

VIS 2015

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egoSlider: Visual Analysis of Egocentric Network Evolution

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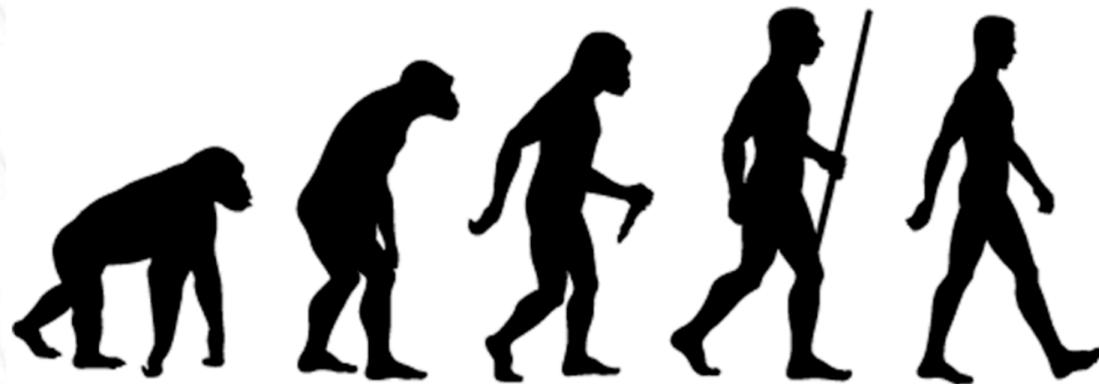
HUAWEI

Definition

- Ego-network: the relationships between a specific individual, i.e., the **ego** and people connected to it, i.e., the **alters**
- Analyzing ego-network evolution provides huge insights to many domains:



Sociology



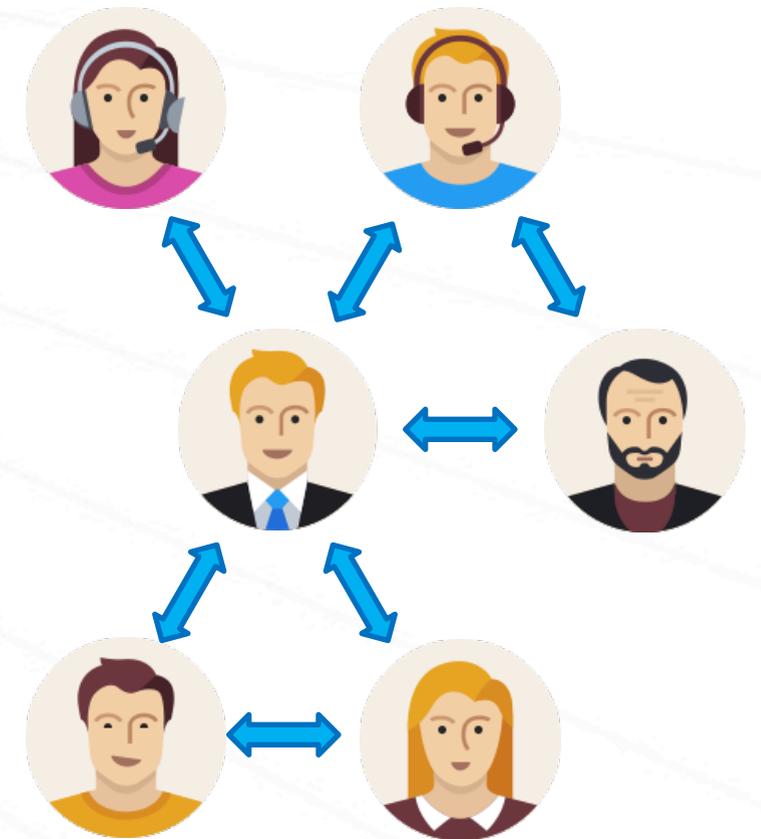
Anthropology



Psychology

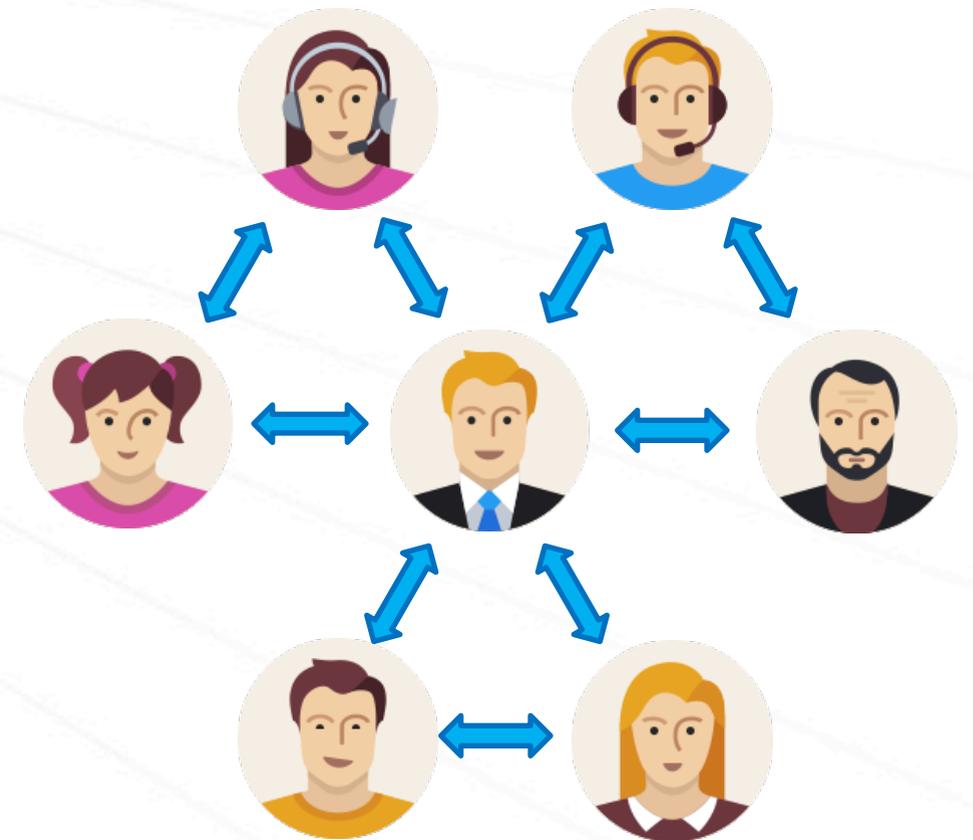
Challenges

- Analyzing ego-network is challenging due to the complex time-varying structures



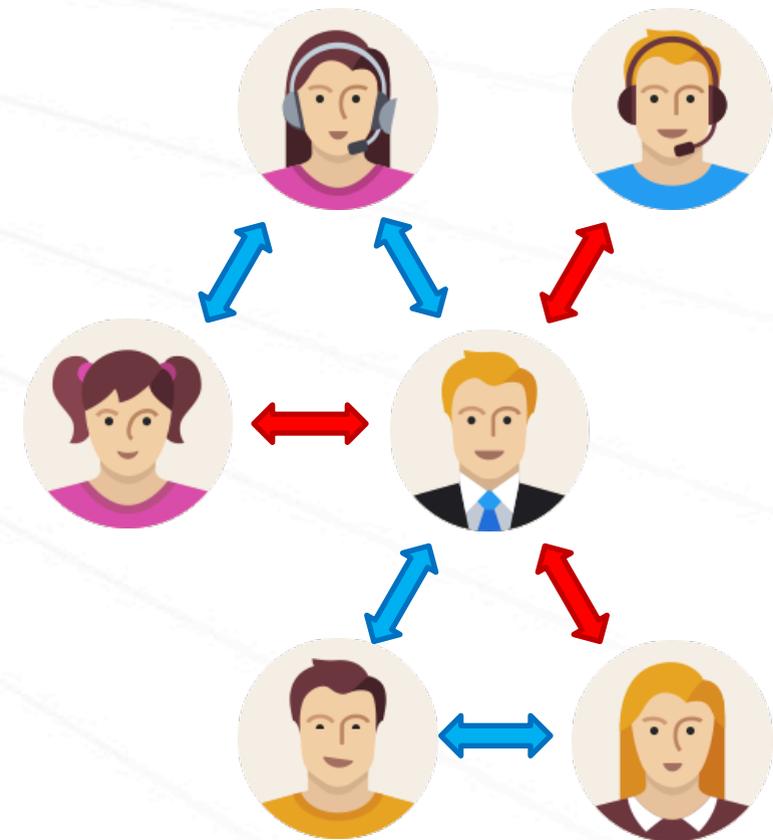
Challenges

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 - *Alters come and leave*



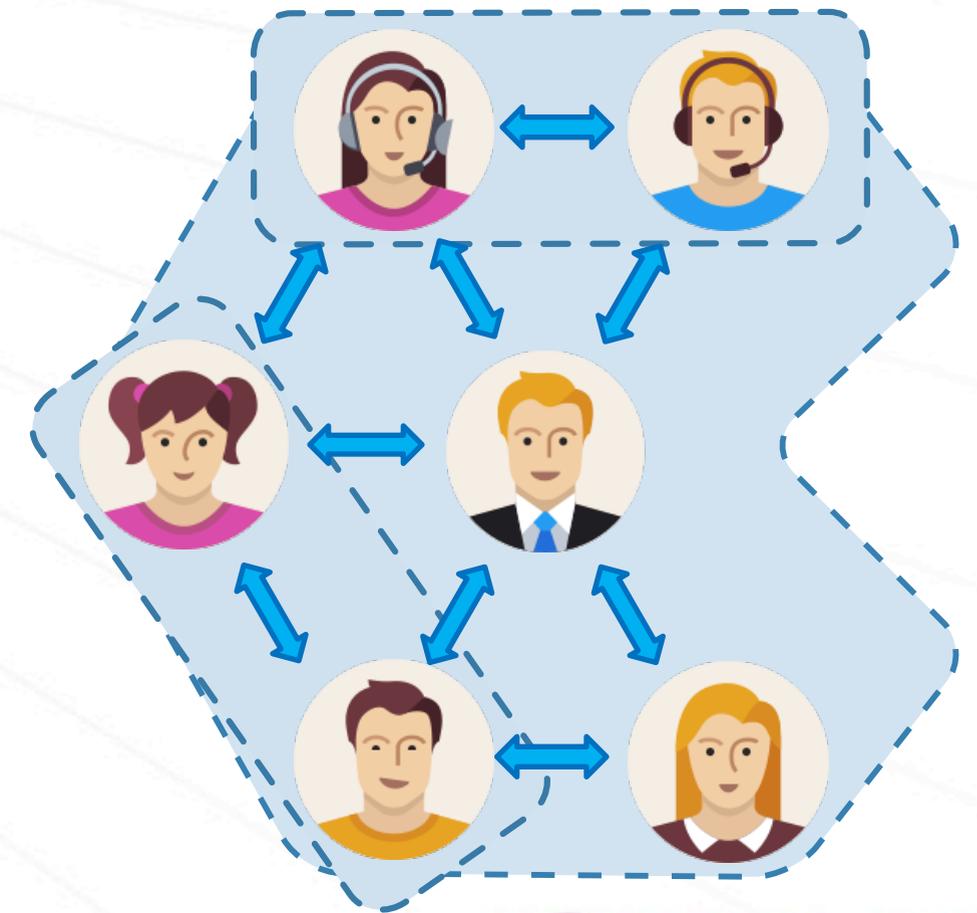
Challenges

- Analyzing ego-network is **challenging** due to the **complex time-varying structures**
 - *Alters come and leave*
 - *Ties grow stronger and fade away*



Challenges

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 - *Alter communities merge and split*



Motivation

- Analyzing ego-network is challenging due to the complex time-varying structures
 - *Alters come and leave*
 - *Ties grow stronger and fade away*
 - *Alter communities merge and split*

Connection strengths and inter-alter relations
are omitted in existing works!

