

MATTHEW BREHMER, PHD

DATA VISUALIZATION RESEARCHER



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I am a postdoctoral researcher at **Microsoft Research** in Redmond, Washington, where I specialize in expressive information visualization design and data visualization for mobile devices. I am a member of the EPIC (Extended Perception, Interaction & Cognition) and Human Computer Interaction groups, and I am affiliated with Microsoft's Data Journalism Program.

EXPERTISE

VISUALIZATION AND INTERFACE DESIGN

I design, develop, and deploy visualization tools and techniques for data analysis and communication.

→ EXAMPLES PROJECTS: *Timeline Storyteller*, *Portfolio Sandbox*, *SoundConsensus*, *ShinyFork*

→ RELATED PUBLICATIONS: J6, J5, T3

QUANTITATIVE HUMAN FACTORS RESEARCH

I conduct controlled experiments as a way to understand human capabilities with respect to perception and attention with the objective of deriving actionable implications for interface design.

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

QUALITATIVE HUMAN FACTORS RESEARCH

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

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

APPLICATION DOMAINS

DATA JOURNALISM AND STORYTELLING

I aim to provide journalists and storytellers with usable and expressive tools for presenting information visually to their audience, such as with tools like *Timeline Storyteller*, *TimeLineCurator*, and *ChartAccent*.

→ RELATED PUBLICATIONS: J4, J6

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

→ RELATED PUBLICATION: J2

APPLICATION DOMAINS (CONT.)

ENERGY MANAGEMENT AND CONSERVATION

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

→ RELATED PUBLICATION: J5

HEALTH AND FITNESS

My MSc research 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 (aka active games): I studied the role of physical exertion on cognitive task performance. I also developed *GAIM*, an XNA/C# toolkit which allowed players with different input peripherals 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), and Ronald A. Rensink (UBC Psychology)

→ EXAMINATION COMMITTEE: Jason Dykes (giCentre, City University London), Alfred Hermida (UBC Journalism), and 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) and Claudia Jacova (UBC Medicine)

→ THESIS READER: Peter Graf (UBC Psychology)

→ RELATED PUBLICATIONS: C4, J3, W1, T2

EDUCATION (CONT.)

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

Microsoft Research

2016 - PRESENT

Postdoctoral Researcher
Redmond, USA

University of British Columbia Department of Computer Science

2009 - 2016

Graduate Research Assistant
Vancouver, Canada

Microsoft Research

2015

Graduate Research Intern
Redmond, USA

Pulse Energy (now a division of EnerNOC)

2013 - 2014

Mitacs Graduate Research Intern
Vancouver, Canada

University of British Columbia Department of Computer Science

2009 - 2011

Graduate Teaching Assistant
Vancouver, Canada

Queen's University School of Computing

2009

Research Assistant
Kingston, Canada

EMC Corporation (now Dell EMC)

2007 - 2008

User Interface Design Intern
Toronto, Canada

Killam Properties, Inc.

2006

Information Technology Staff and Web Developer
Halifax, Canada

INVITED TALKS

Slides and videos from these talks are available at mattbremer.github.io/#talks

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: Introducing Timeline Storyteller and ChartAccent for Microsoft Power BI 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 InfoVis 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

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

INVITED TALKS (CONT.)

<i>Why Visualization? Task Abstraction for Analysis and Design</i> Microsoft Research (Redmond, USA)	2016 / 02 / 01
<i>Matches, Mismatches, and Methods: Multiple-View Workflows for Energy Portfolio Analysis</i> IEEE InfoVis 2015 (Chicago, USA) → RELATED PUBLICATION: J5	2015 / 10 / 28
<i>Matches, Mismatches, and Methods: Multiple-View Workflows for Energy Portfolio Analysis</i> University of Washington (Seattle, USA)	2015 / 09 / 04
<i>The Future of Data and Design ... In Visualization Research</i> Vancouver Data Visualization Meetup (Vancouver, Canada)	2015 / 05 / 19
<i>Overview: The Design, Adoption, and Analysis of a Visual Document Mining Tool For Investigative Journalists</i> IEEE InfoVis 2014 (Paris, France) → RELATED PUBLICATION: J2	2014 / 11 / 14
<i>Visualizing Dimensionally-Reduced Data: Interviews with Analysts and a Characterization of Task Sequences</i> ACM BELIV 2014 (Paris, France) → RELATED PUBLICATION: W3	2014 / 11 / 10
<i>Pre-Design Empiricism for Information Visualization: Scenarios, Methods, and Challenges</i> ACM BELIV 2014 (Paris, France) → RELATED PUBLICATION: W2	2014 / 11 / 10
<i>Visualization Task Abstraction from Multiple Perspectives</i> IEEE VIS Doctoral Colloquium 2014 (Paris, France)	2014 / 11 / 08
<i>A Multi-Level Typology of Abstract Visualization Tasks</i> IEEE InfoVis 2013 (Atlanta, USA) → RELATED PUBLICATION: J1	2013 / 10 / 15
<i>Investigating Interruptions in the Context of Computerised Cognitive Testing for Older Adults</i> ACM CHI 2012 (Austin, USA) → RELATED PUBLICATION: C4	2012 / 05 / 10
<i>A Tale of Two Studies: Investigating the Impact of Interruptions on Task Performance in Older Adults</i> GRAND NCE AGM 2011 (Vancouver, Canada) → RELATED PUBLICATION: W1	2011 / 05 / 14

PUBLICATIONS

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

PUBLICATION TYPES: J = *journal article*, c = *conference proceedings*, w = *workshop paper*, BC = *book chapter*, T = *thesis*, PO = *poster*.

