

Lecture 11: Tabular Data

Information Visualization
CPSC 533C, Fall 2011

Tamara Munzner

UBC Computer Science

Mon, 17 October 2011

Required Readings

Metric-Based Network Exploration and Multiscale Scatterplot.
Yves Chiriota, Fabien Jourdan, Guy Melancon. Proc. InfoVis 04,
pages 135-142. Hierarchical Parallel Coordinates for Exploration of

Large Datasets Ying-Huey Fua, Matthew O. Ward, and Elke A.
Rundensteiner. IEEE Visualization '09.

Parallel sets: visual analysis of categorical data. Fabien Bendix,
Robert Kosara, and Helwig Hauser. Proc. InfoVis 2005, p 133-140.

Further Reading

Hyperdimensional Data Analysis Using Parallel Coordinates.
Edward J. Wignman. Journal of the American Statistical
Association, Vol. 85, No. 411. (Sep., 1990), pp. 664-675.

Parallel Coordinates: A Tool for Visualizing Multi-Dimensional
Geometry. Alfred Inselberg and Bernard Dimsdale, IEEE
Visualization '90, 1990.

Big Picture

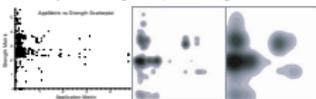
- covered so far
 - design levels
 - problem, abstraction, encoding/interaction, algorithm
 - methods
 - taxonomy of visualization design concerns
- next stage: use these ideas for analysis and design
 - analyze previously proposed techniques and systems
 - design new techniques and systems
- me: this lecture as example (2nd graphs/trees)
 - project proposal, topic presentations

Analysis Via Levels and Methods

- examples in this and graphs/trees lecture
- note: only sometimes does this analysis occur in paper itself!
 - you need to interpret
- (also something to do in your own project!)

Multiscale Scatterplots

- blur shows structure at multiple scales
 - convolve with Gaussian
 - slider to control scale parameter interactively
 - easily selectable regions in quantized image



[Fig 3.4.5. Chiriota, Jourdan, and Melancon. Metric-Based Network Exploration and Multiscale Scatterplot. Proc. InfoVis 2004, p 135-142.]

Problem and Abstraction Levels

- (problem characterization: generic network exploration)
 - minimal problem context: paper is technique-driven not problem-driven
- task abstraction: selection and filtering at different scales
 - within scatterplots

Abstraction Level: Data

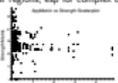
- original data: relational network
 - links between Java classes
- derived attributes: 2 structural metrics for network
 - edge strength: cluster cohesiveness
 - low emgr: logical dependencies between classes
 - edges below color-coded by metric
 - thus: table of numbers



[Fig 3.2. Chiriota, Jourdan, and Melancon. Metric-Based Network Exploration and Multiscale Scatterplot. Proc. InfoVis 2004, p 135-142.]

Encoding/Interaction Level

- basic solution:
 - visual encoding technique: scatterplots
 - mark: points, channels: horiz and vert position
 - interaction technique: range sliders to filter max/min
- limitations
 - interesting areas might not be easy to select as rectangular regions, esp for complex derived attributes



[Fig 3. Chiriota, Jourdan, and Melancon. Metric-Based Network Exploration and Multiscale Scatterplot. Proc. InfoVis 2004, p 135-142.]

Multiscale Scatterplot Selection Technique

- new encoding: derived space created from original scatterplot image
 - grayscale patches forming complex shapes
 - enclosure of darker patches within lighter patches
- new interaction:
 - simple: sliders for filter size s and number of levels k
 - complex: single click to select all items $s \rightarrow k$



[Fig 4. Chiriota, Jourdan, and Melancon. Metric-Based Network Exploration and Multiscale Scatterplot. Proc. InfoVis 2004, p 135-142.]

Multiscale Scatterplot Selection Technique

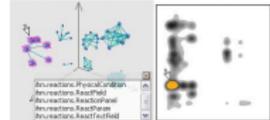
- algorithm level: creating derived space
 - grayscale intensity is combination of
 - blurred proximity relationships from original scatterplot image: convolve with Gaussian filter
 - point density in original scatterplot image
 - quantize image into k levels



[Fig 5. Chiriota, Jourdan, and Melancon. Metric-Based Network Exploration and Multiscale Scatterplot. Proc. InfoVis 2004, p 135-142.]