Analytical Questions

- Macroscopic Level
 - *What are the overall patterns of a large group of people's ego-networks at each time step?*

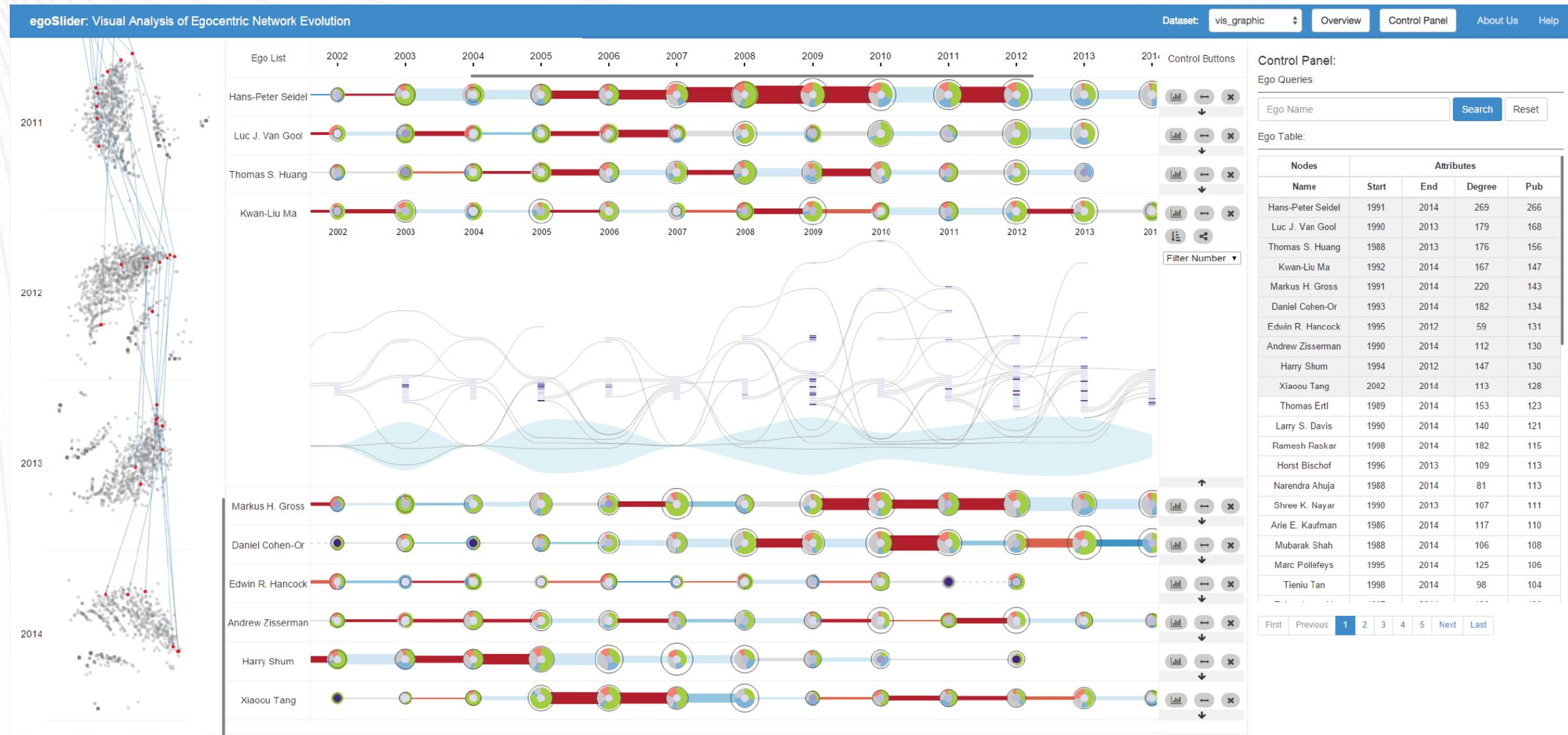
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 - *What are the general similarities between multiple people's ego-networks along time?*

Analytical Questions

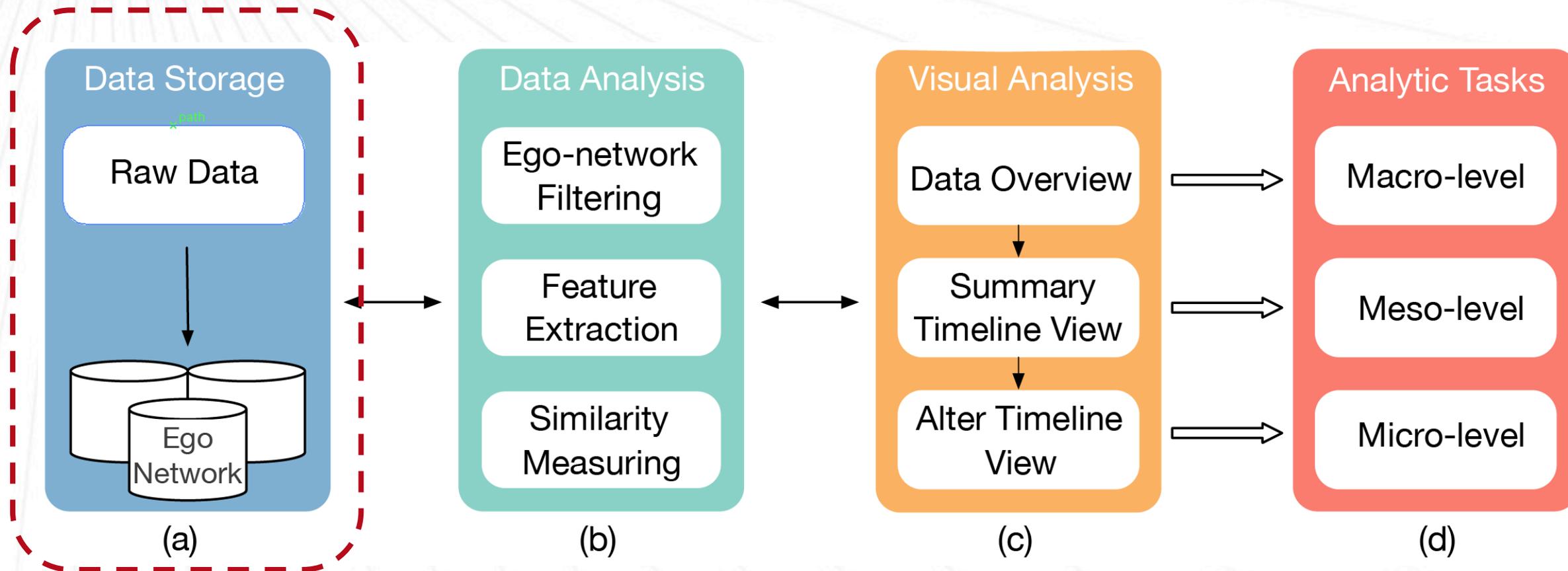
- Macroscopic Level
 - *What are the overall patterns of a large group of people's ego-networks at each time step?*
- Mesoscopic Level
 - *What are the general similarities between multiple people's ego-networks along time?*
- Microscopic Level
 - *How does an ego's alter number and the tie strengths evolve over time? How are the alters connected?*

Demo!



Solution

- egoSlider: an interactive visualization system that enables users to explore, compare, and analyze dynamic ego-network evolutions



egoSlider pipeline

Data Overview – Macroscopic Level

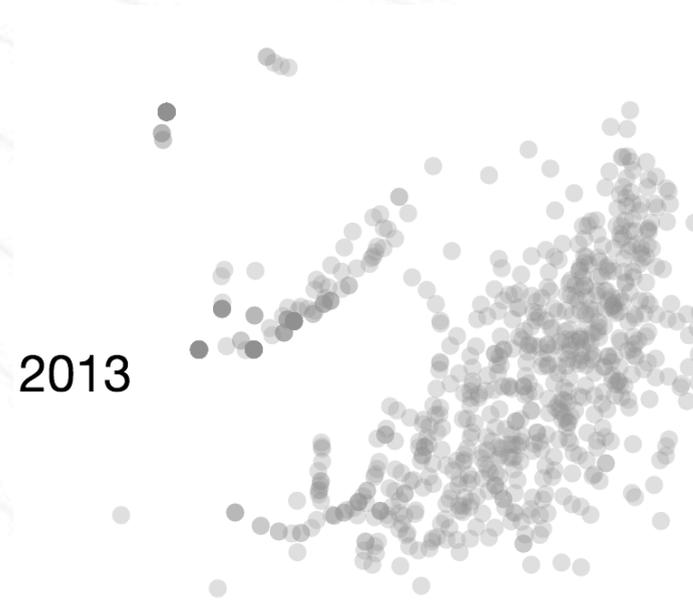
- Goal: obtain a whole picture of all the ego-networks
- Approach: **MDS** (multidimensional scaling)
 - Metric: 7 ego-network attributes including alter number, network density, average tie strength...
 - Distance function: Canberra distance

Data Overview – Macroscopic Level

- Goal: obtain a whole picture of all the ego-networks
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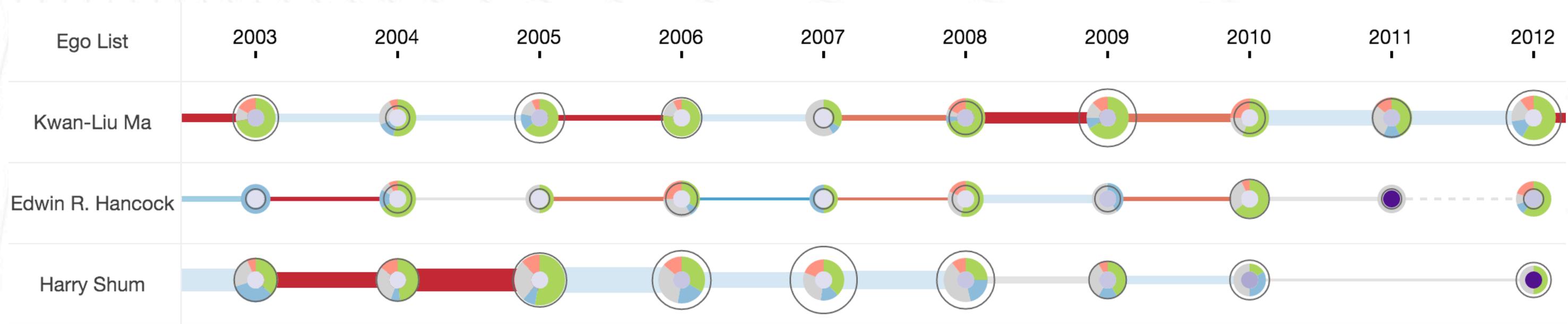
Four groups where one is slightly larger



