“The best way to have a good idea is to have a lot of ideas.”

-Linus Pauling

Agenda

- Wishful thinking
- Break
- Constraint removal
- Lunch and excursion
- Visualization awareness
- Break
- Storyboarding
- Reflection

Guidelines

- All ideas are valid – record them.

Wishful thinking

Or, what would you like to be able to do?

Wishful thinking prompts

- What would you like **to know**?
- What would you like **to be able to do**?
- What would you like to **see**?

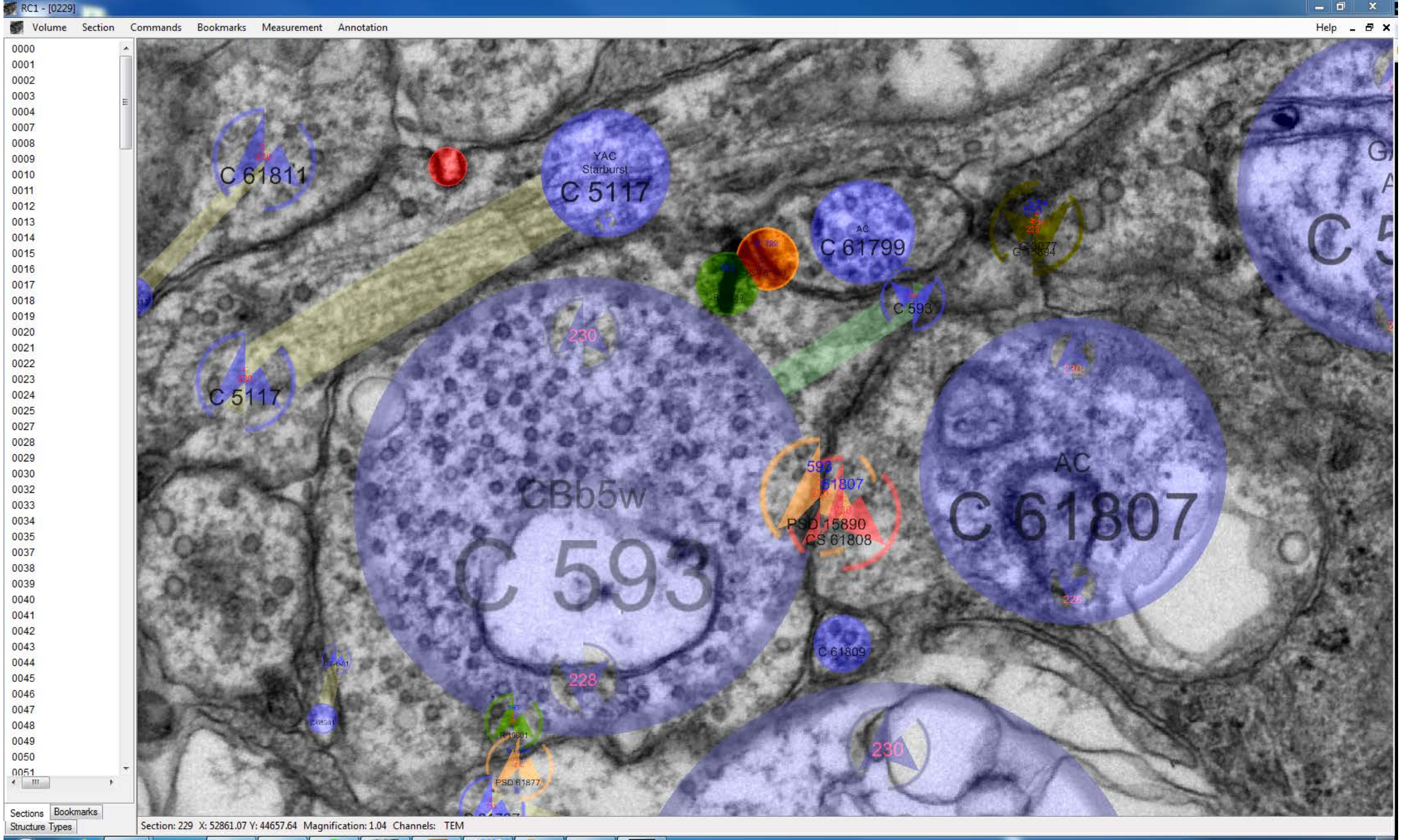
Data

- cell
- group of cells
- cell class
- section (slice) of cells
- connection
- connection type
- entire database
- something else…

For a cell, what class is it?

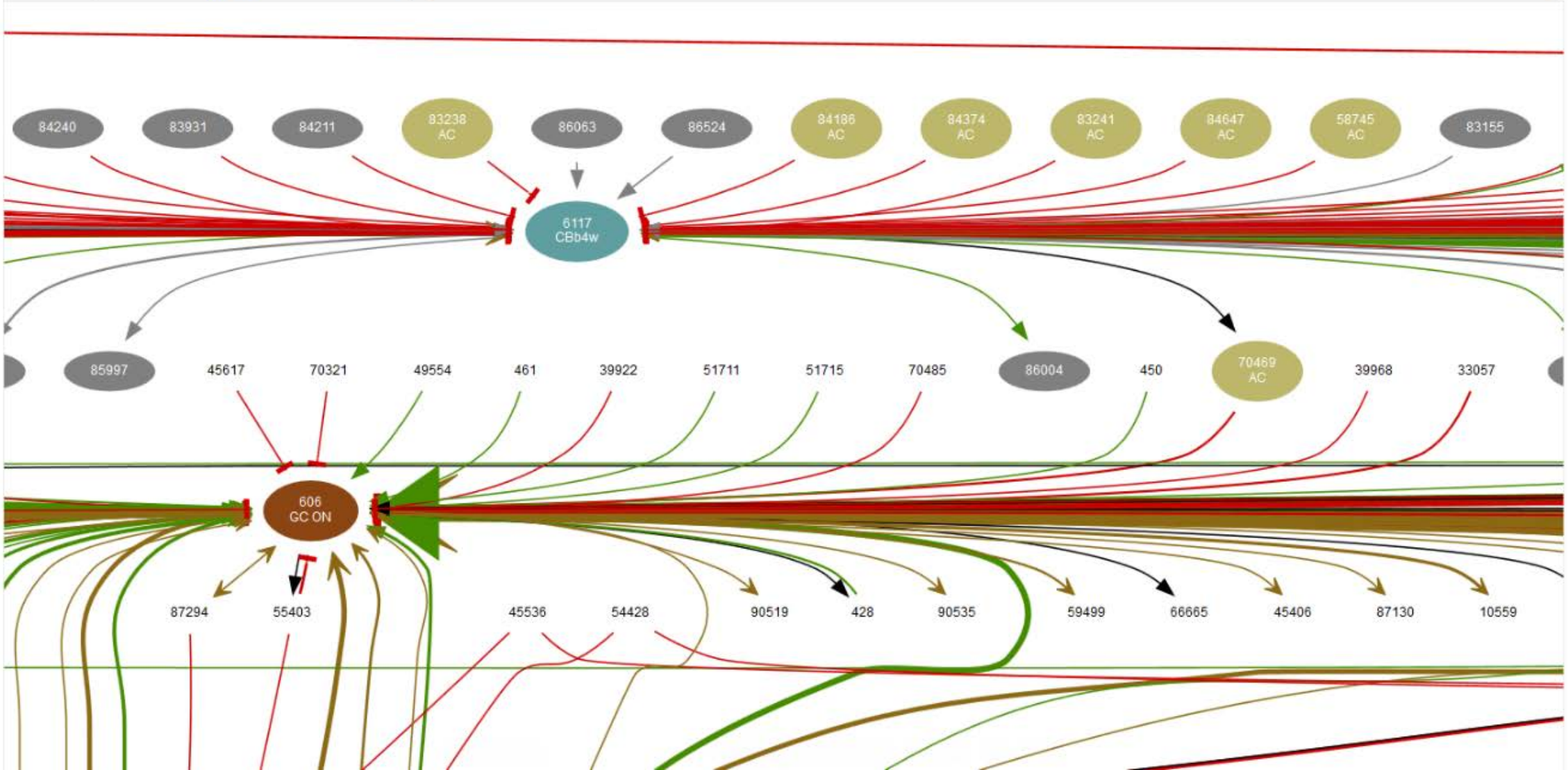
For a cell class, search for cells that are connected to it by a specific connection type.

For a cell, what cell types can be reached by *n* hops?


RC1 - [0229]
Volume
Section
Commands
Bookmarks
Measurement
Annotation
Help
0000
0001
0002
0003
0004
0007
0008
0009
0010
0011
0012
0013
0014
0015
0016
0017
0018
0019
0020
0021
0022
0023
0024
0025
0027
0028
0029
0030
0032
0033
0034
0035
0037
0038
0039
0040
0041
0042
0043
0044
0045
0046
0047
0048
0049
0050
0051
C 61811
YAC
Starburst
C 5117
AC
C 61799
C 593
C 5117
230
CBb5w
C 593
593
61807
PSD 15890
CS 61808
AC
C 61807
C 61809
228
230
PSD 61877
Sections
Bookmarks
Structure Types
Section: 229 X: 52861.07 Y: 44657.64 Magnification: 1.04 Channels: TEM

VikingPlot_1.png (1679 x 934)

Usage Information:	**Zoom: Scroll wheel | Pan: Left click white area and drag | Saving: Zoom to desired size and hit Save buttons**	
Message:		
Invoke Viking Plot 3D:	Invoke Viking Plot 3D	**Hit the button to invoke VikingPlot3D:** 6117
Hops Range Filter:	0 - 0	
Sections Range Filter:	0 - 371	



Tulip 4.6 [Tulip]

File Edit Window Help

Undo
Redo
Workspace
Develop
CSV
Import
Plugins

Algorithms

Filter name...

