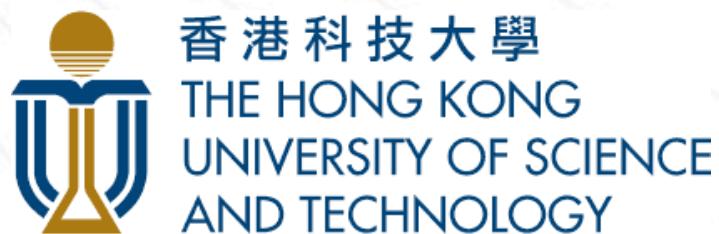


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# egoSlider: Visual Analysis of Egocentric Network Evolution

Yanhong Wu, Naveen Pitipornvivat, Jian Zhao, Sixiao Yang, Guowei Huang, and Huamin Qu

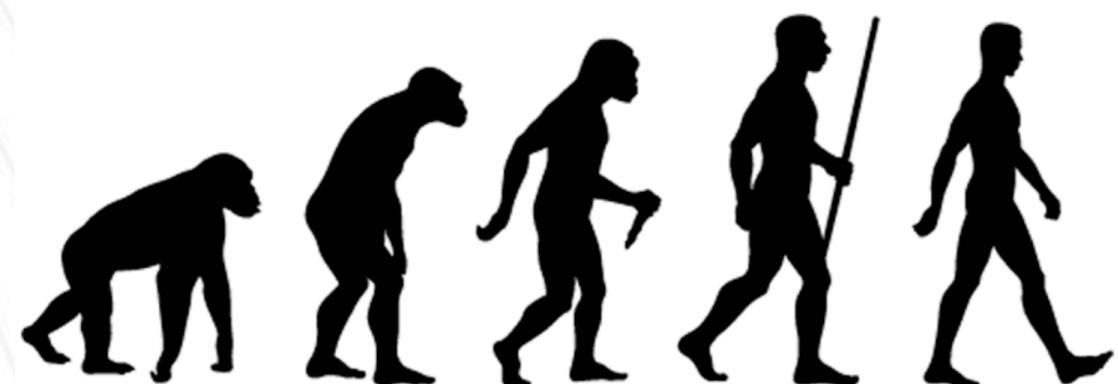


# Definition

- 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



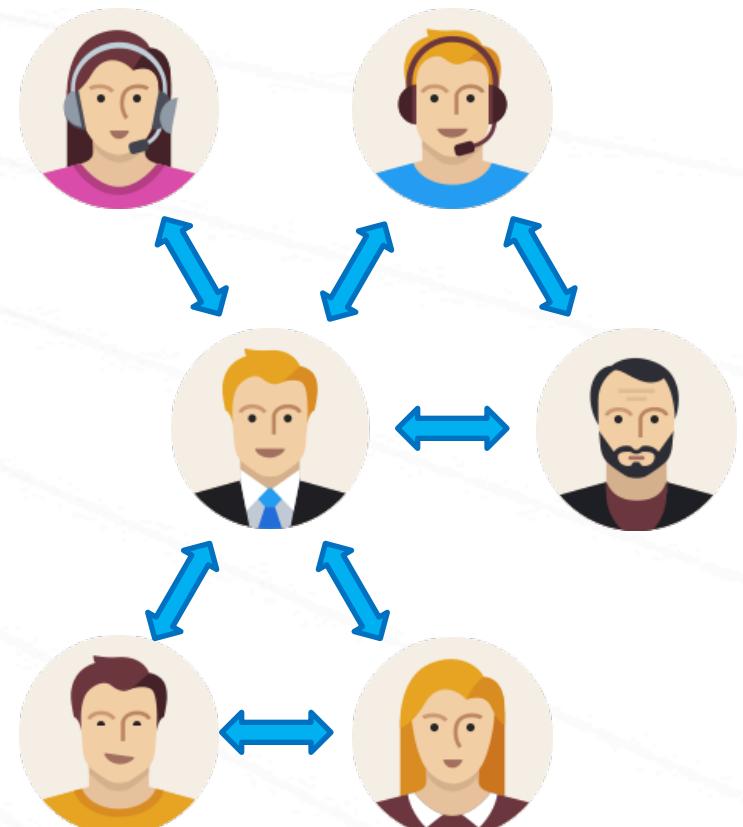
Anthropology



Psylogy

# Challenges

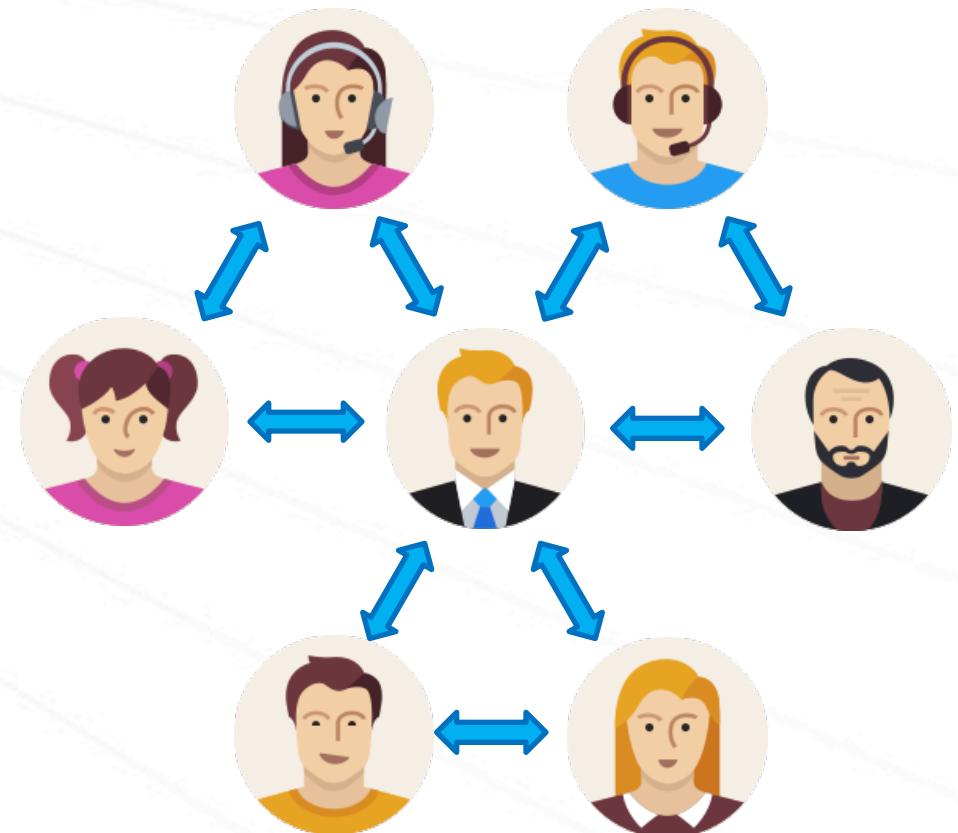
- Analyzing ego-network is challenging due to the complex time-varying structures