One giant cluster, a much smaller cluster, and several outliers

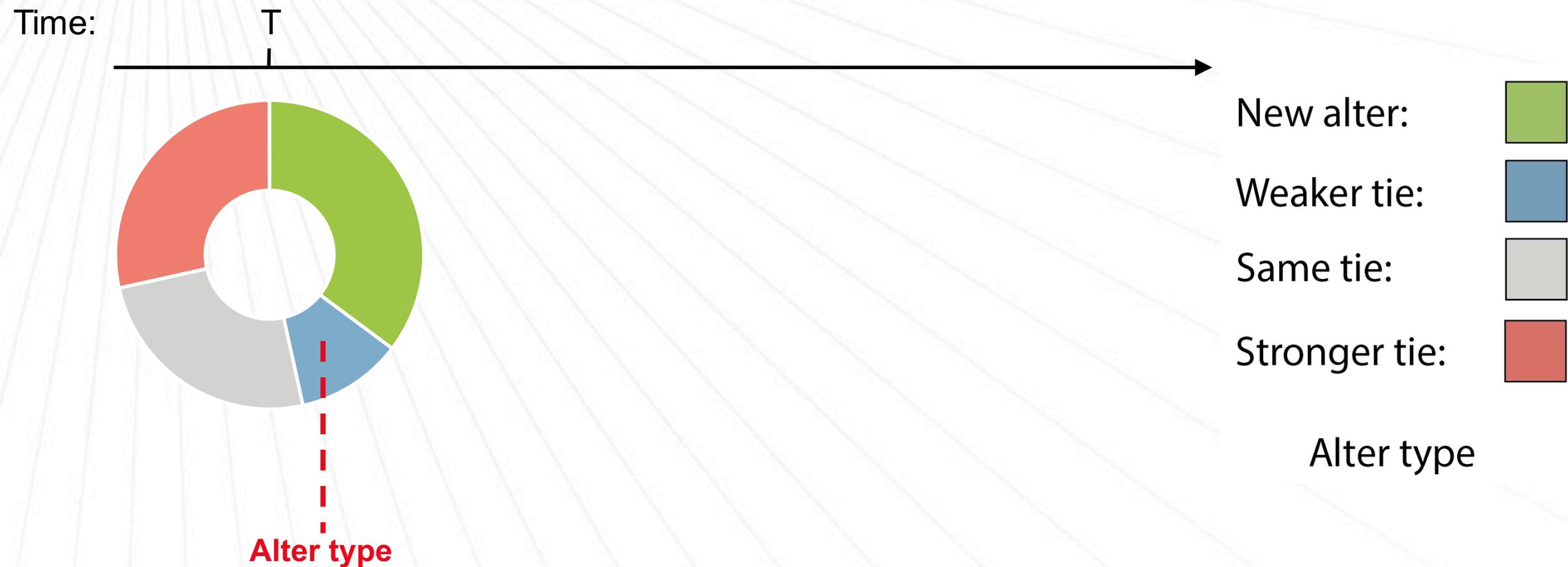
Summary Timeline View – Mesoscopic Level

- Goal: track and compare the statistical feature changes of multiple ego-networks over time
- Approach: snapshot glyph and transition glyph



Summary Timeline View – Mesoscopic Level

- Approach: **snapshot glyph** and transition glyph



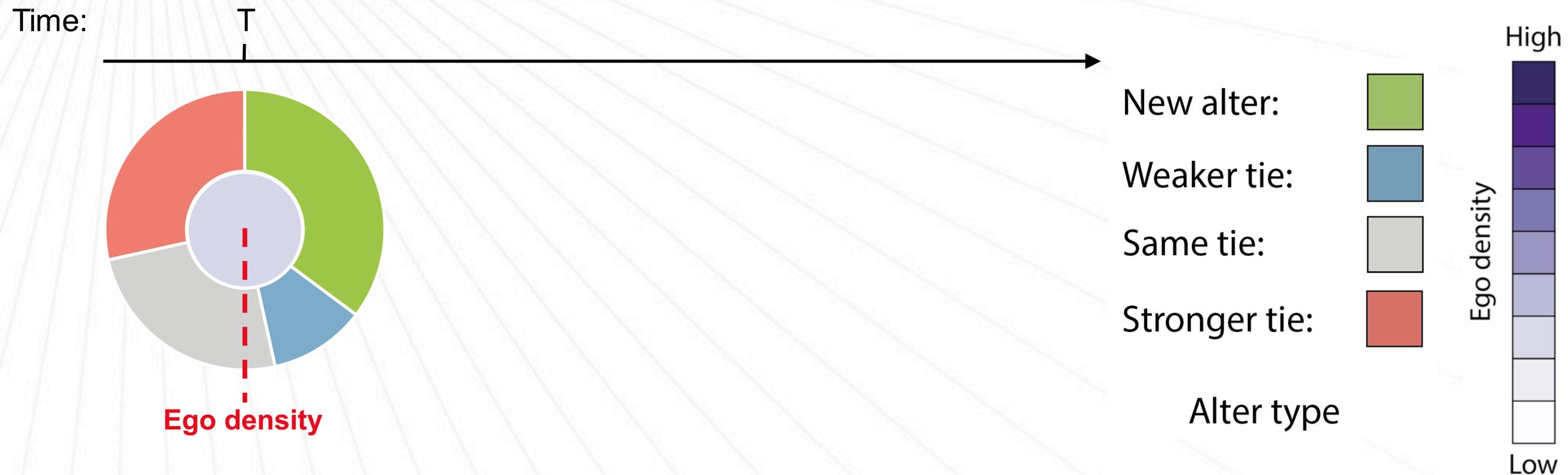
Summary Timeline View – Mesoscopic Level