Favorites

Put your favorite algorithms here

Algorithm

- Edge bundling
- Clustering
  - Equal Value
  - Hierarchical
  - Quotient Clustering
- Topological Test
  - Acyclic
  - Biconnected
  - Connected
  - Directed Tree
  - Free Tree
  - Outer Planar
  - Planar
  - Planar Embedding
  - Simple
  - Triconnected

Graphs

Name	Id	Nodes	Edges
TLP I...	0	353	649

Add panel

TLP Import - 'filename'="C:/Users/u0449600/Downloads/network0.tlp"

Elements

Show Nodes filtered by no selection

matching give a pattern in Any column

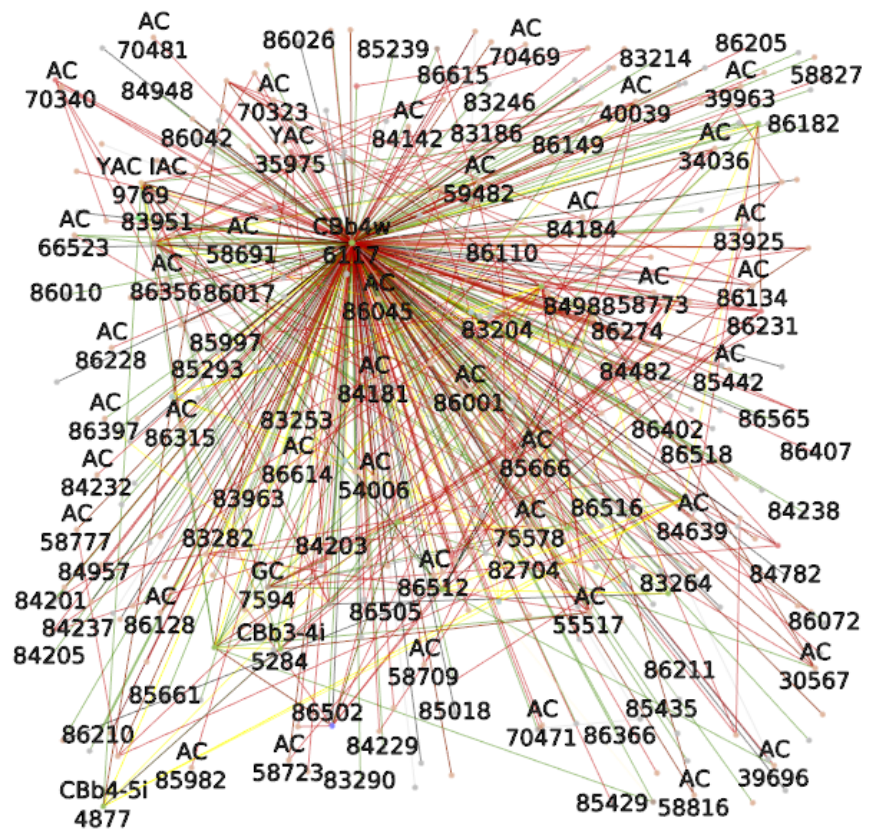
show columns matching give a pattern

	LinkedStructures	StructureURL
0		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(61
1		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(17
2		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(51
3		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(59
4		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(60
5		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(32
6		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(36
7		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(48
8		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(52
9		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(52
10		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(52
11		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(52
12		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(53
13		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(54
14		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(55
15		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(56
16		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(56
17		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(61
18		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(63
19		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(70
20		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(71
21		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(75
22		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(97
23		http://websvc1.connectomes.utah.edu/RC1/OData/ConnectomeData.svc/Structures(15

1 Expose 2 Search 3 Python

Navigate in graph

TLP Import - 'filename'="C:/Users/u



1 / 1

1HopWiringDiagram(Pre-Postsynaptic).sql - OpR-Marc-DB1.Rabbit (AD\u0449600 (66))* - Microsoft SQL Server Management Studio

File Edit View Query Project Debug Tools Window Help

New Query | Rabbit | Execute | Debug

Object Explorer

Connect

- OpR-Marc-DB1 (SQL Server 12.0.2254 -
  - Databases
  - Security
  - Server Objects
  - Replication
  - AlwaysOn High Availability
  - Management
  - Integration Services Catalogs

2HopWiringDiagram...AD\u0449600 (68))* | 1HopWiringDiagram...AD\u0449600 (66))*

```
--This query grabs all synapses of a given cell, whether it is pre or post synaptic in the synapse.
SELECT str1.ID AS QuerySideID, str1.Label AS QuerySideLabel, str2.TypeID AS QuerySideType, 'Post' AS PreorPost,
StLk.Bidirectional AS Bidirectional, StLk.TargetID AS QuerySideSynapseID, StLk.SourceID AS OtherSideSynapseID,
str3.TypeID AS OtherSideType, str4.ID AS OtherSideID, str4.Label AS OtherSideLabel
FROM Structure AS str1, Structure AS str2, StructureLink AS StLk, Structure AS str3, Structure AS str4
WHERE str1.ID = 6117 /*or whatever cell you want to query for*/ AND str2.ParentID = str1.ID
AND StLk.TargetID = str2.ID AND StLk.SourceID = str3.ID AND str3.ParentID = str4.ID
UNION
SELECT str1.ID AS QuerySideID, str1.Label AS QuerySideLabel, str2.TypeID AS QuerySideType, 'Pre' AS PreorPost,
StLk.Bidirectional AS Bidirectional, StLk.SourceID AS QuerySideSynapseID, StLk.TargetID AS OtherSideSynapseID,
str3.TypeID AS OtherSideType, str4.ID AS OtherSideID, str4.Label AS OtherSideLabel
FROM Structure AS str1, Structure AS str2, StructureLink AS StLk, Structure AS str3, Structure AS str4
WHERE str1.ID = 6117
 /*or whatever cell you want to query for*/ AND str2.ParentID = str1.ID
AND StLk.SourceID = str2.ID AND StLk.TargetID = str3.ID AND str3.ParentID = str4.ID
ORDER BY OtherSideID
```

100 %

Results | Messages

	QuerySideID	QuerySideLabel	QuerySideType	PreorPost	Bidirectional	QuerySideSynapseID	OtherSideSynapseID	OtherSideType	OtherSideID	OtherSideLabel
1	6117	CBb4w	28	Post	1	58717	58716	28	176	CBb3-4i
2	6117	CBb4w	229	Post	1	91853	91854	229	176	CBb3-4i
3	6117	CBb4w	28	Post	1	49180	83251	28	514	GAC Aii
4	6117	CBb4w	28	Pre	1	86347	47259	28	595	CBb3-4-5i
5	6117	CBb4w	85	Pre	1	86348	47258	85	595	CBb3-4-5i
6	6117	CBb4w	73	Pre	0	6967	6968	35	606	GC ON
7	6117	CBb4w	73	Pre	0	10053	10052	35	606	GC ON
8	6117	CBb4w	73	Pre	0	10056	10055	35	606	GC ON
9	6117	CBb4w	73	Pre	0	10714	10709	35	606	GC ON
10	6117	CBb4w	73	Pre	0	10715	10708	35	606	GC ON
11	6117	CBb4w	73	Pre	0	10717	10706	35	606	GC ON
12	6117	CBb4w	73	Pre	0	12318	12319	35	606	GC ON
13	6117	CBb4w	73	Pre	0	30887	10713	35	606	GC ON
14	6117	CBb4w	73	Pre	0	51326	51327	35	606	GC ON
15	6117	CBb4w	73	Pre	0	51334	51335	35	606	GC ON
16	6117	CBb4w	73	Pre	0	51530	51368	35	606	GC ON
17	6117	CBb4w	73	Pre	0	51546	10718	35	606	GC ON
18	6117	CBb4w	85	Post	1	51204	51203	85	606	GC ON
19	6117	CBb4w	85	Post	1	86263	12320	85	606	GC ON
20	6117	CBb4w	85	Pre	1	51295	51294	85	606	GC ON

Query executed successfully. | OpR-Marc-DB1 (12.0 RTM) | AD\u0449600 (66) | Rabbit | 00:00:00 | 568 rows

Properties

Current connection parameters

Aggregate Status	
Connection failur	
Elapsed time	00:00:00.412
Finish time	6/8/2015 9:47:23 AM
Name	OpR-Marc-DB1
Rows returned	568
Start time	6/8/2015 9:47:23 AM
State	Open
Connection	
Connection name	OpR-Marc-DB1 (AD\u0
Connection Details	
Connection elaps	00:00:00.412
Connection finish	6/8/2015 9:47:23 AM
Connection rows	568
Connection start t	6/8/2015 9:47:23 AM
Connection state	Open
Display name	OpR-Marc-DB1
Login name	AD\u0449600
Server name	OpR-Marc-DB1
Server version	12.0.2254
Session Tracing ID	
SPID	66

Name
The name of the connection.

Analyze your items

- Which would have the **greatest impact** on your work?
- What are the **patterns** or trends?
- What are the **outliers**? Why?

Constraint removal

Or, what if you could do what you want?

1. Identify constraints

For a cell, what class is it?

Constraint: *Electron microscopy and chemical analysis are mutually exclusive*

2. Remove constraints → what then?

For a cell, what class is it?

Constraint: *electron microscopy and chemical analysis are mutually exclusive*

Constraint removal: *suppose you could somehow do both. Then what? What would this allow?*

Lunch and excursion

Or, what can you relate to what we've talked about today?

Visualization awareness

Or, what’s going on in the visualization zoo?

