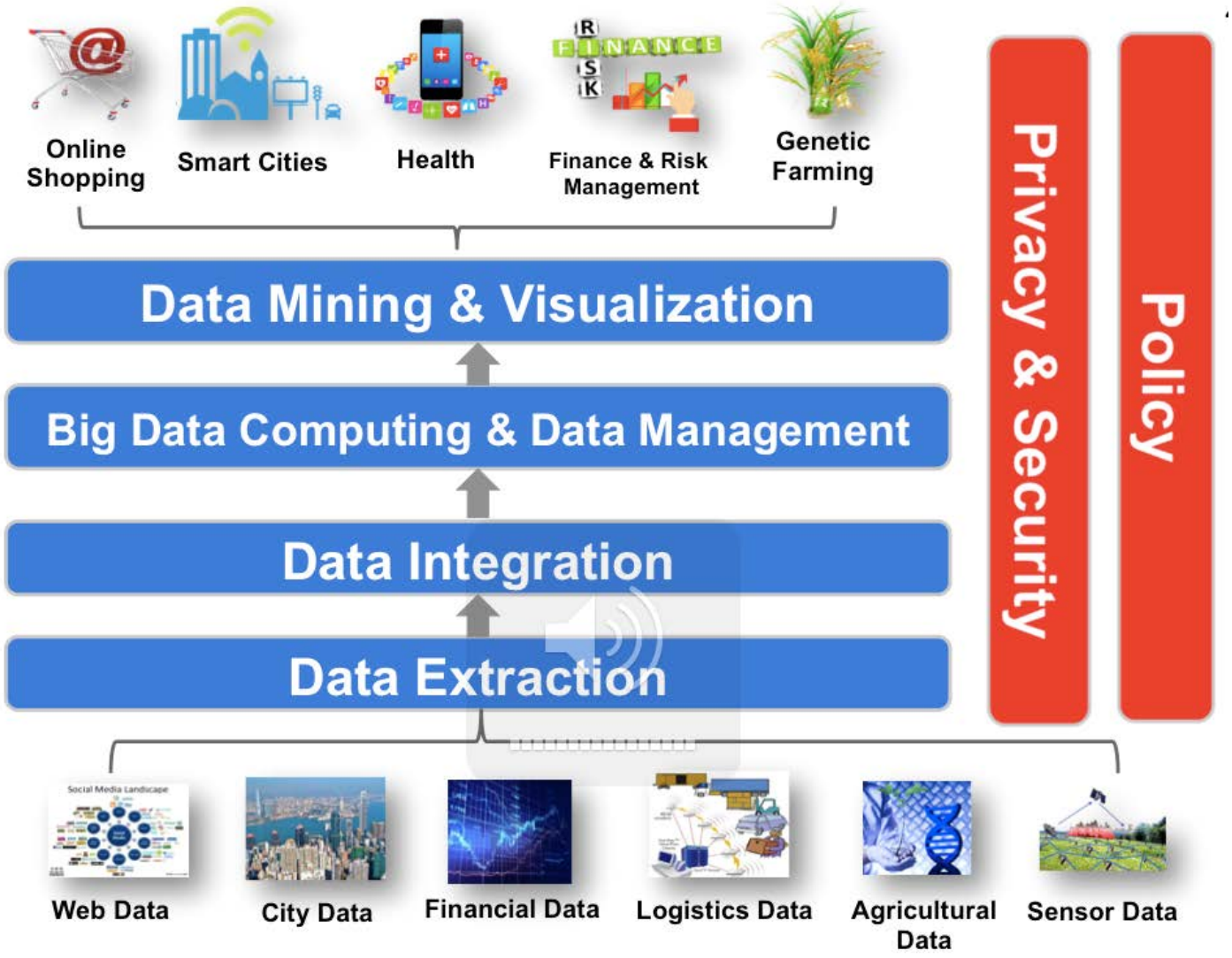
Data Visualization and Data Management

Huamin Qu

Hong Kong University of Science and Technology

INNOVATING TODAY
IMAGINING TOMORROW
敢・創・未來 HKUST

HKUST's Big Data Platform



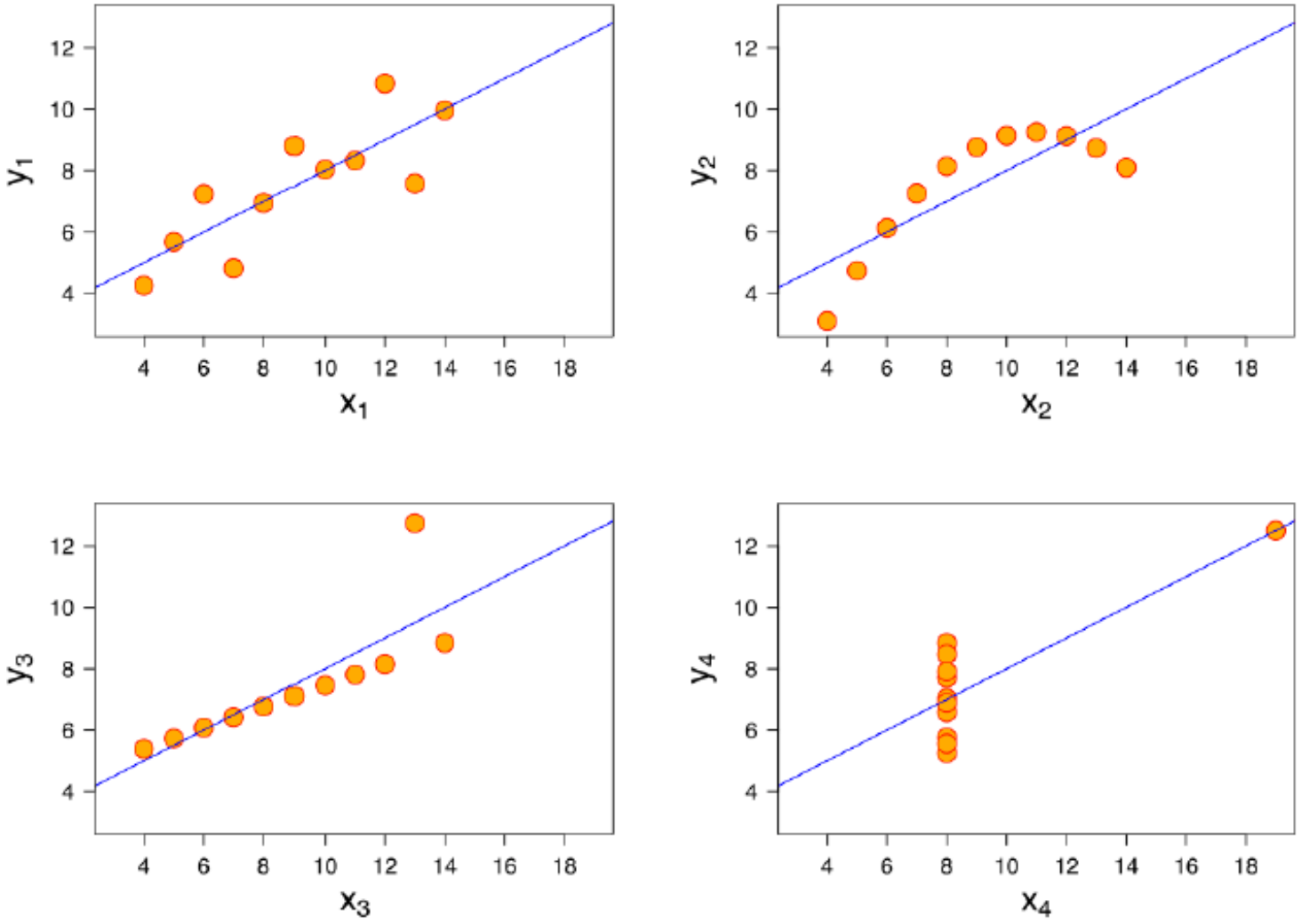
Anscombe's Quartet: Four datasets

Anscombes quarte

I		II		III		IV	
x	*y*	*x*	*y*	*x*	*y*	*x*	*y*
10.0	8.04	10.0	9.14	10.0	7.46	8.0	6.58
8.0	6.95	8.0	8.14	8.0	6.77	8.0	5.76
13.0	7.58	13.0	8.74	13.0	12.74	8.0	7.71
9.0	8.81	9.0	8.77	9.0	7.11	8.0	8.84
11.0	8.33	11.0	9.26	11.0	7.81	8.0	8.47
14.0	9.96	14.0	8.10	14.0	8.84	8.0	7.04
6.0	7.24	6.0	6.13	6.0	6.08	8.0	5.25
4.0	4.26	4.0	3.10	4.0	5.39	19.0	12.50
12.0	10.84	12.0	9.13	12.0	8.15	8.0	5.56
7.0	4.82	7.0	7.26	7.0	6.42	8.0	7.91
5.0	5.68	5.0	4.74	5.0	5.73	8.0	6.89

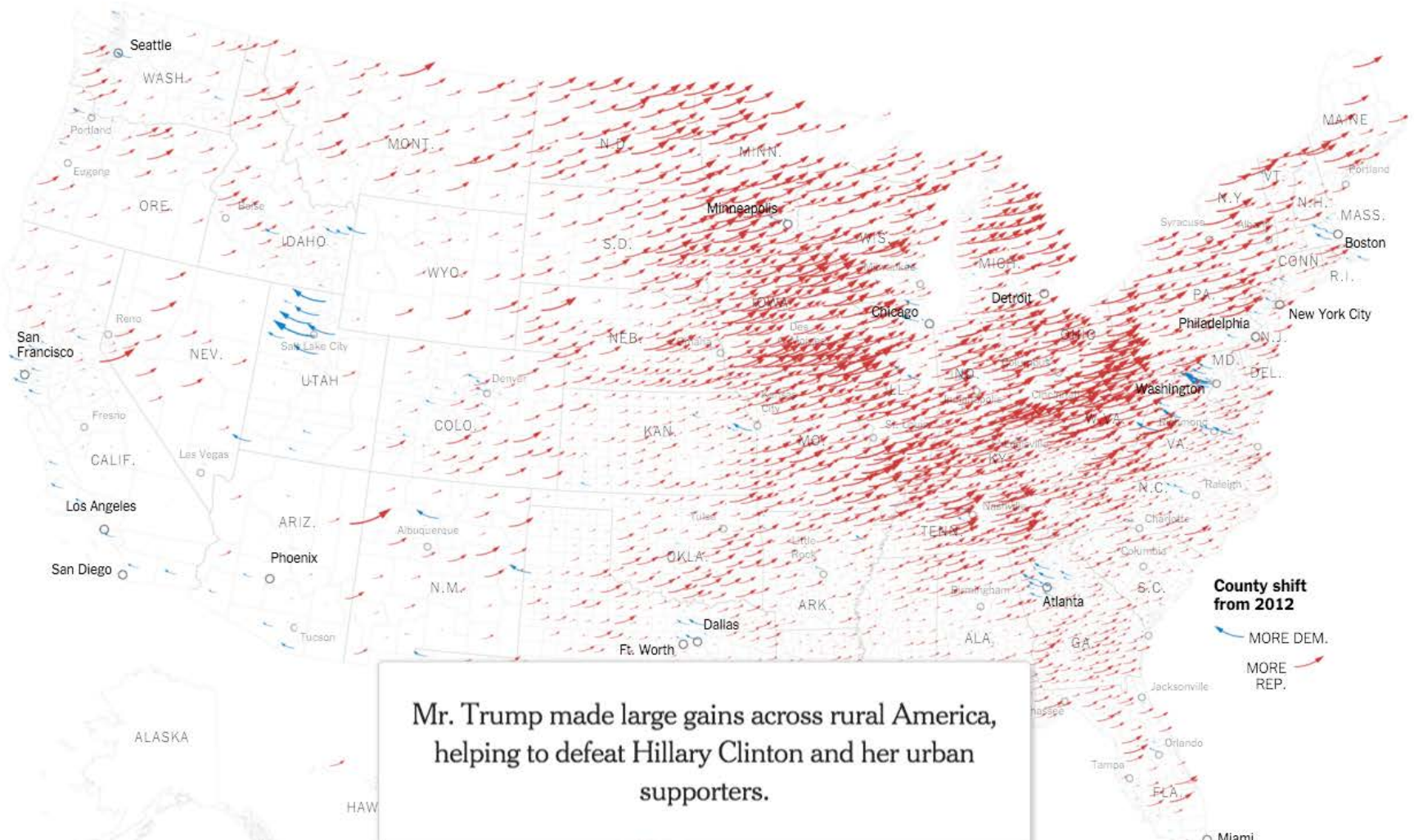
Table 1.1: Anscombe's quartet: four different datasets.

