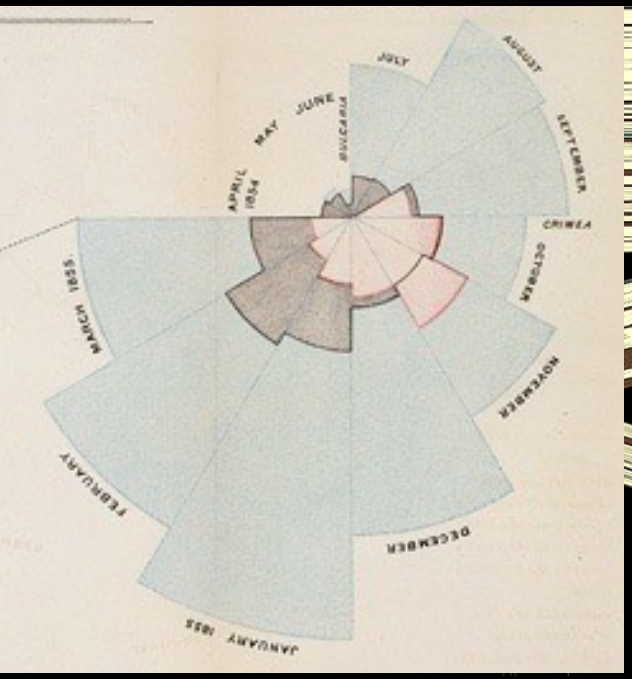
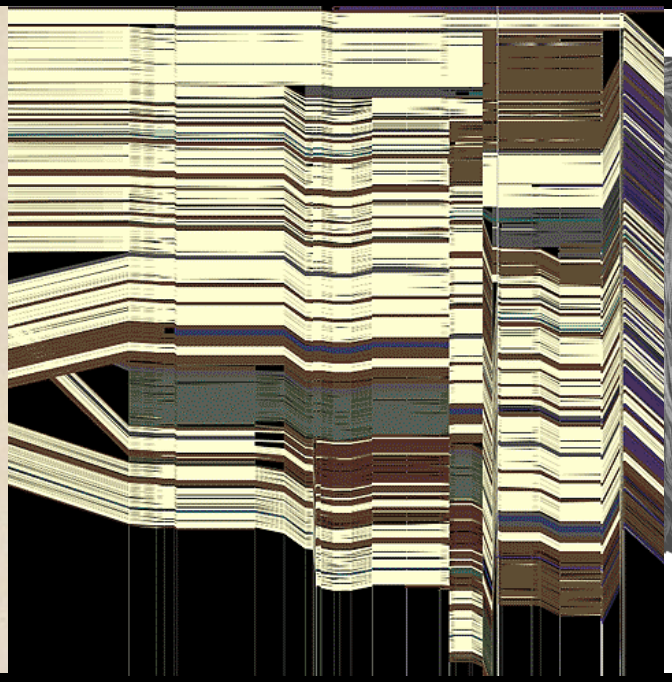
CSE 512 - Data Visualization

Design Review & Critique





Jeffrey Heer University of Washington

Final Project

Possible Project Approaches

Advance your **existing research**.

Pick an **open problem** of interest.

Work in a domain with **real stakeholders**.

Final Project

Create a visualization system, technique, or study.

Many options…

New system for a chosen domain + data set

Novel visualization / interaction technique

Design study or experiment

Deliverables

Share milestone progress

Video demonstration (max. 2 min)

Project results (software, study results, etc.)

Final Project Schedule

Proposal	Wed May 17
Prototype	Wed May 24
Demo Video	Wed May 31
Video Showcase	Thu June 1 (in class)
Deliverables	Tue June 6