Activities

- We will present seven visualizations from various fields
  - Informally discuss data and tasks
- Relate aspects of these examples to what we've talked about
  - e.g., data, tasks, layout, interaction, colors, and aesthetics

LineUp

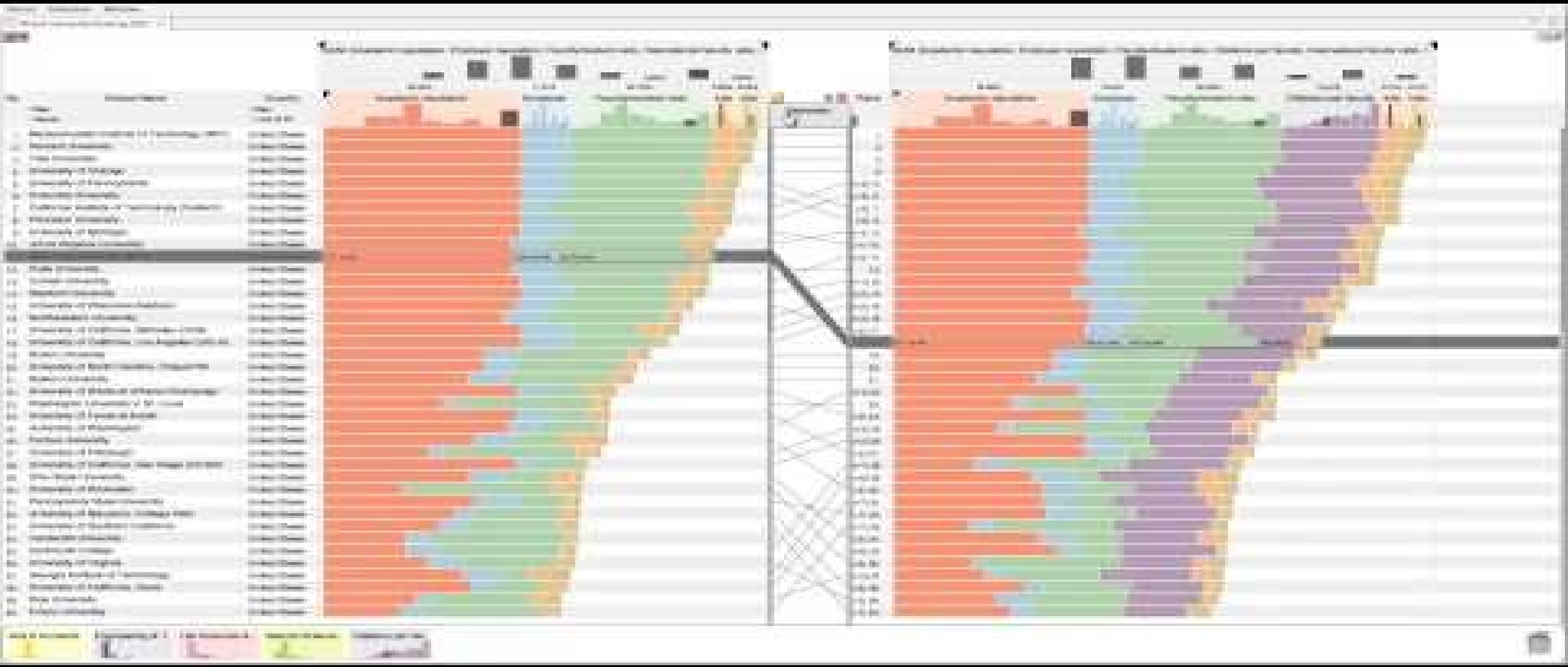
LineUp: Visual Analysis of Multi-Attribute Rankings. S. Gratzl et al. 2013. IEEE Transactions on Visualization and Computer Graphics (Proc. InfoVis)

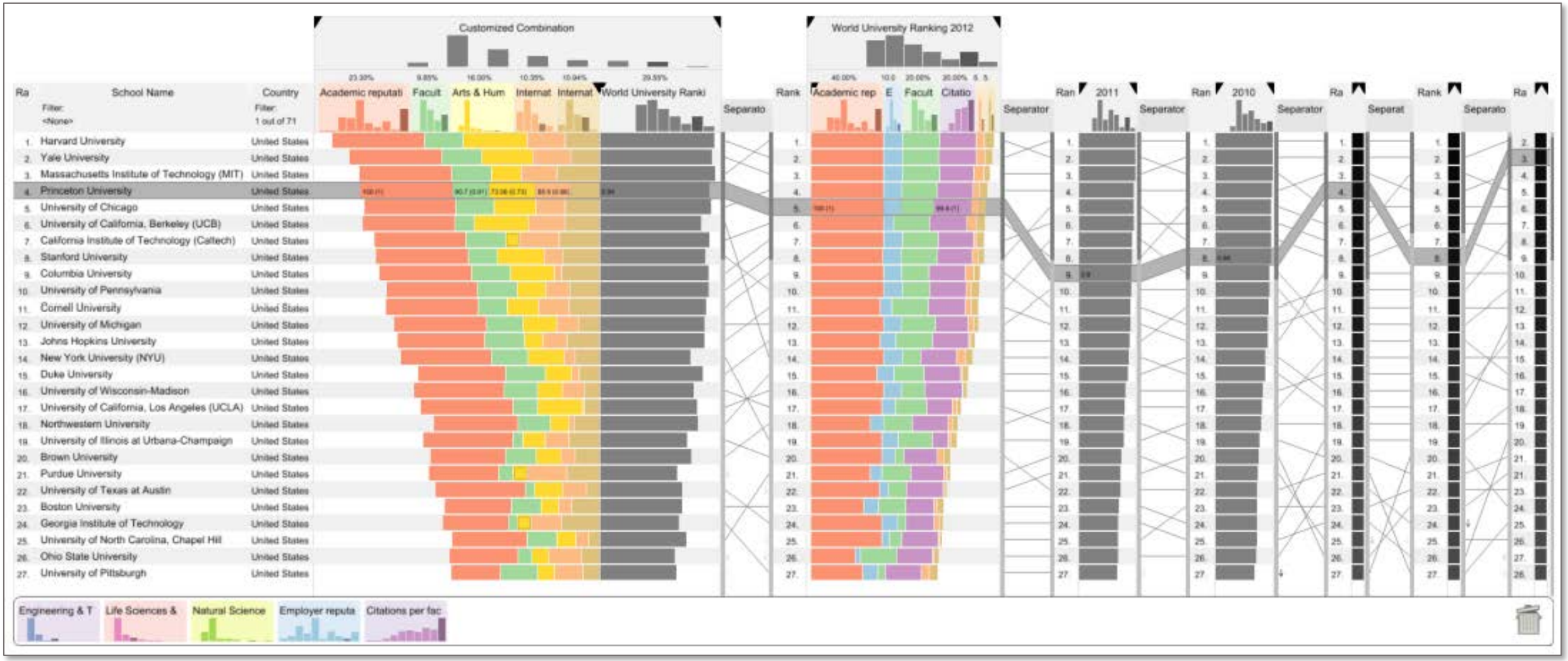
Data

- Hundreds of items – e.g., universities
- Tens of attributes per item – e.g., student-teacher ratio, citations, etc

Tasks

- Rank items based on weighted attributes
- Interactively refine and explain ranks




Customized Combination
World University Ranking 2012
Ra
School Name
Filter:
<None>
Country
Filter:
1 out of 71
Academic reputati
Facult
Arts & Hum
Internat
Internat
World University Ranki
Separato
Rank
Academic rep
E
Facult
Citatio
Separator
Ran
2011
2010
Separat
Rank
Ra
1. Harvard University United States
2. Yale University United States
3. Massachusetts Institute of Technology (MIT) United States
4. Princeton University United States
5. University of Chicago United States
6. University of California, Berkeley (UCB) United States
7. California Institute of Technology (Caltech) United States
8. Stanford University United States
9. Columbia University United States
10. University of Pennsylvania United States
11. Cornell University United States
12. University of Michigan United States
13. Johns Hopkins University United States
14. New York University (NYU) United States
15. Duke University United States
16. University of Wisconsin-Madison United States
17. University of California, Los Angeles (UCLA) United States
18. Northwestern University United States
19. University of Illinois at Urbana-Champaign United States
20. Brown University United States
21. Purdue University United States
22. University of Texas at Austin United States
23. Boston University United States
24. Georgia Institute of Technology United States
25. University of North Carolina, Chapel Hill United States
26. Ohio State University United States
27. University of Pittsburgh United States
Engineering & T
Life Sciences &
Natural Science
Employer reputa
Citations per fac

ABySS-Explorer

ABySS-Explorer: Visualizing Genome Sequence Assemblies. C. B. Nielsen et al. 2009. IEEE Trans. Visualization and Computer Graphics (Proc. InfoVis)