Anscombe's Quartet: Visualizations



What is data visualization?

- Input: data Output: visual form Goal: insight



Obama's big data plan

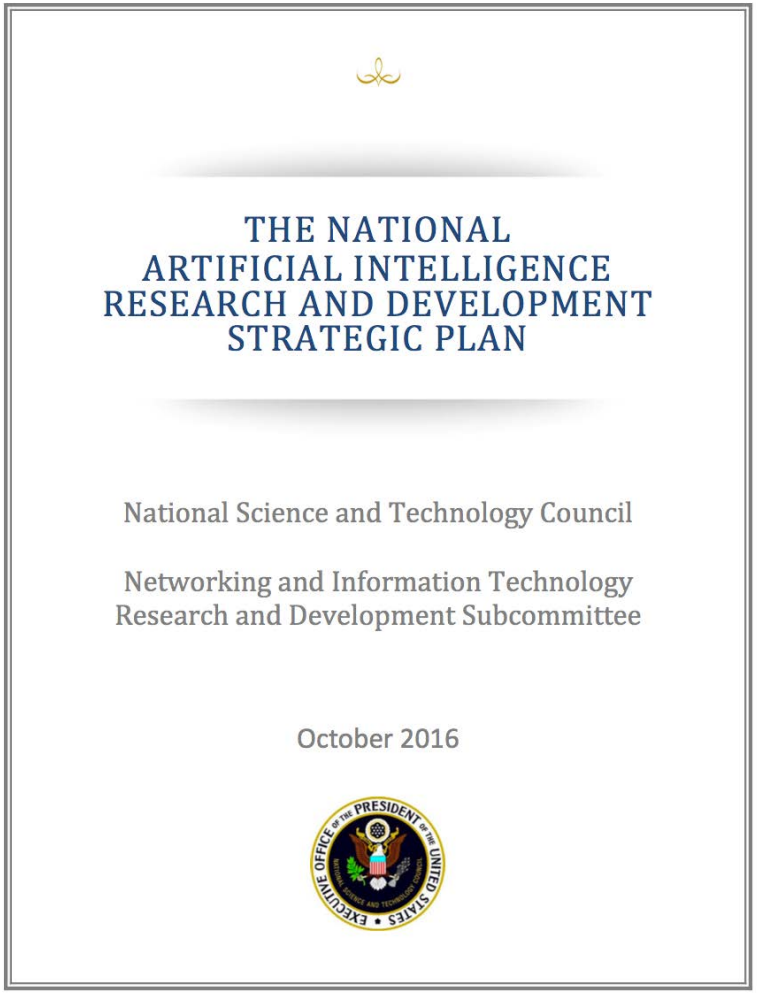
Office of Science and Technology Policy
Executive Office of the President
New Executive Office Building
Washington, DC 20502

FOR IMMEDIATE RELEASE
March 29, 2012

Contact: Rick Weiss 202 456-6037 rweiss@ostp.eop.gov
Lisa-Joy Zgorski 703 292-8311 lisajoy@nsf.gov

OBAMA ADMINISTRATION UNVEILS "BIG DATA" INITIATIVE:
ANNOUNCES $200 MILLION IN NEW R&D INVESTMENTS

- Issuing a $2 million award for a research training group to support training for undergraduates to use graphical and visualization techniques for complex data.



Strategy 2: Develop Effective Methods for Human-AI Collaboration

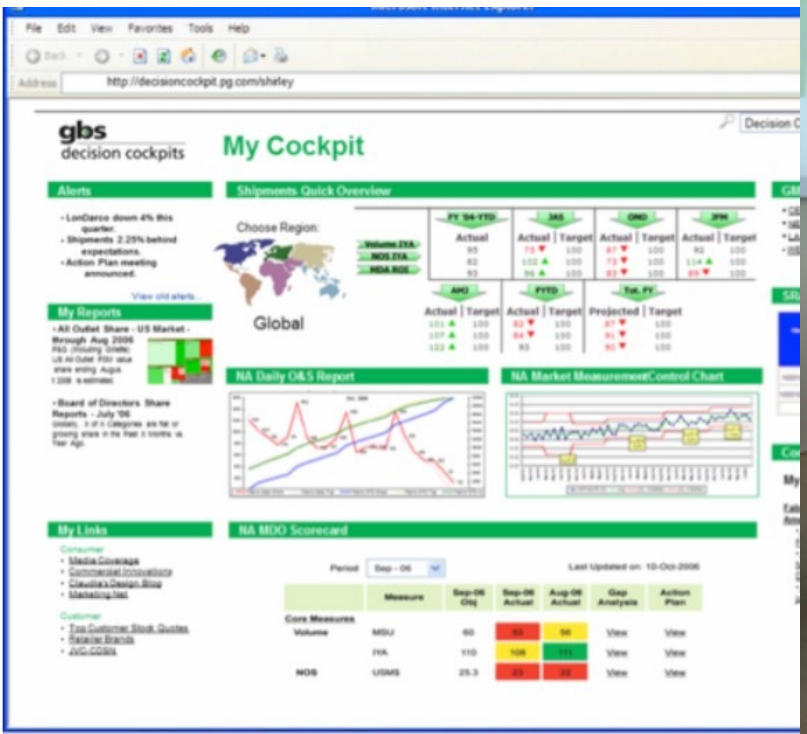
Developing techniques for visualization and AI-human interfaces

Better visualization and user interfaces are additional areas that need much greater development to help humans understand large-volume modern datasets and information coming from a variety of sources. V

HBR Blog Network

How P&G Presents Data to Decision-Makers

by Tom Davenport | 3:00 PM April 4, 2013



VIS@HKUST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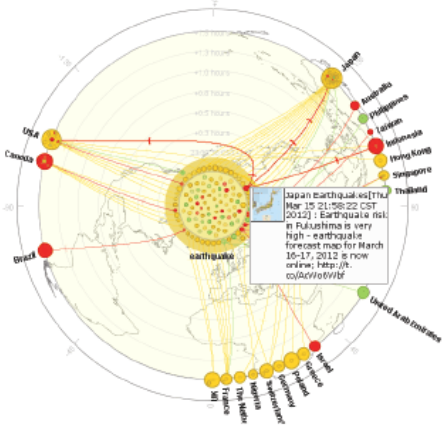
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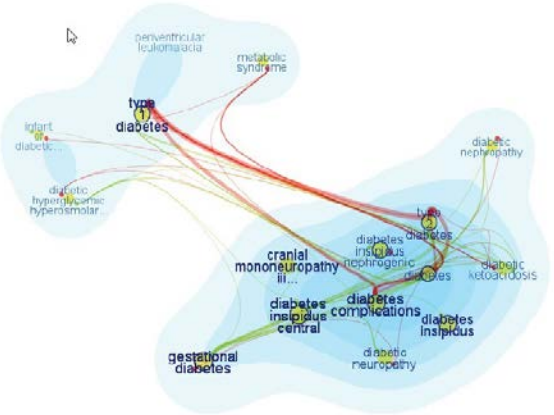
France
UK
earthquake
Japan Earthquakes[Thu Mar 15 21:58:22 CST 2012] : Earthquake risk in Fukushima is very high - earthquake forecast map for March 16-17, 2012 is now online; http://t.co/AcWo6WbF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gestational diabetes
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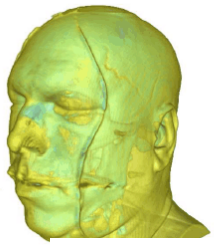

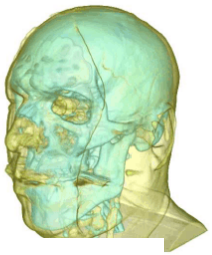

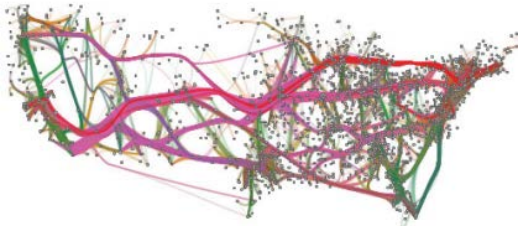

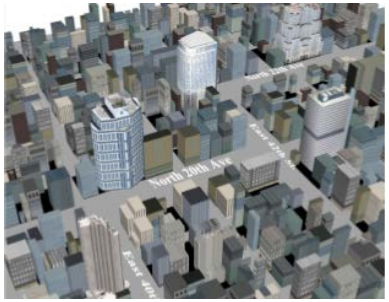
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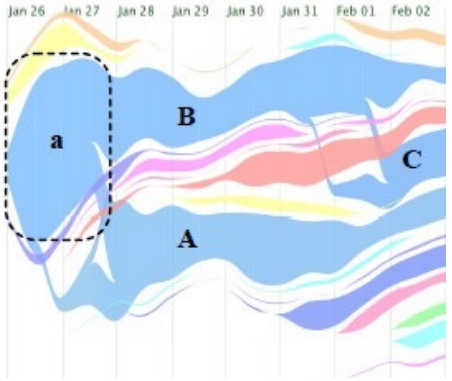
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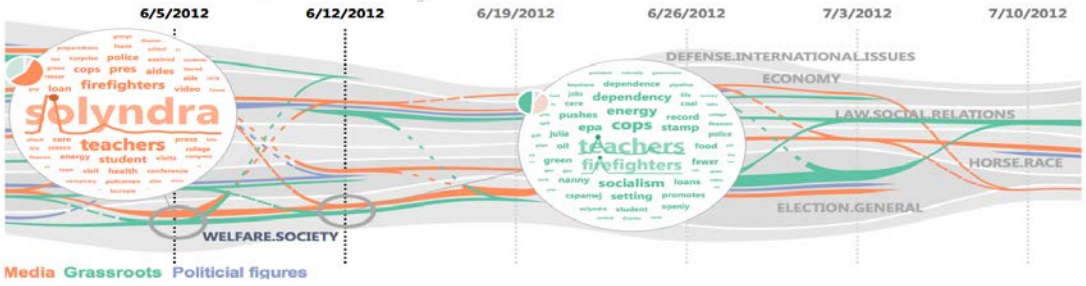
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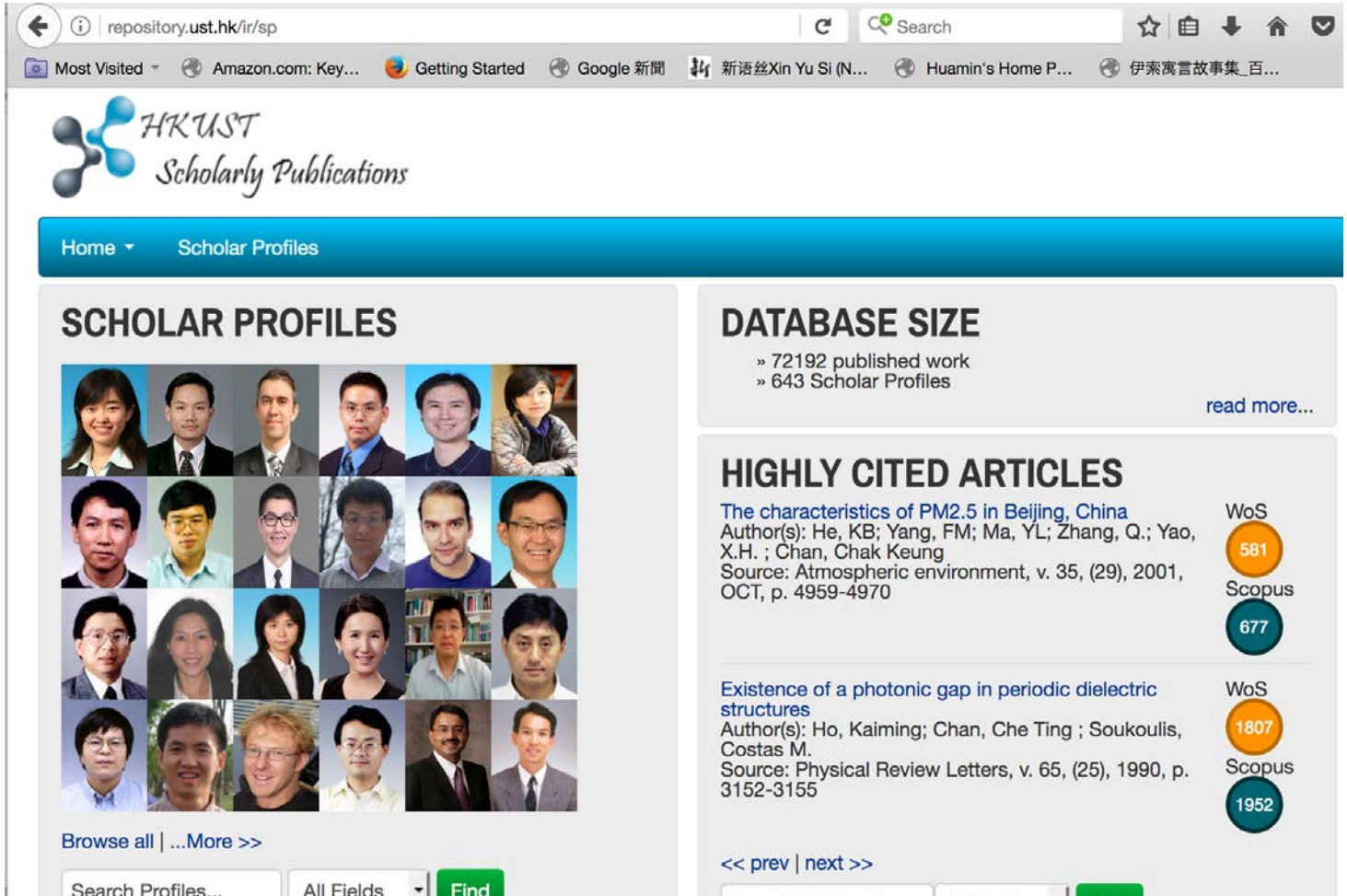
LAW.SOCIAL.RELATIONS
HORSE.RACE
ELECTION.GENERAL
WELFARE.SOCIETY
dependency
energy
pushes
epa
cops
stamp
record
food
fewer
socialism
setting
promotes
loans
Media
Grassroots
Politicial figures

