Today
• timing
- presentation topics
- projects
- meetings timing
- proposal presentation walkthrough
- team (or potential team) sync-ups
- today’s reading discussion, Q&A
- break
- Matt Brehmer guest lecture 3:30
- Timelines Revised
- ClearAccount
- tools discussion

Presentation topics: Pick one or two
• data types
- networks
- trees
- geographic data
- high-dimensional data
- text data
- space & time (spatiotemporal data)
- trajectories
- sequences & events
- multi-attribute tables
- visual fields
- techniques
- machine learning
- genomics
- medicine
- sports
- digital humanities
- literature making
- topics
- color
- design
- perception
- attention
- analysis process
- parallel coordinates
- dimensionality reduction
- clusterning
- matrix views
- multiple view coordination

Groups
• finalize by this Fri Oct 27 at latest
- proposal project walkthrough on discussion board to confirm your group
- please post with current status report, even before that!
• what’s still looking, what’s resolved

Proposals
• projects: written proposals due Mon Nov 5 10pm
  - (no readings due Tue Nov 6)
- heading
  - project title (real title, not just “CPSC 547 proposal” – can change later)
- name & email of every person on team (do not include student numbers)
- intro: brief description of what you’re proposing to do, at high level
  - include personal expertise in this area (for each group member)
- for design studies: domain, data, task
  - deﬁnitely in domain terms
  - get started on abstraction (even if preliminary)
  - do discuss scale of data & time, if levels in each categorical strata; range of ordered strata
  - for technique projects: explain proposed context of use

Proposals II
• proposed infovis solution (what you know so far)
  - do include illustration of what interface might look like, could be hand drawn sketch
  - visual encoding: spatial position: rectilinear node-link view
  - major blocks of available time
  - implementation plan (high-level: platform, language, libraries)
  - clarify your scope/goal: building on work of others to enable more ambitious project, vs rolling your own to learn tools
  - milestones
    - break into meaningful smaller pieces, specific to your project, in addition to generic
    - due estimates target dates of completion and hours of work
    - be explicit about who will do what: work breakdown between group members
    - milestone scope: 7 hrs per person across whole project
  - very typical to structure as possibilities: after A&B, decide on C and do 2 of D-G

Proposals III
• http://www.cs.ubc.ca/~tmm/courses/547-17F/projectdesc.html#proposals
  - also, consult final report structure to have future goal in mind
• http://www.cs.ubc.ca/~tmm/courses/547-17F/projectdesc.html#final

Presentations & Projects
• presentation topic choices due this Friday (Oct 27) at noon
  - project choice discussion on Canvas: 1 or 2 topic choices
  - all teams must have one person with same choice
  - timing let me know if a specific day is bad for you (“veto day”)
- from this set Nov 7, 14, 21, Dec 5
- I’ll assign days soon
- I’ll sign papers (from this year’s VIS conf) at least 1 week before your presentation
  - more on presentation expectations next time (Oct 31)

Projects overall schedule
• Pitches: Tue Oct 17 in class
• Groups finalized: Fri Oct 27 5pm
• Meetings cutoff Thu Nov 2 at 5pm
• Proposals due: Mon Nov 5 at 10pm
  - (no readings due Tue Nov 6)
• Peer Review Projects I: Tue Nov 20 in class
• Peer Review Projects II: Tue Dec 5 in class
• Final presentations: Tue Dec 12 1-5pm
• Final papers due: Fri Dec 15 at 11:59pm

Overview
• cluster hierarchy of sampled params
  - primary navigation control
  - user selects areas, linked highlighting in refinement view
  - visual encoding spatial position: rectilinear node-link view
  - considerations: compactness, linear ordering, skinny aspect ratio
  - rejected circle plots & tree maps vs node-link
  - rejected radial vs rectilinear
• vis enc color:
  - perceptually ordered, colorblind-safe
  - luminance high saturation low

Refinement view: Custom layout

ParaStreck: Visualization of Parameter Space for Image Analysis

Ch 11/12: Manipulate, Facet Paper: Paramorama
**Interaction technology**

- What do you design for?
  - mouse & keyboard on desktop
  - large screens, lower, multiple clicks
  - touch interaction on mobile
  - small screen, no hover, just tap
  - gestures from video / sensors
  - ergonomic reality vs movie bombast
  - eye tracking?