Logistics

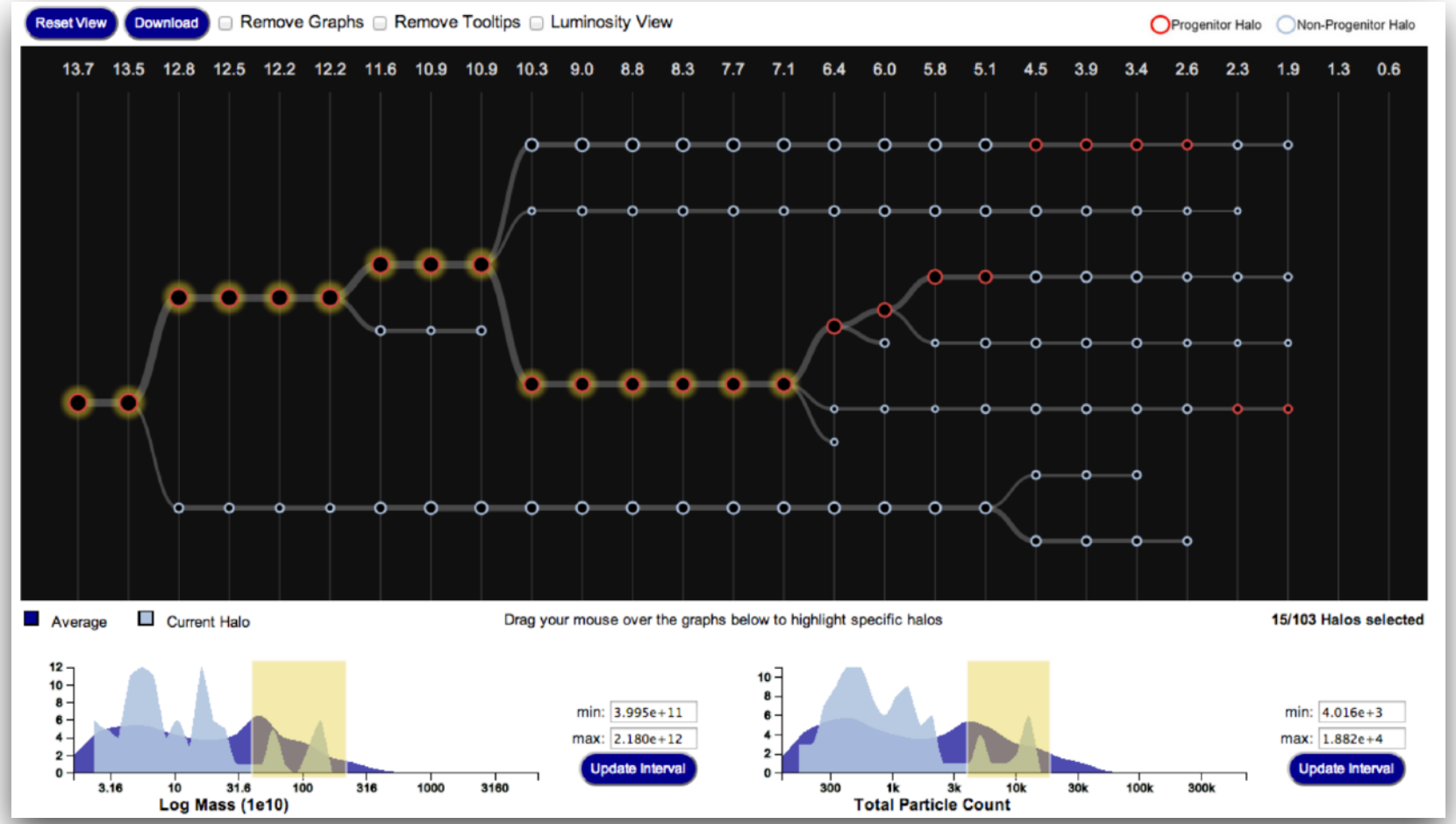
Final project description posted online

Work in groups of up to 4 people

Start determining your project topic!