- Approach: **snapshot glyph** and transition glyph



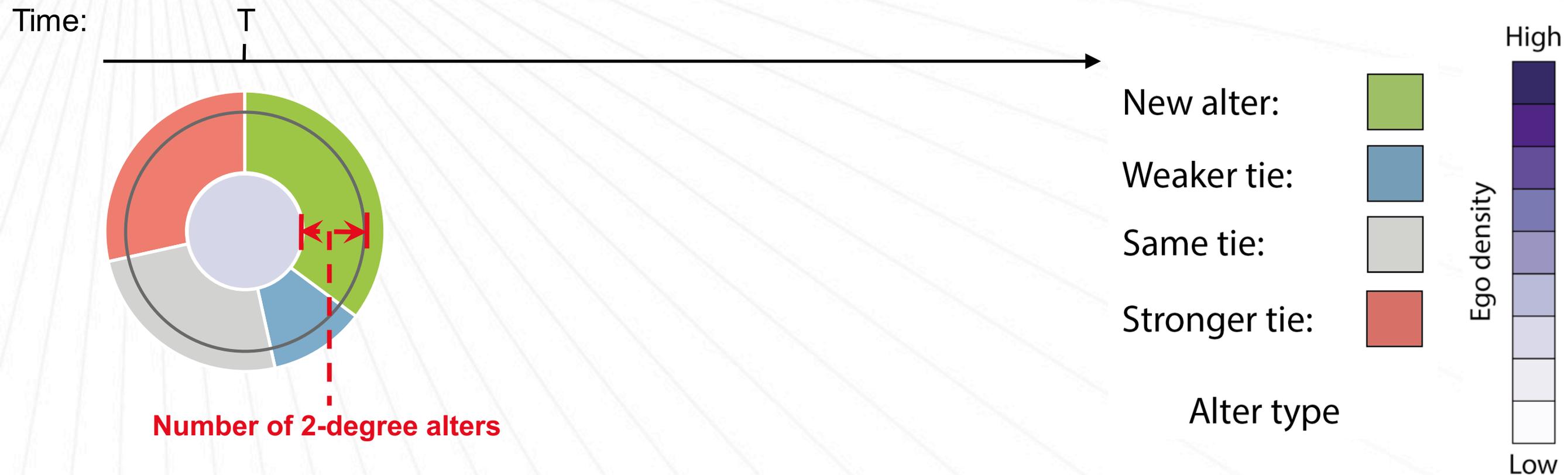
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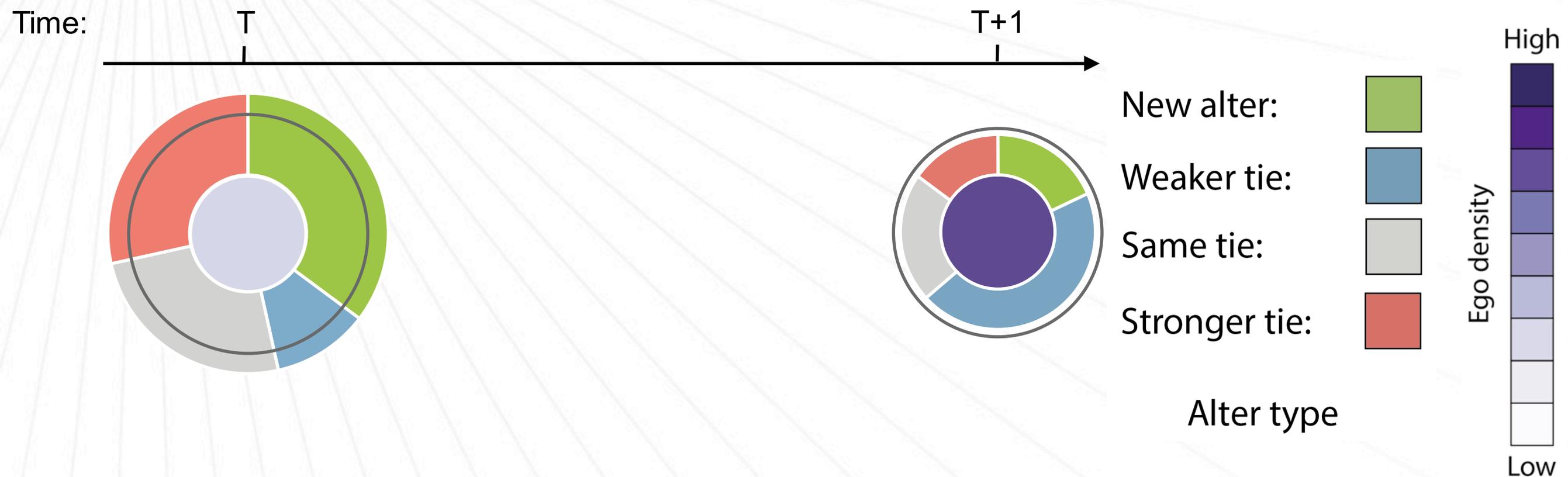
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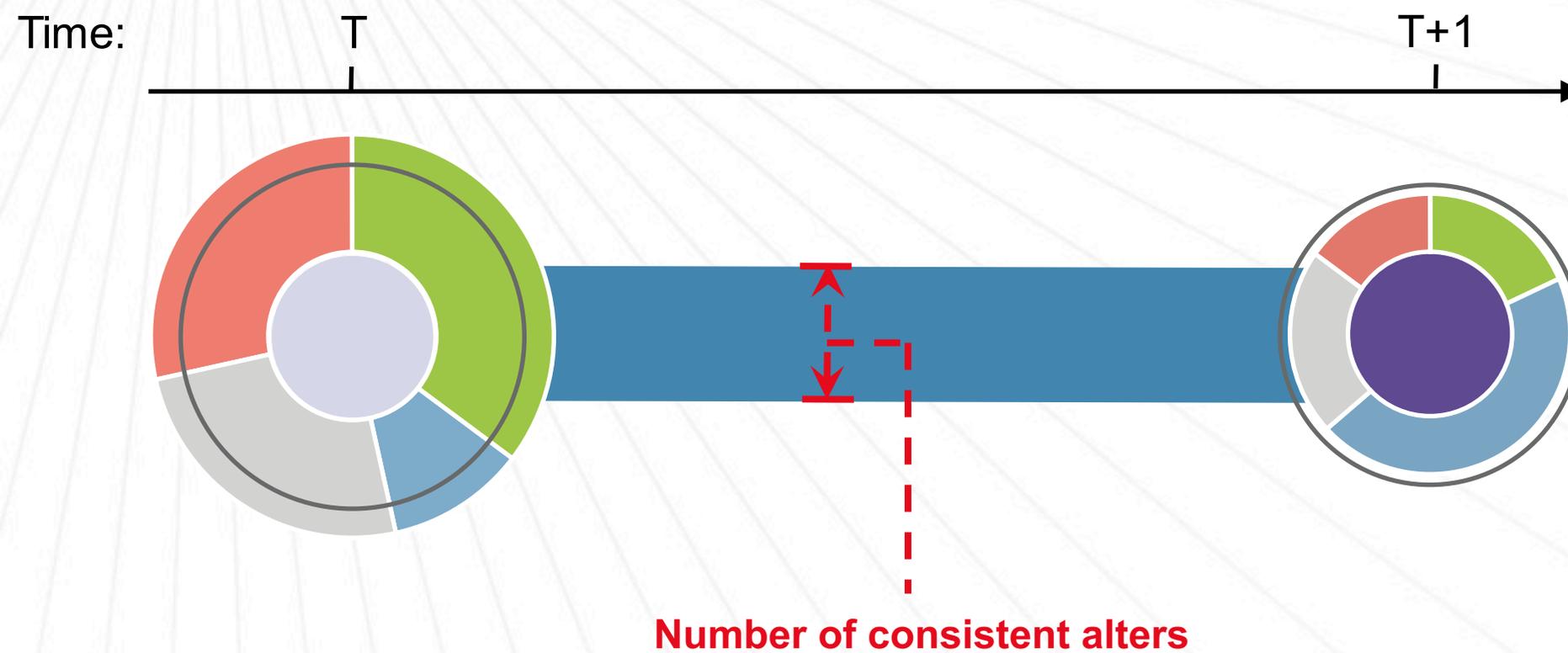
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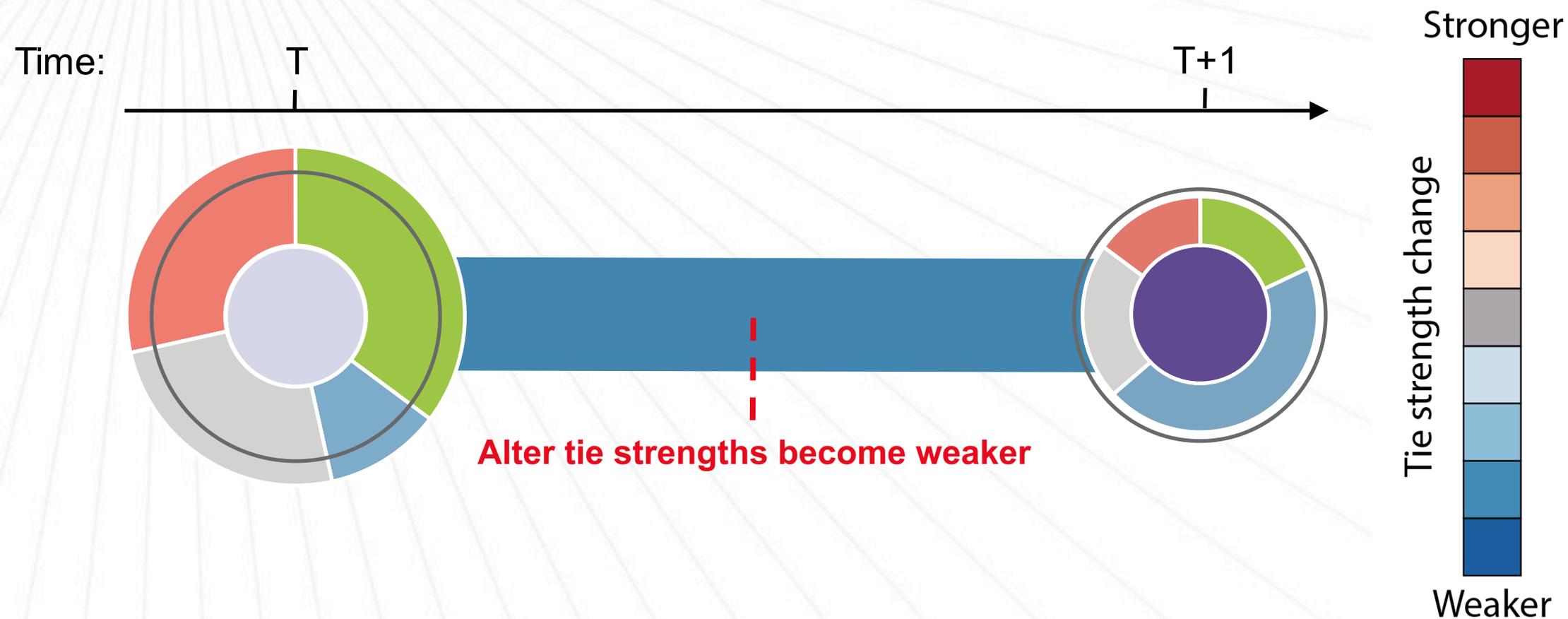
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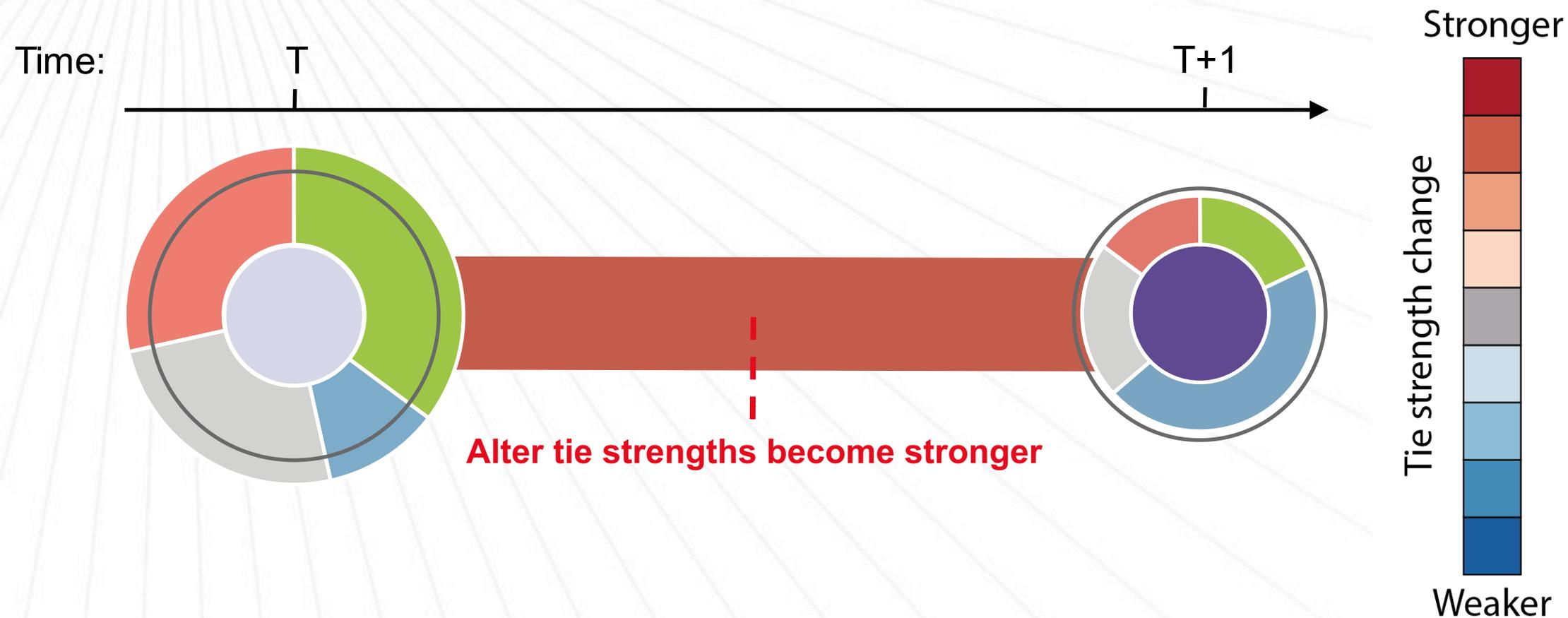
