InfoVis Group Research

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www.cs.ubc.ca/~tmm/talks.html#344-outro23nov
Visualization defined & motivated

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

• 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

- Domain situation
  Observe target users using existing tools

- Data/task abstraction
  - Visual encoding/interaction idiom
    Justify design with respect to alternatives
  - Algorithm
    Measure system time/memory
    Analyze computational complexity
  - Analyze results qualitatively
  - Measure human time with lab experiment (lab study)
  - Observe target users after deployment (field study)
  - Measure adoption

problem-driven work

technique-driven work

driven work

theoretical foundations

evaluation

quant
qual
mixed
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
    • pre-design & post-deployment, often qualitative
  – opportunistic collaboration
    • many domains, industry & academia
Design studies: domains

• many domains
  – fisheries, in-car networks, journalism, ...

• genomics
  – Harvard Med School, BC Cancer, UBC Biodiversity, Agilent, ...

• log analysis
  – Google web search, AT&T web hosting, Mobify e-commerce
  – building & energy usage
Ocupado design study

Ocupado: Visualizing Location-Based Counts Over Time Across Buildings

Michael Oppermann
Tamara Munzner

https://youtu.be/KcwjVK8eUdw
Technique-driven work

• scalable algorithms & systems
  – typical evaluation: computational benchmarks

• new visual encoding & interaction techniques
  – typical evaluation: controlled experiments with people (quant)
  – typical evaluation: qualitative assessment

• areas
  – graph drawing, dimensionality reduction
  – human-in-the-loop curation/assessment of ML results
https://youtu.be/Lff398EEswM
Courses

• grad course CPSC 547: next offering Sep 2025
• new-ish ugrad course: CPSC 447
  – (first three years was CPSC 436V)
  – current offering
    https://www.students.cs.ubc.ca/~cs-447/23Jan/
  – current offering now (Sep 2023), then Jan 2025
  – 4th year majors course
    • theory: visualization foundations
    • tooling: D3.js
    • prereq: CPSC 310 (for JavaScript)
    • HCI not required, but very helpful
More info

- book (free through UBC library) http://www.cs.ubc.ca/~tmm/vadbook


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