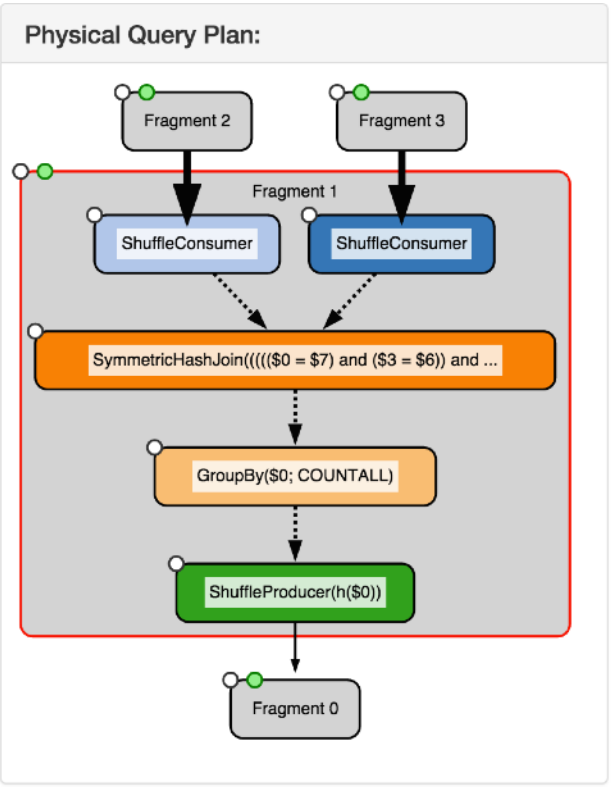
Inspiration…

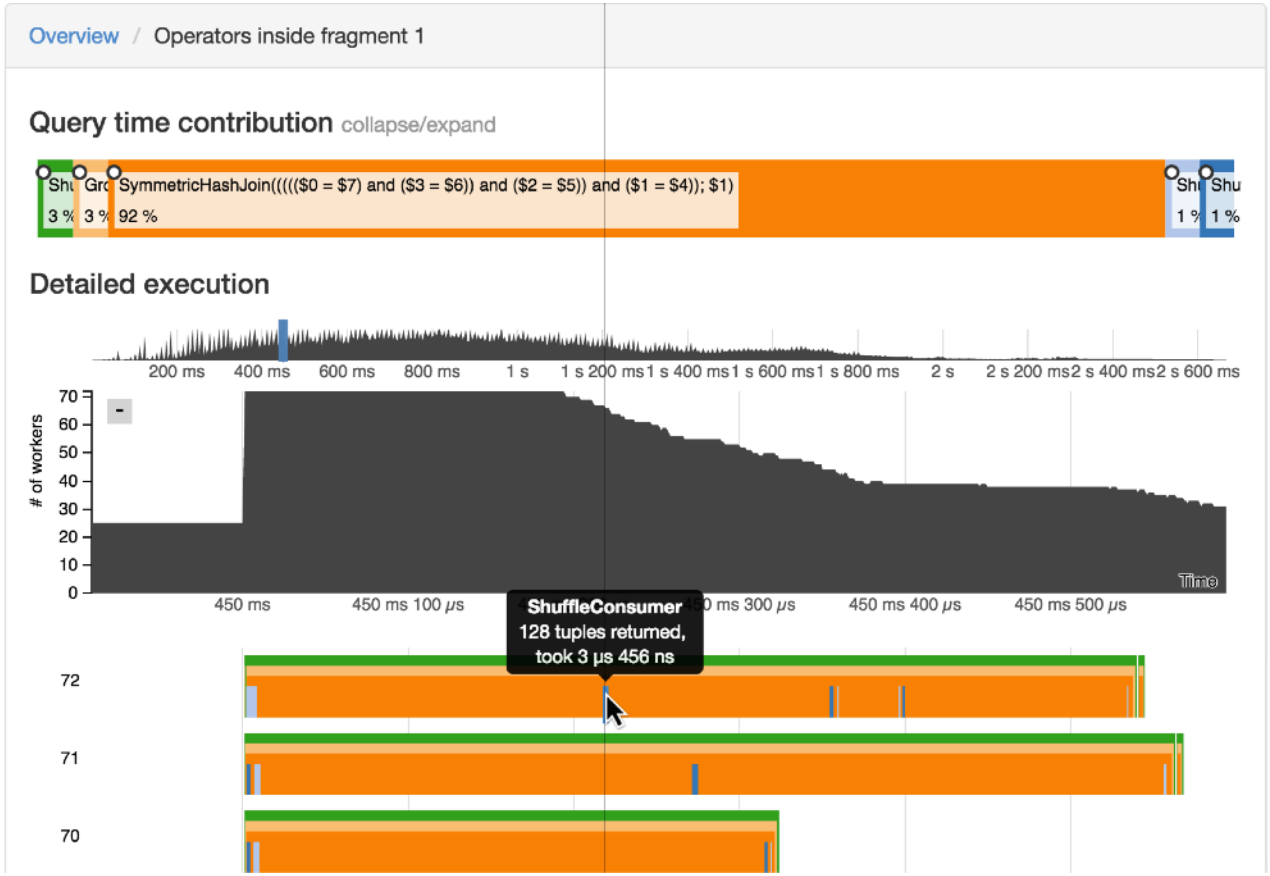
Visualizing Galaxy Merger Trees



S. Loebman, **J. Ortiz**, **L. Orr**, M. Balazinska, T. Quinn et al. [SIGMOD '14]

Perfopticon Distributed Query Performance





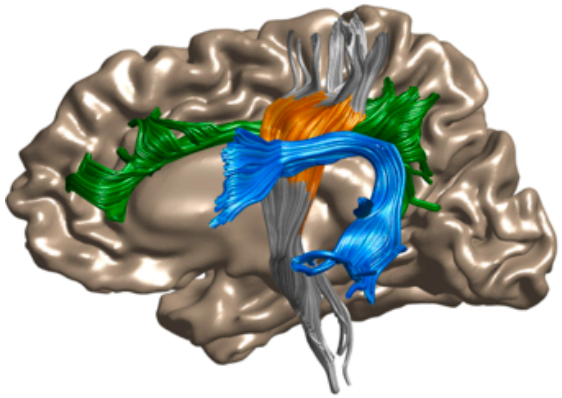
Dominik Moritz et al. [EuroVis '15]