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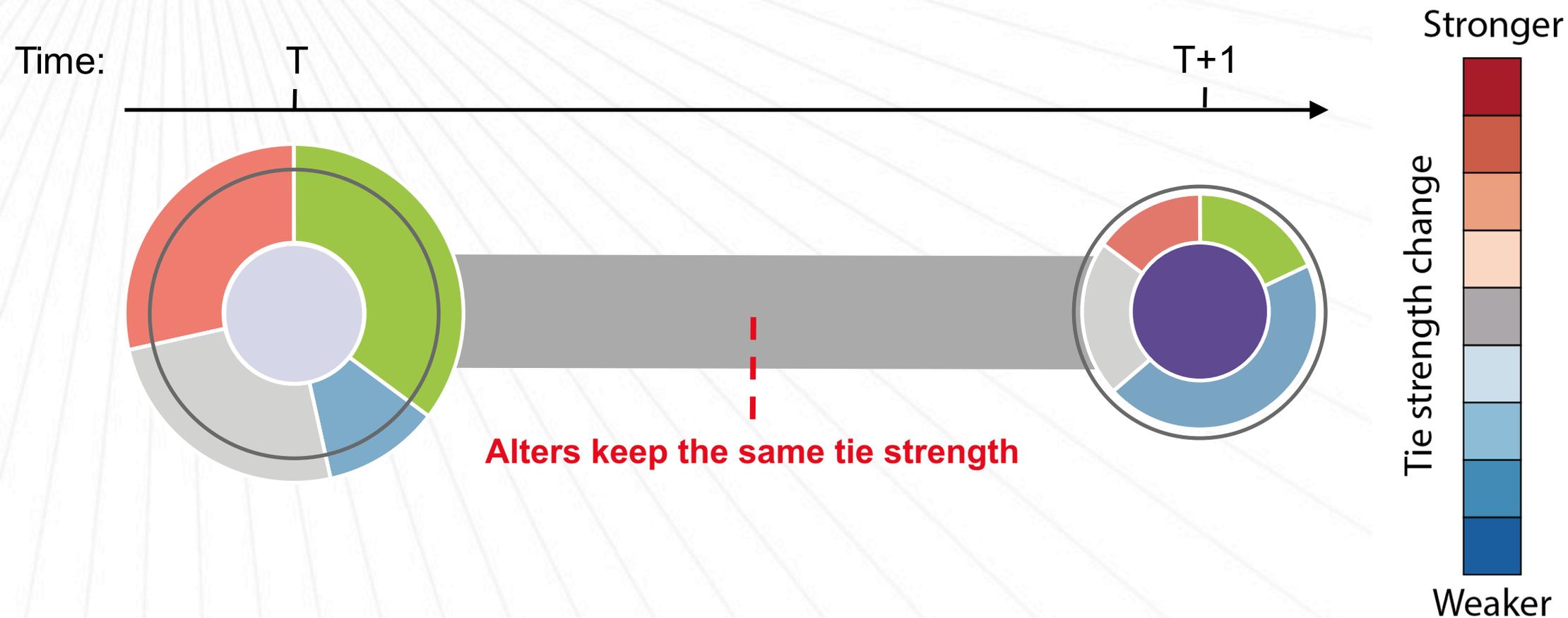
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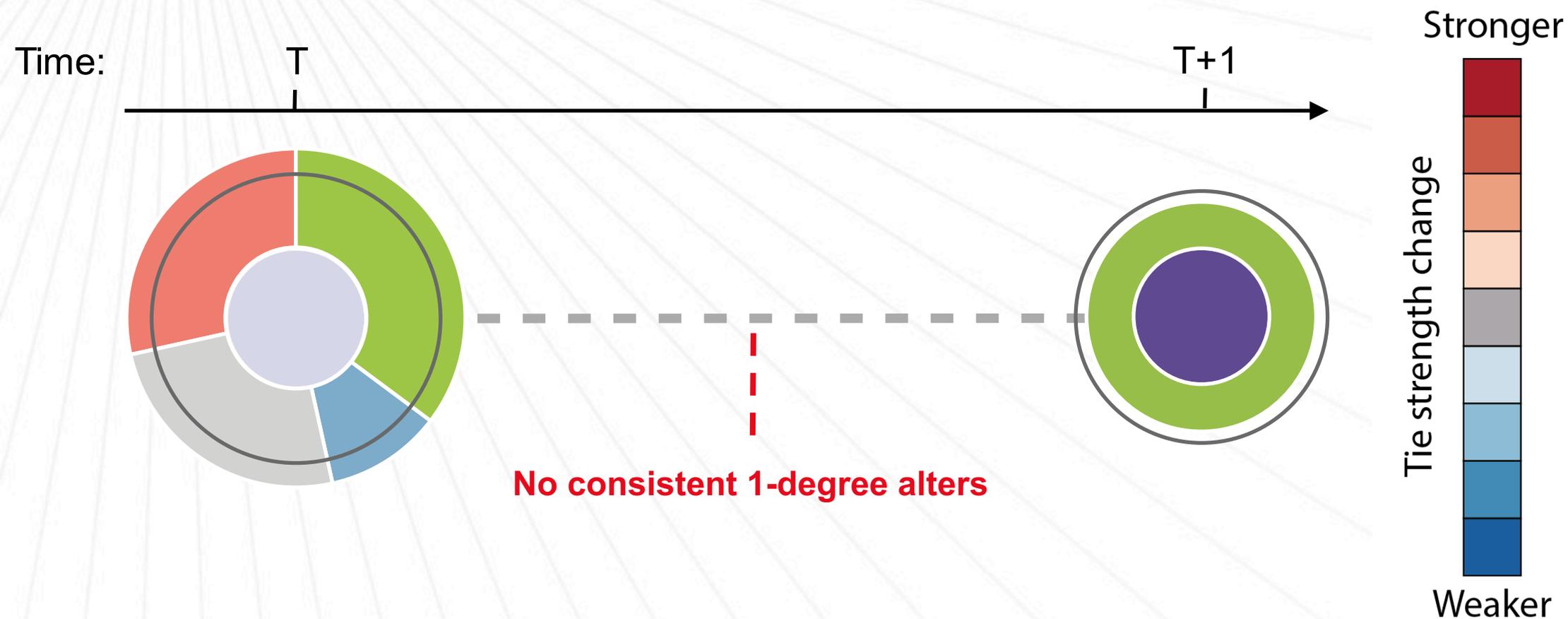
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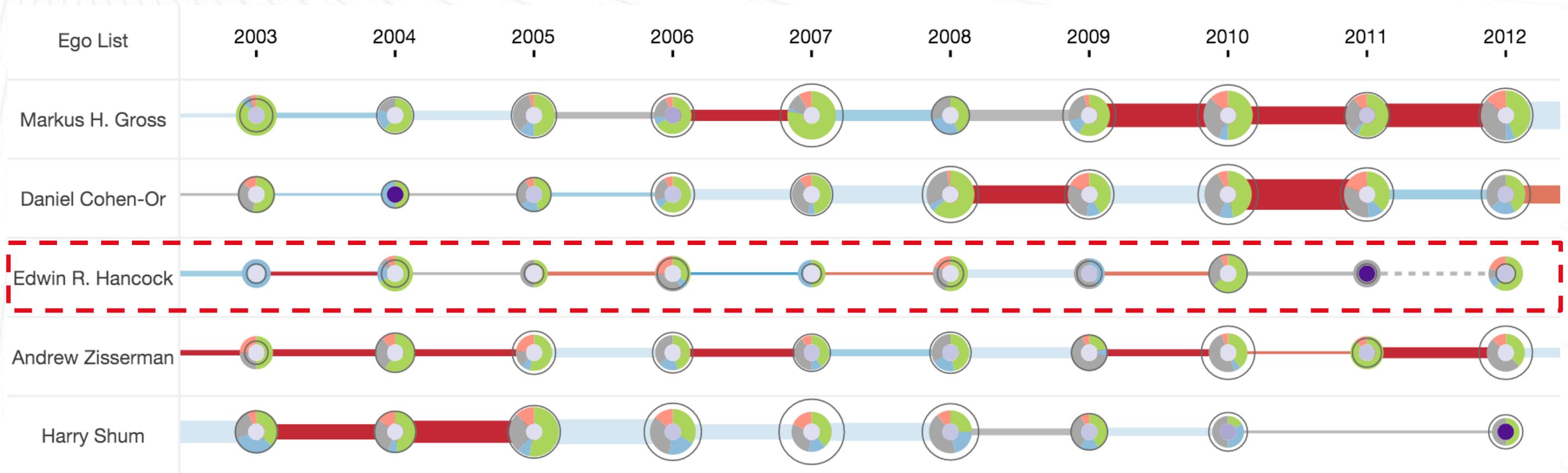
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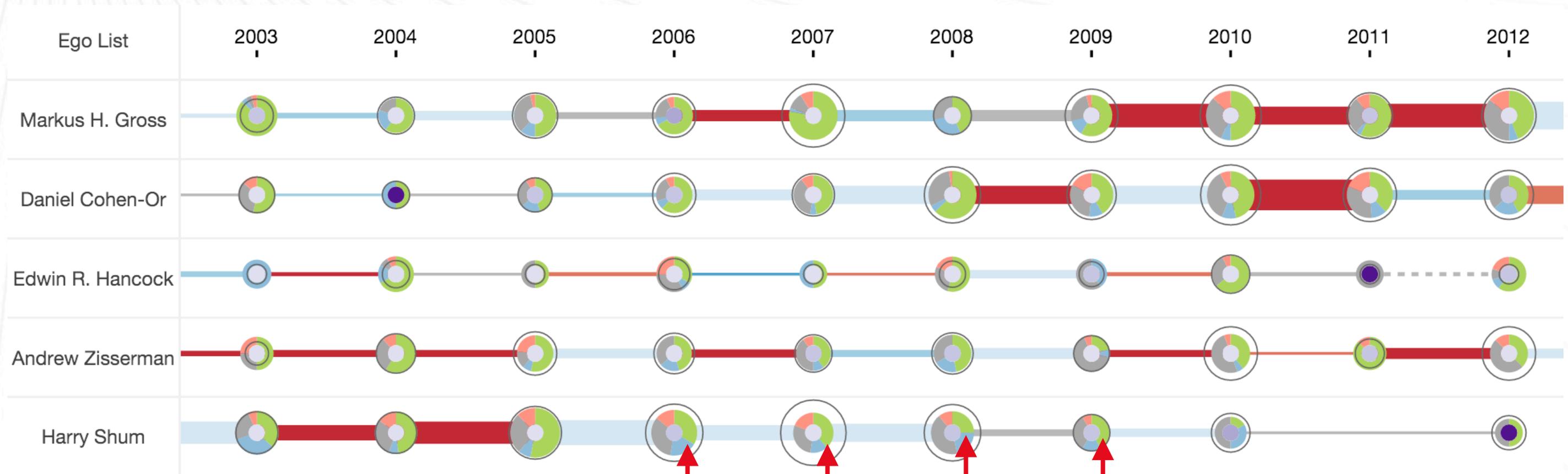
Summary Timeline View – Mesoscopic Level