Visualization for Students

- Choose an advisor
- Know paths of PG students
- Present a research paper

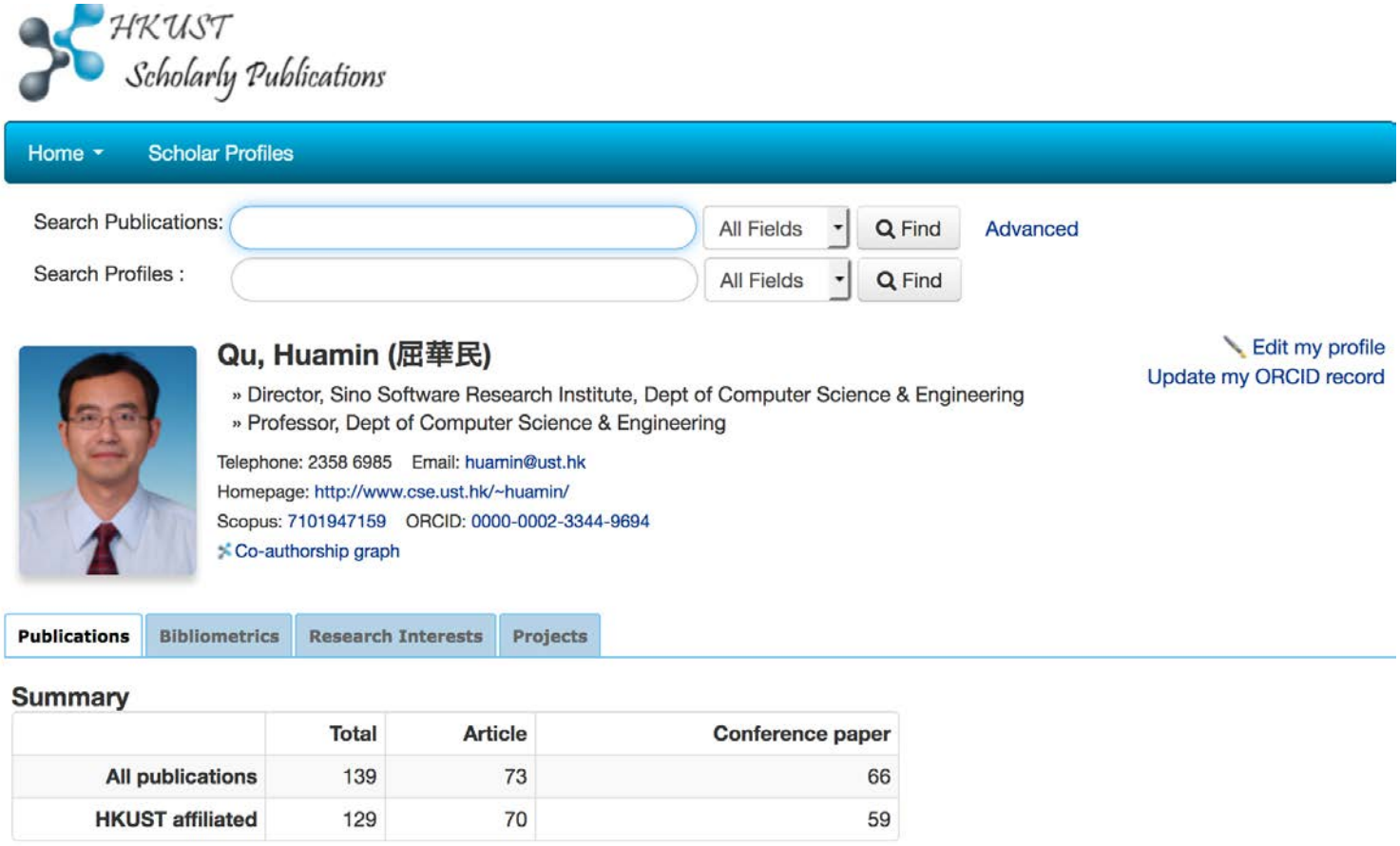
Choosing an Advisor

- http://repository.ust.hk/ir/sp



Choosing an Advisor

- http://repository.ust.hk/ir/AuthorProfile/qu-huamin

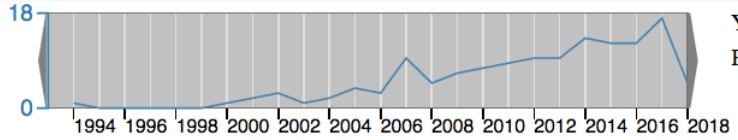


	Total	Article	Conference paper
All publications	139	73	66
HKUST affiliated	129	70	59

HKUST Co-authorship Graph

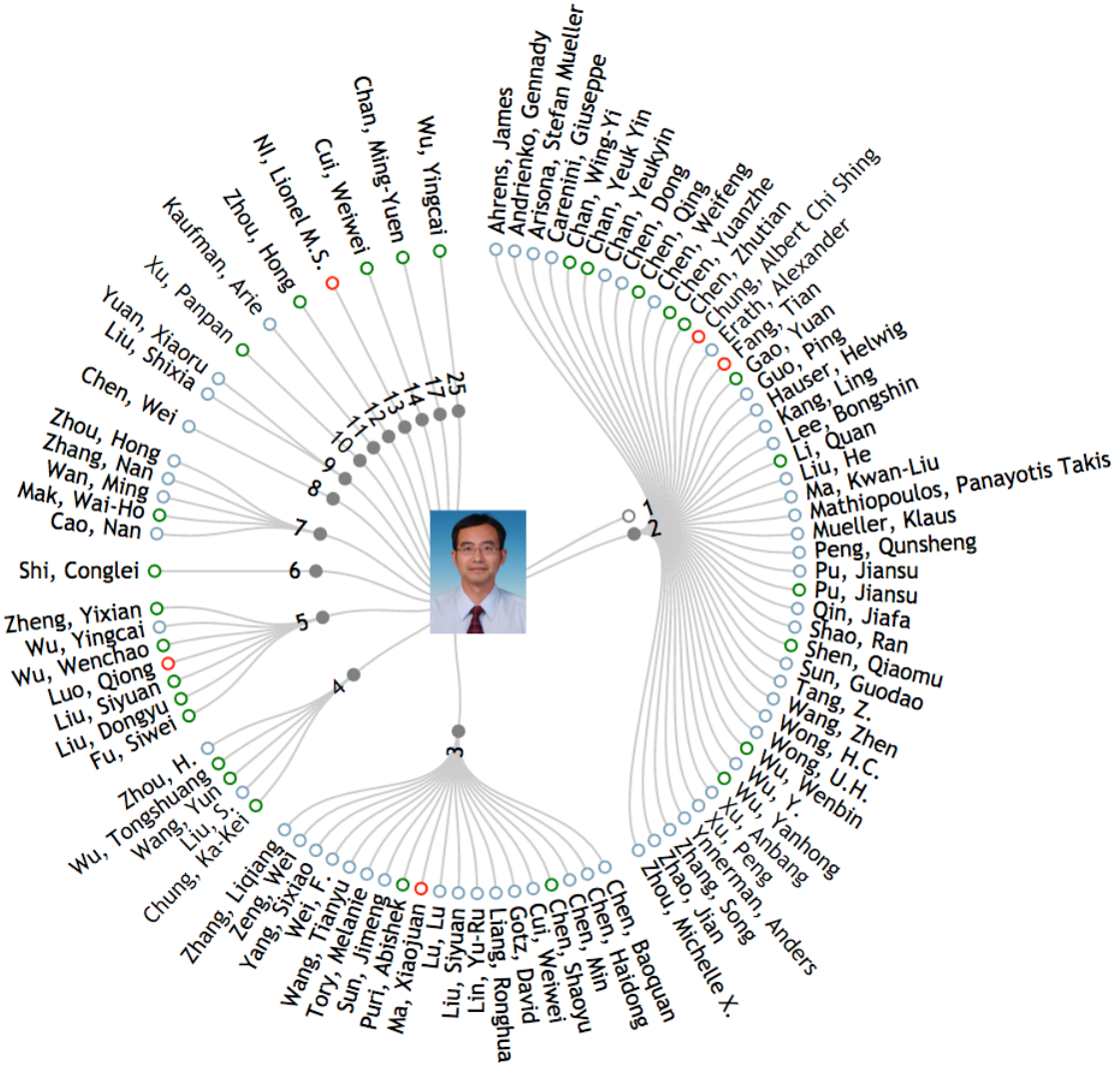
Powered by: HKUST VisLab

Qu, Huamin **Department:** CSE **Total co-authors:** 270 **Total publications:** 139 *Help*