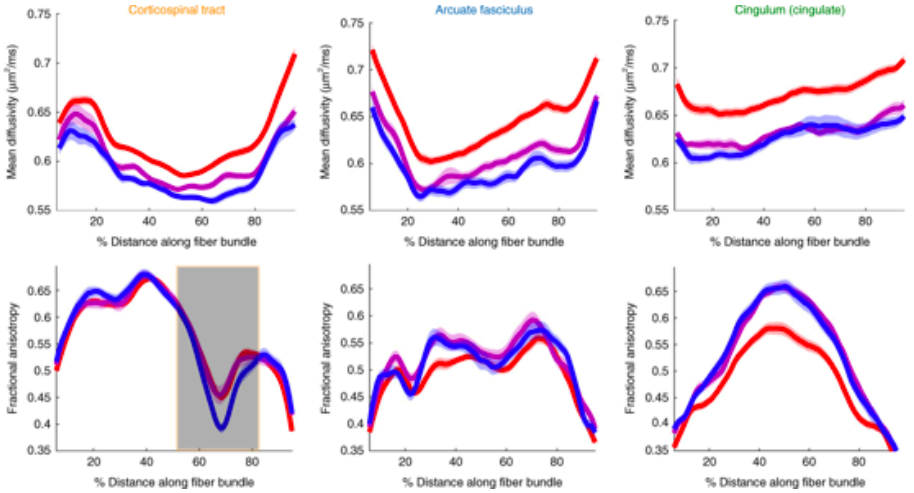
nature COMMUNICATIONS

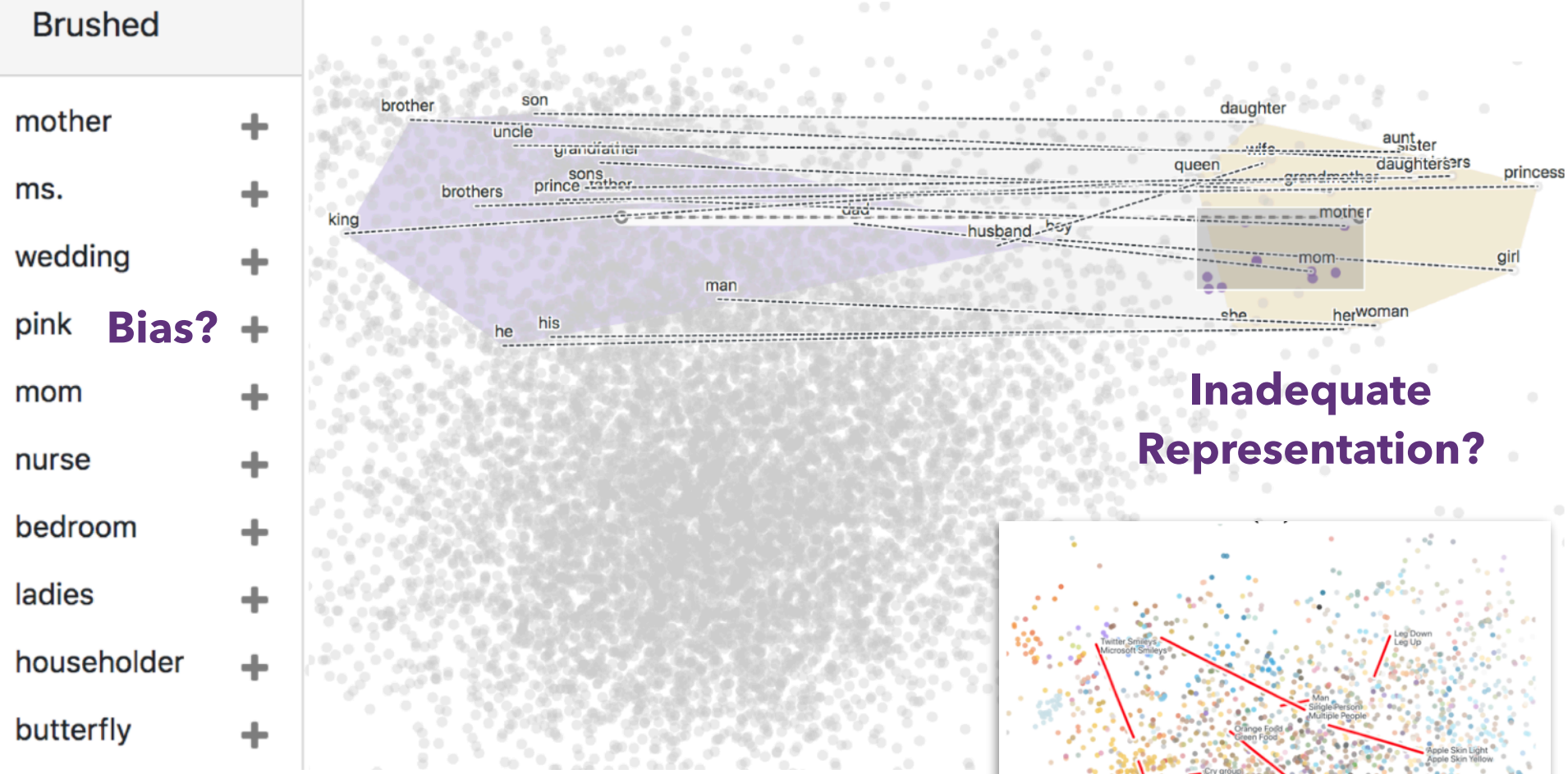
Article | OPEN | Published: 05 March 2018

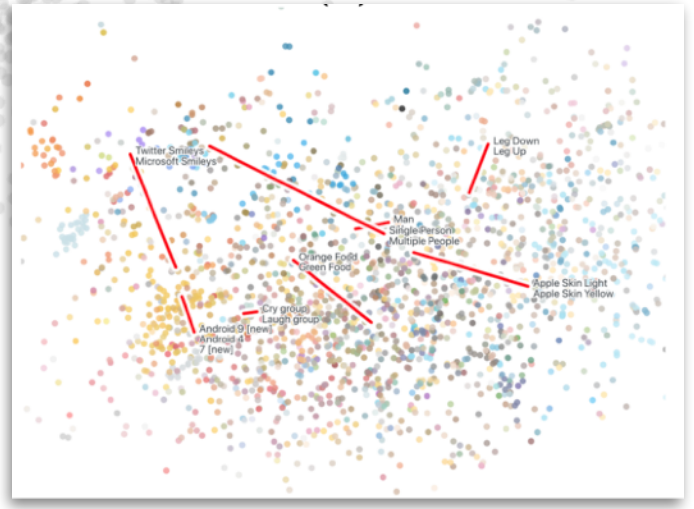
A browser-based tool for visualization and analysis of diffusion MRI data

Jason D. Yeatman ✉, Adam Richie-Halford, Josh K. Smith, Anisha Keshavan & Ariel Rokem ✉









