InfoVis Group Research

Tamara Munzner @tamaramunzner
Department of Computer Science
University of British Columbia

CPSC 344 Outro
27 Nov 2019

http://www.cs.ubc.ca/~tmm/talks.html#344-outro19

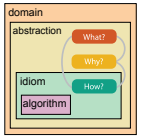
Visualization (vis) defined & motivated

Computer-based visualization systems provide visual representations of datasets designed to help people carry out tasks more effectively.

Visualization is suitable when there is a need to augment human capabilities rather than replace people with computational decision-making methods.

Nested model: Four levels of visualization design

- *domain situation*
  - who are the target users?
- *abstraction*
  - translate from specifics of domain to vocabulary of vis
    - **what** is shown? **data** abstraction
    - **why** is the user looking at it? **task** abstraction
- *idiom*
  - **how** is it shown?
    - **visual encoding** idiom: how to draw
    - **interaction** idiom: how to manipulate
- *algorithm*
  - efficient computation



[A Nested Model of Visualization Design and Validation. Munzner. IEEE TVCG 15(6):921-928, 2009 (Proc. InfoVis 2009).]

[A Multi-Level Typology of Abstract Visualization Tasks Brehmer and Munzner. IEEE TVCG 19(12):2376-2385, 2013 (Proc. InfoVis 2013).]

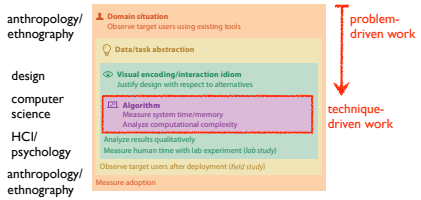
Why is validation difficult?

- different ways to get it wrong at each level

[A Nested Model of Visualization Design and Validation. Munzner. IEEE TVCG 15(6):921-928, 2009 (Proc. InfoVis 2009).]

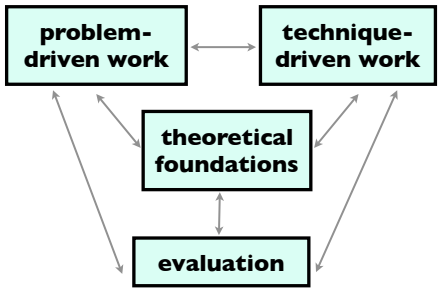
Evaluation: broadly interpreted

- methods from many fields, qualitative & quantitative
  - controlled experiments in lab, field studies of deployed systems



[A Nested Model of Visualization Design and Validation. Munzner. IEEE TVCG 15(6):921-928, 2009 (Proc. InfoVis 2009).]

Tamara Munzner, UBC CS, InfoVis Research



Problem-driven work

- design studies
  - in collaboration with target users
    - real data, real tasks
    - intensive requirements analysis
  - iterative refinement
    - deploy tools/systems
  - typical evaluation: field studies
- my strategy: opportunistic collaboration
  - many domains
  - both industrial and academic partners

Problem-driven: Tech industry

T F E P

Heidi Lam

Diane Tang (Google)

SessionViewer: web log analysis
https://youtu.be/T4MaTZd56G4

Peter McLachlan

Stephen North (AT&T Research)

LiveRAC: systems time-series logs
https://youtu.be/Id0c3H0VSkw

Problem-driven: Energy, sustainability

T F E P

Matt Brehmer

Kevin Tate (Pulse/EnerNOC)

Energy Manager

Maryam Booshehrian

Torsten Moeller (SFU)

Vismon
https://youtu.be/h0kHoS4VYmk

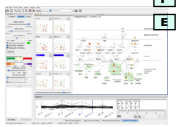
Problem-driven: Genomics

T F E P

Aaron Barsky

Jenn Gardy (UBC Micro)

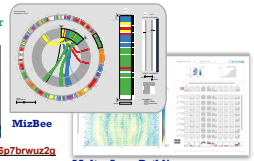
Robert Kincaid (Agilent)



Cerebral
https://youtu.be/76HhG1FQngI

Miriah Meyer

Hanspeter Pfister (Harvard)