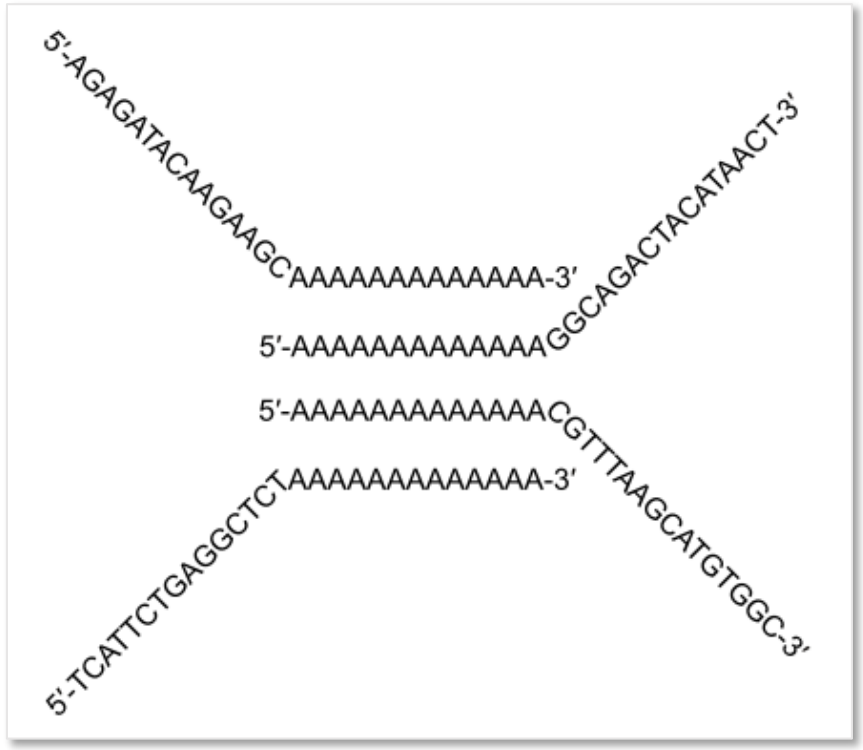
Data

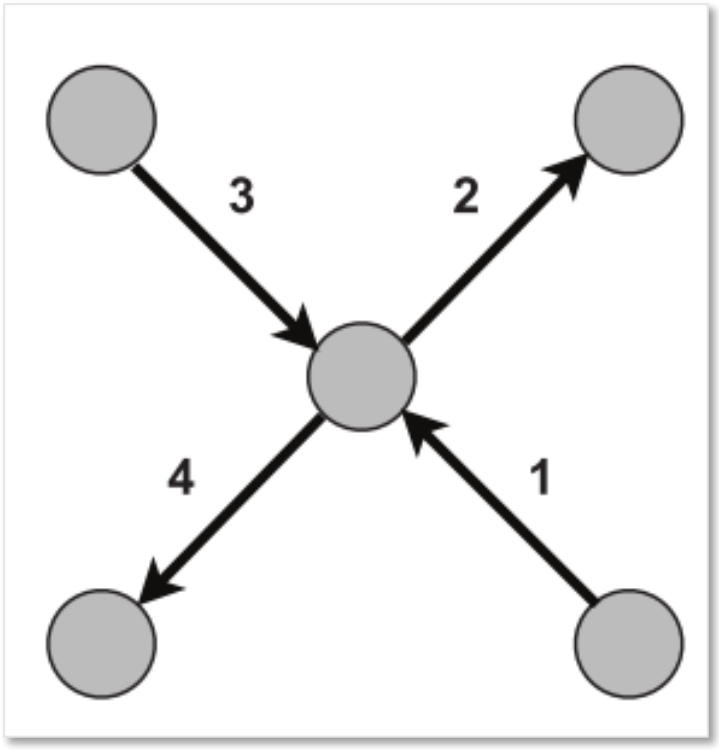
- Genome sequences divided into short, contiguous chunks - “contigs”
- Automated assembly of chunks into larger genes – “assembly”

Tasks

- Understand assembly structure
- Assess assembly quality

Data


5′-AGAGATACAAGAAGCAAAAAAAAAAAAAA-3′
5′-AAAAAAAAAAAAAAGGCAGACTACATAACT-3′
5′-AAAAAAAAAAAAAACGTTTAAGCATGTGGC-3′
5′-TCATTCTGAGGCTCTAAAAAAAAAAAAAA-3′

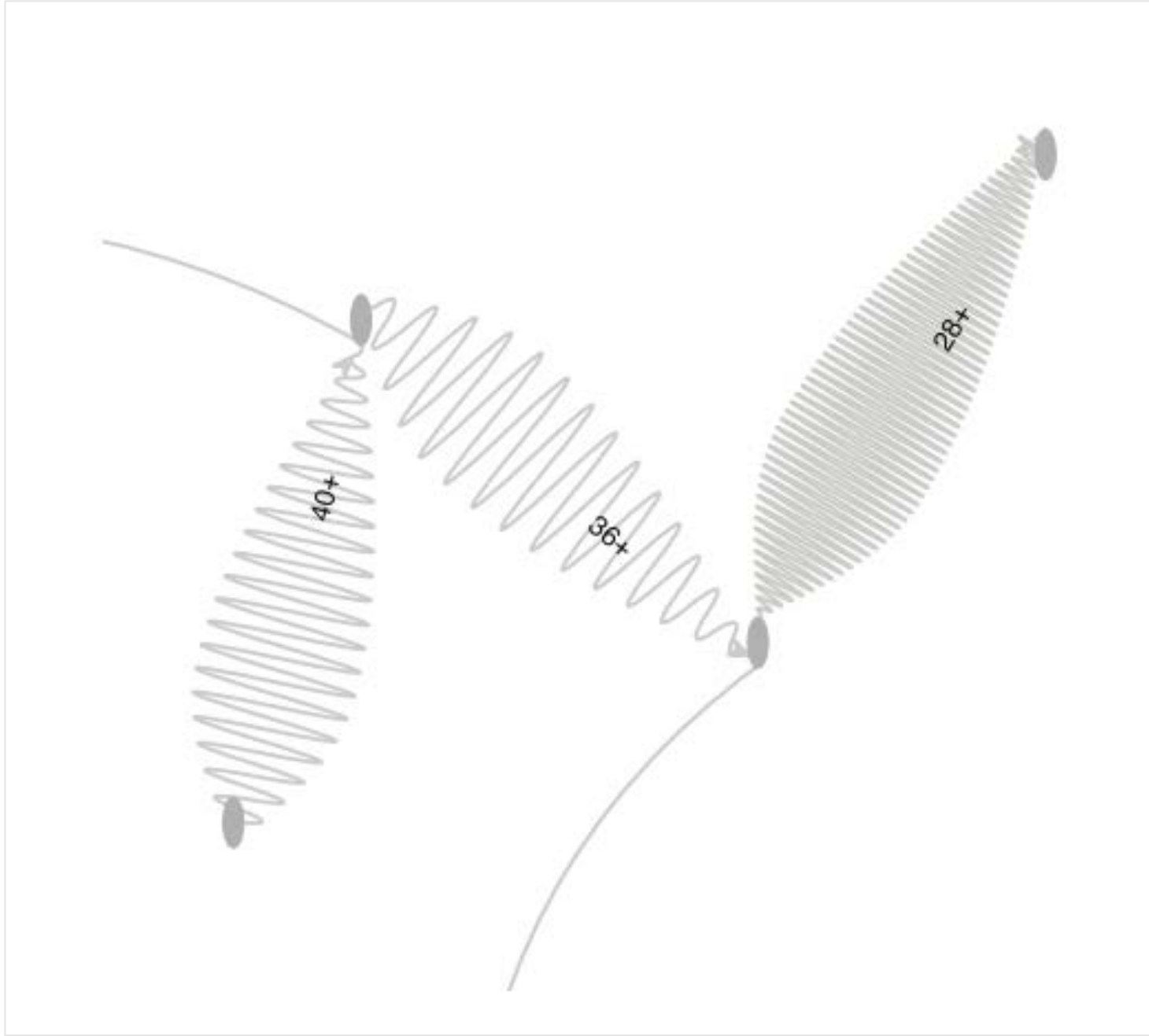

3
2
4
1

5'-CTCTCTCTTCCAGTAAGACTGCGAAAAAT-3'

5'-AAAAATGCCAGTAAGACTGACGGGGGG-3'

5'-CTCTCTCTTCCAGTAAGACTGCGAAAAAT-3'

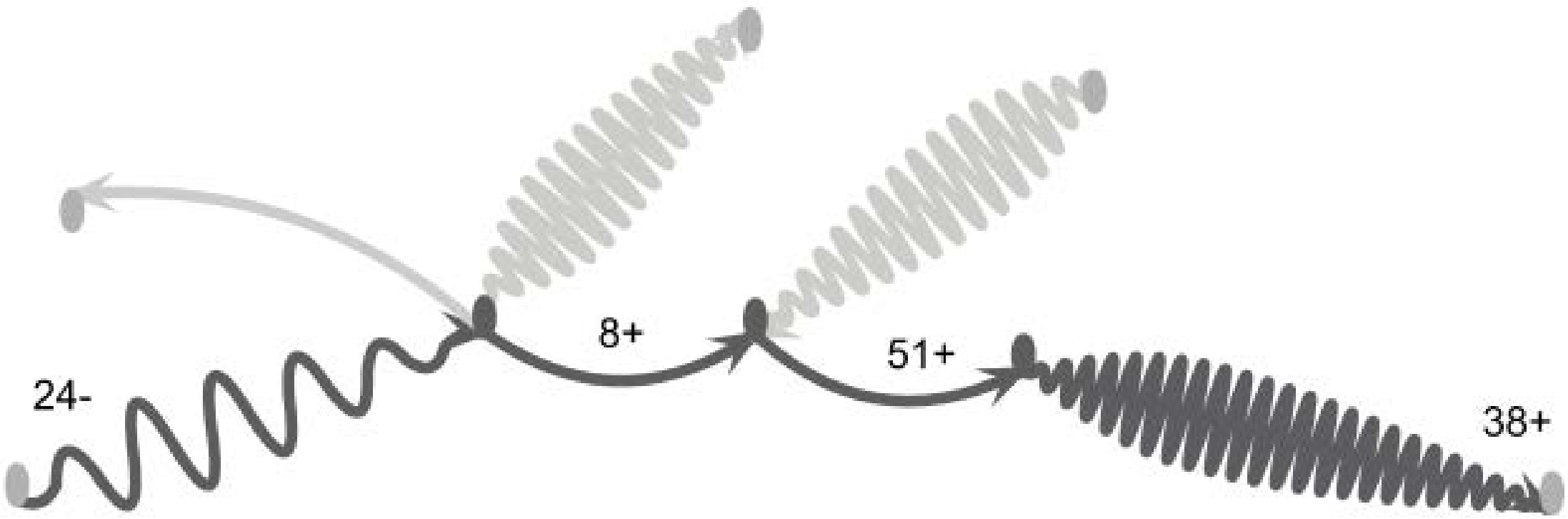
3'-TTTTTACGGTCATTCTGACTGCCCCCC-5'