**Selection**

- Selection: basic operation for most interaction
- Design choices: typical visual channels
  - change item color
  - but hides existing color coding
  - add outline mark
  - change size (ex: increase outline mark linewidth)
  - change shape (ex: from solid to dashed line for link mark)
  - unusual channels motion
    - motion: usually avoid for single view
    - with multiple views, could justify to draw attention to other views

**Highlighting**

- Highlight: change visual encoding for selection targets
  - visual feedback closely tied to but separate from selection interaction
- Design choices: typical visual channels
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**Tooltips**

- Tooltips: popup information for selection
  - hover or click
  - can provide useful additional detail on demand
  - beware: does not support overview!
    - always consider if there’s a way to visually encode directly to provide overview
    - “If you make a rollover or tooltip, assume nobody will see it. If it’s important, make it explicit.”
      - Ginger Ash, NYT

**Scrollytelling**

- Scrollytelling: how: navigate page by scrolling (panning down)
  - pros: familiar & intuitive, from standard web browsing
    - linear (only up & down) vs possible overload of click-based interface choices
  - cons:
    - full-screen mode may lack affordances
    - scrolling, no direct access
    - unexpected behaviour
    - continuous control for discrete steps
  - example: icicle plot
  - small zoom, only viewport changes, changes preserved

**Animated transition + constrained navigation**

- Animated transition: hierarchical bar chart
  - add detail during transition to new level of detail

**Animated transition + constrained navigation**

- Example: multilevel matrix views
  - movie: http://www.win.tue.nl/vsl1/home/lhff/lematris/Zoomin.avi
  - movie: http://www.win.tue.nl/vsl1/home/lhff/lematris/Zoomout.avi
  - movie: http://www.win.tue.nl/vsl1/home/lhff/lematris/Pan.avi

**Semantic zooming**

- Semantic zoom: for interaction to geometric zoom
  - resolution-aware layout adapts
  - can provide useful additional detail on demand

**Navigating: Changing viewpoint/visibility**

- Change viewpoint
  - changes which items are visible within view
  - camera metaphor
    - pan/translate/scroll
    - zoom in/out
  - change size (ex: increase outline mark linewidth)
  - change shape (ex: from solid to dashed line for link mark)

**System:** LiveRAC

- Semantic zoom: for interaction to geometric zoom
  - resolution-aware layout adapts
  - can provide useful additional detail on demand

**Motion**

- motion: usually avoid for single view
  - with multiple views, could justify to draw attention to other views

Idiom: Scrollytelling

- How: navigate page by scrolling (panning down)

Idiom: Animated transition - bar detail

- Example: hierarchical bar chart
  - add detail during transition to new level of detail

Idiom: Animated transition - tree detail

- Example: multilevel matrix views
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  - movie: http://www.win.tue.nl/vsl1/home/lhff/lematris/Pan.avi

Idiom: scrolled navigation

- Scrolled navigation
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Idiom: Semantic zooming

- Semantic zoom: for interaction to geometric zoom
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**Idiom: Small multiples**
- encoding: same
- data: none shared
- different: attributes for node colors
- (same network layout)
- navigation: shared

**System: Cerebral**

**Coordinate views: Design choice interaction**
- why juxtapose views?
  - benefits: eyes vs memory
  - lower cognitive load to move eyes between 2 views than remembering previous state with single changing view
- create display area, 2 views side by side each have only half the area of one view

**Partitioning: Recursive subdivision**
- different encoding for second-level regions
  - choropleth maps

**Input View**
- how to divide data between views
  - split into regions by attributes
  - encodes association between items using spatial proximity
  - order of splits has major implications for what patterns are visible
- no strict dividing line
  - layers: grouped bars
  - continuous region in which visually encoded data is shown on the display
  - glyphs: small icons
  - abut: with internal structure that arises from multiple marks

**System: HIVE**
- single bar chart with grouped bars
  - split by state into regions
  - compare glyph within each region showing all
- compare easy within state, hard across ages
- compare easy within age, harder across states

**System: HIVE**
- multiple bar charts
  - split by age into regions
  - one chart per region
  - compare easy within age, harder across states

**Superimpose layers**
- layer: set of objects spread out over region
  - each set is visually distinguishable group
  - overall: whole view
  - design choices
    - how many layers, how to distinguish?
    - encode with different, nonoverlapping channels
    - two layers achievable, three with careful design
    - small static set, or dynamic from many possible?

**System: HIVE**
- background layer: roads
  - hue, size distinguishing man from minor
  - high luminance contrast from background
  - background layer: regions
  - desaturated colors for water, parks, land areas
  - user can selectively focus attention
    - "get it right in black and white"
    - check luminance contrast with grayscale

**Dynamic visual layering**
- interactive based on selection
- one-hop neighbour highlighting demos: click vs hover (lightweight)

**Idiom: Trellis plots**
- superimpose within same frame
  - color code by year
  - partitioning
    - split by type, rows are wheat varieties
    - main-effects ordering
      - derive value of median for group, use to order
      - order rows within view by variety median
      - order views themselves by site median

**System: Improve**
- investigate power of multiple views
  - push focus to view count, interaction
  - how many is old
    - open research
    - reconstructable lists
    - easy backup
    - useful when linked to other renderings

**Superimposing limits**
- few layers, but many lines
  - up to a few dozen
  - but not hundreds
- superimpose vs juxtapose: empirical study
  - superimposed for local, multiple for global
  - roads:
    - local maximum global slope, decimation
    - same screen space for all multiples vs single superimposed

**Dynamic visual layering**
- interactive based on selection
- one-hop neighbour highlighting demos: click vs hover (lightweight)