- Case Study



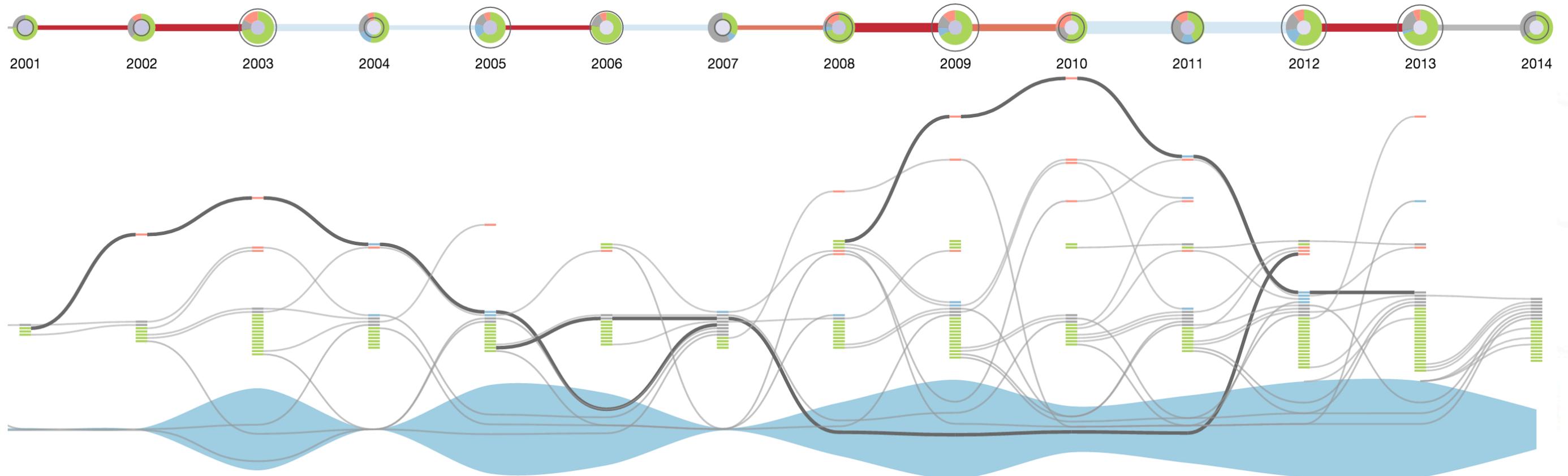
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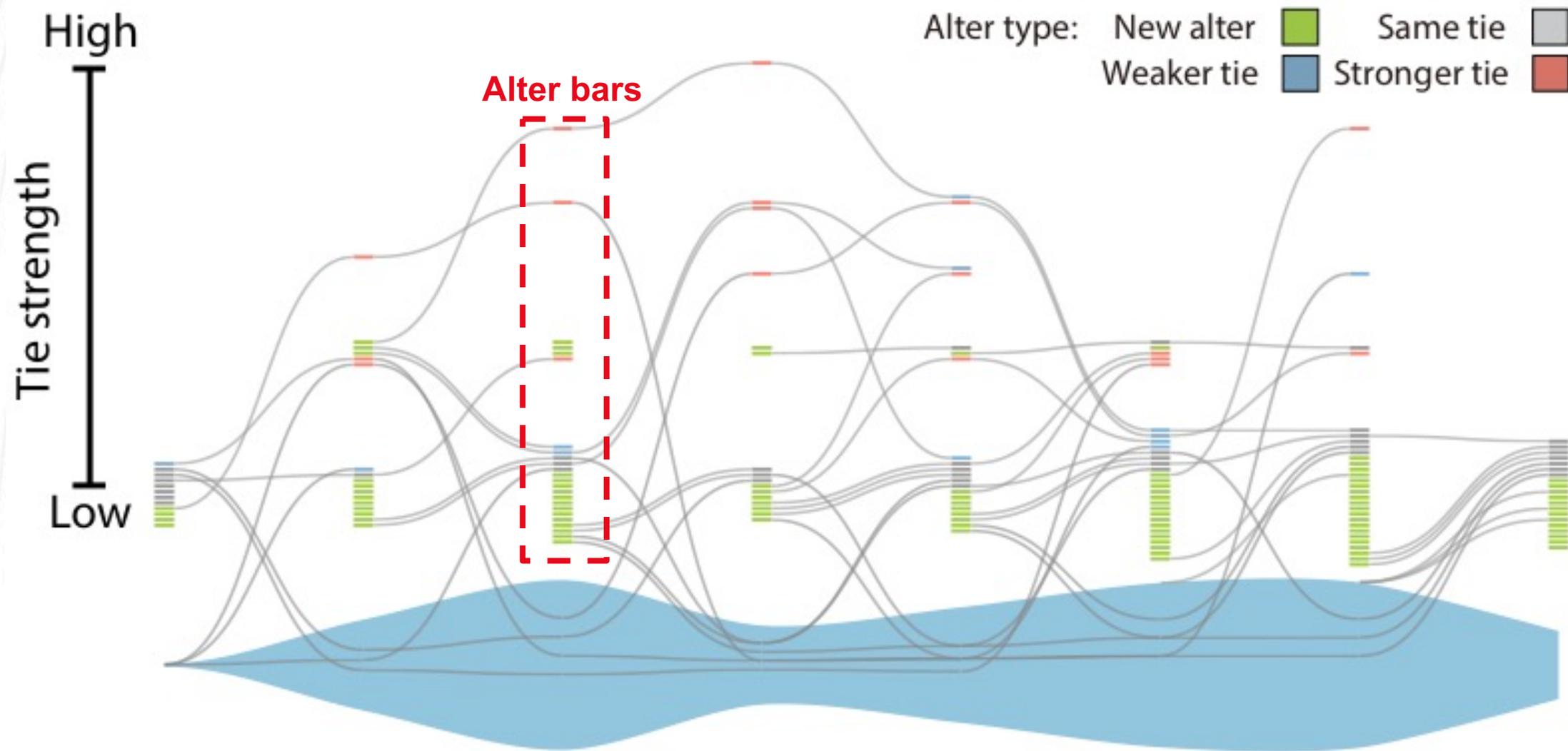
Alter Timeline View – Microscopic Level

- Goal: study the detailed behaviors of a particular individual's ego-network evolution
- Approach: **timeline-based** visualization