MizBee

MulteeSum, Pathline

https://youtu.be/86p7brwuz2g

Problem-driven: Genomics, journalism

T F E P

Joel Ferstay

Cydney Nielsen (BC Cancer)

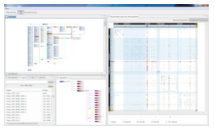
Variant View
https://youtu.be/AHDnv_qMXxQ

Jonathan Stray (Assoc Press)

Overview
https://vimeo.com/71483614

Problem-driven: Autos, e-commerce

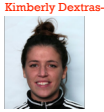
T F E P



Michael Sedlmair

RelEx (BMW)
https://youtu.be/89IsQXc6Ao4

Kimberly Dextras-Romagnino



Segmentifier (Mobify)
https://youtu.be/TobYDFeISOg

Technique-driven work

- scalable algorithms & systems
  - typical evaluation: computational benchmarks
- new layout & interaction techniques
  - typical evaluation: controlled experiments on human subjects

Technique-driven: Graph drawing

T F E P

Daniel Archambault

David Auber (Bordeaux)

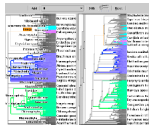
TopoLayout
SPF
Grouse
GrouseFlocks
TugGraph

https://youtu.be/AWXAe8zvkt8

Detangler
https://youtu.be/QOtnHSsUV6k

Benjamin Renoust

Guy Melançon (Bordeaux)



TreeJuxtaposer
https://youtu.be/GdaPj8a9QEo

Evaluation experiments: Graph drawing

T F E P

Dmitry Nekrasovski

Adam Bodnar

Joanna McGrenere

Stretch and squish navigation

Jessica Dawson

Joanna McGrenere

Search set model of path tracing

Technique: Dimensionality reduction

T F E P

Stephen Ingram

Glimmer

DimStiller

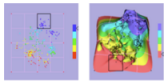
Glint

QSNE

Evaluation experiments: Dim. reduction

T F E P

Melanie Tory

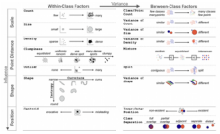


Points vs landscapes for dimensionally reduced data

Guidance on DR & scatterplot choices

Michael Sedlmair

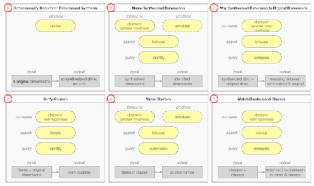
Melanie Tory



Taxonomy of cluster separation factors

Evaluation in the field: Dim. reduction

T F E P



DR in the Wild

Matt Brehmer

Michael Sedlmair

Melanie Tory

Stephen Ingram

Curation & Presentation: Timelines

T F E P

TimeLineCurator

https://vimeo.com/123246662

Johanna Fulda (Sud. Zeitung)

Matt Brehmer

Timelines Revisited

timelinesrevisited.github.io/

Bongshin Lee (Microsoft)

Benjamin Bach (Microsoft)

Nathalie Henry-Riche (Microsoft)

Theoretical foundations

T F E P

Papers Process & Pitfalls

Nested Model

Design Study Methodology

Abstract Tasks

Michael Sedlmair

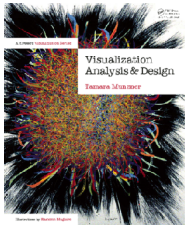
Miriah Meyer

Matt Brehmer

Theoretical foundations

T F E P

- book http://www.cs.ubc.ca/~tmm/vadbook
- papers, videos, software, talks, courses
  http://www.cs.ubc.ca/group/infovis
  http://www.cs.ubc.ca/~tmm



Visualization Analysis & Design

www.cs.ubc.ca/~tmm/talks.html#344-outro19

@tamaramunzner

Grad course: CPSC 547

- teaching now
- final presentations Tue Dec 10
  - 3-7pm FSC 2330A
    - you're invited!
      http://www.cs.ubc.ca/~tmm/courses/547-19/projects.html

Ugrad course: CSPC 436V

- brand new, pilot is Jan 2020
  - https://www.cs.ubc.ca/~tmm/courses/436V-20/
- 4th year majors course
  - theory: visualization foundations
  - tooling: D3.js