

Course Wrap-Up

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What Have We Covered This Semester?

- ▶ Intro to Info Vis
- ▶ Systems and Toolkits
- ▶ Design Principles and Graph Types
- ▶ Data
- ▶ Visual Perception
- ▶ Cognition and Frameworks
- ▶ Overview+Detail and Focus+Context
- ▶ Interaction
- ▶ Time Series
- ▶ Graphs, Networks
- ▶ Multivariate Data
- ▶ Hierarchies, Trees
- ▶ Text and Documents
- ▶ Storytelling and Data Journalism
- ▶ Evaluation
- ▶ Maps
- ▶ WWW
- ▶ Big Data

What Have You Done This Semester?

- ▶ HW 1 - Graph Design IQ, Tutorials
- ▶ HW 2 - Table and Graph Design
 - ▶ student data
- ▶ HW 3 - Re-create Existing Vis
- ▶ HW 4 - Network Visualization
 - ▶ NodeXL
- ▶ HW 5 - Real-World Data
 - ▶ voter record linkage
 - ▶ Navy medical data
 - ▶ VA educational data
- ▶ Semester Project
 - ▶ quantum sensing trends

Still Interested?

- ▶ 7 Foundational Papers to Read
- ▶ What is Progress in InfoVis?
- ▶ InfoVis Research Paper Types
 - ▶ Design Study Methodology

7 Foundational Papers - 1

- ▶ Graphical Perception: Theory, Experimentation, and Application to the Development of Graphical Methods
 - ▶ W. S. Cleveland and R. McGill
 - ▶ *Journal of the American Statistical Association*, Sept 1984
 - ▶ foundations of visual encodings
 - ▶ introduction of visualization based on rigorous experimentation

<http://fellinglovewithdata.com/guides/7-classic-foundational-vis-papers>

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7 Foundational Papers - 2

- ▶ The Structure of the Information Visualization Design Space
 - ▶ Stuart K. Card and Jock Mackinlay
 - ▶ InfoVis 1997
 - ▶ basic components that build a visualization and how to connect them

<http://fellinglovewithdata.com/guides/7-classic-foundational-vis-papers>

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7 Foundational Papers - 3

- ▶ Visual Information Seeking: Tight Coupling of Dynamic Query Filters with Starfield Displays
 - ▶ Christopher Ahlberg and Ben Shneiderman
 - ▶ SIGCHI 1997
 - ▶ *we covered this in the interaction lecture*
 - ▶ precursor to Spotfire
 - ▶ first attempt at controlling visualization through interactive queries
 - ▶ dynamic filtering

<http://felinlovewithdata.com/guides/7-classic-foundational-vis-papers>

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7 Foundational Papers - 4

- ▶ High-Speed Visual Estimation Using Preattentive Processing.
 - ▶ C. G. Healey, K. S. Booth and J. T. Enns
 - ▶ *ACM Transactions on Computer -Human Interaction (TOCHI)*, June 1996
 - ▶ describes preattentive processing
 - ▶ ties together perception to visualization
 - ▶ later paper (that we covered)
 - ▶ Healey and Enns, Attention and Visual Memory in Visualization and Computer Graphics, *Transactions on Visualization and Computer Graphics*, 2011

<http://felinlovewithdata.com/guides/7-classic-foundational-vis-papers>

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7 Foundational Papers - 5

- ▶ Automating the Design of Graphical Presentations of Relational Information
 - ▶ Jock Mackinlay
 - ▶ *ACM Transactions on Graphics*, April 1986
 - ▶ beginnings of Tableau
 - ▶ goal to automatically design effective visualizations by matching data features to visual features through the use of logic rules
 - ▶ definition of visual primitives

<http://fellinglovewithdata.com/guides/7-classic-foundational-vis-papers>

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7 Foundational Papers - 6

- ▶ How NOT to Lie with Visualization
 - ▶ Bernice E. Rogowitz, Lloyd A. Treinish
 - ▶ *Journal of Computers in Physics*, May/June 1996
 - ▶ focused on color use and perception
 - ▶ detailed explanation of how the visual eye can be misled if the wrong color mapping is used
 - ▶ how to build effective color scales

<http://fellinglovewithdata.com/guides/7-classic-foundational-vis-papers>

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7 Foundational Papers - 7

- ▶ The Eyes Have It: A Task by Data Type Taxonomy for Information Visualizations
 - ▶ Ben Shneiderman
 - ▶ IEEE Conference on Visual Languages, 1996
 - ▶ *we covered this in the cognition lecture*
 - ▶ classification of info vis techniques according to data type
 - ▶ visual information seeking mantra

<http://felinlovewithdata.com/guides/7-classic-foundational-vis-papers>

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Still Interested?