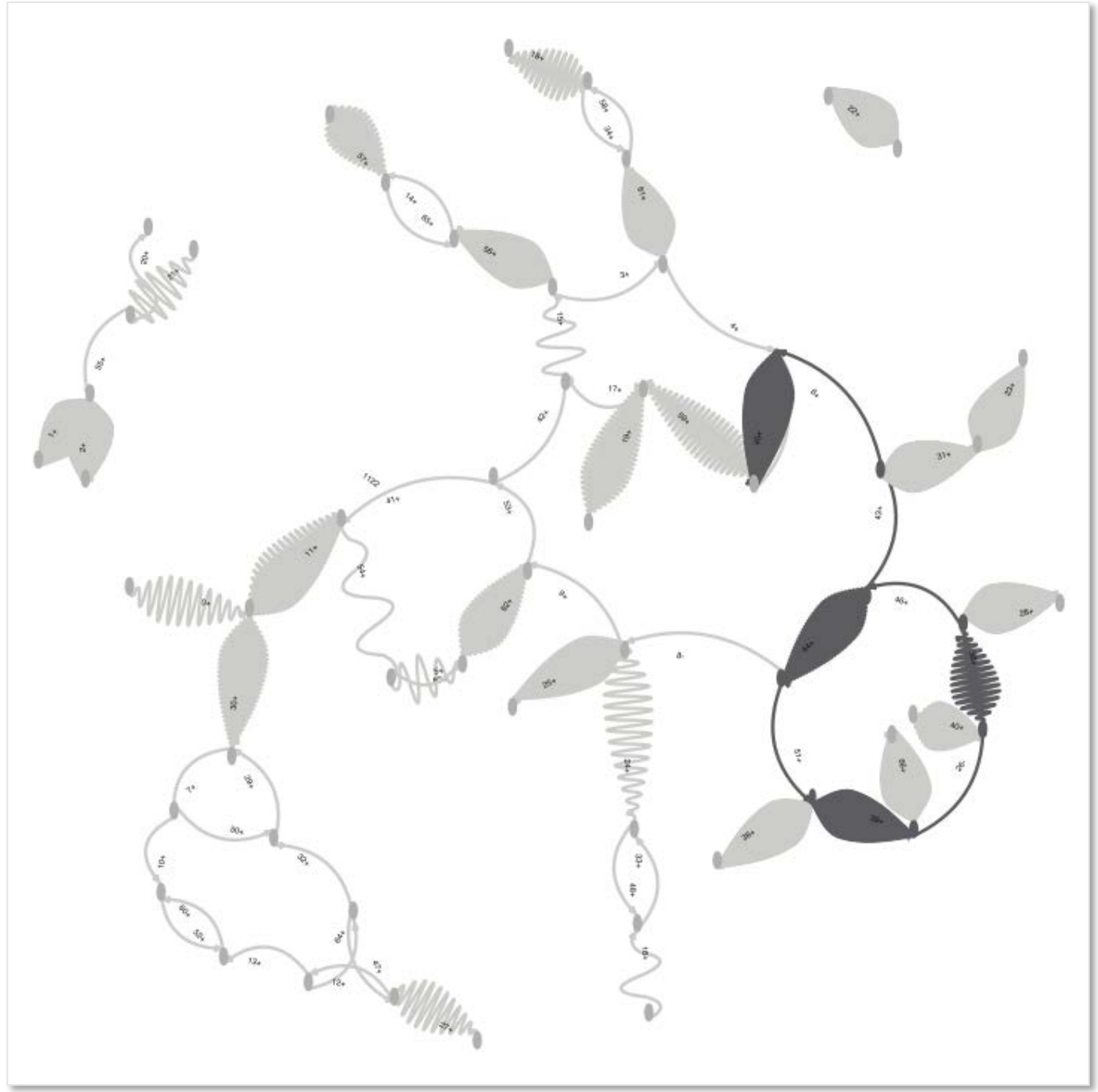

40+
36+
28+

5'-GCAGGACCGT-3' ⇢ 5'-TGGCCAGGTA-3'

...TCGATGTAGCAGGACCGTAAAAAA AAAAAACGTGGCCAGGTAGCATCATG...

contig 8+ contig 38+





Feeling the Crunch of the Deadline

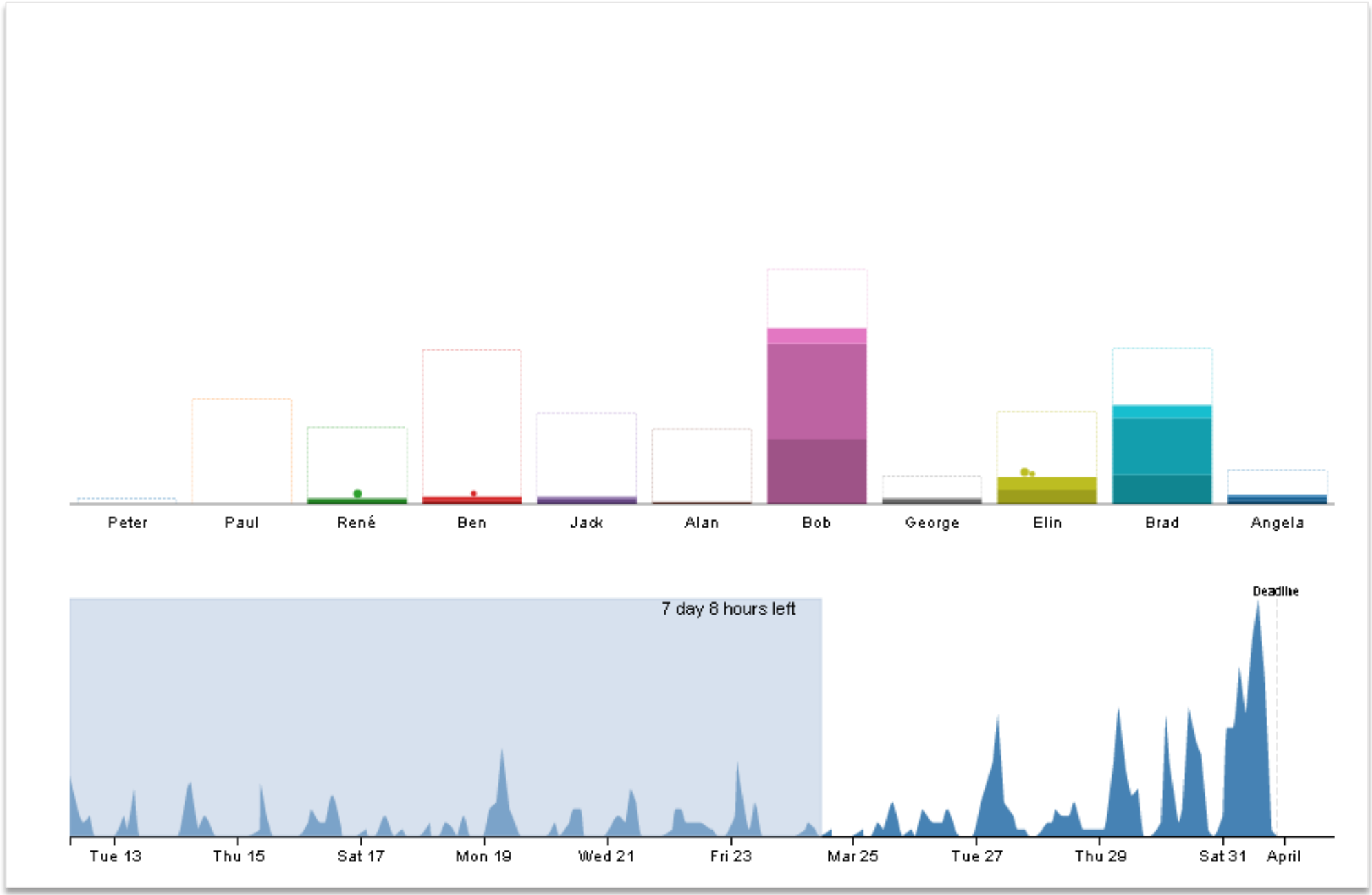
From VisualSedimentation.org

Data

- 20 different project repositories
- Series of commits 20 days before a paper deadline

Tasks

- Enjoy the visualization
- Sympathize with the researchers


Peter
Paul
René
Ben
Jack
Alan
Bob
George
Elin
Brad
Angela
7 day 8 hours left
Deadline
Tue 13
Thu 15
Sat 17
Mon 19
Wed 21
Fri 23
Mar 25
Tue 27
Thu 29
Sat 31
April

Multivariate Network Exploration and Presentation: From Detail to Overview via Selections and Aggregations

Multivariate Network Exploration and Presentation: From Detail to Overview via Selections and Aggregations.
S. Elzen and J. van Wijk. 2014. IEEE Trans. on Visualization and Computer Graphics. (Proc. InfoVis)

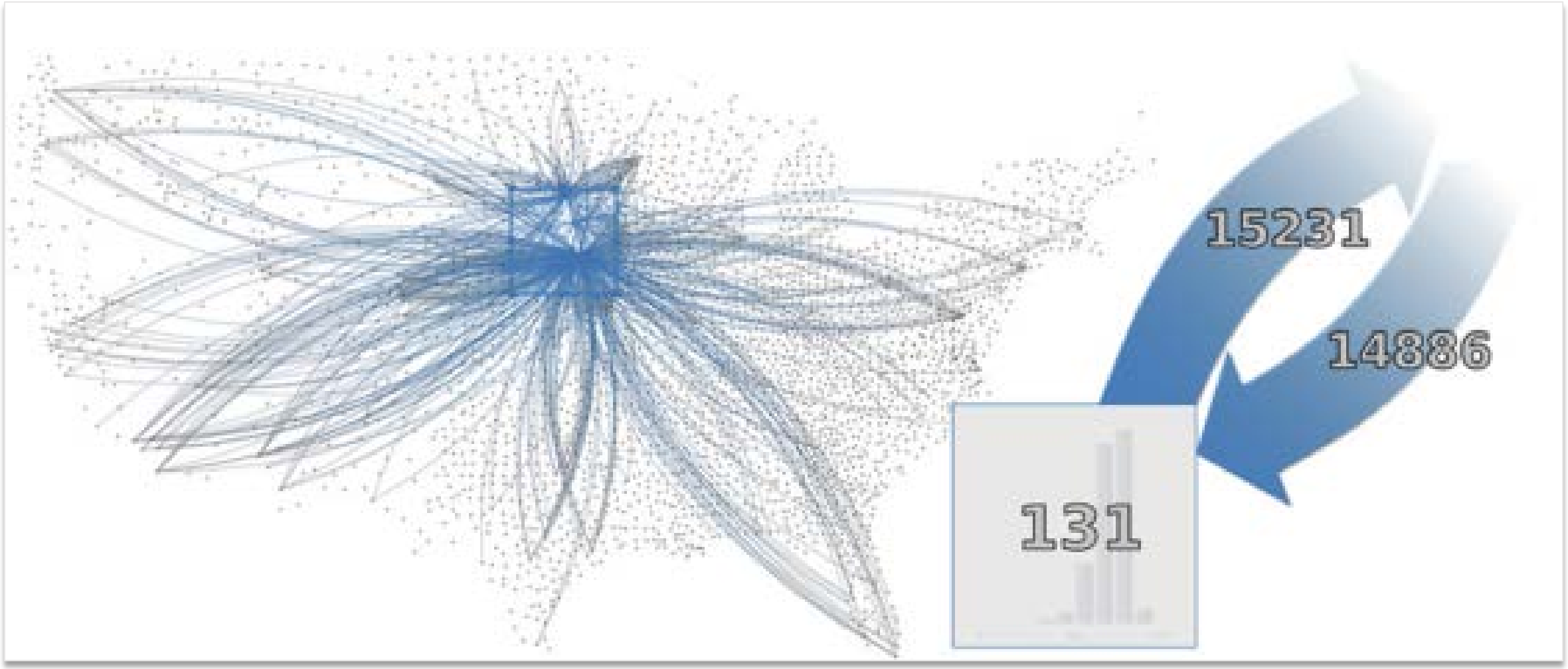
Data

- Collected from the census
- ~3000 nodes represent US counties
- ~80,000 edges represent migrations between counties

