UBC Grad Course in InfoVis

IEEE VisWeek 2010 Panel
Perspectives on Teaching Data Visualization

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Coverage: Subfields

- infovis, with one lecture on scivis
    - me, and many others
- scivis, with one lecture on infovis
    - even more courses
- vis: true integration, covering both fields well
    - common: really one of above two things
    - rare: true integration with deep coverage of both
        - is this holy grail? should it be?

How to Organize? Multiple Cross-Cuts

- Principles
    - Perception, Cognition, ...
- Techniques/Algorithms
    - Focus+Context, Small Multiples, Force-Directed Layout, MDS, Treemaps, Semantic Zooming, ...
- Data Types
    - Graphs/Trees, Tables, High-Dimensional, Text, ...
- Domains
    - Biology, Software, Journalism, Networking, ...
- Evaluation
    - one lecture (common case)
- common case: grab bag. me too! (now)

Current Topics

- Intro
- Design Studies
- Fundamentals
- Perception/Memory
- Color
- Statistical Graphics
- Multiples/Interaction
- Space/Layers/Order
- Navigation/Zooming
- Focus+Context
- High Dimensionality
- Graphs/Trees
- User Studies

Current Structure

- first half: they read, I lecture. core material.
- second half: they present
    - student presentations on additional material that others not required to read
- second half: they do projects. types:
    - programming
        - problem-driven
        - technique-driven
        - implement system from research literature
    - analysis: use existing tool(s) to analyze datasets
        - much longer writeup
        - course thus accessible to nonmajors. a few each year.
    - survey

Beyond Technical Content: Research Skills

- as central as content material for grad course
- reading research papers
  - several dozen
- writing technical material
  - reading questions
  - project proposal
  - final report (in VisWeek research paper format)
- giving technical talks
  - presentations on topic of their choice
  - project updates
  - final presentation
- reading reviews
  - I give detailed written comments
  - at level of paper review for final material
  - includes both style and content

Biggest Weakness: No Synthesis Text

- recurring eval theme: reading load much too heavy
  - 5 readings/class * 2 classes/week * 6 core weeks
- no textbook with sufficient synthesis
  - Ware textbook great for cognitive principles
    - not for communicating what we as a field have learned over past 20 years
  - original readings usually have far different intent than what I want students to think about
- writing textbook now
  - then will restructure course considerably
    - more time for design exercises once reading load lighter

Rethinking Topics: Beyond The Grab-Bag

- principles
  - design process, visual encoding, interaction, general
    - 2009 nested model: address evaluation-as-carbuncle
- techniques
  - composite views
    - spatial ordering, additional channels, pixel-oriented, layering, glyphs
  - adjacent views
    - linking between views, types of multiples
  - data reduction
    - overviews, aggregation, filtering, navigation, focus+context, reducing dimensionality
- practice (data types)
  - graphs, trees, tables, text, geographic, spatial fields

Material

- book
  - summary chapter test-driving book structure available now
    - appears in Shirley ugrad graphics textbook, 3rd ed
    - freely downloadable, thanks to AK Peters
      http://www.cs.ubc.ca/labs/imager/tr/2009/VisChapter/
  - full book to come
    - hope to have teachable draft by fall 2011

- all course material available online
  http://www.cs.ubc.ca/~tmm/courses/infovis
  - all 7 years: readings, lectures, demos, projects, ...

Logistics

Take 1

- structure
    - readings spread across through term
    - projects in second half of term
    - students pick which topic to present
    - each topic two days:
        - first two student presenters
        - then I lecture
    - grading: 50% project, 35% presentation, 15% participation

Take 1 Failure Modes

- projects all on simpler stuff from first half of class, not all the cool stuff at the end
- students horribly bored by their colleagues presenting on material they'd just read
- my lectures require lastminute readjustment for good coverage w/o repetition
- course not accessible to nonCS students since requires programming for projects

Take 2

- first half: they read, I lecture. core material.
- second half: they present, they do projects
- student presentations on additional material that others not required to read
- grading: 50% project, 25% presentation, 15% participation, 5% assignment
- projects can be programming or analysis
    - analysis: use existing tool(s) to analyze datasets, much longer writeup
    - course thus accessible to nonmajors. a few each year.

Getting Them To Do Readings

- Take 2 failure mode: they don't do the reading
- heavy reading load: 5 readings/lecture, 2 lectures/week, 1st 6 weeks
- anon eval: "lectures covered material so well I didn't have to do reading". sigh.
- fix: 75% of participation grade is written questions
  - due 2 hrs before lecture
  - one question/comment per reading
  - Take 3 failure mode: incoherent/thoughtless questions
    - fix: graded by buckets: zero, poor, ok, good, great
    - show them examples of each bucket on first day
- ideally: read (and grade) before lecture
  - bring highlighted printout of Qs to raise interesting points during lecture

Project Structure

- Take 1 failure mode: feedback from me about project problems too late
    - fix: mandatory meeting(s) with me before written proposals due
- topic: I have page of project suggestions, but most projects self-initiated
    - some dataset/task they care about
    - I highly encourage tie-in to current/proposed thesis research
- presentation does not have to be on project topic, but can be
- groups of 2 allowed, a few each year
    - I see no quality correlation with group vs. individual

Adding Structure for Grading

- failure modes:
    - felt too subjective and hard to be consistent
    - my expectations clearest in retrospect
- fix: add more detail in grading rubric in year i, add more detail to expectations for structure in year i+1
    - project breakdown, proposal structure
- 25% Presentations
    - Content Summary 50%, Synthesis/Critique 20%, Presentation Style 15%, Materials Preparation 15%
- bucket grades again: zero, poor, ok, good, great

Outcomes

- doing well in course highly correlated with doing well with me in research
    - decide in advance how many slots I have each year
    - go through in order of class rank, offer slot, stop when full.
- later publication not a primary goal
    - a few projects become VisWeek posters
    - no project has become a paper
        - students who work with me typically move on to something more substantial
        - students who work with somebody else don't have time to polish enough for a paper