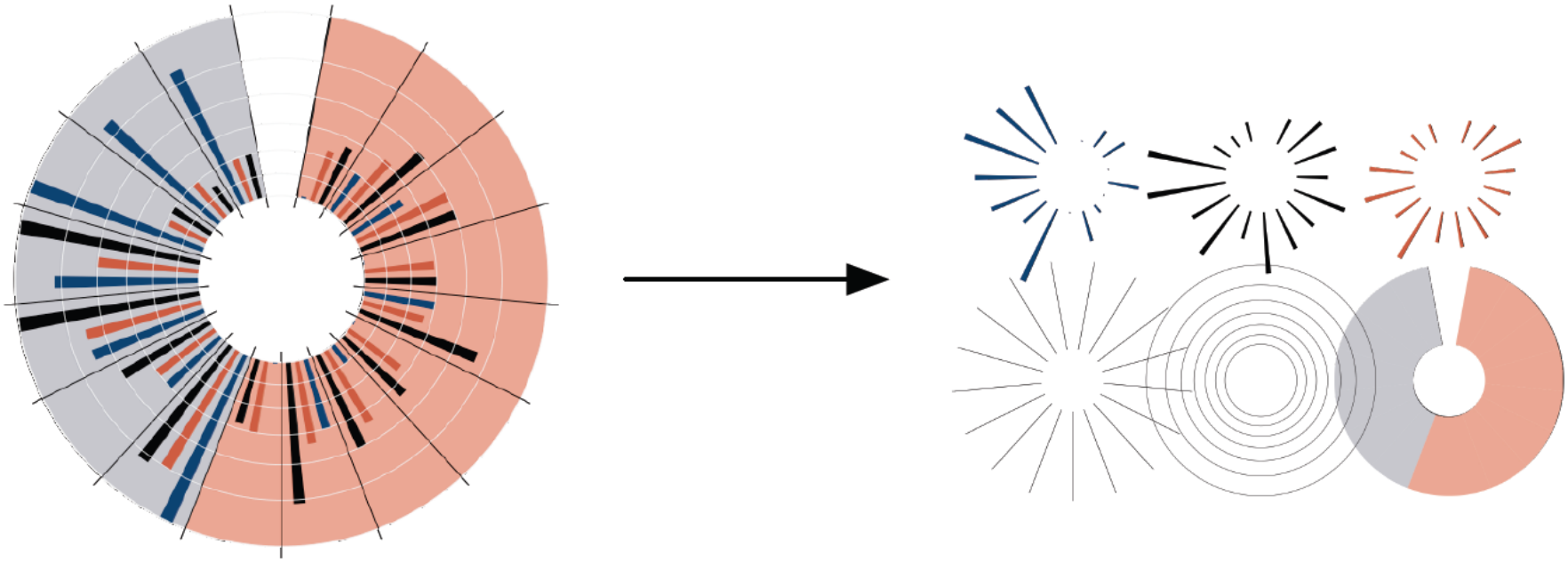
Latent Space Cartography

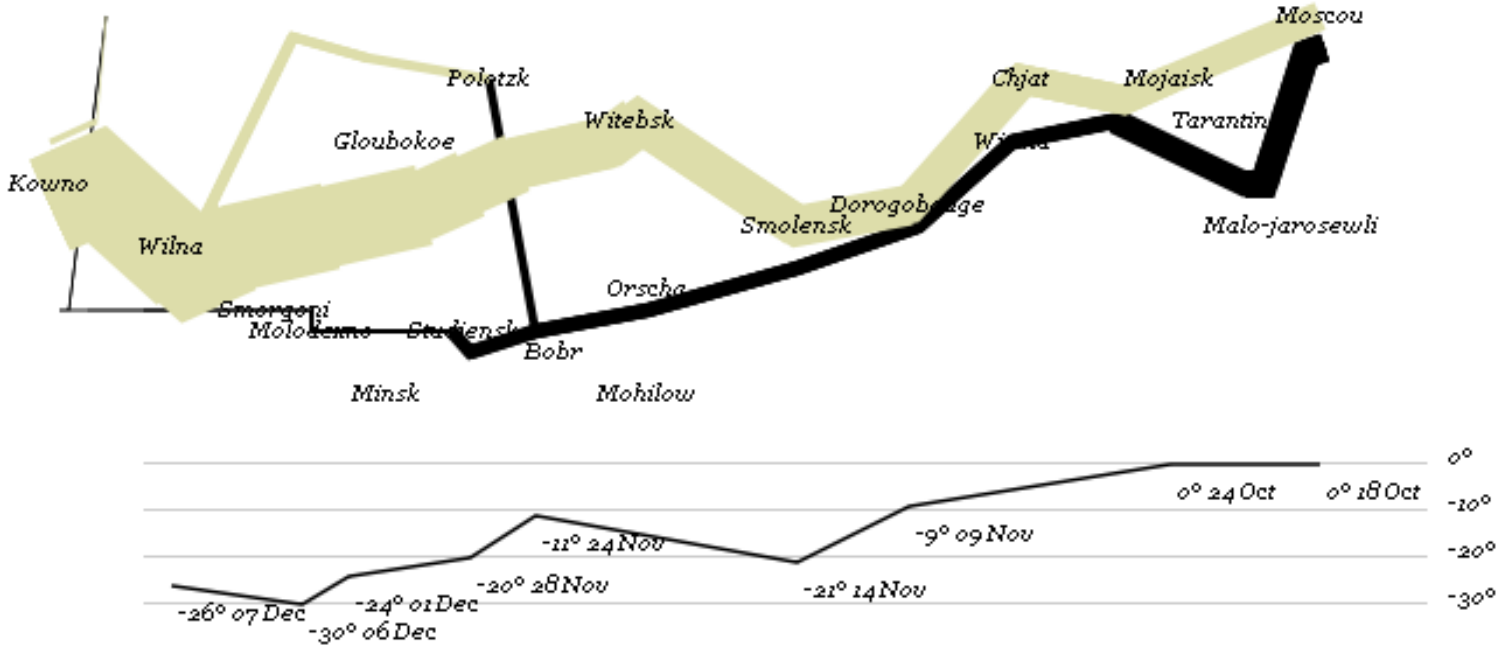
Visual Analysis of Vector Space Embeddings