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# Challenges

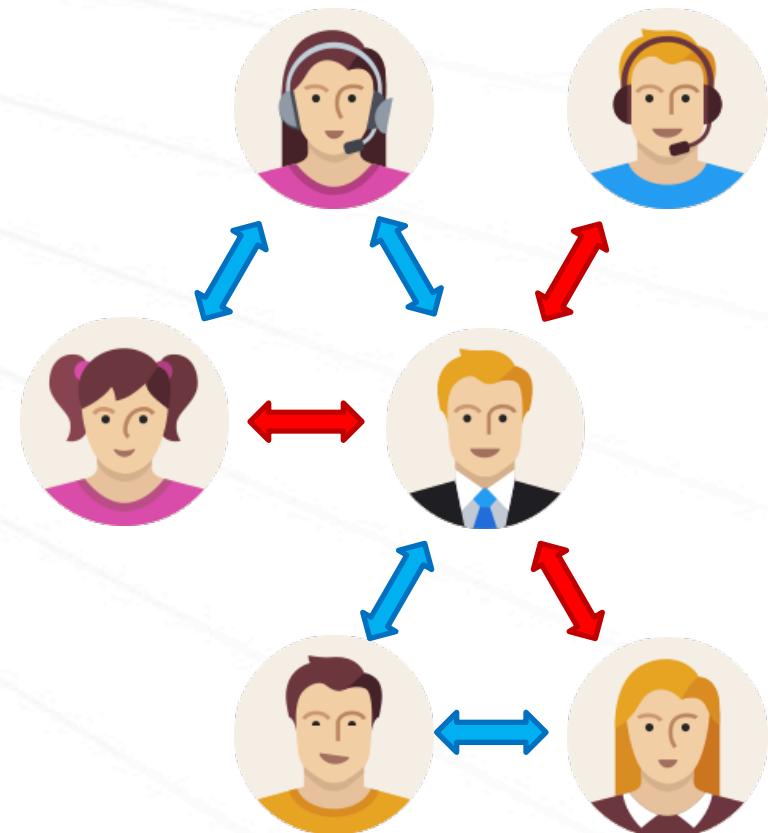
- Analyzing ego-network is challenging due to the complex time-varying structures
  - *Alters come and leave*



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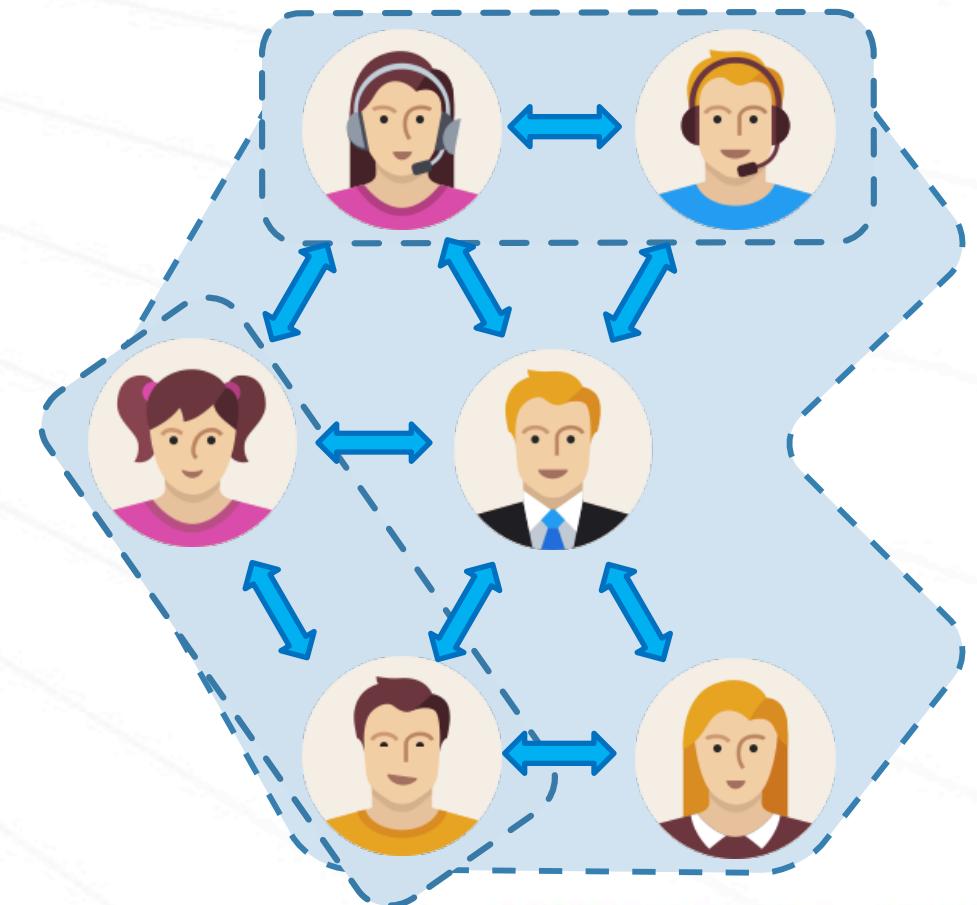
# Challenges

