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?
  • why is the user looking at it?
• 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: They may show it right, but it’s the wrong thing
  • Algorithm: Your code is too slow

Evaluation: broadly interpreted
• methods from many fields, qualitative & quantitative
  – controlled experiments in lab, field studies of deployed systems

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

Courses
• grad course CPSC 547: next offering Sep 2025
• new-ish ugrad course: CPSC 447
  – (first three years was CPSC 436V)
  – 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

Ocupado design study
Ocupado: Visualizing Location-Based Counts
Over Time Across Buildings
Michael Oppenworth
Tamara Munzner

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

TimelineCurator

More info
• book (free through UBC library)
http://www.cs.ubc.ca/~tmm/vadbook
• papers, videos, software, talks, courses
http://www.cs.ubc.ca/group/infovis
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