PUBLICATIONS AS PRIMARY AUTHOR

***Visualizing Ranges over Time on Mobile Phones:
A Task-Based Crowdsourced Evaluation*** J8

Matthew Brehmer, Bongshin Lee, Petra Isenberg, and Eun Kyoung Choe
To appear in Volume 25, Issue 1 (Jan. 2019) of *IEEE Transactions on Visualization and Computer Graphics (InfoVis 2018)*.

Evaluating Data-Driven Stories & Storytelling Tools BC1

Fereshteh Amini*, **Matthew Brehmer***, Gordon Bolduan, Christina Elmer, and Benjamin Wiederkehr (* equal contribution)
A chapter in *Data-Driven Storytelling*, a book edited by Sheelagh Carpendale, Nicholas Diakopoulos, Christophe Hurter, and Nathalie Henry Riche, 2018.

***Demonstrating the Value of Visualization:
Highlights from the 2017 PacificVis Visual Data Storytelling Contest*** Po1

Matthew Brehmer, Kyungwon Lee, Ivan Viola, Jinwook Seo, and Bongshin Lee.
In poster proceedings of the 2017 *IEEE VIS Conference*.

***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*.

Why Visualization? Task Abstraction for Analysis and Design T3

Matthew Brehmer
University of British Columbia PhD Dissertation (April, 2016).

***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 (InfoVis 2015)*.

***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 (InfoVis 2014)*.

PUBLICATIONS (CONT.)

- 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)*.
- 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)*.
- 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 (InfoVis 2013)*.
- Investigating Interruptions in the Context of Computerised 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)*.
- 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).
- 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*.
- 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*.
- 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).

CO-AUTHORED PUBLICATIONS

Charticulator: Interactive Construction of Bespoke Chart Layouts

J7

Donghao Ren, Bongshin Lee, and **Matthew Brehmer**

To appear in Volume 25, Issue 1 (Jan. 2019) of *IEEE Transactions on Visualization and Computer Graphics (InfoVis 2018)*.

[Best Paper Honorable Mention Award]

Reflecting on the Evaluation of Visualization Authoring Systems

W5

Donghao Ren, Bongshin Lee, **Matthew Brehmer**, and Nathalie Henry Riche

To appear the workshop proceedings of *BELIV 2018: Evaluation and Beyond - Methodological Approaches for Visualization*.

What's the Difference?:

C6

Evaluating Variants of Multi-Series Bar Charts for Visual Comparison Tasks

Arjun Srinivasan, **Matthew Brehmer**, Bongshin Lee, and Steven Drucker

In proceedings of the 2018 *ACM Conference on Human Factors in Computing Systems (CHI)*.

Data Visualization on Mobile Devices

W4

Bongshin Lee, **Matthew Brehmer**, Eun Kyoung Choe, Petra Isenberg, Ricardo Langer, and Raimund Dachsel

In extended abstract proceedings of the 2018 *ACM Conference on Human Factors in Computing Systems (CHI)*.

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*.

TimeLineCurator:

J4

Interactive Authoring of Visual Timelines from Unstructured Text

Johanna Fulda, **Matthew Brehmer**, and Tamara Munzner

In Volume 22, Issue 1 (Jan. 2016) of *IEEE Transactions on Visualization and Computer Graphics (VAST 2015)*.

C-TOC (Cognitive Testing on Computer):

J3

Investigating the Usability and Validity of a Novel Self-administered Cognitive Assessment Tool in Aging and Early Dementia

Claudia Jacova, Joanna McGrenere, Hyunsoo S. Lee, William Wang, Sarah Le Huray, Emily F. Corenblieth, **Matthew Brehmer**, Charlotte Tang, Sherri Hayden, B. Lynn Beattie, and Ging-Yuek R. Hsiung

In *Alzheimer Disease and Associated Disorders* (July 2015).

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).

CO-AUTHORED PUBLICATIONS (CONT.)

The Haptic Crayola Effect:

C3

Exploring the Role of Naming in Learning Haptic Stimuli

Inwook Hwang, Karon MacLean, **Matthew Brehmer**, Jeff Hendy, Andreas Sotirkopoulos, and Seungmoon Choi

In proceedings of the 2011 *IEEE World Haptics Conference*.

Classifying Input for Active Games

C1

Tadeusz Stach, Nicholas Graham, **Matthew Brehmer**, Andreas Hollatz

In proceedings of the 2009 *ACM Advances in Computer Entertainment Technology (ACE) Conference*.

ACADEMIC SERVICE

Organizing Committee: IEEE VIS 2018 (Co-Chair: Visualization in Practice), 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*: Conference on Fairness, Accountability, and 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)

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

Student Volunteer: ACM CHI Conference (2011, 2013, 2015, 2016)

UNIVERSITY SERVICE

University of Washington: Invited Project Judge for CSE 442 Data Visualization (2017)

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 University Computing Students' Association: Student Orientation Leader (2005), First Year Representative (2004-2005)

AWARDS

University of British Columbia: Student Service Award (2016), Volunteering Award (2015), Mitacs-Accelerate Graduate Research Internship Program Award (2013-2014), Natural Sciences & Engineering Research Council of Canada (NSERC) Postgraduate Scholarship (2011-2014), Four Year Doctoral Fellowship (2011-2015), Department of Computer Science Merit Scholarship (2009-2011)

Queen's University: Dean's Entrance Scholarship in Computing (2004-2005)

REFERENCES

References are available upon request.