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



# Challenges

- 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*



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# 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?*

# 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?*

# 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?*

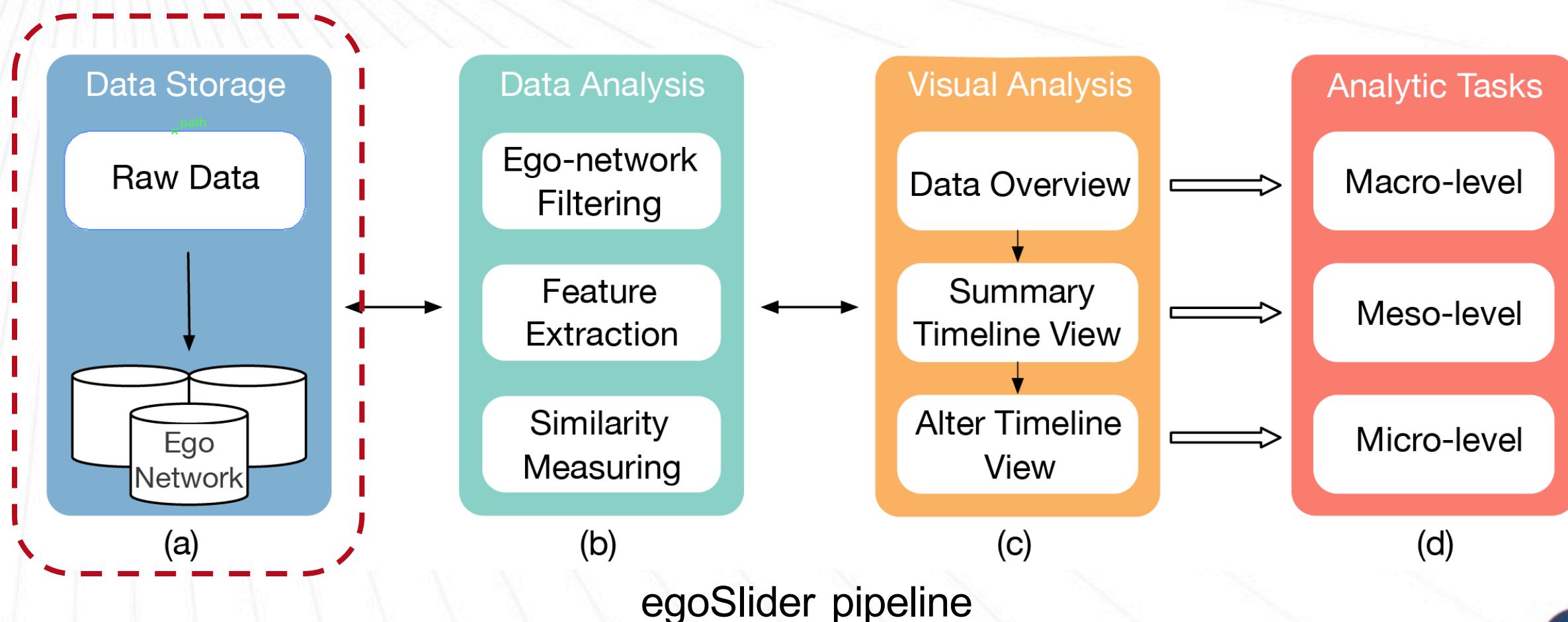
# Demo!



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# Solution

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

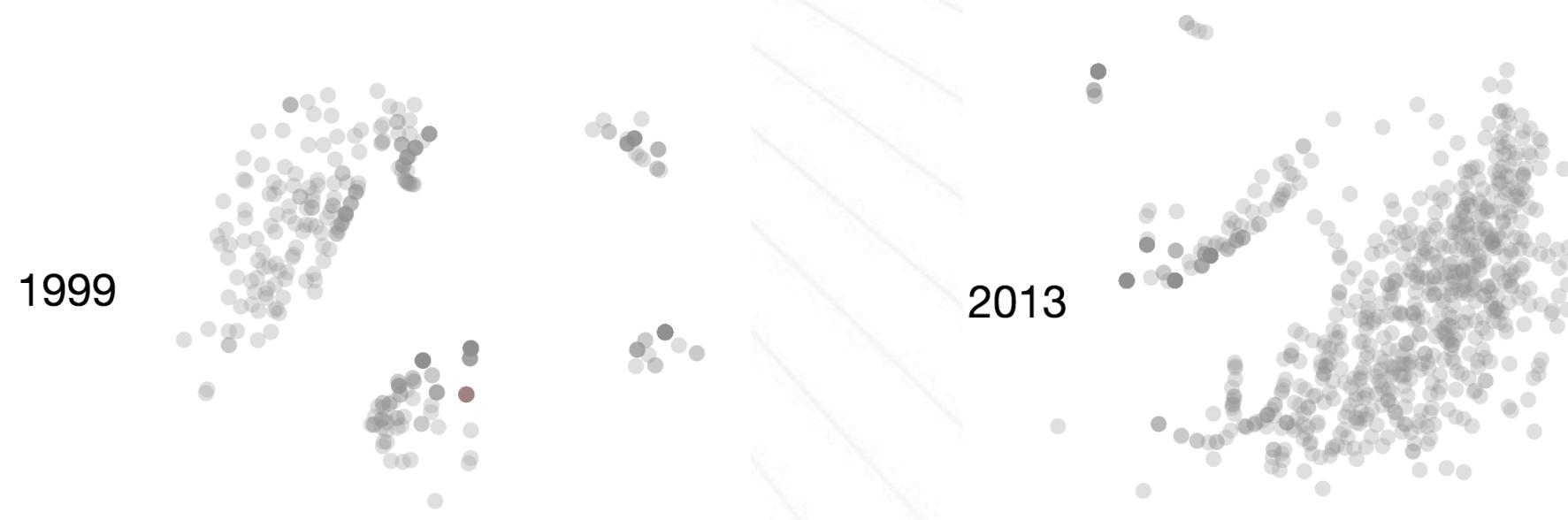


# Data Overview – Macroscopic Level

- 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
- Approach: MDS (multidimensional scaling)

