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


Why is validation difficult?

- different ways to get it wrong at each level

- Domain situation
  You misunderstood their needs

- Data/task abstraction
  You’re showing them the wrong thing

- Visual encoding/interaction idiom
  The way you show it doesn’t work

- Algorithm
  Your code is too slow

Evaluation: broadly interpreted

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

anthropology/ethnography
design
computer science
HCI/psychology
anthropology/ethnography

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

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

Heidi Lam
(Google)

LiveRAC: systems time-series logs
https://youtu.be/ld0c3H0VSkw

Peter McLachlan
(AT&T Research)

Stephen North

Diane Tang
(Anonymous)
Problem-driven: Energy, sustainability

Vismon
https://youtu.be/h0kHoS4VYmk
Problem-driven: Genomics

Aaron Barsky (UBC Micro)

Jenn Gardy (Agilent)

Robert Kincaid (Agilent)

Miriah Meyer

Hanspeter Pfister (Harvard)

Cerebral
https://youtu.be/76HhG1FQngI

MizBee
https://youtu.be/86p7brwuz2g

MulteeSum, Pathline

https://youtu.be/76HhG1FQngI
Problem-driven: Genomics, journalism

Joel Ferstay
Cydney Nielsen
(BC Cancer)

Jonathan Stray
(Assoc Press)

Variant View
https://youtu.be/AHDnv_qMXxQ

Overview
https://vimeo.com/71483614
Problem-driven: Autos, e-commerce

**RelEx (BMW)**
https://youtu.be/89lsQXc6Ao4

**Current work:**
Mobify clickstream collaboration
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

Daniel Archambault (Bordeaux)

David Auber (Bordeaux)

TopoLayout
SPF
Grouse
GrouseFlocks
TugGraph

https://youtu.be/GdaPj8a9QEo
https://youtu.be/AWX Ae8zvkt8

Benjamin Renoust

Detangler
https://youtu.be/QOtnHSsUV6k

Guy Melançon (Bordeaux)

TreeJuxtaposer
https://youtu.be/GdaPj8a9QEo
Evaluation experiments: Graph drawing

Dmitry Nekrasovski  Adam Bodnar  Joanna McGrenere

Stretch and squish navigation

Jessica Dawson  Joanna McGrenere

Search set model of path tracing
Technique: Dimensionality reduction

Stephen Ingram

Glimmer

DimStiller

Glint

QSNE
Evaluation experiments: Dim. reduction

Points vs landscapes for dimensionally reduced data

Guidance on DR & scatterplot choices

Taxonomy of cluster separation factors
Evaluation in the field: Dim. reduction

DR in the Wild

Matt Brehmer  Michael Sedlmair  Melanie Tory  Stephen Ingram
Curation & Presentation: Timelines

**TimeLineCurator**
https://vimeo.com/123246662

**Timelines Revisited**
timelinesrevisited.github.io/

Johanna Fulda (Sud. Zeitung)

Matt Brehmer

Bongshin Lee (Microsoft)

Benjamin Bach (Microsoft)

Nathalie Henry-Riche (Microsoft)
Theoretical foundations

Papers Process & Pitfalls

Design Study Methodology

Michael Sedlmair  Miriah Meyer

Nested Model

Abstract Tasks  Matt Brehmer
Theoretical foundations

• 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

• grad course: CPSC 547
  • teaching now
  • final presentations Tue Dec 15
    • 1-5pm FSC 2330A
    • you’re invited!
      http://www.cs.ubc.ca/~tmm/courses/547-17F/
      projects.html

• on sabbatical next year
• ugrad course planned for Sep 2019

www.cs.ubc.ca/~tmm/talks.html#344-outro17

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