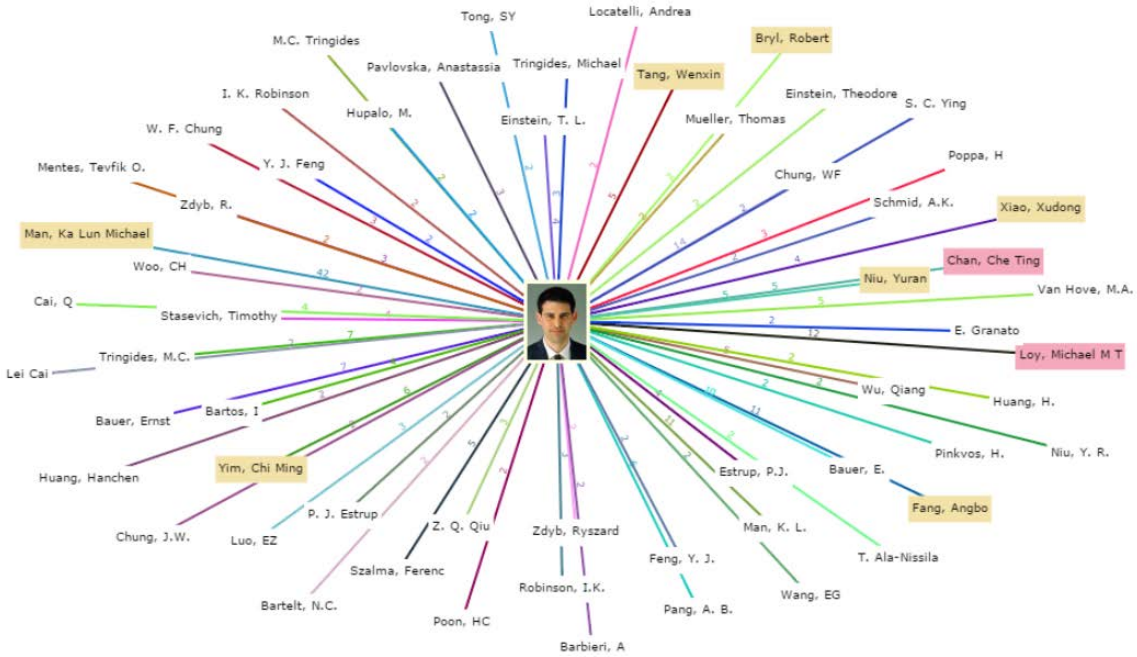
Year: 1993 - 2017
Publication: 139

Co-author List by: Name Publication



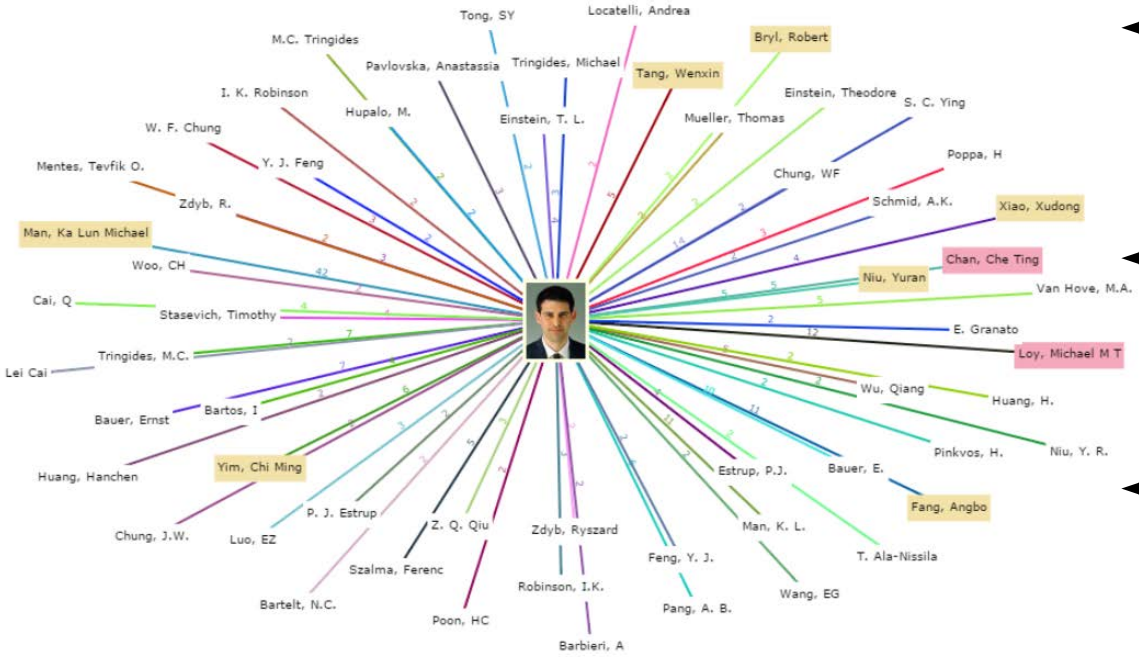
HKUST Faculty Members Other HKUST Members Others Last update: 2017-04-11 00:19:46

VISUALIZATION OF EGO-NETWORK



Michael S. Altman's ego-network visualization from HKUST Scholarly Publications

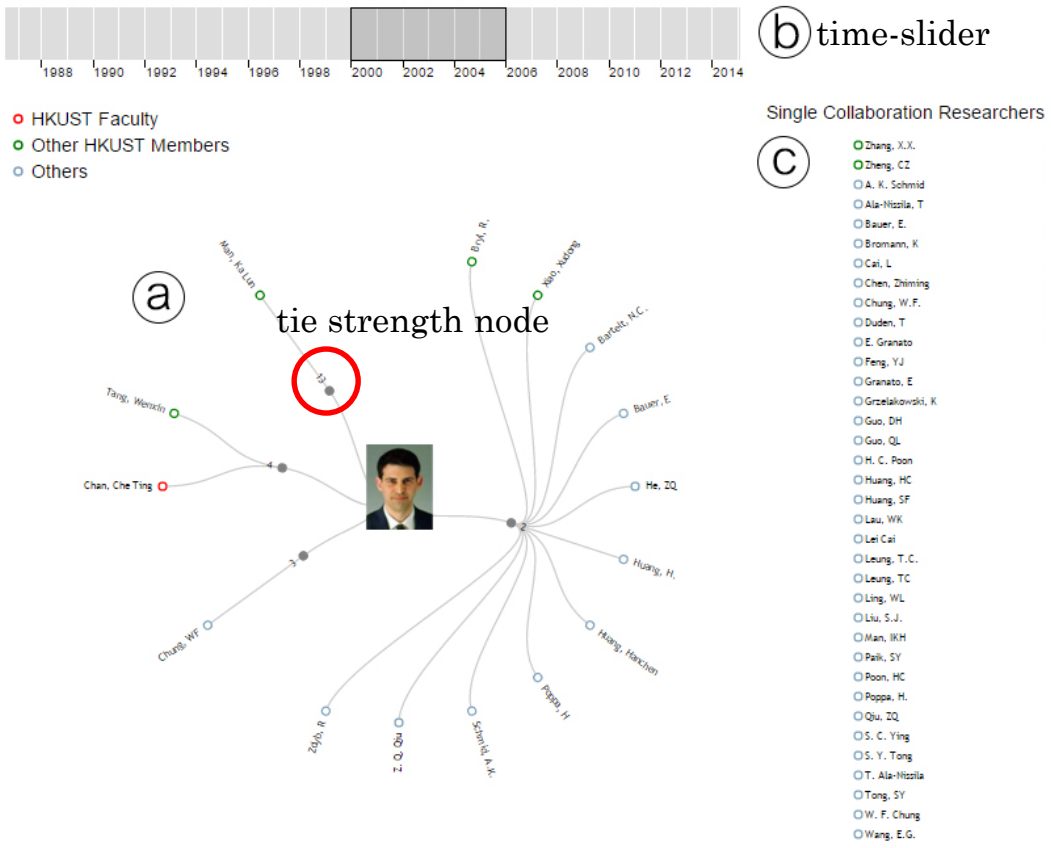
VISUALIZATION OF EGO-NETWORK



Michael S. Altman's ego-network visualization from HKUST Scholarly Publications

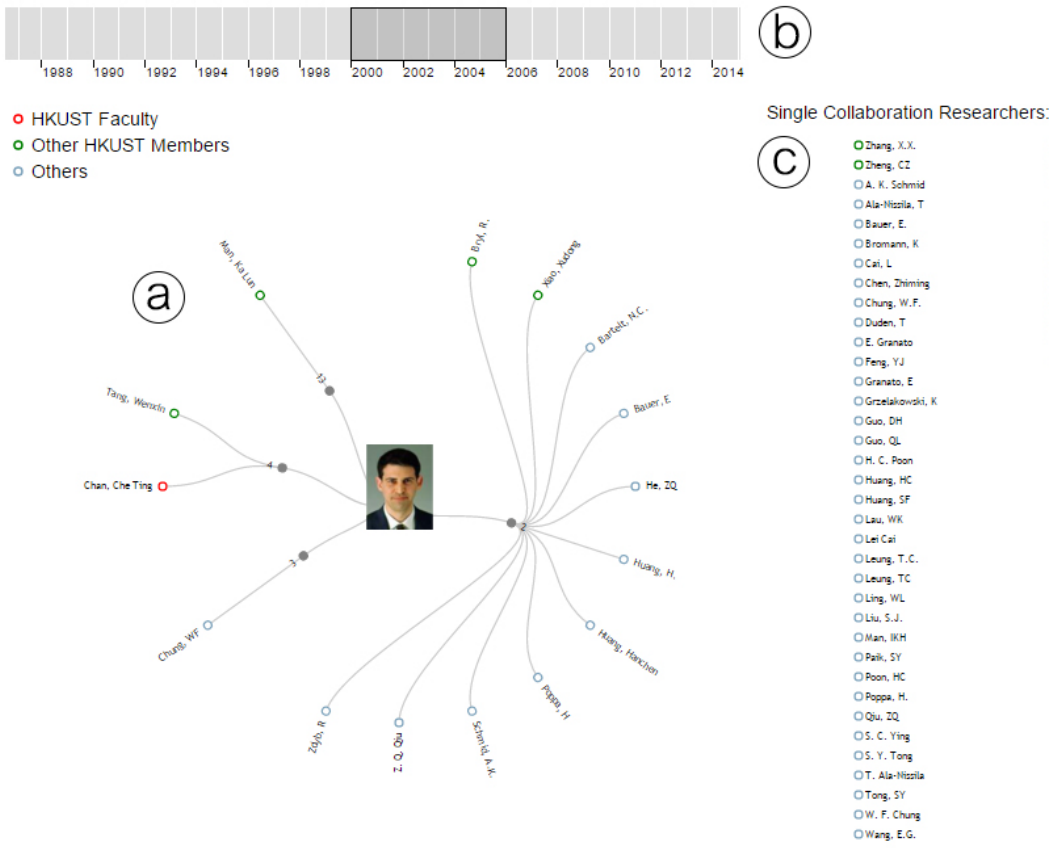
- Do not utilize benefits from animation and color
- Tie strength value on each link is hard to read and compare
- Do not include temporal information

TIME TREE DESIGN



- Alters are grouped by tie strength nodes according to the tie strength value
- Alter nodes shown here correspond to a specified time range from the time-slider
- If the layout is too dense, alters whose tie strength is 1 are listed in the right pane
- Node colors represent each type of alters