Yang Liu, Eunice Jun, Qisheng Li (CSE 512, Spring '18)

Protovis: A Graphical Toolkit for Visualization

Mike Bostock






```
var army = pd.nest(napoleon.army, "dir", "group“);
var vis = new pv.Panel();

var lines = vis.add(pv.Panel).data(army);
lines.add(pv.Line)
  .data(function() army[this.idx])
  .left(lon).top(lat).size(function(d) d.size/8000)
  .strokeStyle(function() color[army[paneIndex][0].dir]);

vis.add(pv.Label).data(napoleon.cities)
  .left(lon).top(lat)
  .text(function(d) d.city).font("italic 10px Georgia")
  .textAlign("center").textBaseline("middle");
```

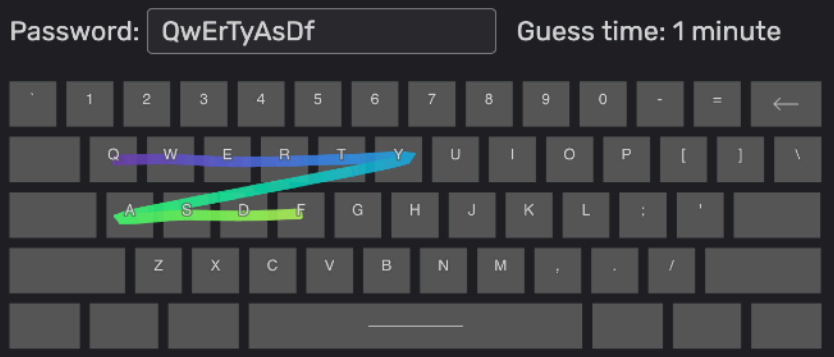
```
vis.add(pv.Rule).data([0,-10,-20,-30])
  .top(function(d) 300 - 2*d - 0.5).left(200).right(150)
  .lineWidth(1).strokeStyle("#ccc")
  .anchor("right").add(pv.Label)
    .font("italic 10px Georgia")
    .text(function(d) d+"°").textBaseline("center");

vis.add(pv.Line).data(napoleon.temp)
  .left(lon).top(tmp) .strokeStyle("#0")
 .add(pv.Label)
  .top(function(d) 5 + tmp(d))
  .text(function(d) d.temp+"° "+d.date.substr(0,6))
```

KEYBOARD WALKING

Passwords with a “keyboard walking” pattern start at an arbitrary key, then move in a direction (usually right or down) while continuing to hit keys. Sometimes this is combined with holding down the SHIFT key, so that some characters are uppercase or symbols to improve complexity.

While the generated password may seem to be random and unhackable, password crackers check for these keyboard patterns and guess them early on.

Many passwords in the leaked passwords dataset have a spatial pattern. Other than the numeric passwords like 123456, common keyboard walking offenders include qwerty and 1qaz@wsx.

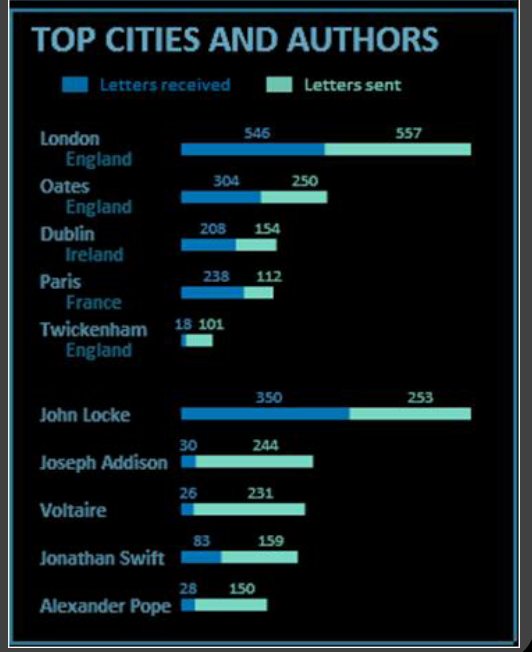


Semantic Passwords

Vishal Devireddy (CSE 512, Spring '21)

Visualizing the Republic of Letters

Daniel Chang, Yuankai Ge, Shiwei Song



Tips for a Successful Project

Focus on a compelling **real-world problem**.
How will you gauge success?

Consider **multiple design alternatives**.
Prototype quickly (use Tableau, R, *etc*…).

Seek feedback (representative users, peers, …).
Even informal usage can provide insights.

Choose **appropriate team roles**.

Start early (and read the suggested paper!)