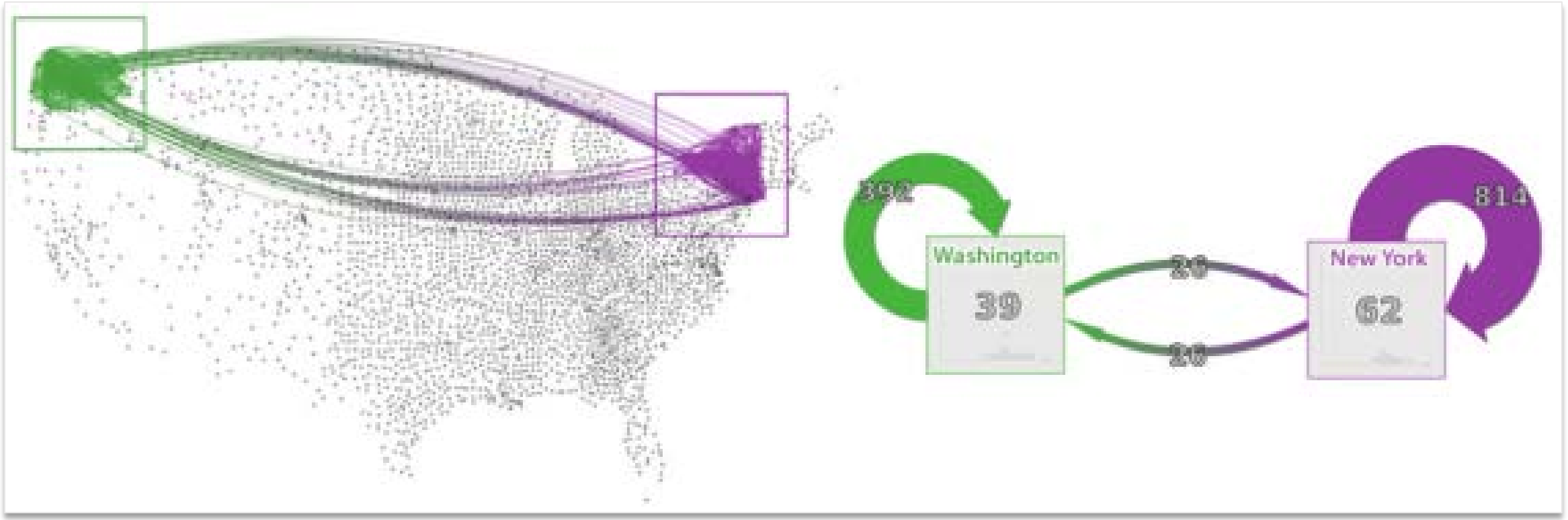
Tasks

- Explore relationships between nodes and attributes
- Present results of exploration