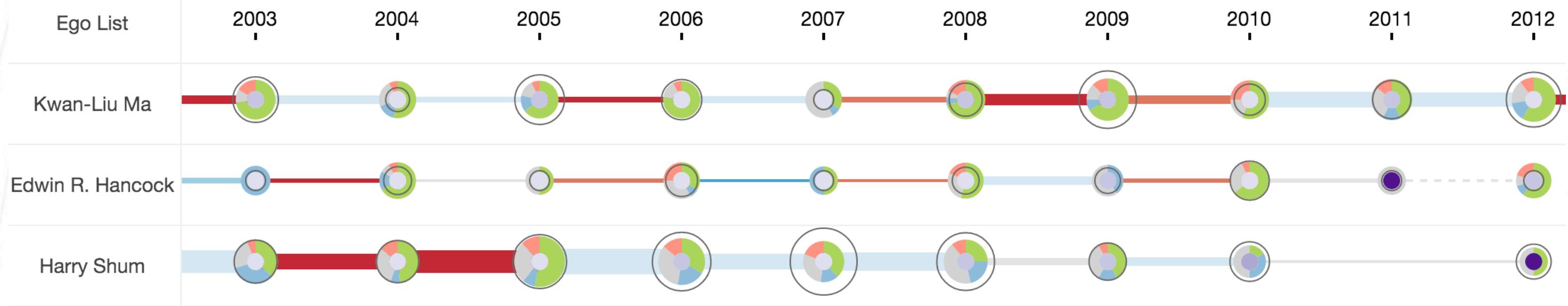


Four groups where one is slightly larger

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

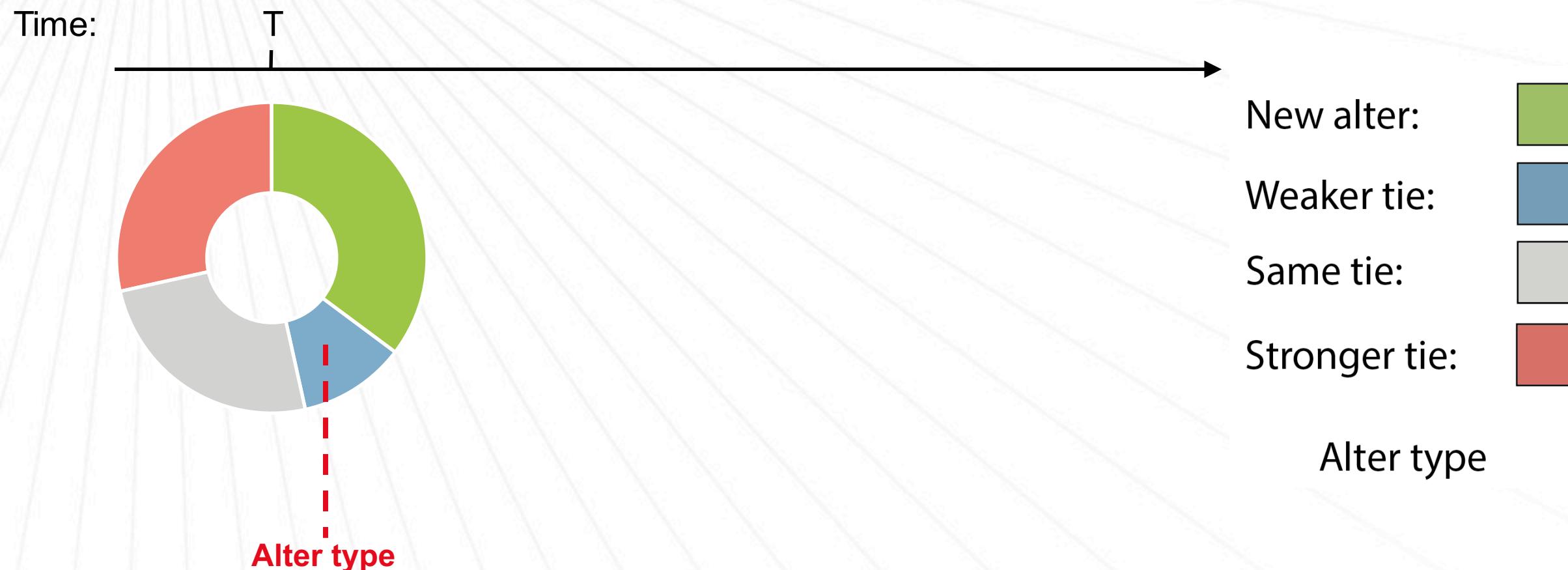
# Summary Timeline View – Mesoscopic Level