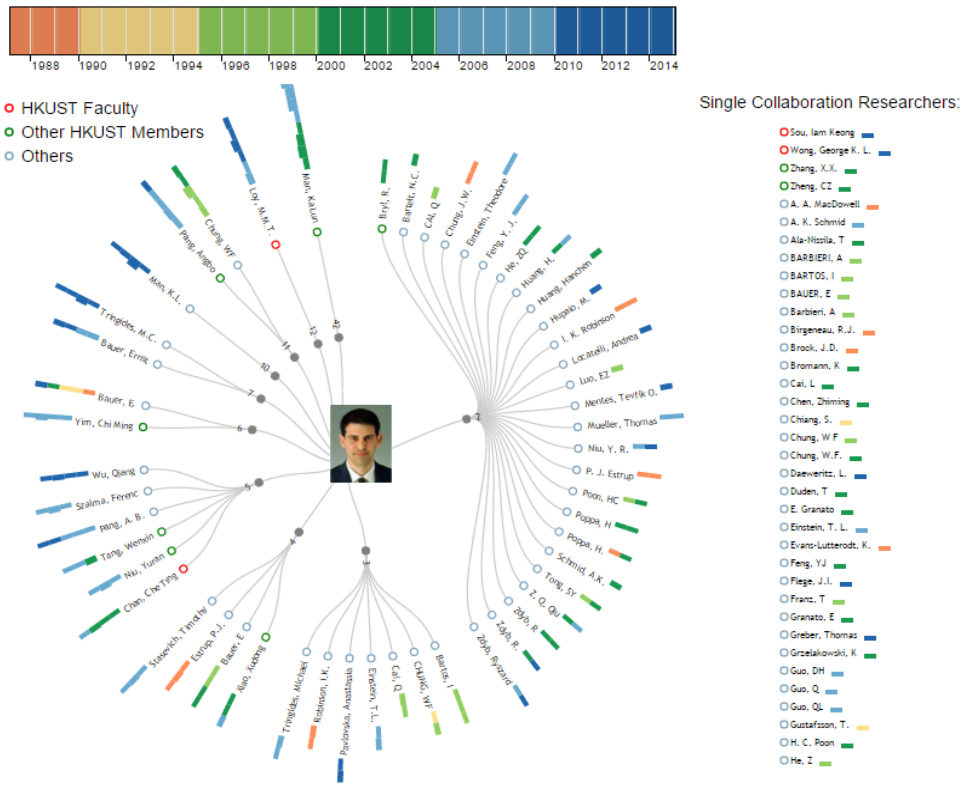
Time tree design



Limitations

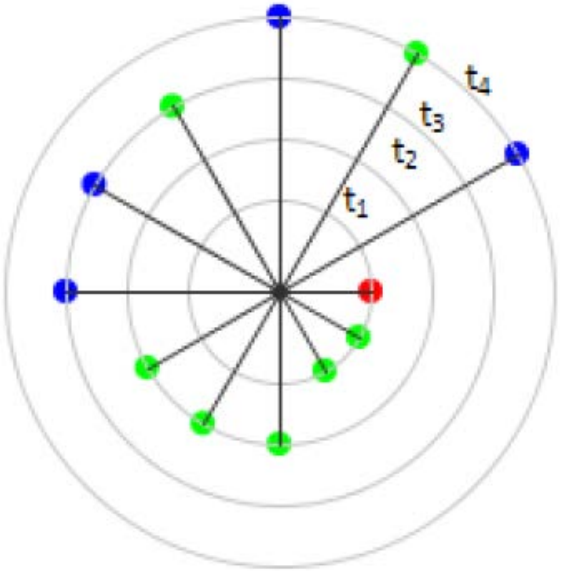
- Do not show overall trends of alters and tie strength value
- Hard to compare between two time steps

Time Tree with Color Bars



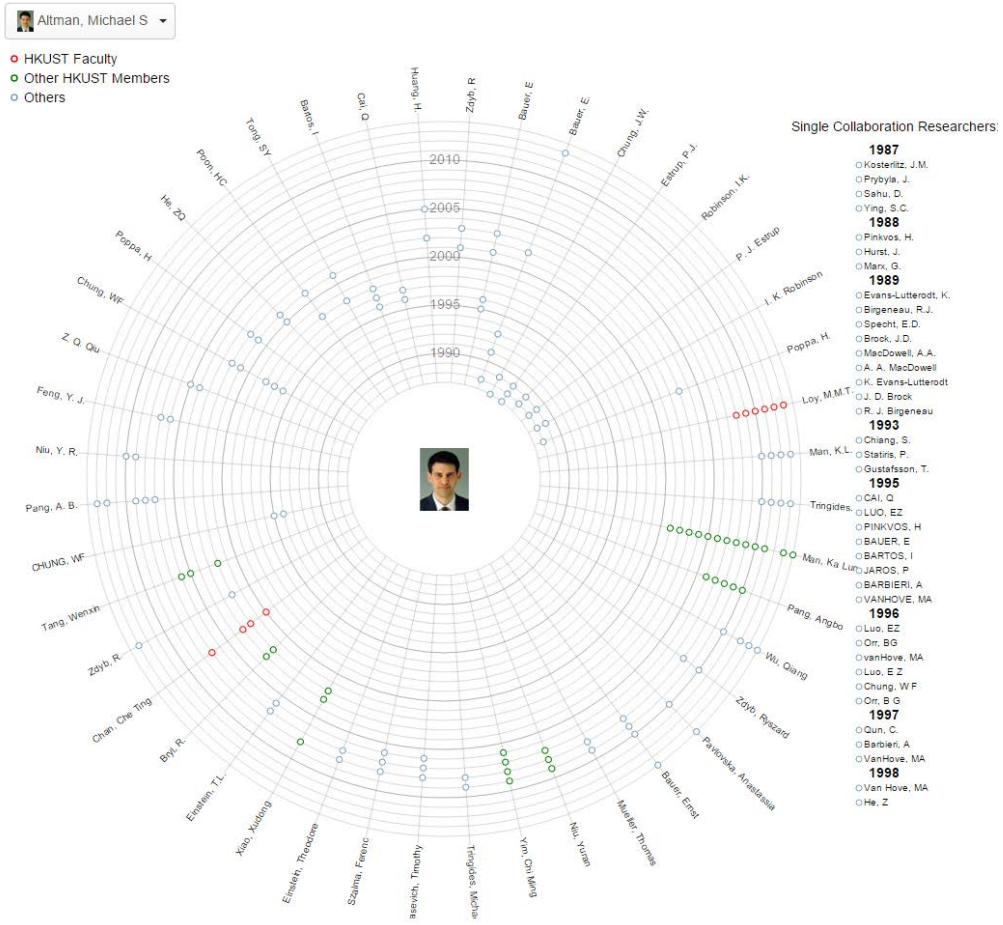
- Colors are assigned for every group of 5 years
- Color bars are added next to alter nodes
- Color bar represents a year that alters interact with the ego
- Height of color bar encodes tie strength respect to that year
- Node colors represent each type of alters

Concentric circle design



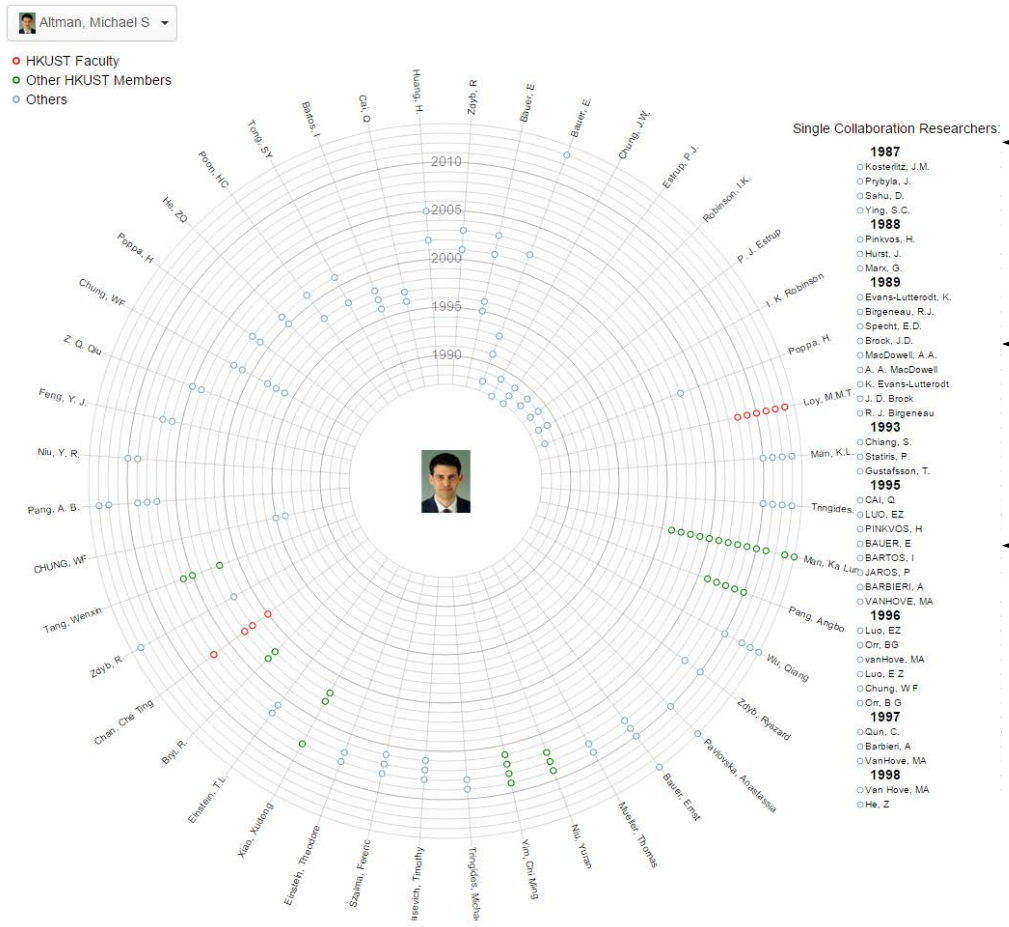
Tree ring ego network layout principle from [2]

Concentric circle design



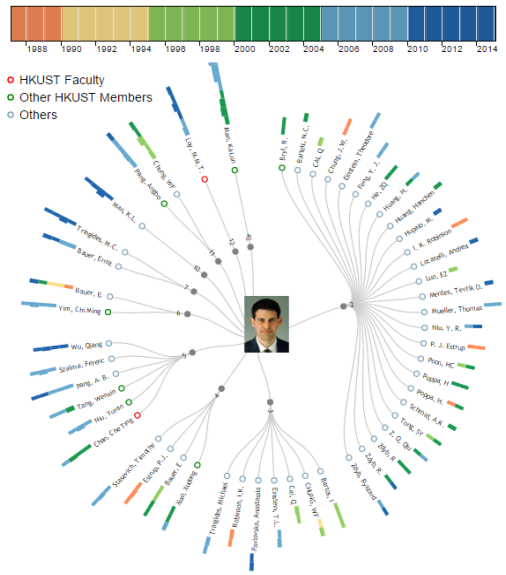
- Each ring represents a one year period
- Alters have their own specific angular positions and are placed according to the time they interacted with the ego
- Radius of each circle encodes tie strength value.
- If the layout is too dense, alters whose tie strength is 1 are listed in the right pane

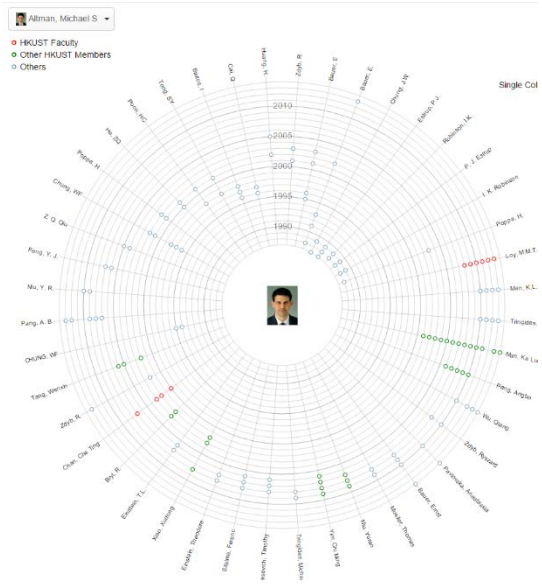
Concentric circle design



- Encode temporal information by concentric circle
- Trends can be observed from nodes appearing on each circle
- Allow comparison between multiple time steps