Prototype
Peer Critiques

Critique Questions

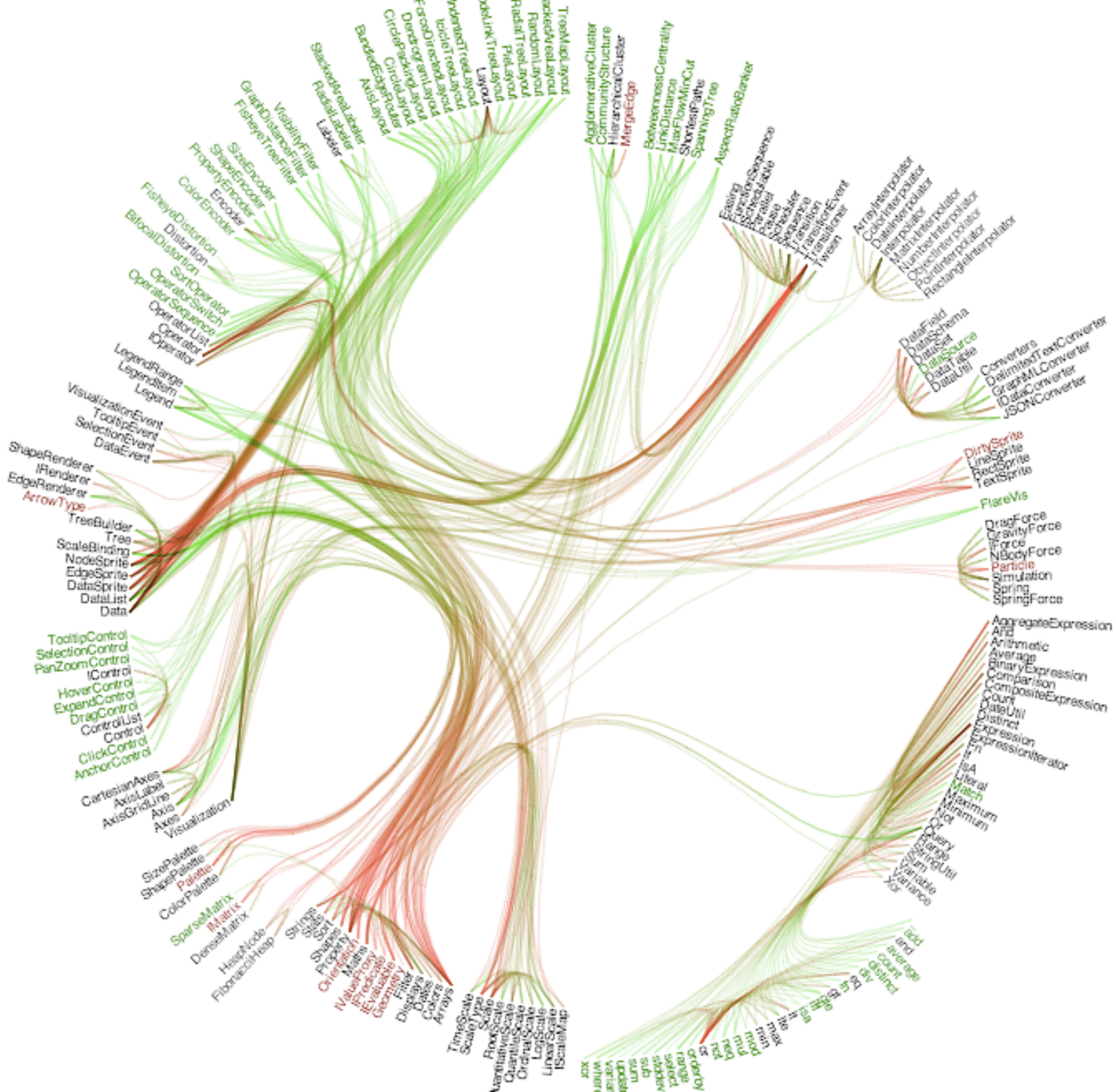
What is the purpose of the visualization?
Does it serve its purpose well?
Does it convey the data honestly?
Does it show the appropriate level of detail?
Are expressive & effective visual encodings used?
Do the interactions aid understanding of the data?
Is the design well-organized? Is it innovative?
What would like to change or refine?
How might things be done differently?

I Like… / I Wish… / What If?

I LIKE…
Praise for design ideas and/or well-executed implementation details. *Example: "I like the navigation through time via the slider; the patterns observed as one moves forward are compelling!"*

I WISH…
Constructive statements on how the design might be improved or further refined. *Example: "I wish moving the slider caused the visualization to update immediately, rather than the current lag."*

WHAT IF?
Suggest alternative design directions, or even wacky half-baked ideas. *Example: "What if we got rid of the slider and enabled direct manipulation navigation by dragging data points directly?"*