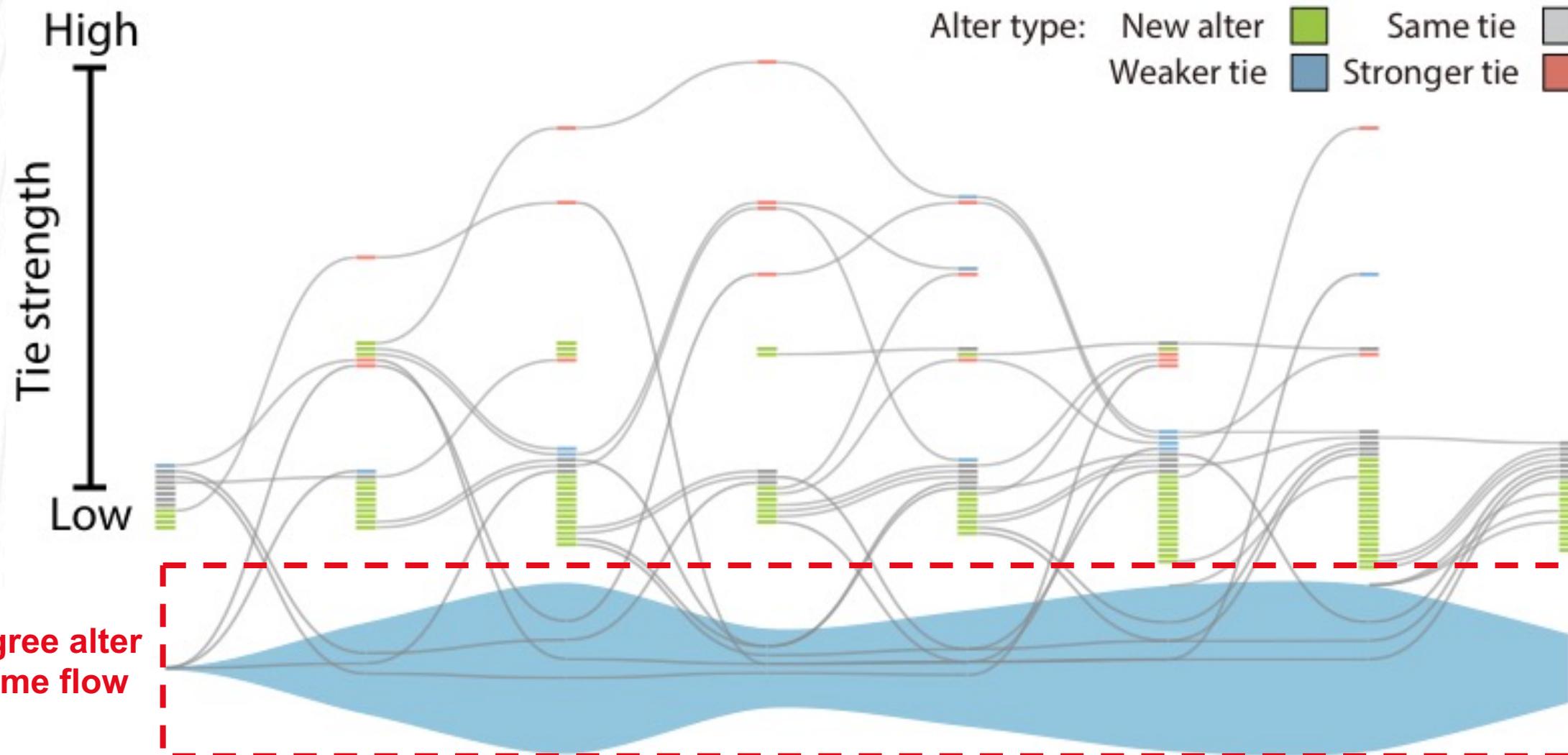
Alter Timeline View – Microscopic Level

- Approach: timeline-based visualization



Alter Timeline View – Microscopic Level

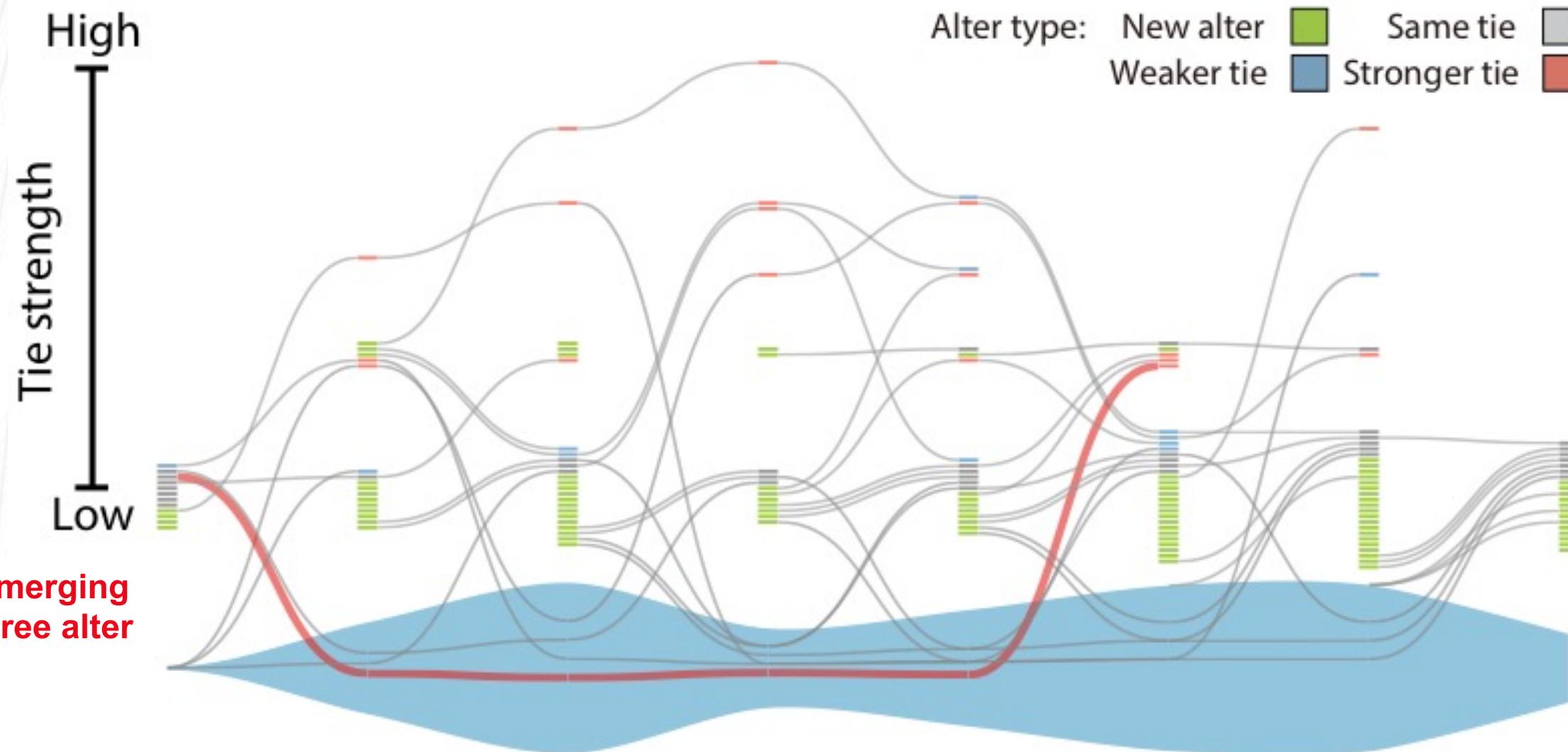
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2-degree alter
volume flow

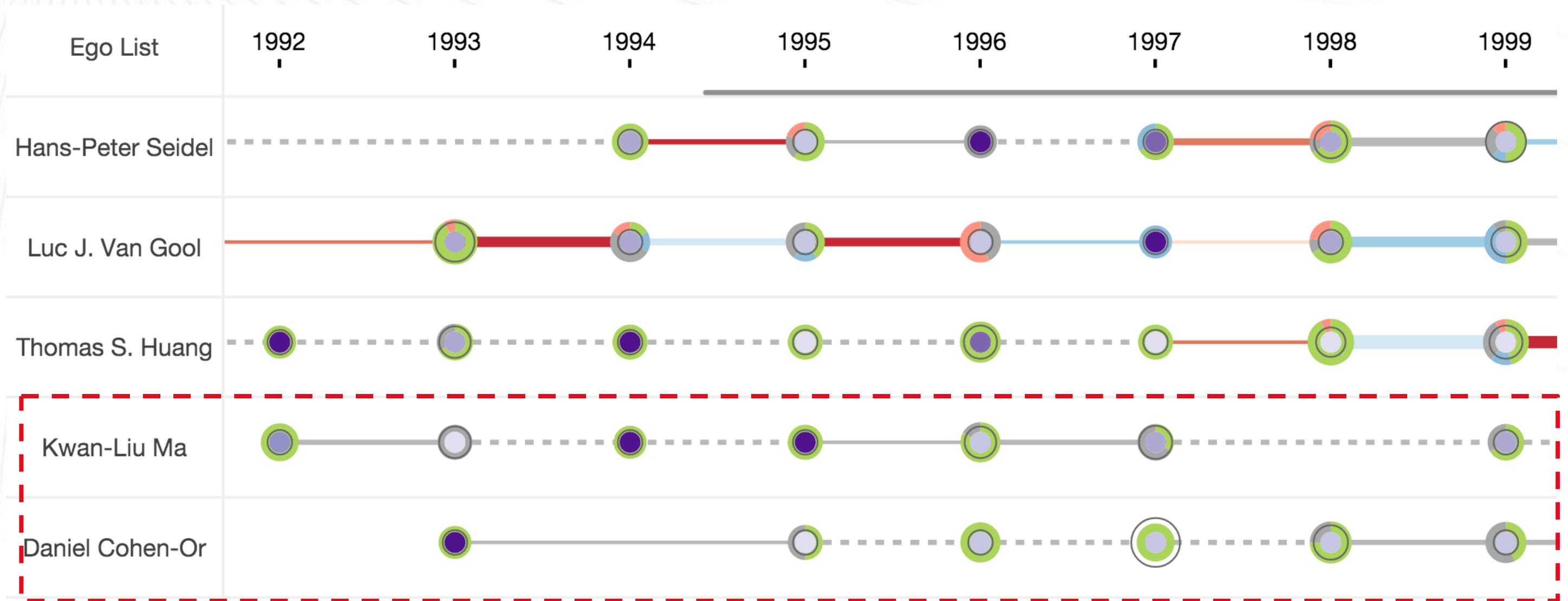
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Alter Timeline View – Microscopic Level

- Case Study

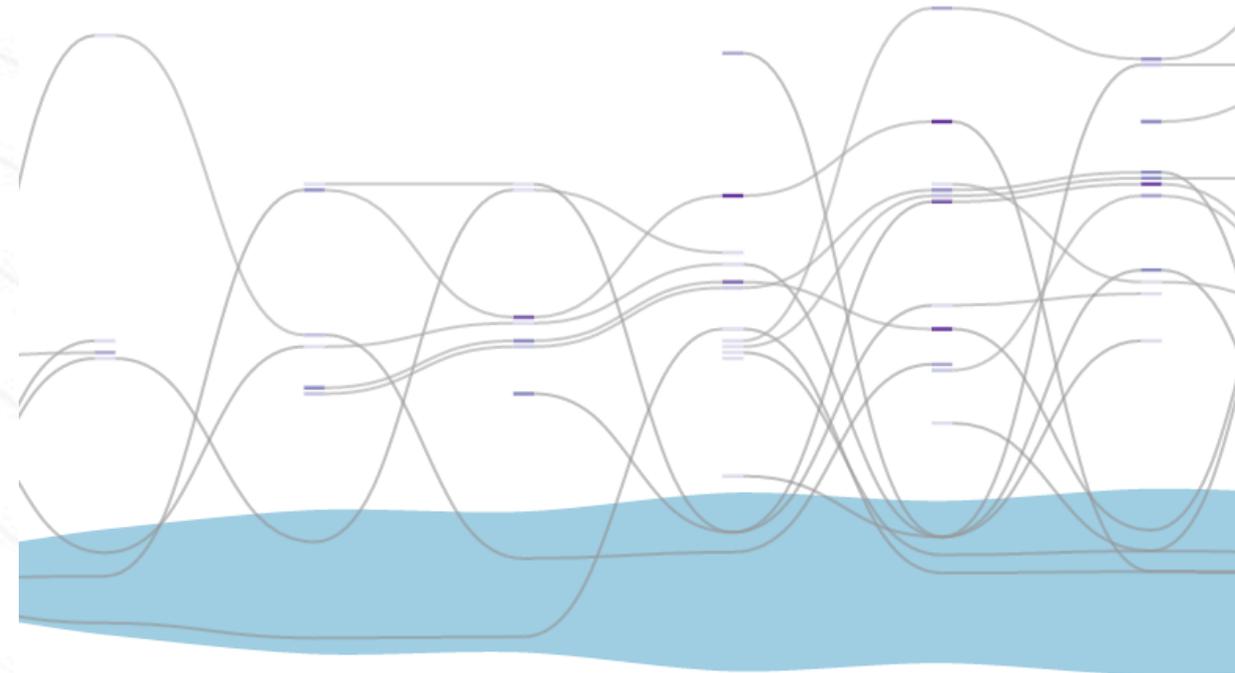


Alter Timeline View – Microscopic Level

- Case Study



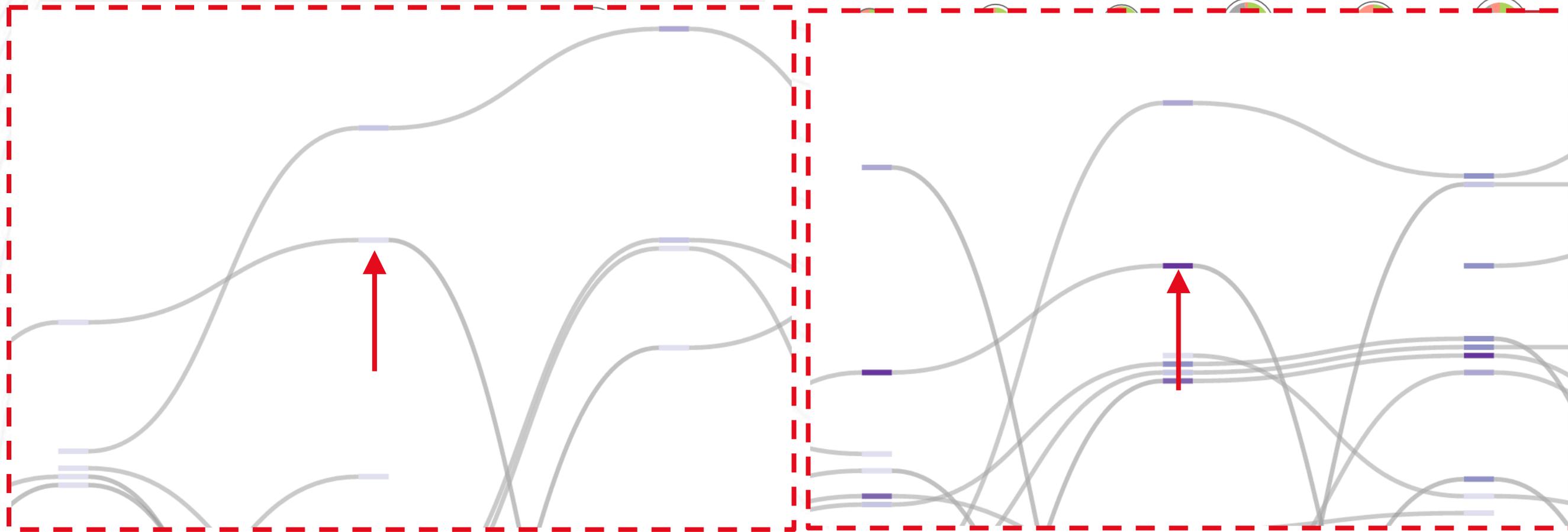
Prof. Kwan-Liu Ma's filtered ego-network between 2005 - 2010