Method: Linked Views

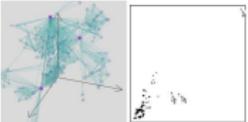
- second linked view: 3D node-link network
 - patch selection in blurred scatterplot view shows corresponding components in network view
 - selection in one view filters what is shown in the other



[Fig 6. Chiriota, Jourdan, and Melancon. Metric-Based Network Exploration and Multiscale Scatterplot. Proc. InfoVis 2004, p 135-142.]

Results: IMDB

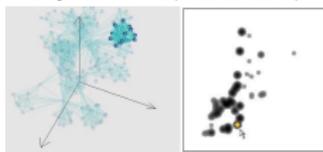
- original data: IMDB graph
- metrics: network centrality, node degree
- 3 hubs selected in network view



[Fig 7. Chiriota, Jourdan, and Melancon. Metric-Based Network Exploration and Multiscale Scatterplot. Proc. InfoVis 2004, p 135-142.]

Results: IMDB 2

- single click in blurred scatterplot view selects entire clique



[Fig 8. Chiriota, Jourdan, and Melancon. Metric-Based Network Exploration and Multiscale Scatterplot. Proc. InfoVis 2004, p 135-142.]

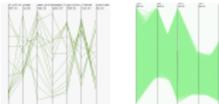
Critique

Critique

- strengths
 - successful construction and use of derived space
 - appropriate validation
 - qualitative discussion of result images to show new technique capabilities
 - synergy between encoding and interaction choices
- weaknesses
 - somewhat tricky to follow thread of argument since into framing focuses on network exploration, but fundamental technique contribution more about scatterplot encoding/interaction

Hierarchical Parallel Coordinates

- technique-driven paper
- (no problem characterization)
- scale up parallel coordinates to large datasets
- limitation: overplotting/occlusion



[Fig. 1.2. Fux, Ward, and Rudensteyn: Hierarchical Parallel Coordinates for Visualizing Large Multivariate Data Sets. IEEE Visualization '96]

Parallel Coordinates: Basics

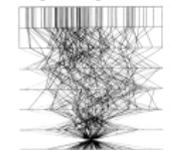
- scatterplot limitation: vis enc with orthogonal axes
- only 2 attribs with spatial position channel in plane
- instead, line up axes in parallel to show many attribs with position channel
- items shown with line with k segments (not as point)



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Par Coord Tasks: Showing Correlation

- pos corr: straight lines; neg corr: all cross at single point



[Figure 1.4. People Centered Design for Dimensional Data Mining. Copyright © 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 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Interaction: Filtering

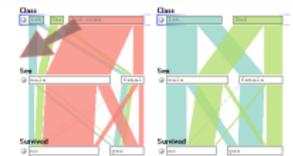


Fig. 4. Bendi, Kucera, Heuer. Parallel sets: visual analysis of categorical data. Proc. InfoVis 2006, p. 133-140.

Interaction: Highlighting

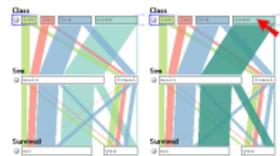


Fig. 5. Bendi, Kucera, Heuer. Parallel sets: visual analysis of categorical data. Proc. InfoVis 2006, p. 133-140.

Results: Case Study

- corr between family type, city sizes, income, detergent?

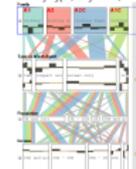


Fig. 6. Bendi, Kucera, Heuer. Parallel sets: visual analysis of categorical data. Proc. InfoVis 2006, p. 133-140.