- ▶ 7 Foundational Papers to Read
- ▶ What is Progress in InfoVis?
- ▶ InfoVis Research Paper Types and Pitfalls
 - ▶ Design Study Methodology

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What is Progress in Info Vis?

- ▶ Real-World Impact
- ▶ Knowledge Construction
- ▶ Technical Achievement
- ▶ Education and Adoption

<http://fellinlovewithdata.com/reflections/progress-in-vis>

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InfoVis Papers

Tamara Munzner
"Process and Pitfalls..."
Book Chapter, 2008

- ▶ First, how to validate the claim that an infovis paper has made a contribution?
 - ▶ 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

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InfoVis Paper Types

- ▶ **Technique/Algorithms**
 - ▶ focus on novel algorithms, implementation expected
- ▶ **Design Study**
 - ▶ make the case that a new visual representation is a suitable solution for a particular domain problem
 - ▶ contribution is typically a well-reasoned justification of how existing techniques can be usefully combined
- ▶ **Systems/Toolkits**
 - ▶ architectural choices made in the design of an infrastructure, framework, ...
- ▶ **Evaluation**
- ▶ **Model**
 - ▶ formalisms and abstractions as opposed to design or evaluation of a particular technique or system
 - ▶ subcategories: Taxonomy, Formalism, Commentary

Design Study Methodology Suitability

Sedlmair et al.
"Design Study Methodology..."
InfoVis 2012

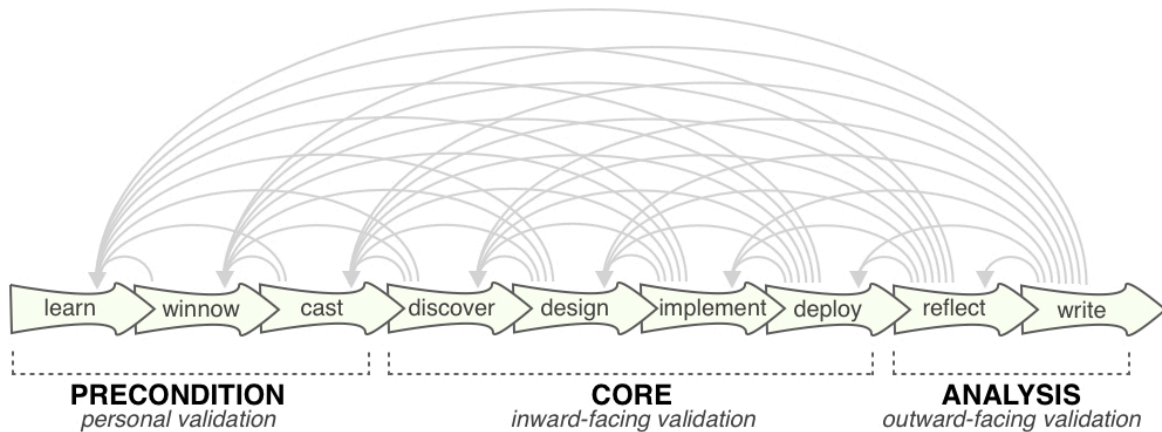


<http://www.cs.ubc.ca/nest/imager/tr/2012/dsm/>

Design Study Methodology

9 Stage Framework

Sedlmair et al.
"Design Study Methodology..."
InfoVis 2012



Design Study Methodology

Pitfalls 1-16

Sedlmair et al.
"Design Study Methodology..."
InfoVis 2012

PF-1	premature advance: jumping forward over stages	general
PF-2	premature start: insufficient knowledge of vis literature	learn
PF-3	premature commitment: collaboration with wrong people	winnow
PF-4	no real data available (yet)	winnow
PF-5	insufficient time available from potential collaborators	winnow
PF-6	no need for visualization: problem can be automated	winnow
PF-7	researcher expertise does not match domain problem	winnow
PF-8	no need for research: engineering vs. research project	winnow
PF-9	no need for change: existing tools are good enough	winnow
PF-10	no real/important/recurring task	winnow
PF-11	no rapport with collaborators	winnow
PF-12	not identifying front line analyst and gatekeeper before start	cast
PF-13	assuming every project will have the same role distribution	cast
PF-14	mistaking fellow tool builders for real end users	cast
PF-15	ignoring practices that currently work well	discover
PF-16	expecting <i>just talking</i> or <i>fly on wall</i> to work	discover