- 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



# Summary Timeline View – Mesoscopic Level

- Approach: snapshot glyph and transition glyph



# Summary Timeline View – Mesoscopic Level

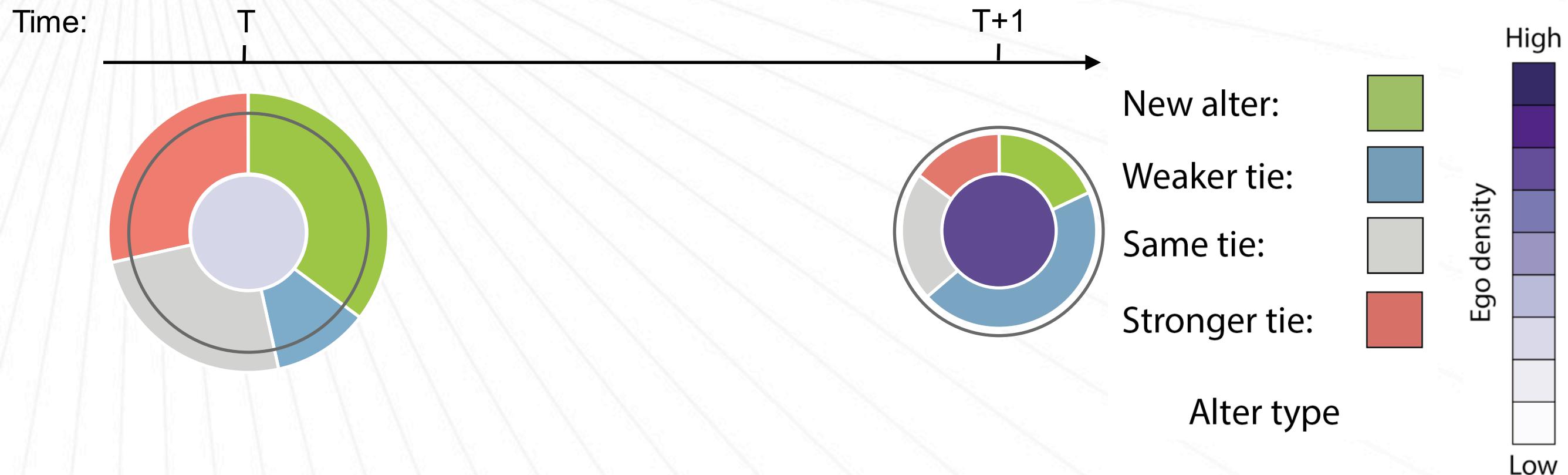
- Approach: snapshot glyph and transition glyph



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# Summary Timeline View – Mesoscopic Level

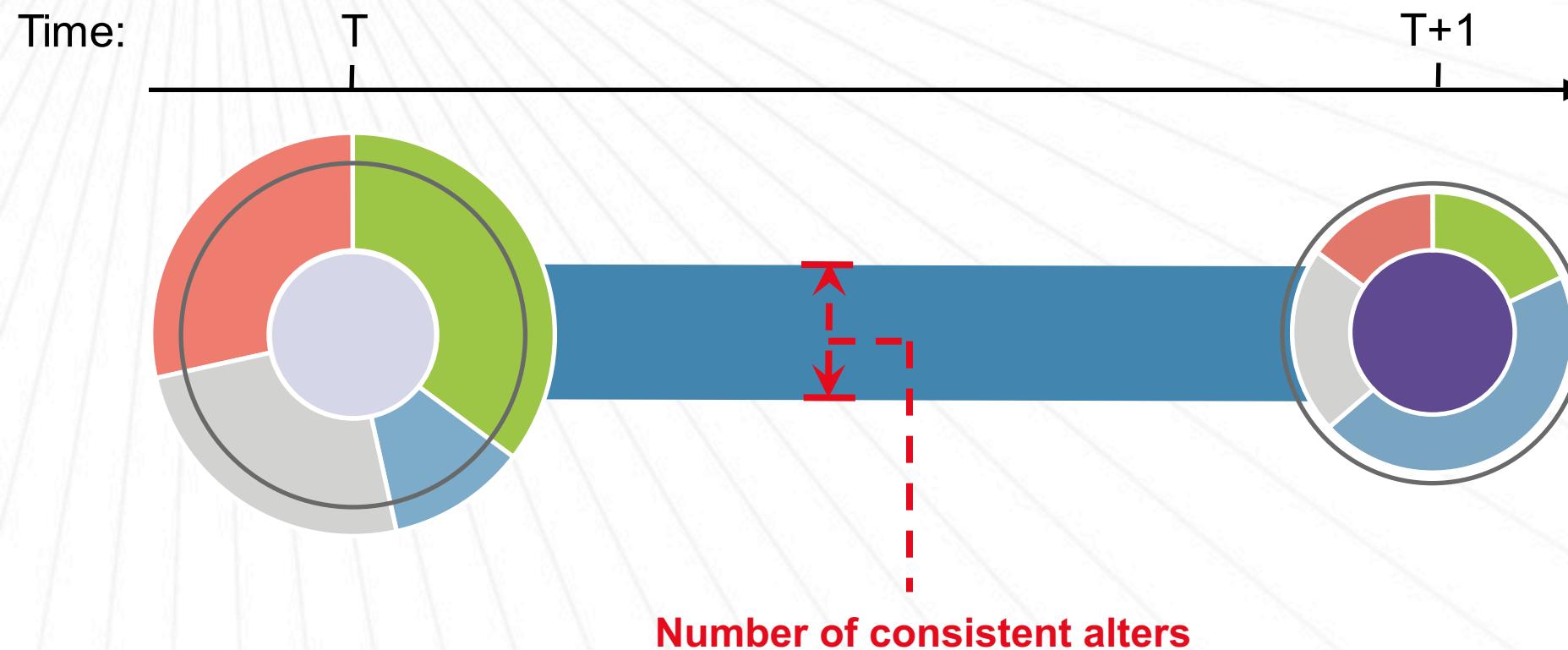
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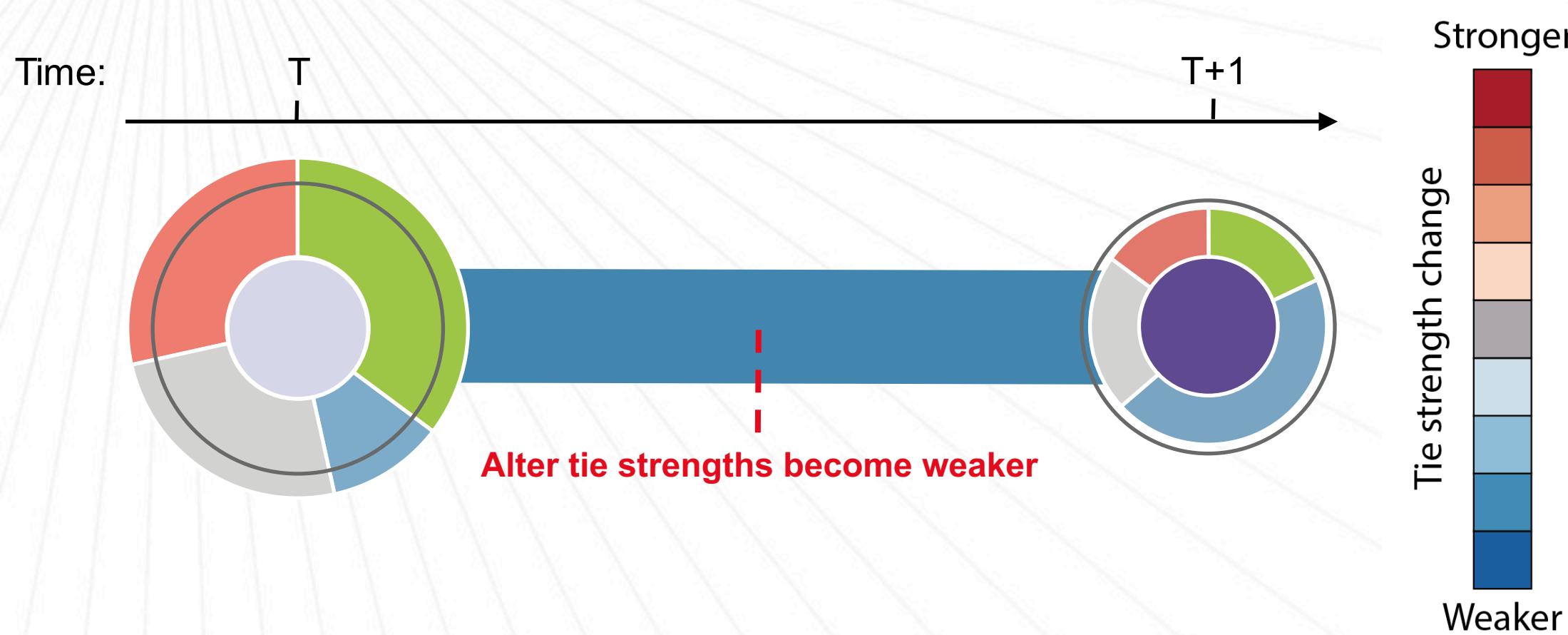
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- Approach: snapshot glyph and transition glyph