Comparison

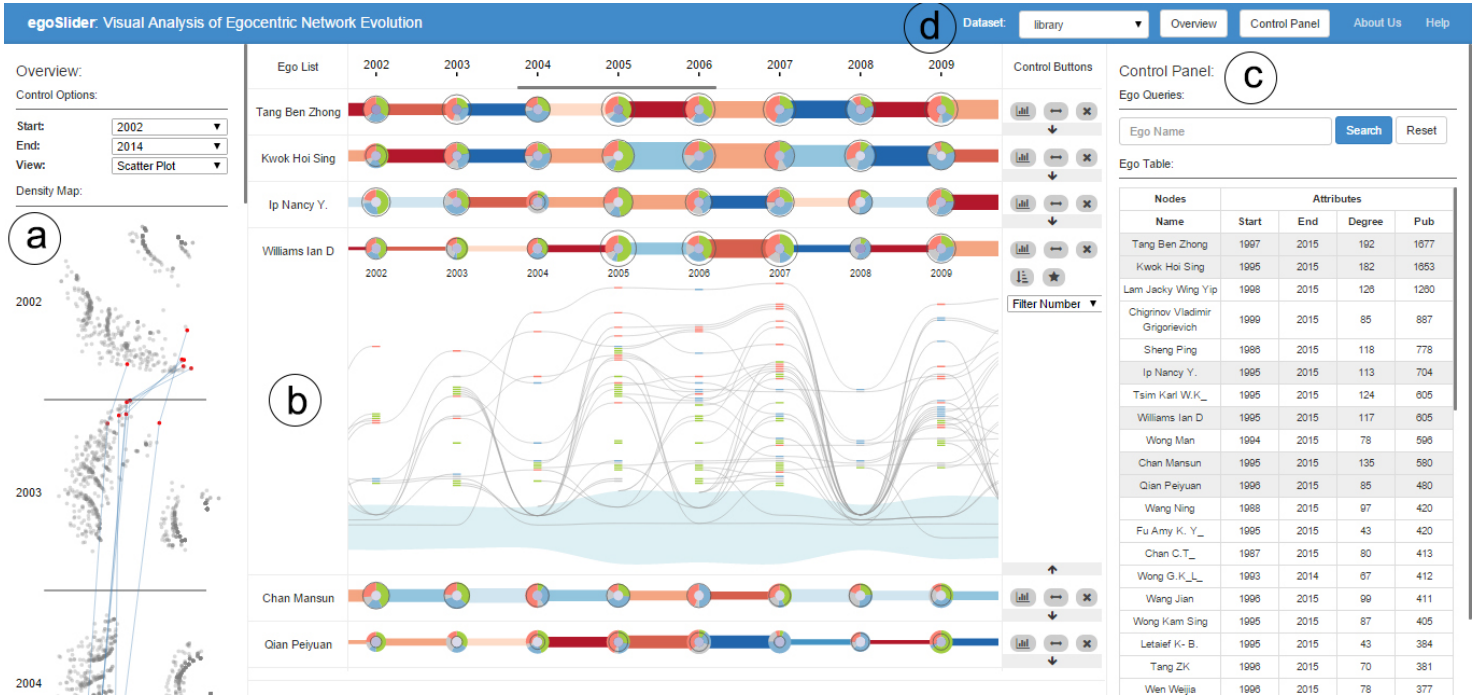




- More compact layout
- Suitable for analysis on specific alters

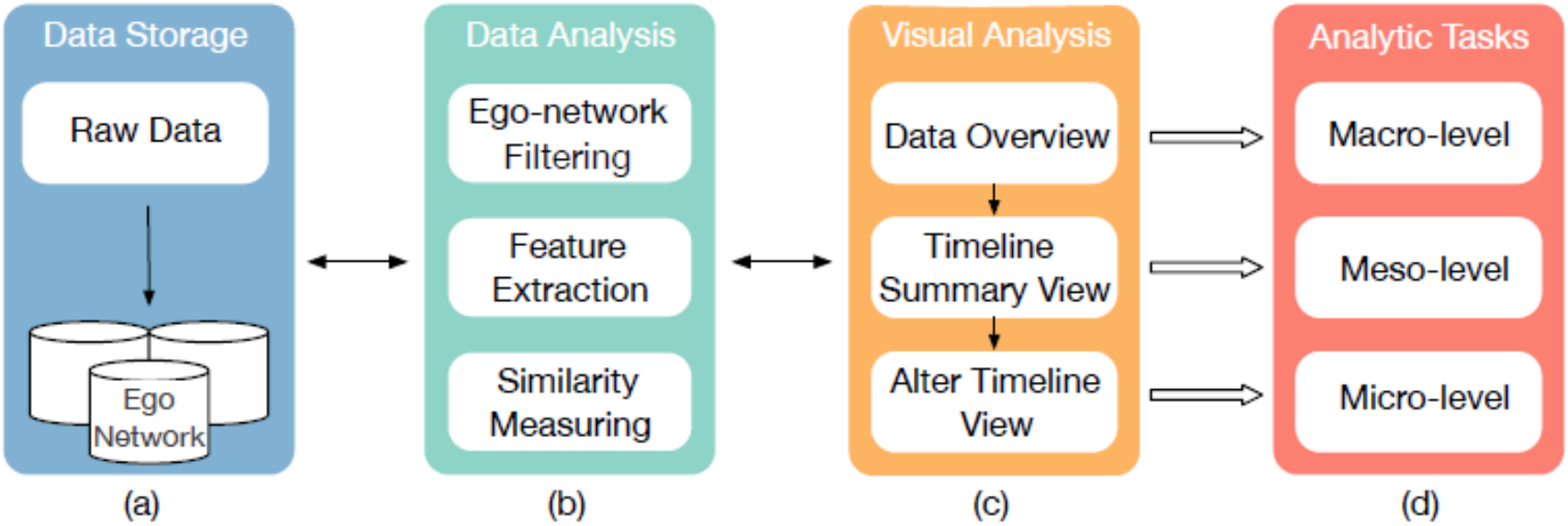
- Require more screen space
- Better comparison between time steps

VISUAL ANALYTICS OF EGO-NETWORK



egoSlider [4], a visual analysis tool for exploring and analyzing dynamic ego-networks.

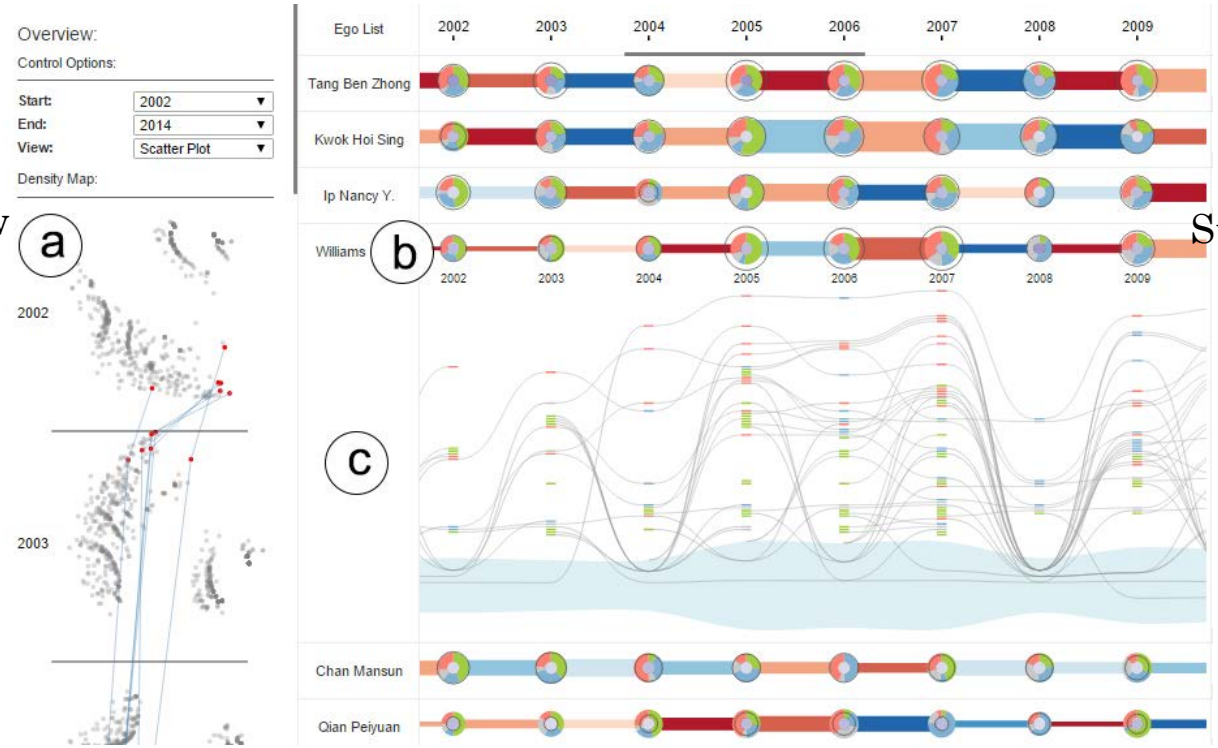
System overview



Macroscopic level tasks focus on the overview of all ego-networks
Mesoscopic level tasks focus on overall comparison of multiple ego-networks
Mesoscopic level tasks focus on details of specific ego-network