Prof. Daniel Cohen-Or's filtered ego-network between 2005 - 2010

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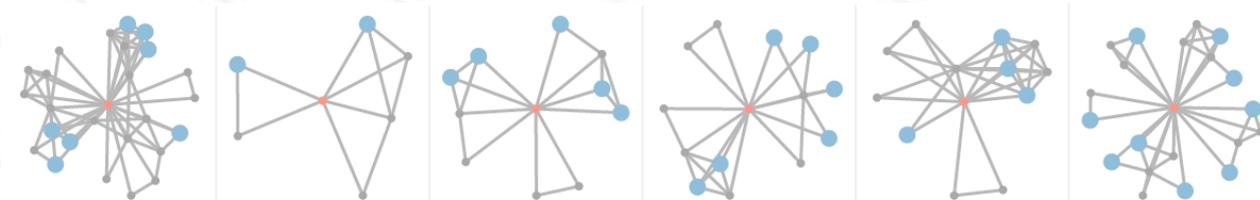
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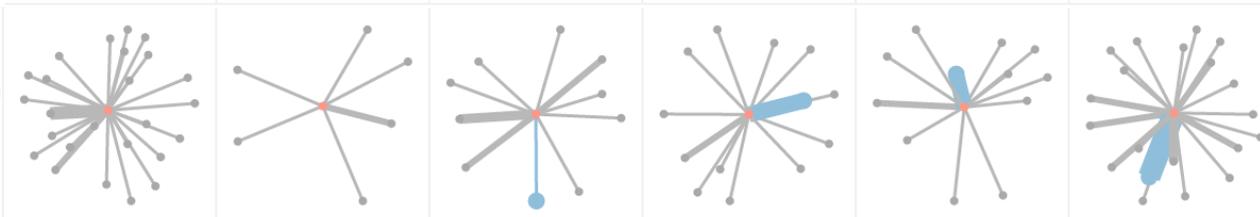
Evaluation

- Case study – DBLP dataset
 - 64,892 authors and 52,038 papers from 31 conferences
- User study
 - 15 participants are recruited
 - Compared with an improved node-link based system

(a) Highlighting nodes



(b) Highlighting edges

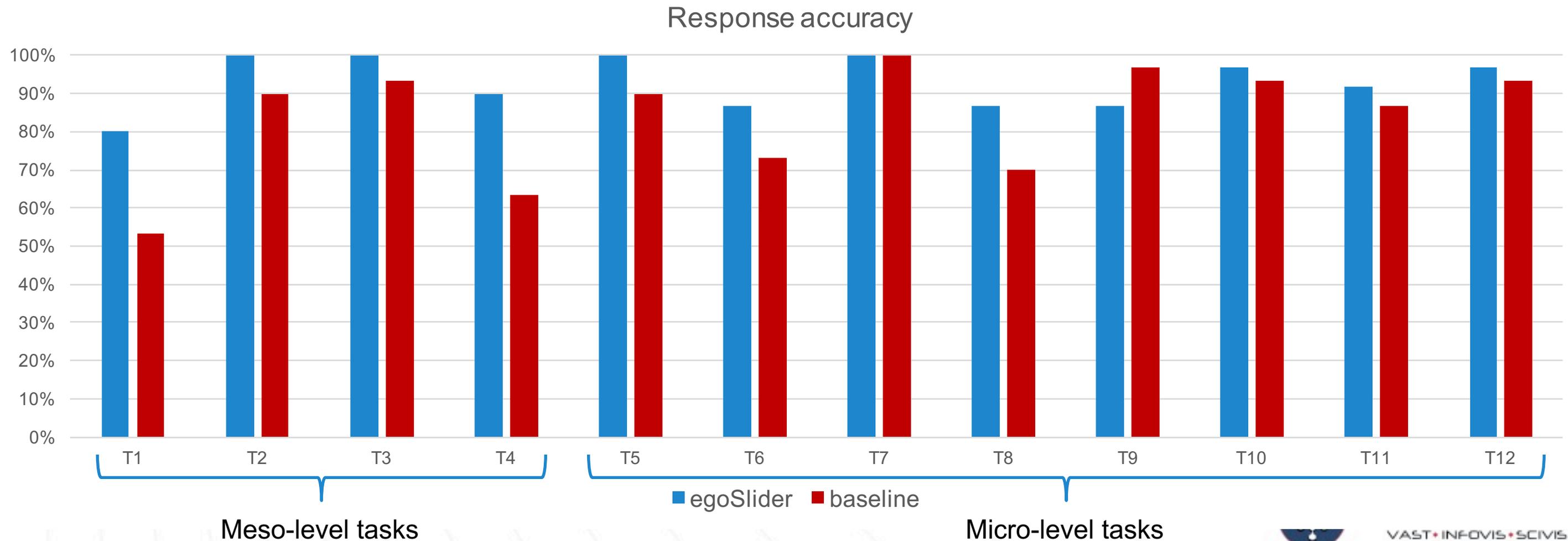


(c) Highlighting clusters



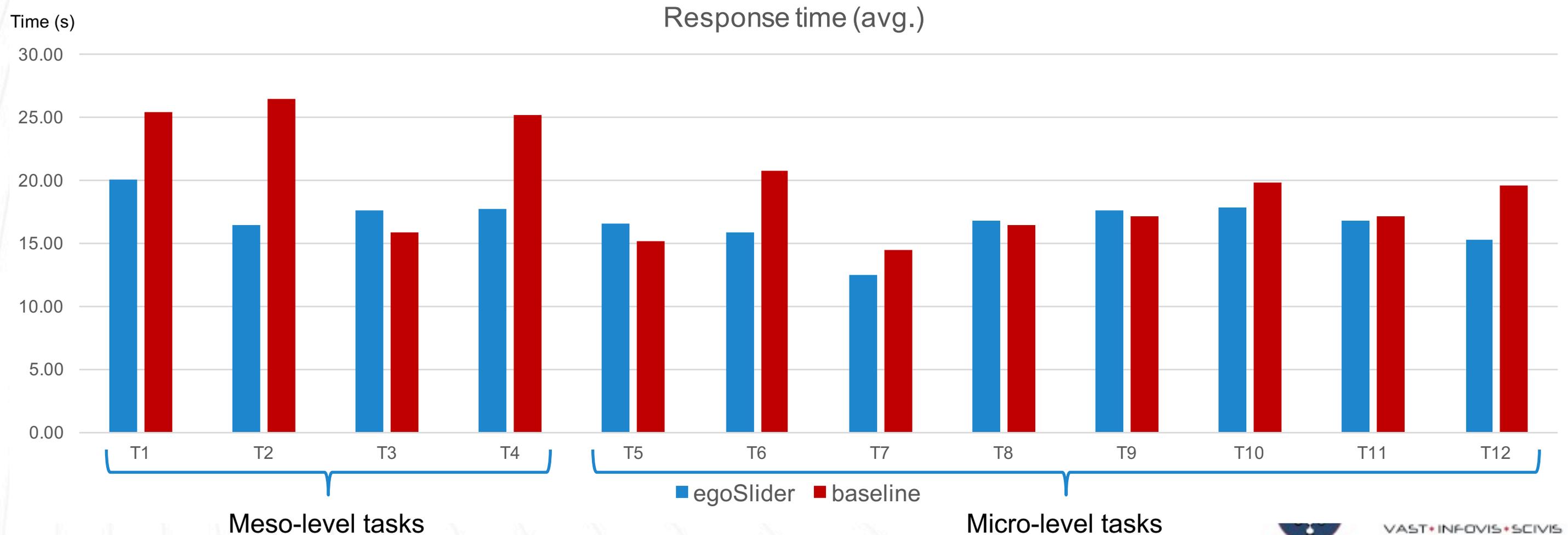
User Study - Results

- 12 tasks in mesoscopic and microscopic level
 - 6 significantly better in both response accuracy and response time



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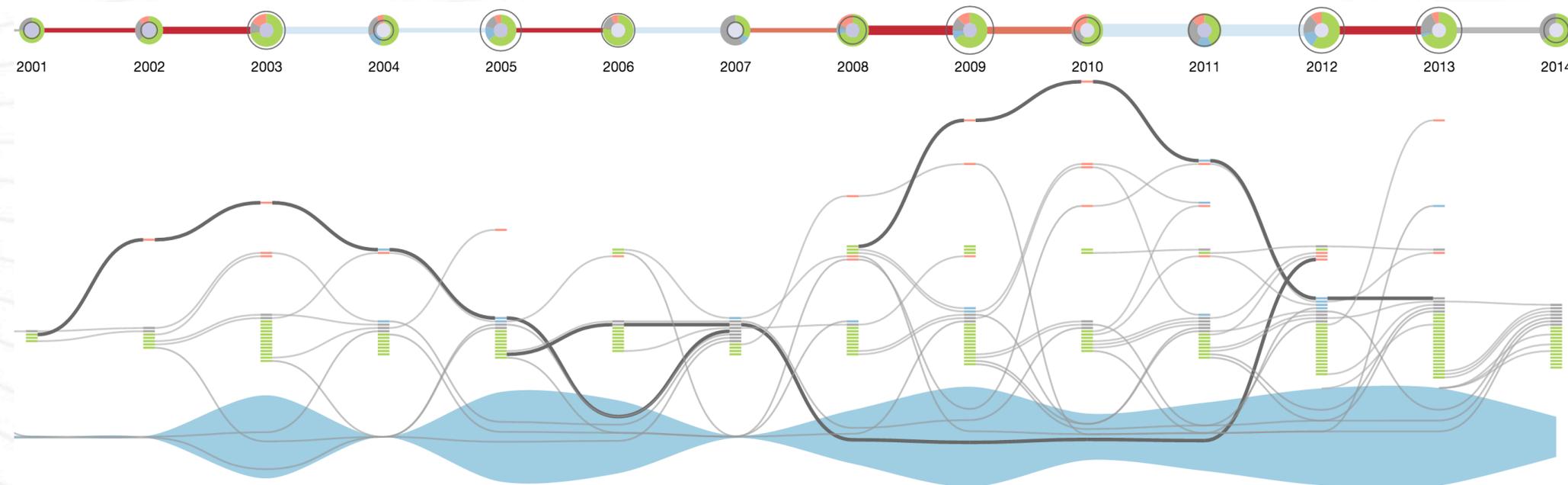
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Future Work

- Investigate ego-network sequence similarities
- Incorporate modern multivariate visualization techniques
- Conduct more realistic case studies and user studies

Q&A



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