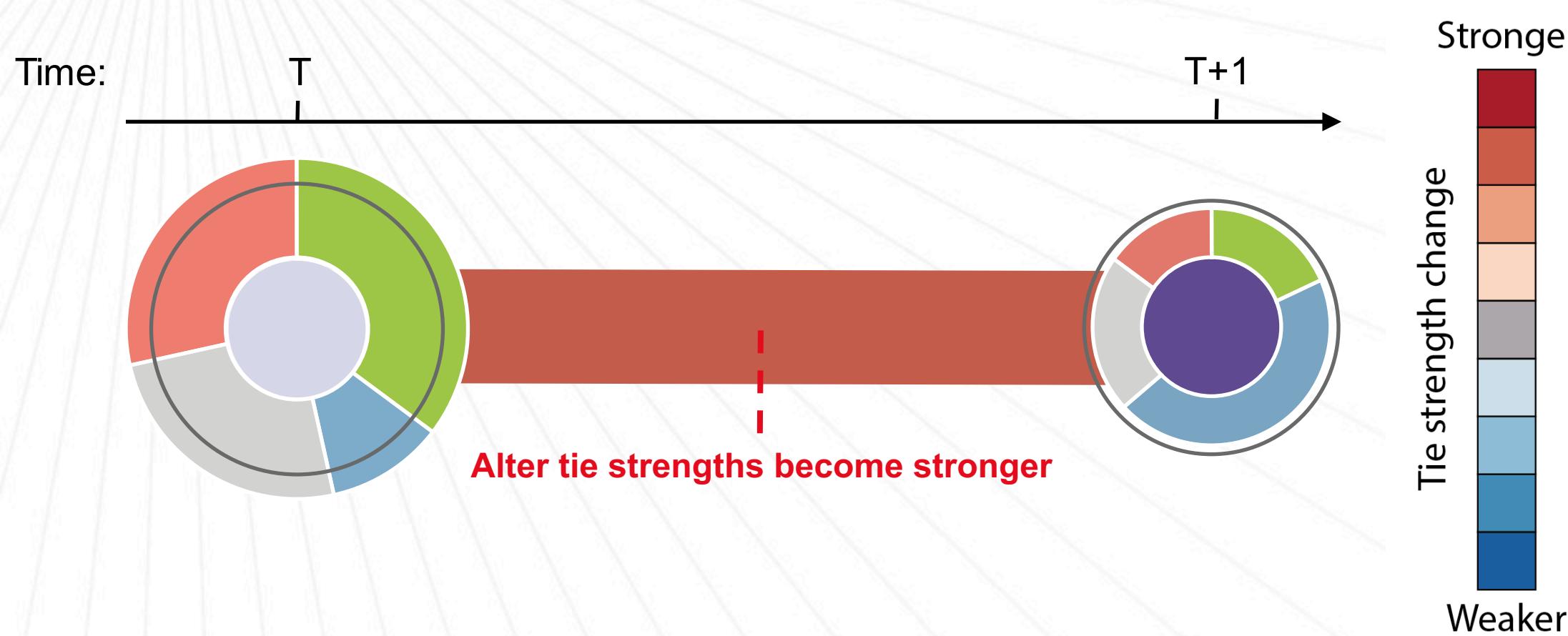
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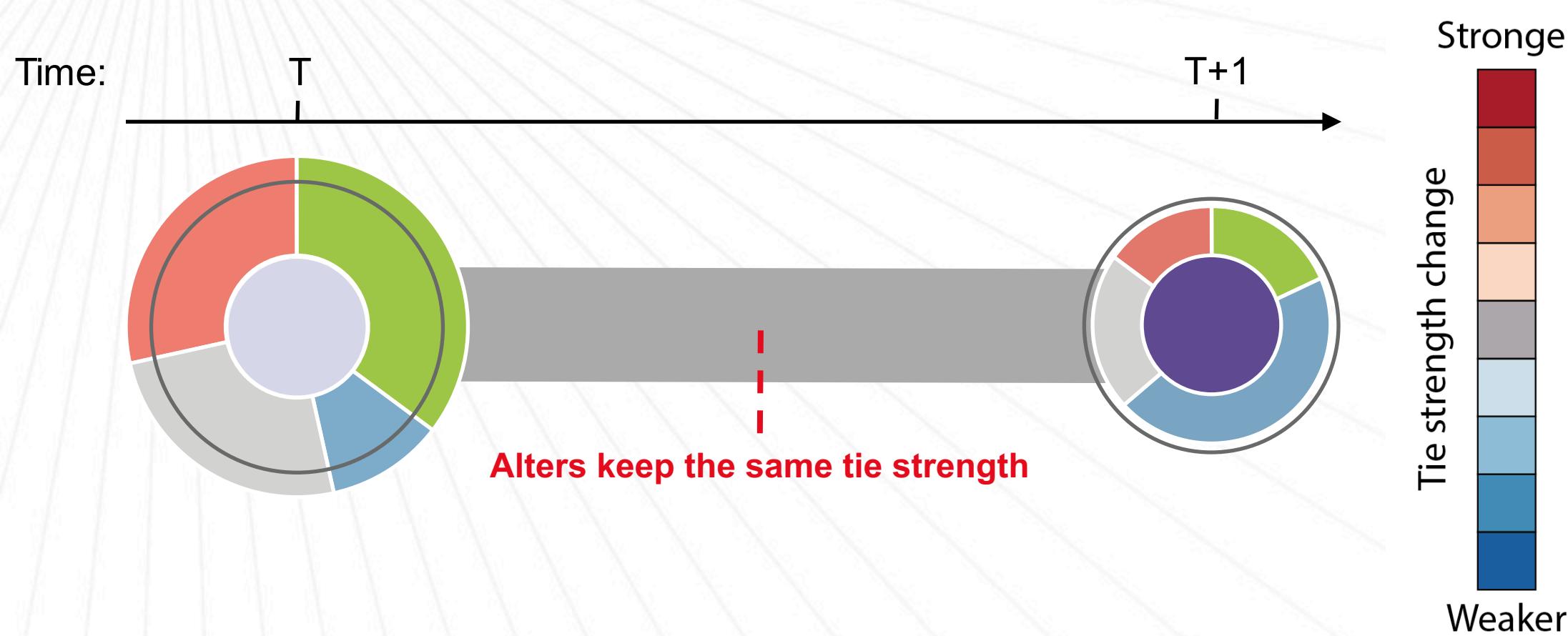
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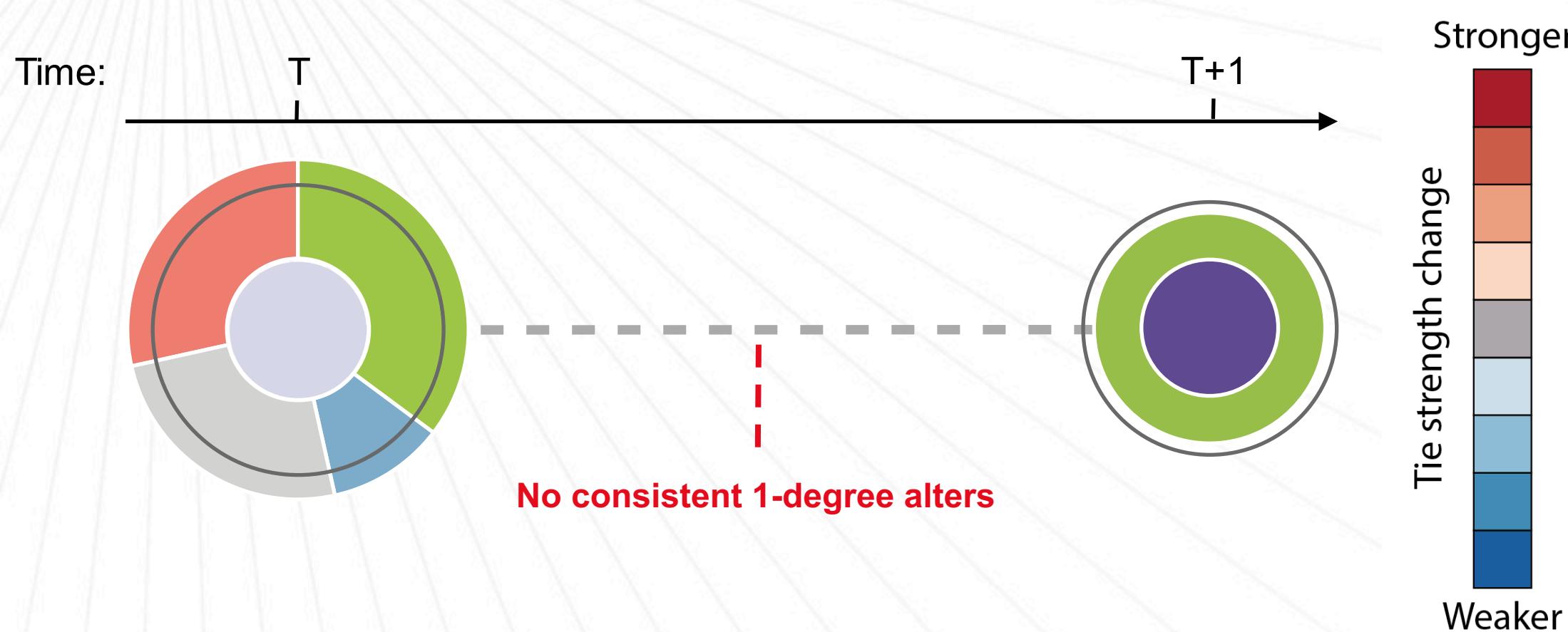
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- Approach: snapshot glyph and transition glyph



