Lecture 16: Writing InfoVis Papers
Information Visualization
CPSC 533C, Fall 2007

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Overview

- Initial Stage: Paper Types
- Middle Pitfalls: Visual Encoding
- Late Pitfalls: Paper Strategy, Tactics, Results
- Final Pitfalls: Style and Submission
- Generality
InfoVis Validation Approaches

- algorithm complexity analysis
- implementation performance (speed, memory)
- quantitative metrics
- qualitative discussion of result pictures
- user anecdotes (insights found)
- user community size (adoption)
- informal usability study
- laboratory user study
- field study with target user population
- design justification from task analysis
- visual encoding justification from theoretical principles
Paper Types: Technique

- paper types as guide through validation choices

- technique/algorithm
  - most common: here’s new algorithm to do X
  - do first, or do better

- validation
  - complexity, performance
  - quant metrics, qual discussion of pix
Paper Types: Design Study

- design study
  - justify visual encoding choices
    - what is mapping from domain problem to visual encoding
    - why does it solve problem
    - abstraction and justification is critical
  - not just apply technique X to domain Y
  - formative evaluation: ethnographic analysis, iterative design

- validation
  - anecdotes, adoption
  - design justification from task analysis
  - visual encoding justification from theoretical principles
  - secondary: user studies
Paper Types

- systems
  - design study for library/toolkit architectural choices
    - not for application-level visual encoding
    - lessons learned: why does anybody else care?
- summative evaluation / user studies
  - lab studies of abstracted tasks
  - field studies with target users
- model
  - taxonomies: aid to thinking, finding gaps
  - formalism: new models/definitions (ex: space-scale)
  - commentary: advocate (ex: fisheye followup)
Type Pitfalls
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- Design in Technique’s Clothing
  - if no major algorithm contrib, probably design study

- Application Bingo
  - don’t just pick random technique-problem combinations
  - must justify why technique solves problem

- All That Coding Means I Deserve A Systems Paper
  - only if you have architectural lessons to share

- Neither Fish Nor Fowl
  - hard to straddle boundaries
  - pick one primary contrib, vs. others as secondary
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Middle Stage: Visual Encoding

- Unjustified Visual Encoding should justify why visual encoding design choices are appropriate for the problem.
- Even if you start from a technique-driven place, it's important to characterize the capabilities of the new technique before submitting a paper.
- Consider whether 2D or 3D is better, and justify when the benefits of 3D outweigh the cost of occlusion.
- Abstract visual encoding allows the choice over mapping variables to spatial position.
Middle Stage: Visual Encoding

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  - should justify why visual encoding design choices appropriate for problem
  - requires clear statement of problem and encoding, of course
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- Hammer In Search Of Nail
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  - even if start from technique-driven place
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- 2D Good, 3D Better
  - must justify when benefits 3D outweigh cost of occlusion
  - abstract visual encoding allows choice over mapping variables to spatial position
Middle Stage: Visual Encoding 2

- **Color Cacophony**
  - blatant disregard for basic color perception facts
  - huge areas of highly saturated color
  - color coding intended for regions too small for distinguishability
  - nominal color coding for too many (15+) categories
  - red/green with no luminance difference
  - encode 3 separate variables with RGB
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- **Rainbows Just Like In The Sky**
  - unjustified use of continuous rainbow colormap
  - hue does not have implicit perceptual ordering
  - standard rainbow colormap is perceptually nonlinear
  - for many nameable regions, quantize into segmented colormap
Later Stage

- after bulk of work done
- before begin writing draft
- strategy: paper-level structure
- tactics: section-level problems
- results: results section in specific
Later Pitfalls: Strategy

What I Did Over My Summer Vacation

- focus on effort not contribution
- too low-level

Least Publishable Unit

- tiny increment beyond (your) previous work
- bonus points: new name for old technique

Dense As Plutonium

- so much content that no room to explain why/what/how
- fails reproducability test

Bad Slice and Dice

- two papers split up wrong
- neither is standalone, yet both repeat
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Stealth Contributions

It's your job to tell the reader explicitly.

Consider carefully, often different from original goals.
Later Pitfalls: Tactics

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Paper Writing: Contributions

- what are your research contributions?
  - what can we do that wasn’t possible before?
  - how can we do something better than before?
  - what do we know that was unknown or unclear before?

- determines everything
  - from high-level message to which details

- often not obvious
  - diverged from original goals, in retrospect

- state them explicitly and clearly in introduction
  - don’t hope that reviewer or reader will fill in for you
  - don’t leave unsaid what should be obvious after close reading of previous work
    - pw very important - but many readers skip
  - goal is clarity, not overselling
    - do include limitations: often later, in discussion subsection
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- **I Am Utterly Perfect**
  - discussion of limitations makes paper stronger
Later Pitfalls: Results

- Unfettered By Time
  - Choose level of detail for performance numbers
  - Detailed graphs for technique, high-level for design/evaluation

- Fear and Loathing of Complexity
  - Present the complexity analysis for technique papers
  - Full proof not required

- Straw Man Comparison
  - Compare against state-of-the-art algorithms
  - Head-to-head hardware best

- Tiny Toy Datasets
  - Compare against state-of-the-art dataset sizes for technique
  - Small datasets may be acceptable for user studies

- But My Friends Liked It
  - Asking labmates not convincing when targets different

- Unjustified Tasks
  - User study tasks should be ecologically valid
  - Convincing abstraction of real-world tasks of target users
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- Nonspecific Use Of Large
  - hundreds, 10K, 100K, millions, billions?
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often detected when same reviewer for both

instant dual rejection, multi-conference blacklist

Resubmit Unchanged
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Generality

- type: infovis
- encoding: color is general vis, others more infovis
- strategy: all research
- tactics: all research
- results: general vis
- style: all research, except
  - Story-Free Captions: general vis and graphics
  - My Picture Speaks For Itself: more infovis