Critique

Critique

- strengths
 - handles categorical, frequencies
- weaknesses/limits
 - designed for few not many distinct values
 - designed for few not many attributes

Synthesis

- emphasis on derived spaces
 - multiscale scatterplot, hier par coord
- extending scope of data handled
 - hier par coord: handle more data
 - parallel sets: handle different data
 - all three designed to show all attrib
 - in contrast to dimensionality reduction

Projects

- programming
 - problem-driven (design studies)
 - technique-driven (new technique idea)
 - implementation (of previously proposed technique)
- analysis
 - survey
- team of two people requires scope*2
- new this year: submit source code along with final report
- pre-proposal meetings: deadline in two days
 - many already done (I signed off)
 - still a few to do (deadline in two days)

Project Proposals I

<http://www.cs.ubc.ca/tmm/courses/533-11/projectdesc.html>

- title (mandatory)
 - names/email for people on team
- description of problem you're targeting
 - prob-driv: domain, task, dataset
 - tech-driv: explain in terms of method taxonomy
- personal experience with this problem
 - description of proposed solution
 - prob-driv:
 - data and task abstraction
 - encoding and interaction techniques
 - if refining/improving previous solution, you analyze that in same terms
 - tech-driv:
 - encoding and/or interaction techniques, in detail

Project Proposals II

- scenario of use
 - what user will do/use step by step in performing a task while using system
- must include illustrations
- proposed implementation approach
 - high-level: platforms/language, toolkits if any
 - big picture of what you code vs what toolkit supports
 - ok to have set of alternatives if not narrowed down yet
- schedule: milestones with target dates
 - be specific: not just generic (plan/code/writeup)
 - think agile: get basics working early, then augment
- previous work
 - not as complete as final, but you should have a start
- one per project due Oct 20 5pm as PDF by email
 - subject header: 533 submit proposal

Topic Presentations: Signing Up

- topic list
 - www.cs.ubc.ca/tmm/courses/533-11/presentations.html
- choice can indeed be motivated by your project topic
 - sign up by email by Fri 10/21 5pm
 - required: three topic choices
 - optional: one sets date that you do most want
 - Wed 11/9, Wed 11/25, Mon 11/28, Wed 11/30
 - I will post final topic/date assignments by Mon 10/31
 - might have two people split one topic if it's popular
 - I will post list of papers on topic 10 days in advance
 - you pick 3 papers total, at least 1 must be from my list

Presentations

- you present 3 papers in 25 minutes
 - aim for 20 minutes presentation, 5 minutes questions
- grading criteria
 - content summary: 50%
 - you explain papers to people who have not read them
 - you analyze the work w.r.t design levels and methods
 - synthesis/critique: 20%
 - for both individual papers, and across all three
 - presentation style: 15%
 - materials preparation: 15%
 - slides required
- logistics
 - you may use my laptop or yours
 - if my laptop slides due 11am (PDF or PPT)
 - if my laptop, check in advance for videos/demos

Presentations: Process Advice

- bad idea: make slides; give talk in class

Presentations: Process Advice

- bad idea: make slides; give talk in class
- good idea: start early and refine iteratively
 - make slides
 - practice talk out loud with timer
 - realize it's too long
 - realize it's too short
 - realize what you forgot to put on slide
 - realize why order of explanation is backwards
 - realize where you need more pictures/diagrams
 - realize where you haven't figured out what to say
 - refine slides
 - loop back up to practice; repeat until great!

Presentations: Process Advice 2

- tips on practicing
 - always time it (whole thing, ideal slide by slide)
 - best: give talk to somebody and get feedback
 - at least once practice standing like giving real talk
- tips on slides
 - ensure smallest text readable from back of room
 - use color correctly (sufficient luminance contrast)
 - early drafts often test-oriented; add pictures as refine
- tips on speaking
 - talk loud enough that we can hear
 - vary your tone of voice
 - it gets better; practice makes it less scary
 - lots more useful tips
 - www.cs.ubc.ca/~tmm/courses/533-11/presentations.html#preparation

Reading For Next Time: NOTE CHANGE

Prefuse: A Toolkit for Interactive Information Visualization. Jeffrey Heer, Stuart K. Card, James Landay. Proc ACM CHI, 421-430, 2005.

Protovis: A Graphical Toolkit for Visualization. Michael Bostock and Jeffrey Heer. IEEE Trans. Visualization & Computer Graphics (Proc. InfoVis), 2009.

D3: Data-Driven Documents. Michael Bostock, Vadim Ogievetsky, Jeffrey Heer. IEEE Trans. Visualization & Computer Graphics (Proc. InfoVis), 2011.

Reminders

- Project meetings due 10/19
 - this Wednesday
- No class next week (Oct 24/26)