Main interface

Data Overview

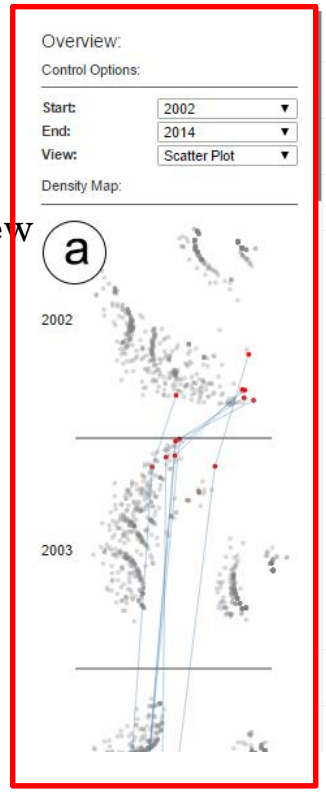


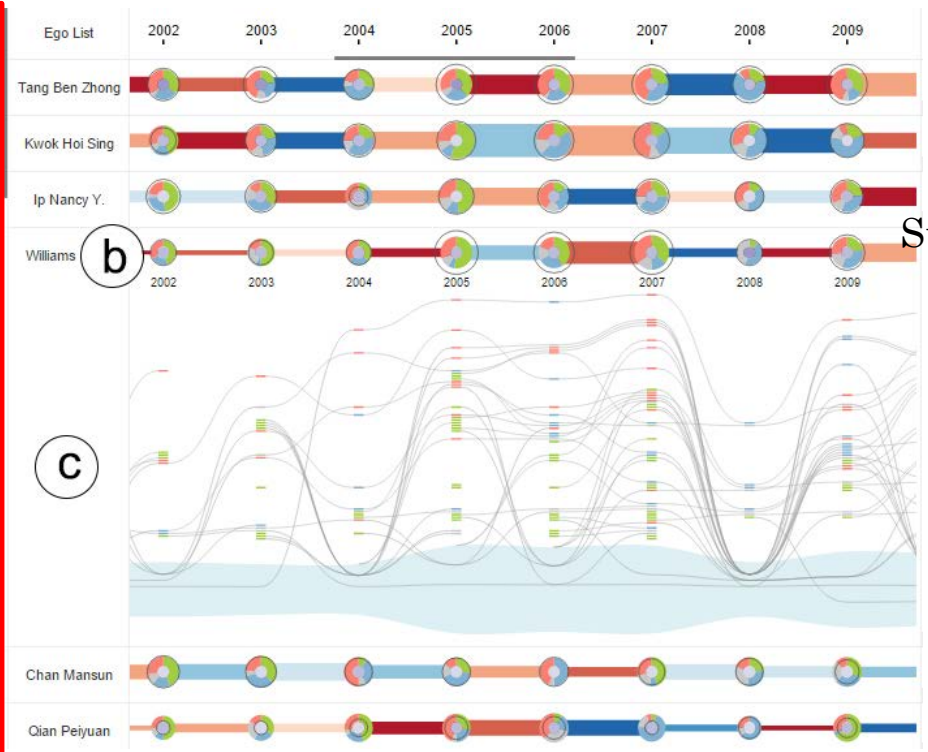
Summary Timeline View

Alter Timeline View

Main interface

Data Overview





Summary Timeline View

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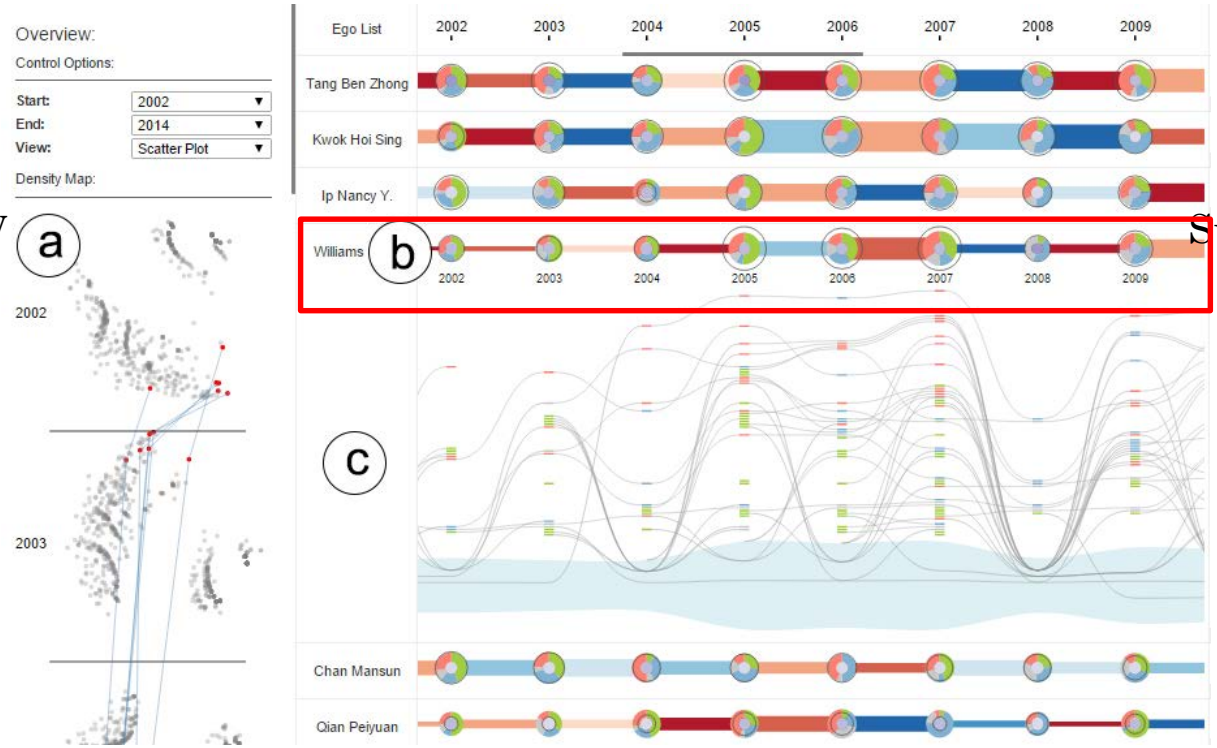
Main interface

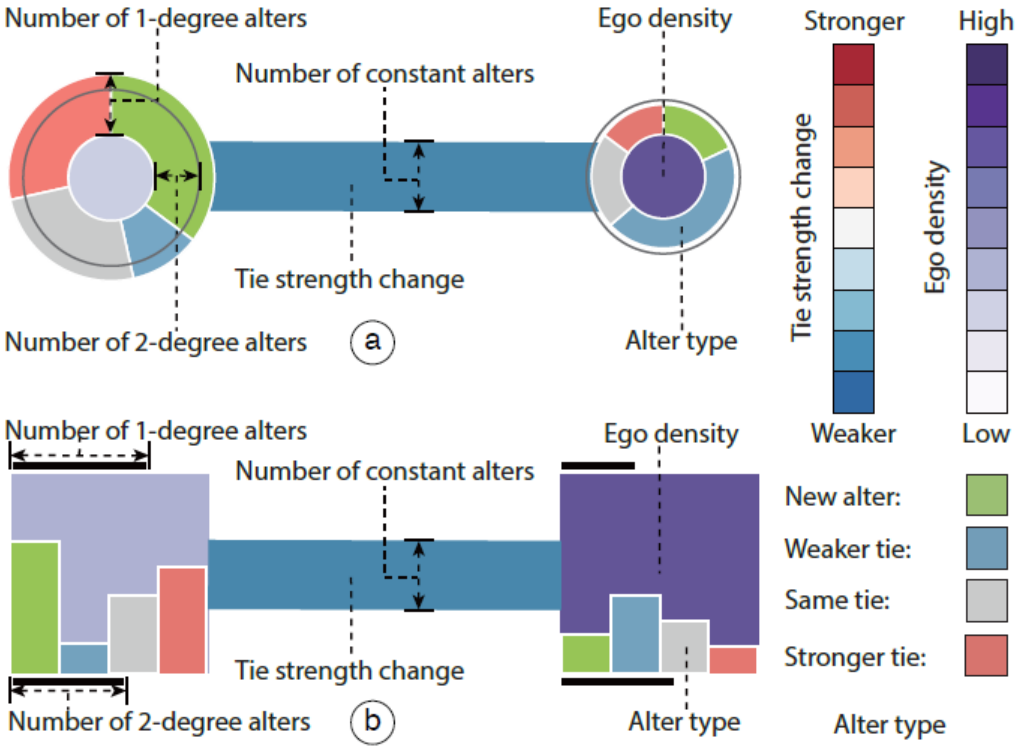
Data Overview



Summary Timeline View

Alter Timeline View

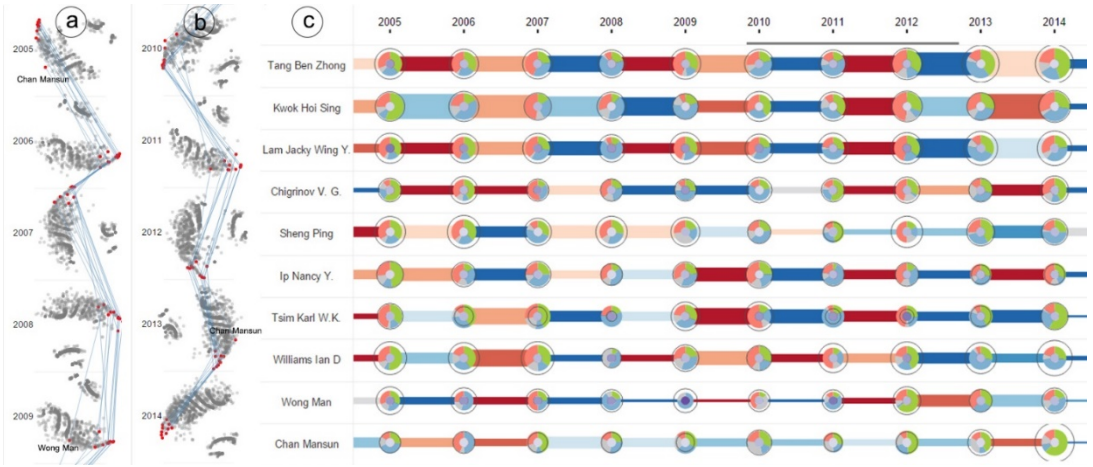
Summary Timeline View



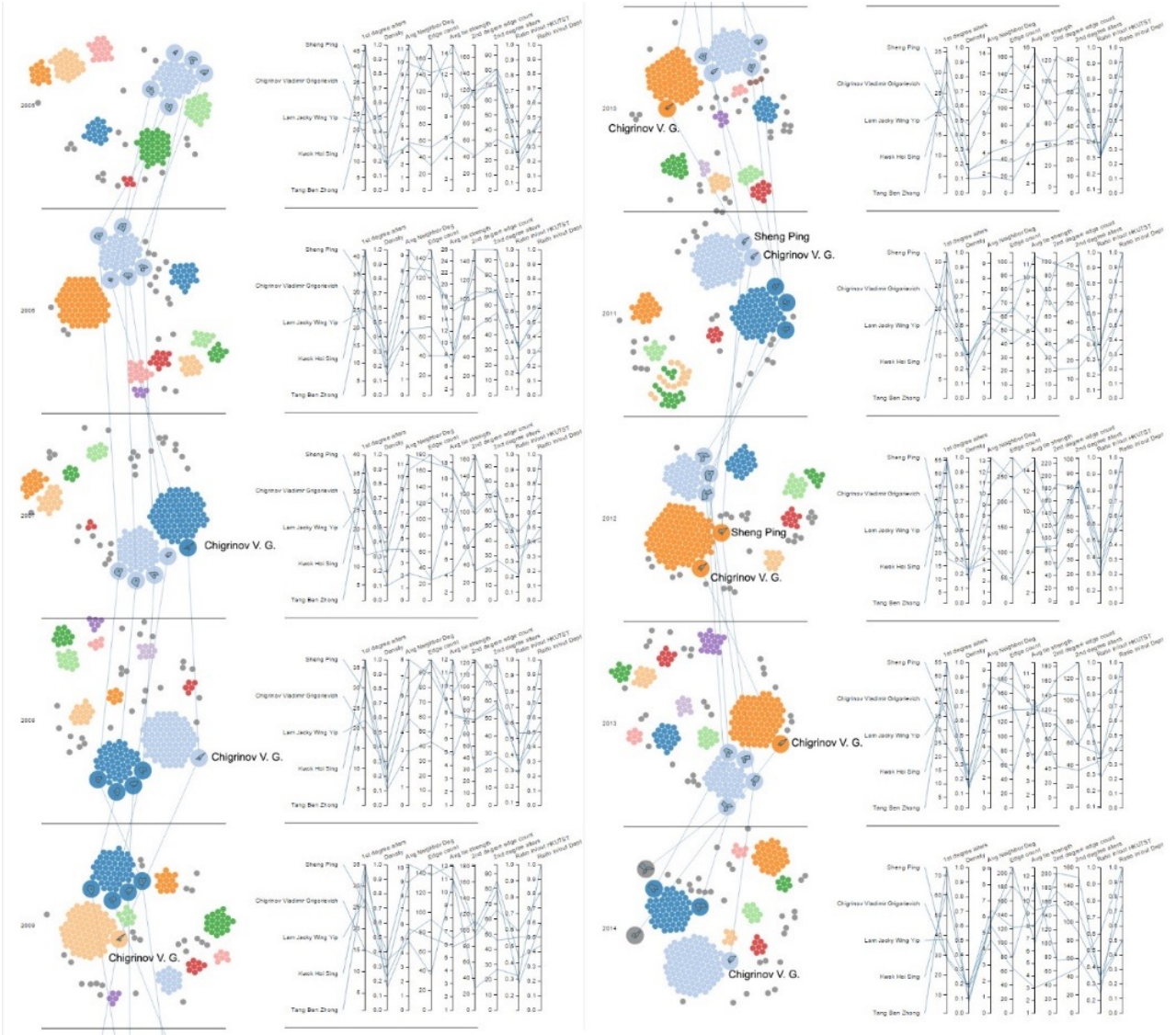
Snapshot glyph and transition glyph

Case Study:
HKUST Collaboration Network

- Retrieve dataset from HKUST Scholarly Publications
- 57383 publications from 1983-2014
- 4189 distinct ego-networks are constructed.
- Tie strength between two authors is defined as the number of papers they co-author in a year.



