UBC Grad Course in InfoVis
IEEE VisWeek 2010 Panel
Perspectives on Teaching Data Visualization

Tamara Munzner
UBC Computer Science
28 October 2010

Coverage: Subfields
- infovis, with one lecture on scivis
- many topics and others
- scivis, with one lecture on infovis
- even more courses
- visual integration, covering both fields well
- common: really one of above two things
- rare: true integration with deep coverage of both
- is this holy grail goal? 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.

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 Draft 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
- examples (data types)
  - graphs, trees, tables, text, geographic, spatial fields

Material
- book
  - summary chapter test-driving book structure available online
    - http://www.cs.ubc.ca/∼tmm/courses/infovis
    - all 7 years: readings, lectures, demos, projects, ...

Logistics
- project breakdown, proposal structure
- one lecture (common case)
- proposals due
- due 2 hrs before lecture
- one question/comment per reading
- project updates
- 5% grading after reading
- project presentations
  - in class
  - grade
  - 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 horridly bored by their colleagues presenting on material they’d just read
- my lectures require last-minute readjustment for good coverage w/o repetition
- course not accessible to non-CS students since requires participation

Take 2 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-initialized
- 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

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

Rethinking Topics: Beyond The Grab-Bag
- principles
  - design process, visual encoding, interaction, general
  - 2009 Draft 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
    - composites, aggregation, filtering, navigation, focus-context, reducing dimensionality
  - examples
    - tables, text, geographic, spatial fields

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-initialized
  - 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 structures in year i+1
  - proposal breakdown, proposal structure
  - 20% 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