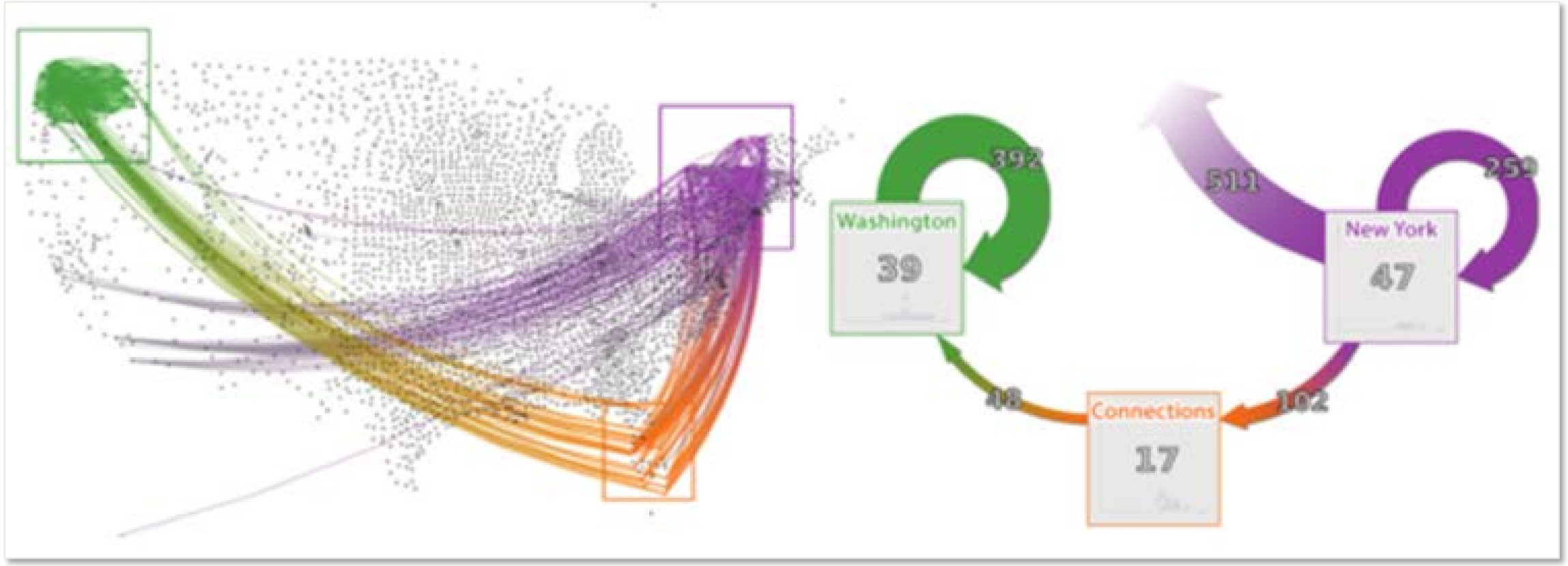
Exploring the data

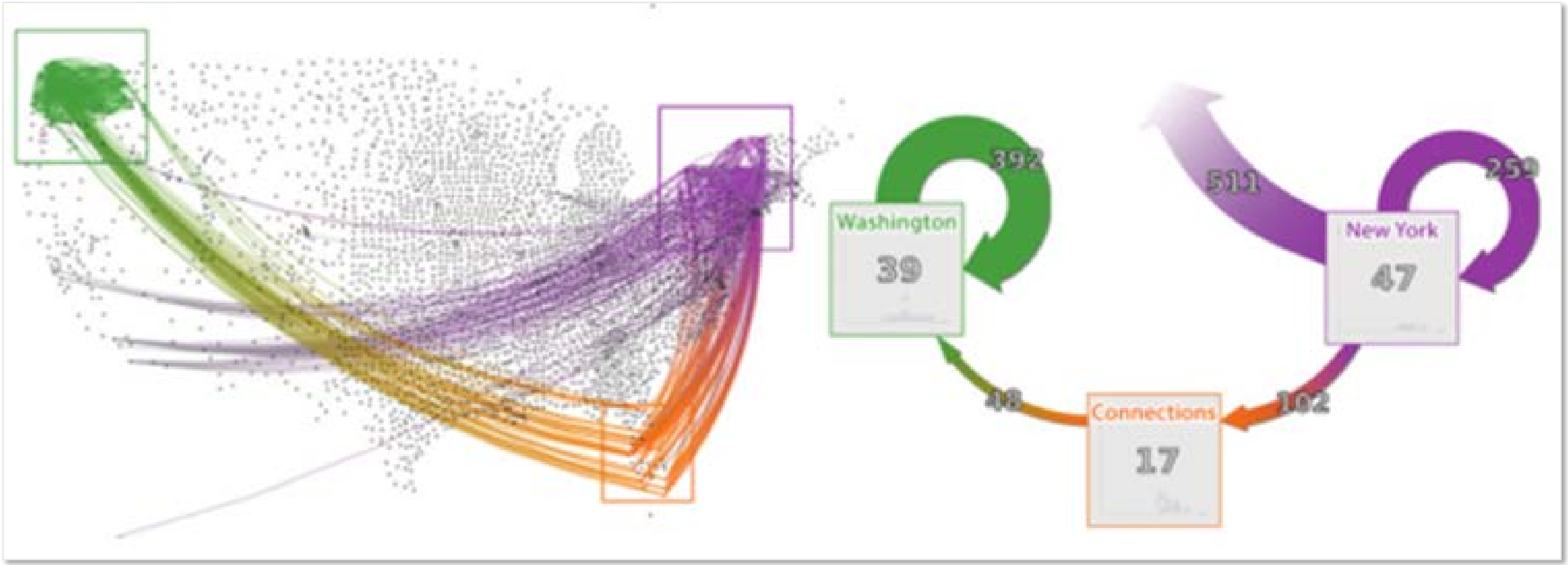


One-hop migration



Two-hop migration




392
Washington
39
511
New York
47
48
Connections
17
102

Les Misérables Co-occurrence

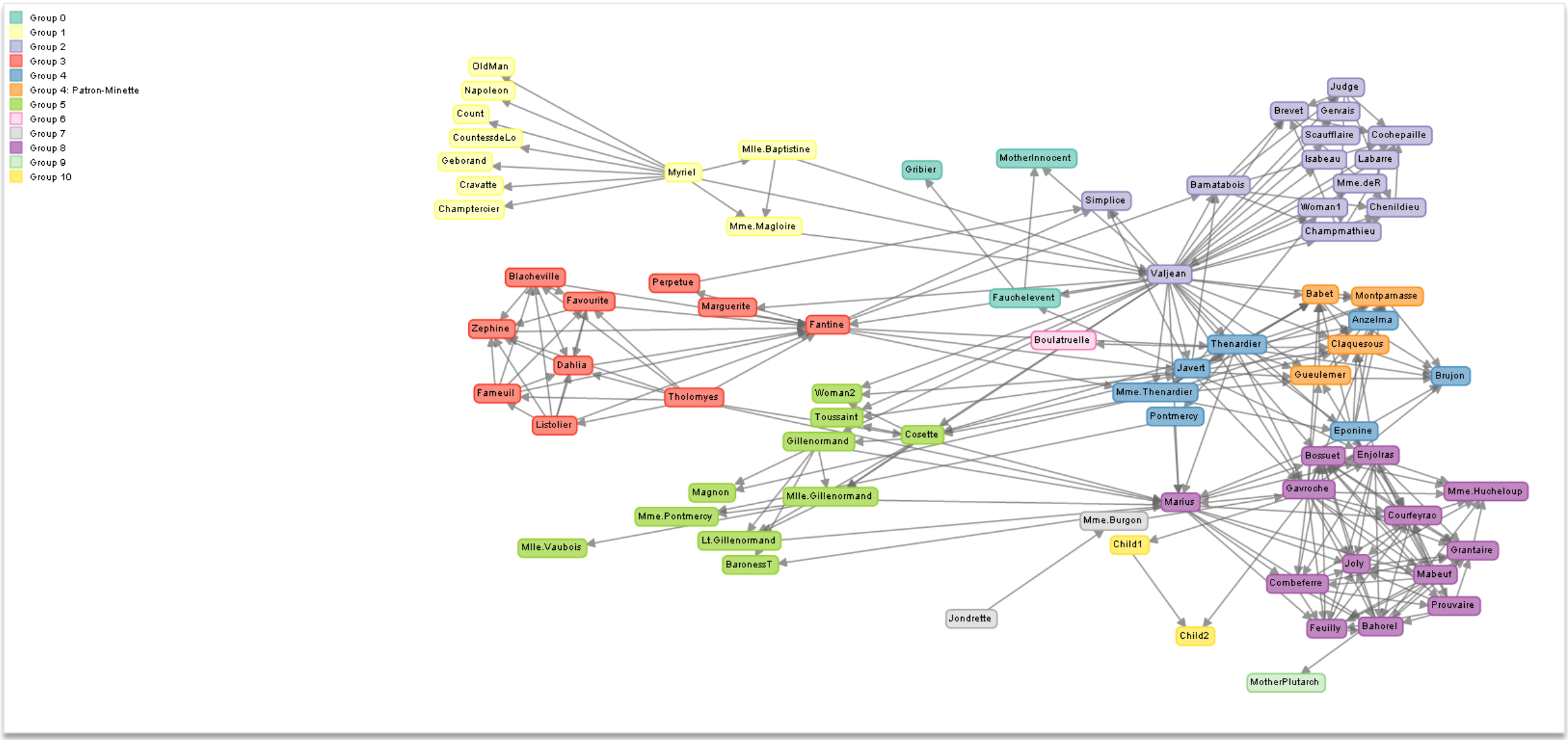
From Mike Bostock’s Blog

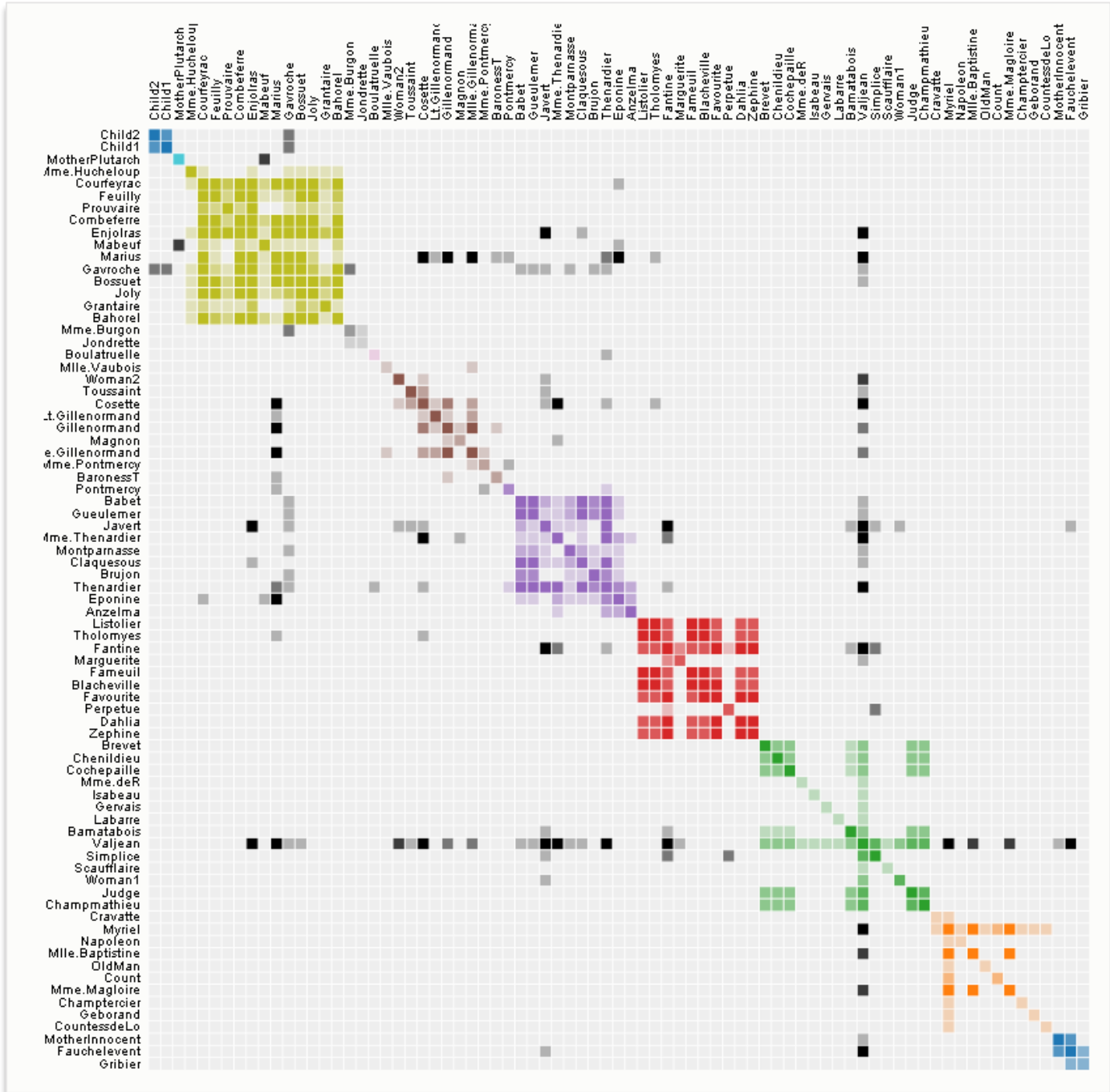
Data

- Characters in the play *Les Misérables* (tens)
- Edges representing co-occurrences

Tasks

- Enjoy the visualization
- Understand patterns in co-occurrences


Group 0
Group 1
Group 2
Group 3
Group 4
Group 4: Patron-Minette
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
OldMan
Napoleon
Count
CountessdeLo
Geborand
Cravatte
Champtercier
Myriel
Mlle.Baptistine
Mme.Magloire
Gribier
MotherInnocent
Simplice
Judge
Brevet
Gervais
Scaufflaire
Cochepaille
Isabeau
Labarre
Mme.deR
Bamatabois
Woman1
Chenildieu
Champmathieu
Valjean
Blacheville
Perpetue
Favourite
Marguerite
Zephine
Fantine
Fauchelevent
Babet
Montparnasse
Anzelma
Boulatruelle
Thenardier
Claquesous
Dahlia
Javert
Gueulemer
Brujon
Fameuil
Tholomyes
Mme.Thenardier
Woman2
Toussaint
Pontmercy
Listolier
Cosette
Eponine
Gillenormand
Bossuet
Enjolras
Magnon
Mlle.Gillenormand
Gavroche
Mme.Hucheloup
Marius
Mme.Pontmercy
Mme.Burgon
Courfeyrac
Mlle.Vaubois
Lt.Gillenormand
Child1
Grantaire
Joly
Mabeuf
BaronessT
Combeferre
Prouvaire
Jondrette
Feuilly
Bahorel
Child2
MotherPlutarch


Child2
Child1
MotherPlutarch
Mme.Hucheloup
Courfeyrac
Feuilly
Prouvaire
Combeferre
Enjolras
Mabeuf
Marius
Gavroche
Bossuet
Joly
Grantaire
Bahorel
Mme.Burgon
Jondrette
Boulatruelle
Mlle.Vaubois
Woman2
Toussaint
Cosette
Lt.Gillenormand
Gillenormand
Magnon
Mlle.Gillenormand
Mme.Pontmercy
BaronessT
Pontmercy
Babet
Gueulemer
Javert
Mme.Thenardier
Montparnasse
Claquesous
Brujon
Thenardier
Eponine
Anzelma
Listolier
Tholomyes
Fantine
Marguerite
Fameuil
Blacheville
Favourite
Perpetue
Dahlia
Zephine
Brevet
Chenildieu
Cochepaille
Mme.deR
Isabeau
Gervais
Labarre
Bamatabois
Valjean
Simplice
Scaufflaire
Woman1
Judge
Champmathieu
Cravatte
Myriel
Napoleon
Mlle.Baptistine
OldMan
Count
Mme.Magloire
Champtercier
Geborand
CountessdeLo
MotherInnocent
Fauchelevent
Gribier