Design Study Methodology

Pitfalls 17-32

Sedlmair et al.
"Design Study Methodology..."
InfoVis 2012

PF-17	experts focusing on visualization design vs. domain problem	discover
PF-18	learning their problems/language: too little / too much	discover
PF-19	abstraction: too little	design
PF-20	premature design commitment: consideration space too small	design
PF-21	mistaking technique-driven for problem-driven work	design
PF-22	non-rapid prototyping	implement
PF-23	usability: too little / too much	implement
PF-24	premature end: insufficient deploy time built into schedule	deploy
PF-25	usage scenario not case study: non-real task/data/user	deploy
PF-26	<i>liking</i> necessary but not sufficient for validation	deploy
PF-27	failing to improve guidelines: confirm, refine, reject, propose	reflect
PF-28	insufficient writing time built into schedule	write
PF-29	no technique contribution \neq good design study	write
PF-30	too much domain background in paper	write
PF-31	story told chronologically vs. focus on final results	write
PF-32	premature end: win race vs. practice music for debut	write

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Back to Papers

More Pitfalls

Tamara Munzner
"Process and Pitfalls..."
Book Chapter, 2008

- Paper Type Pitfalls
- Middle Pitfalls – Visual Encoding
- Late Pitfalls
 - strategy
 - tactical
 - results
- Final Pitfalls
 - writing style
 - submission

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Paper Type Pitfalls

- ▶ Design in Technique's Clothing
 - ▶ providing only performance measurements
- ▶ Application Bingo vs. Design Study
 - ▶ apply some random technique to a new problem
- ▶ All That Coding Means I Deserve A Systems Paper
- ▶ Neither Fish Nor Fowl
 - ▶ straddles multiple categories

Middle Pitfalls

Visual Encoding

- ▶ Unjustified Visual Encoding
 - ▶ straightforward visual encoding of the exact input data is often not sufficient
- ▶ Hammer in Search of a Nail
 - ▶ common research pitfall
- ▶ 2D Good, 3D Better
- ▶ Color Cacophony
- ▶ Rainbows Just Like in the Sky
 - ▶ standard rainbow colormap is perceptually nonlinear

Late Pitfalls Strategy

Tamara Munzner
"Process and Pitfalls..."
Book Chapter, 2008

- ▶ What I Did Over My Summer Vacation
 - ▶ do not enumerate all activities that required effort, know what is a contribution
- ▶ Least Publishable Unit
- ▶ Dense As Plutonium
- ▶ Bad Slice and Dice

Late Pitfalls Tactical

Tamara Munzner
"Process and Pitfalls..."
Book Chapter, 2008

- ▶ Stealth Contributions
 - ▶ don't be modest, leaving contributions unsaid
 - ▶ sentence near end of intro "The contribution of this work is..."
- ▶ I Am So Unique
 - ▶ don't ignore previous work
- ▶ Enumeration Without Justification (Prev Work)
 - ▶ tell a story to the reader
- ▶ Sweeping Assertions
- ▶ I Am Utterly Perfect

Late Pitfalls

Results

Tamara Munzner
"Process and Pitfalls..."
Book Chapter, 2008

- ▶ Unfettered By Time
 - ▶ how long to get your results?
- ▶ Fear and Loathing of Complexity
- ▶ Straw Man Comparisons
- ▶ Tiny Toy Datasets
- ▶ But My Friends Liked It
- ▶ Unjustified Tasks

Final Pitfalls

Style

Tamara Munzner
"Process and Pitfalls..."
Book Chapter, 2008

- ▶ Deadly Detail Dump
- ▶ Story-Free Captions
 - ▶ paper story is understandable w/just figures and captions
- ▶ My Picture Speaks For Itself
- ▶ Grammar is Optional
- ▶ Mistakes Were Made
 - ▶ passive voice
- ▶ Jargon Attack
- ▶ Nonspecific Use of "Large"

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