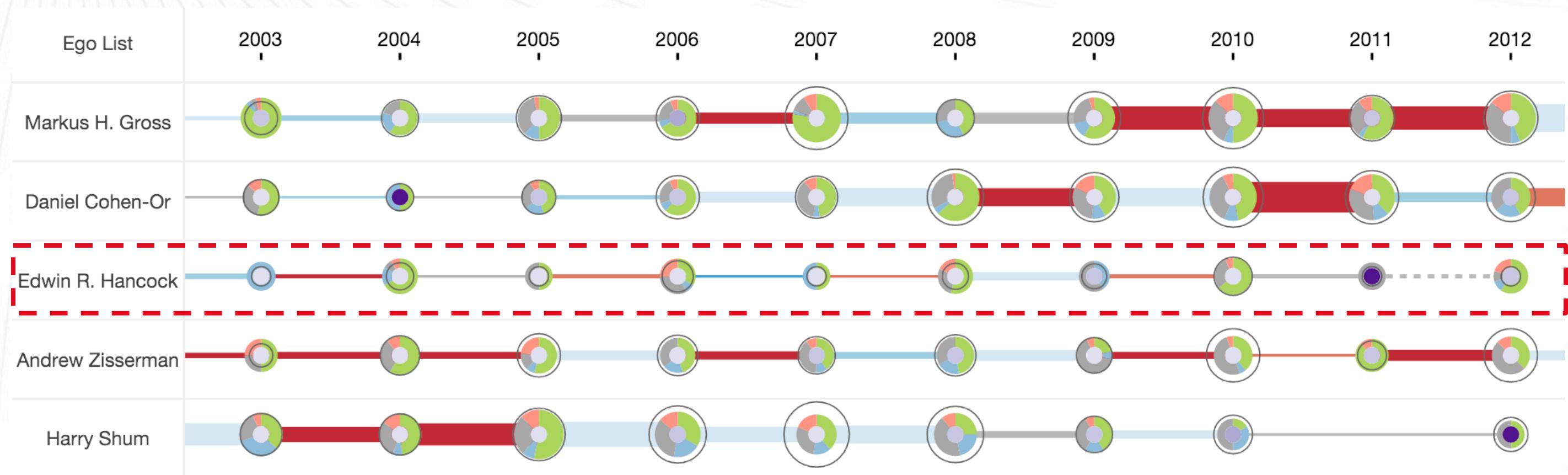
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# Summary Timeline View – Mesoscopic Level

