITISH COLUMBIA COMPUTER SCIENCE GRADUATE STUDENTS' ASSOCIATION: Vice President (Social Affairs) (2010-2011), Graduate Student Orientation Committee (2012), Organizer of the Un-Distinguished Lecture Series (2010–2011, 2012–2013)

QUEEN'S UNIV. COMPUTING STUDENTS' ASSOC.: Orientation Leader (2005), First Year Rep. (2004-2005)

AWARDS

IEEE VIS: Best InfoVis Paper Honorable Mention (2018) for J7 (Charticulator)

UNIVERSITY OF BRITISH COLUMBIA: Student Service Award (2016), Volunteering Award (2015), Mitacs-Accelerate Research Internship Program Award (2013-2014), **Natural Sciences & Engineering Research Council of Canada (NSERC) Postgraduate Scholarship** (2011-2014), Four Year Doctoral Fellowship (2011-2015), Dept. of Computer Science Merit Scholarship (2009-2011)

QUEEN'S UNIVERSITY: Dean's Entrance Scholarship in Computing (2004-2005)

REFERENCES

Dr. **Tamara Munzner**, PROFESSOR, COMPUTER SCIENCE, UBC - **tmm@cs.ubc.ca** - 604-827-5200
Dr. **Ken Hinckley**, PRINCIPAL RESEARCHER, MICROSOFT - **kenh@microsoft.com** - 425-703-9065
Dr. **Bongshin Lee**, SENIOR RESEARCHER, MICROSOFT - **bongshin@microsoft.com** - 425-704-0779
Dr. **Joanna McGrenere** - PROFESSOR, COMPUTER SCIENCE, UBC - **joanna@cs.ubc.ca** - 604-827-5201