NeuroLines

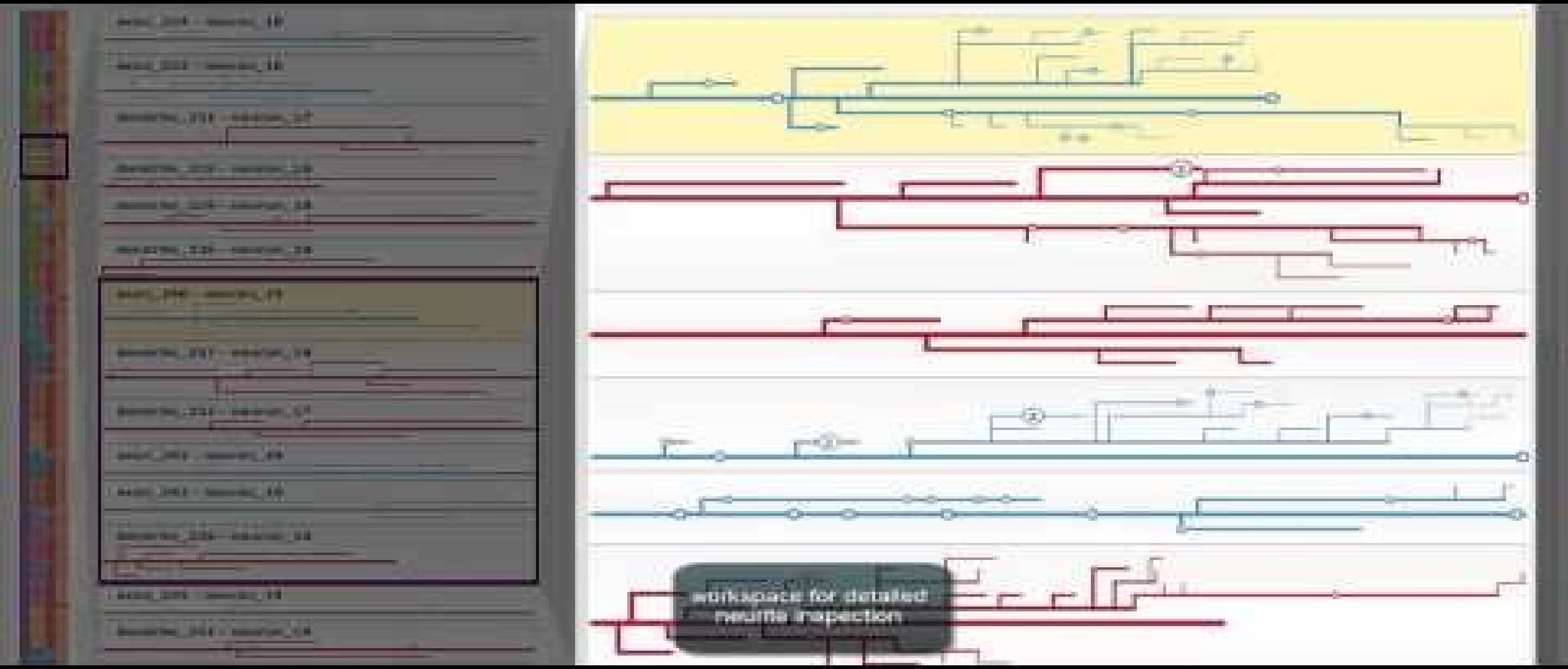
NeuroLines: A Subway Map Metaphor for Visualizing Nanoscale Neuronal Connectivity. A. Al-Awami et al. 2014. IEEE Transactions on Visualization and Computer Graphics (Proc. InfoVis)

Data

- Electron microscopy volume
- Manual annotation of cells and synapses

Tasks

- Explore synapses patterns with respect to connections, branching, and pathways


workspace for detailed
results inspection


4
8
17
17
14
8
8
5
3

Poemage

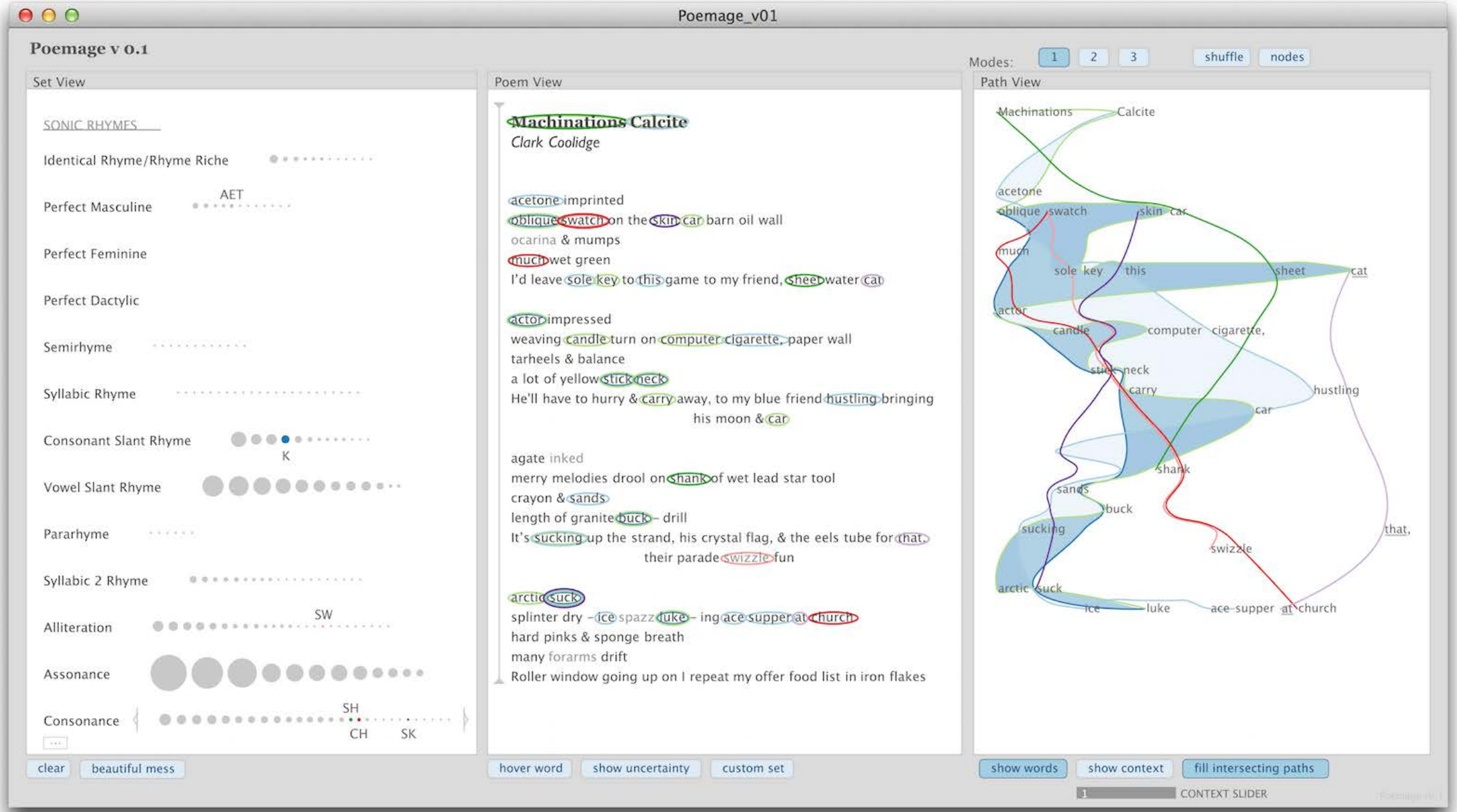
Poemage: Visualizing the Sonic Topology of a Poem. N. McCurdy et al. 2015. IEEE Transactions on Visualization and Computer Graphics (Proc. InfoVis) [Under Review]

Data

- Raw data: text
- Derived data: **rhyme sets** – sets of words linked through sonic/linguistic resemblances

Tasks

- Explore individual rhyme sets in the space of the poem
- Explore the **sonic topology** of a poem – the complex structures formed via the interaction of rhyme sets across the space of the poem.


Poemage_v01
Poemage v 0.1
Modes:
1
2
3
shuffle
nodes
Set View
SONIC RHYMES
Identical Rhyme/Rhyme Riche
Perfect Masculine
AET
Perfect Feminine
Perfect Dactylic
Semirhyme
Syllabic Rhyme
Consonant Slant Rhyme
K
Vowel Slant Rhyme
Pararhyme
Syllabic 2 Rhyme
Alliteration
SW
Assonance
Consonance
SH
CH
SK
clear
beautiful mess
Poem View
Machinations Calcite
Clark Coolidge
acetone imprinted
oblique swatch on the skin car barn oil wall
ocarina & mumps
much wet green
I'd leave sole key to this game to my friend, sheet water cat
actor impressed
weaving candle turn on computer cigarette, paper wall
tarheels & balance
a lot of yellow stick neck
He'll have to hurry & carry away, to my blue friend hustling bringing
his moon & car
agate inked
merry melodies drool on shank of wet lead star tool
crayon & sands
length of granite buck – drill
It's sucking up the strand, his crystal flag, & the eels tube for that,
their parade swizzle fun
arctic suck
splinter dry – ice spazz duke – ing ace supper at church
hard pinks & sponge breath
many forarms drift
Roller window going up on I repeat my offer food list in iron flakes
hover word
show uncertainty
custom set
Path View
Machinations
Calcite
acetone
oblique
swatch
skin
car
much
sole
key
this
sheet
cat
actor
candle
computer
cigarette,
stick
neck
carry
hustling
car
shank
sands
buck
sucking
that,
swizzle
arctic
suck
ice
luke
ace
supper
at
church
show words
show context
fill intersecting paths
1
CONTEXT SLIDER

Storyboarding

Or, what does interaction with future software look like?

Sketching

- This is ***not*** about pretty pictures
- This is about **ideas**
- Flesh out & communicate your ideas on paper

Image: http://i2.wp.com/www.alexemde.de/wp/wp-content/uploads/2014/07/Storyboard-1.jpeg

Storyboarding

- Focuses on the **tasks**

- Show the **person** and the **flow** of events
  - *e.g.* a comic strip

- Accomplish: **setting**, **sequence**, & **satisfaction**

Reflection and conclusion

Or, what are the most interesting ideas from today?