TreeMapLayout
StackedAreaLayout
RandomLayout
RadialTreeLayout
PieLayout
NodeLinkTreeLayout
Layout
IndentedTreeLayout
IcicleTreeLayout
ForceDirectedLayout
DendrogramLayout
CirclePackingLayout
CircleLayout
BundledEdgeRouter
AxisLayout
StackedAreaLabeler
RadialLabeler
Labeler
VisibilityFilter
GraphDistanceFilter
FisheyeTreeFilter
SizeEncoder
ShapeEncoder
PropertyEncoder
Encoder
ColorEncoder
FisheyeDistortion
Distortion
BifocalDistortion
SortOperator
OperatorSwitch
OperatorSequence
OperatorList
Operator
IOperator
LegendRange
LegendItem
Legend
VisualizationEvent
TooltipEvent
SelectionEvent
DataEvent
ShapeRenderer
IRenderer
EdgeRenderer
ArrowType
TreeBuilder
Tree
ScaleBinding
NodeSprite
EdgeSprite
DataSprite
DataList
Data
TooltipControl
SelectionControl
PanZoomControl
IControl
HoverControl
ExpandControl
DragControl
ControlList
Control
ClickControl
AnchorControl
CartesianAxes
AxisLabel
AxisGridLine
Axis
Axes
Visualization
SizePalette
ShapePalette
Palette
ColorPalette
SparseMatrix
IMatrix
DenseMatrix
HeapNode
FibonacciHeap
Strings
Stats
Sort
Shapes
Property
Maths
Orientation
IValueProxy
IPredicate
IEvaluable
Geometry
Filter
Displays
Dates
Colors
Arrays
TimeScale
ScaleType
Scale
RootScale
QuantitativeScale
QuantileScale
OrdinalScale
LogScale
LinearScale
IScaleMap
xor
where
variance
update
sum
sub
stddev
select
range
orderby
or
not
neq
mul
mod
min
max
lte
lt
isa
iff
gte
gt
fn
eq
div
distinct
count
average
and
add
Xor
Variance
Variable
Sum
StringUtil
Range
Query
Or
Not
Minimum
Maximum
Match
Literal
IsA
If
ExpressionIterator
Expression
Distinct
DateUtil
Count
CompositeExpression
Comparison
BinaryExpression
Average
Arithmetic
And
AggregateExpression
SpringForce
Spring
Simulation
Particle
NBodyForce
IForce
GravityForce
DragForce
FlareVis
TextSprite
RectSprite
LineSprite
DirtySprite
JSONConverter
IDataConverter
GraphMLConverter
DelimitedTextConverter
Converters
DataUtil
DataTable
DataSource
DataSet
DataSchema
DataField
RectangleInterpolator
PointInterpolator
ObjectInterpolator
NumberInterpolator
MatrixInterpolator
Interpolator
DateInterpolator
ColorInterpolator
ArrayInterpolator
Tween
Transitioner
TransitionEvent
Transition
Sequence
Scheduler
Pause
Parallel
ISchedulable
FunctionSequence
Easing
AspectRatioBanker
SpanningTree
ShortestPaths
MaxFlowMinCut
LinkDistance
BetweennessCentrality
MergeEdge
HierarchicalCluster
CommunityStructure
AgglomerativeCluster

I Like… / I Wish… / What If?

I LIKE…

The goal of supporting developers to improve decoupling.
The “cut-line” interaction to isolate links of interest.
The use of gradients to show edge directionality.

I WISH…

I could author multiple cut-lines for compound queries.
More details on demand were shown upon mouse-hover.

WHAT IF?

You could incorporate information from applications that use this code? How often are different modules used?

Exploring Peer Evaluation on Venture-Lab Spring 2012 | 1. Select Axes | 2. Filter | About | Showing 1206 row(s)(s)

REVIEWER ☐ gpa ☐ academic_major ☐ age_range ☐ location ☑ gender ☐ signin_count ☑ user_id

REVIEW ☑ avg_score ☐ score1 ☐ score2 ☐ score3 ☐ score4 ☐ score5

REVIEWEE ☑ team_id ☑ team_size

reviewer$gpa	reviewer$acad...	reviewer$age_...	reviewer$locat...	reviewer$gender	reviewer$signi...	reviewer$user_id	review$avg_s...	review$score1	review$score2	review$score3	review$score4	review$score5	reviewee$tea...	reviewee$tea...
NULL	NULL	NULL	NULL	NULL	21	37212	4	4	5	6	4	1	5069	4
NULL	NULL	NULL	NULL	NULL	21	37212	7.4	8	7	7	6	9	5470	17
Does not ...	Science	26-30	Netherlands	Male	124	2230	6.8	7	7	8	7	5	5693	7
Does not ...	Science	26-30	Netherlands	Male	124	2230	2.2	2	1	3	4	1	5836	4
Do not w...	Business	31-35	Spain	Male	80	2848	4.4	4	1	7	9	1	5069	4
3-3.49	Other	21-25	Spain	Female	75	2826	5	5	5	5	5	5	5215	4
3-3.49	Engineering	over 50	United St...	Male	110	19502	3.6	5	5	2	3	3	5215	4
3.5-4.00	Science	36-40	Greece	Male	125	27386	3.6	3	6	5	3	1	5250	3
3-3.49	Engineering	over 50	United St...	Male	110	19502	7	9	5	9	6	6	5693	7

I Like… / I Wish… / What If?

I LIKE…

The 1D histograms on the parallel coordinates display.
The use of brushing and linking between components.
Attention to small details, such as white masks for axis labels.

I WISH…

Data fields were configured to focus on the most relevant features.
The interaction was faster (lower latency).
A color-blind friendly color palette had been used.

WHAT IF?

One tried to visualize the data using a technique other than parallel coordinates? What encodings work best for the intended audience?

Critique Categories

Visualization Design
Choice of visual encodings (expressive, effective?)
Is the appropriate information visible by default?

Interaction Design
Choice of interaction techniques
Do they enhance understanding of the data?
Usability, discoverability, performance

Overall Design Quality
Organization, legibility, fitness for chosen goals

A3 Peer Reviews

Review **three** A3 submissions (assigned on Canvas)

Submit **three** critique forms by **Tue 5/16, 11:59**

Follow **I like / I wish / What if?** format for critiques
Be positive! Be constructive! Share wild ideas!

https://courses.cs.washington.edu/courses/cse512/23sp/a3-review.html

Reminders!

Final Project Proposal Due **Wed 5/17, 11:59pm**

https://courses.cs.washington.edu/courses/cse512/23sp/fp.html

Three Peer Evaluations Due **Tue 5/16, 11:59pm**

https://courses.cs.washington.edu/courses/cse512/23sp/a3-review.html