Case Study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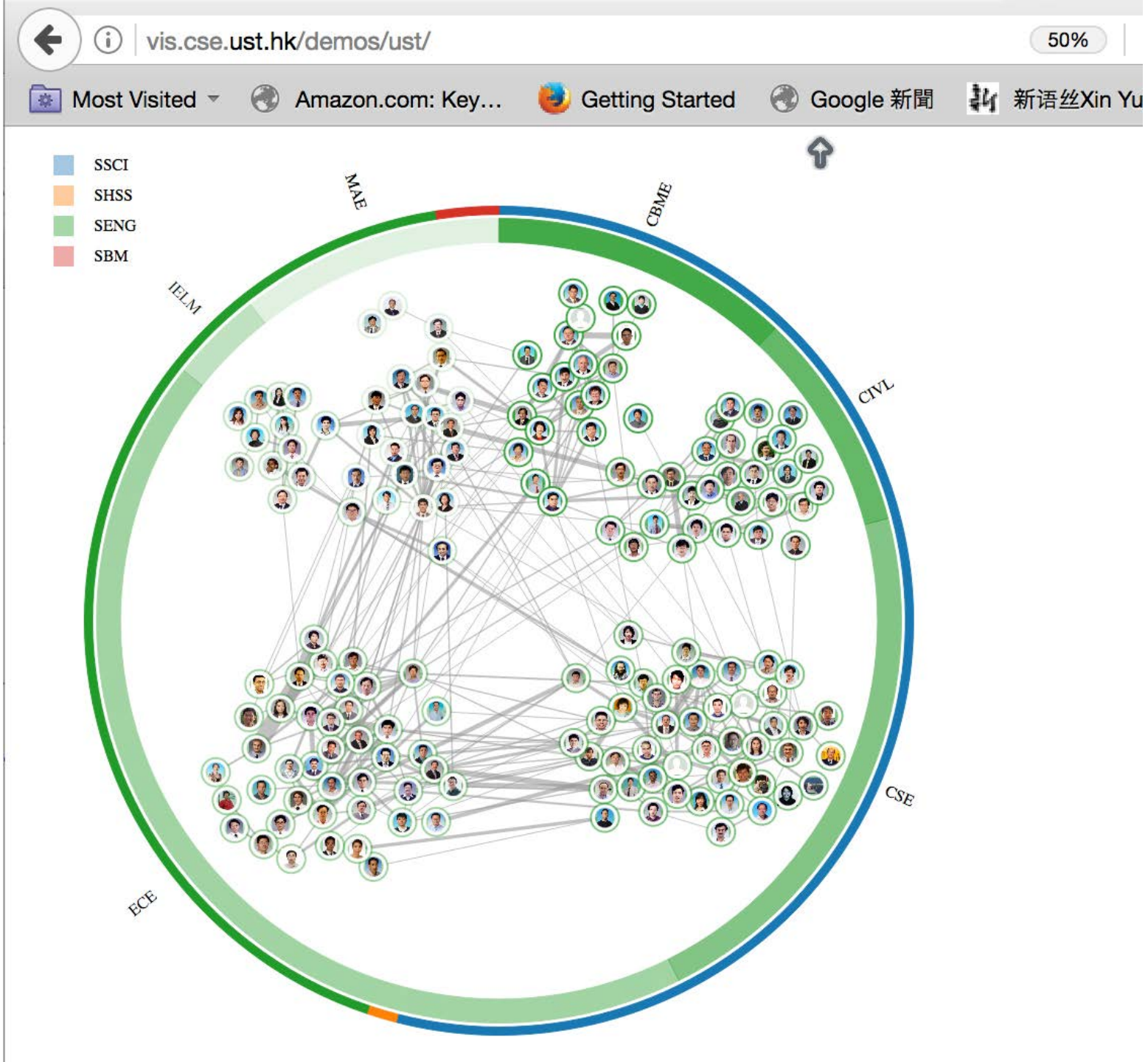
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MAE
CBME
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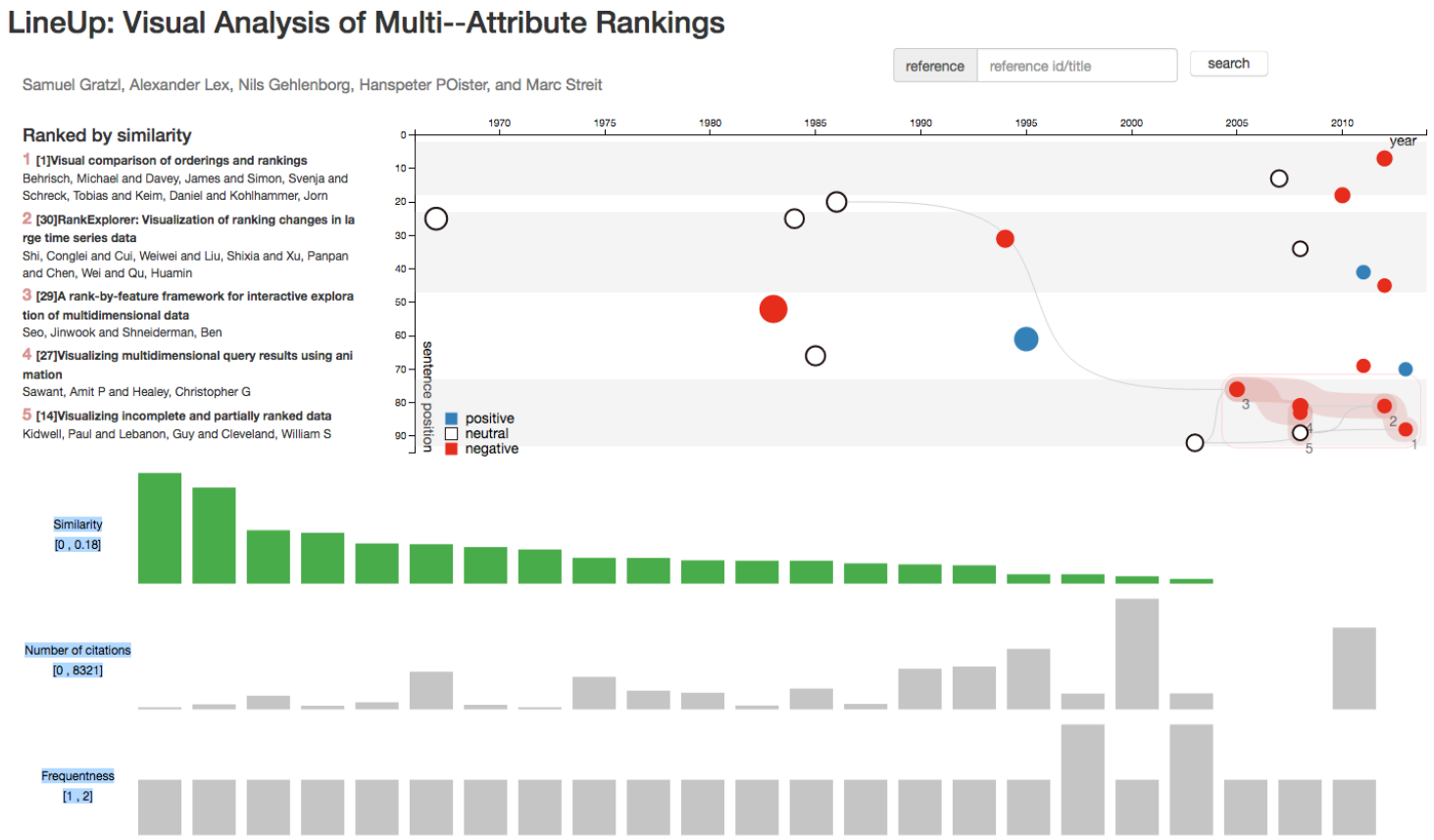
CIVL
CSE
ECE

Paths of PG students

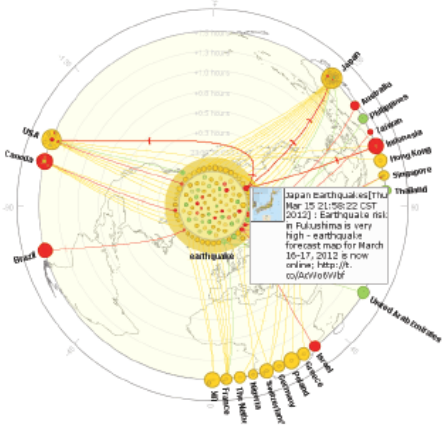
- http://vis.cse.ust.hk/pqeDefenceVis/

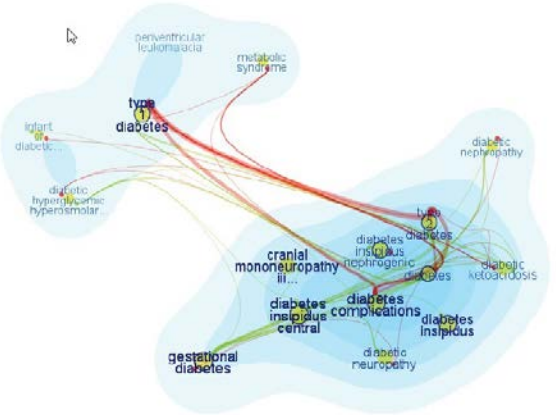
Presenting a Paper

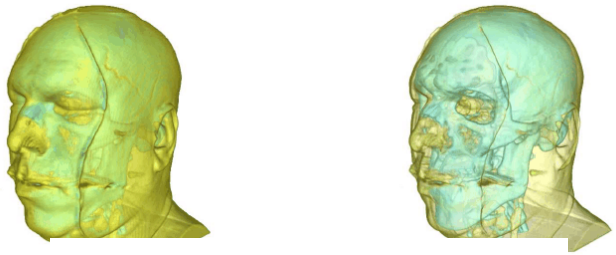
- http://vis.cse.ust.hk/vispaper/#!/

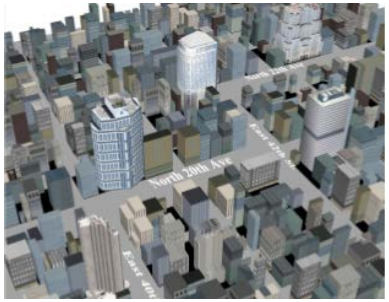


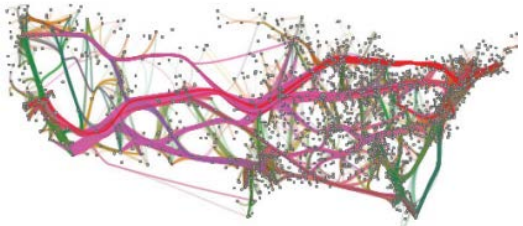
Thank You!

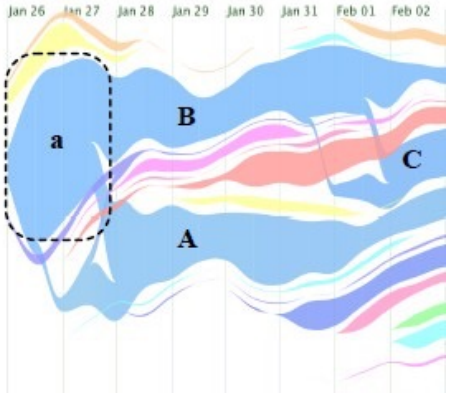


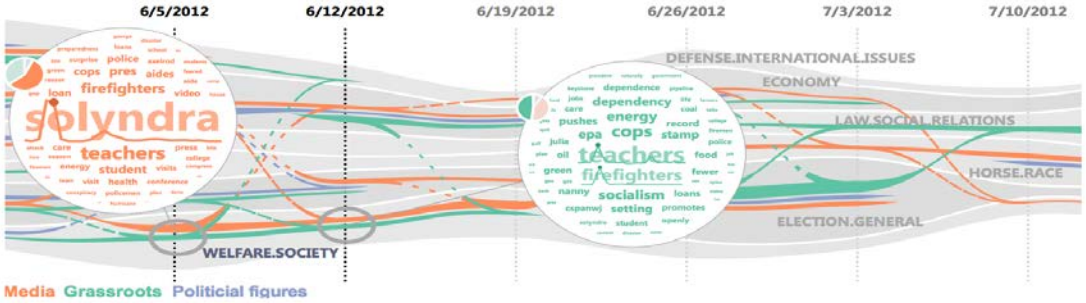












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