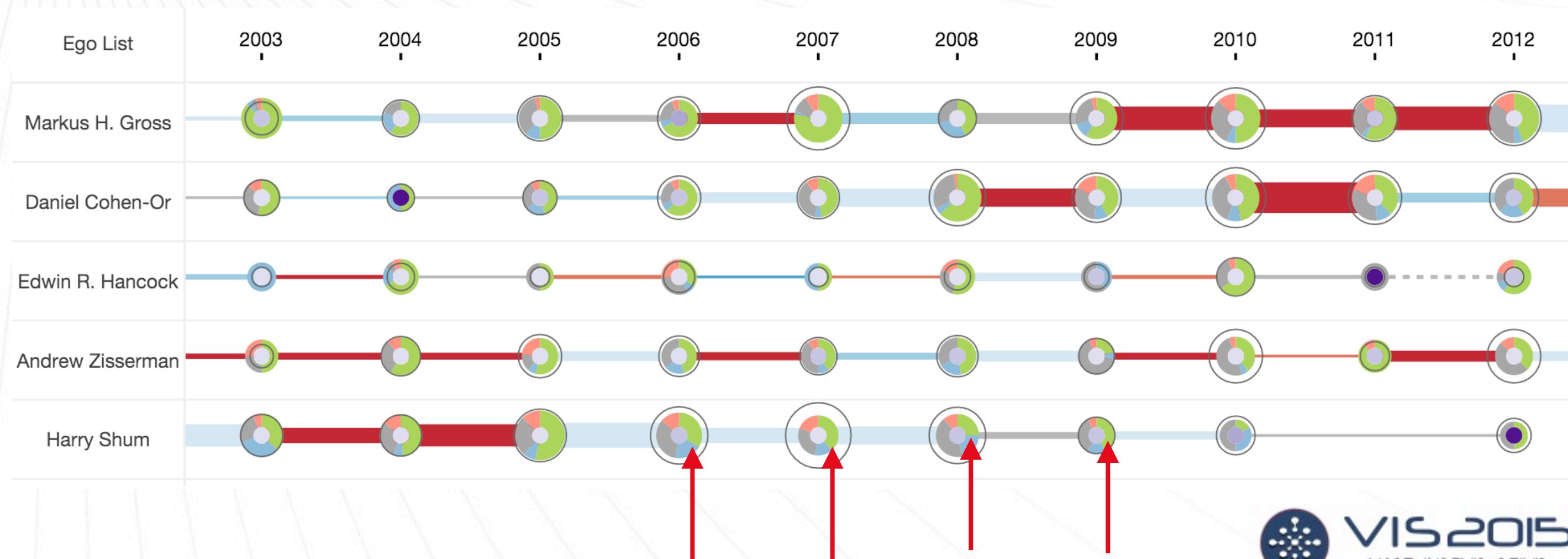
- Case Study



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# Summary Timeline View – Mesoscopic Level

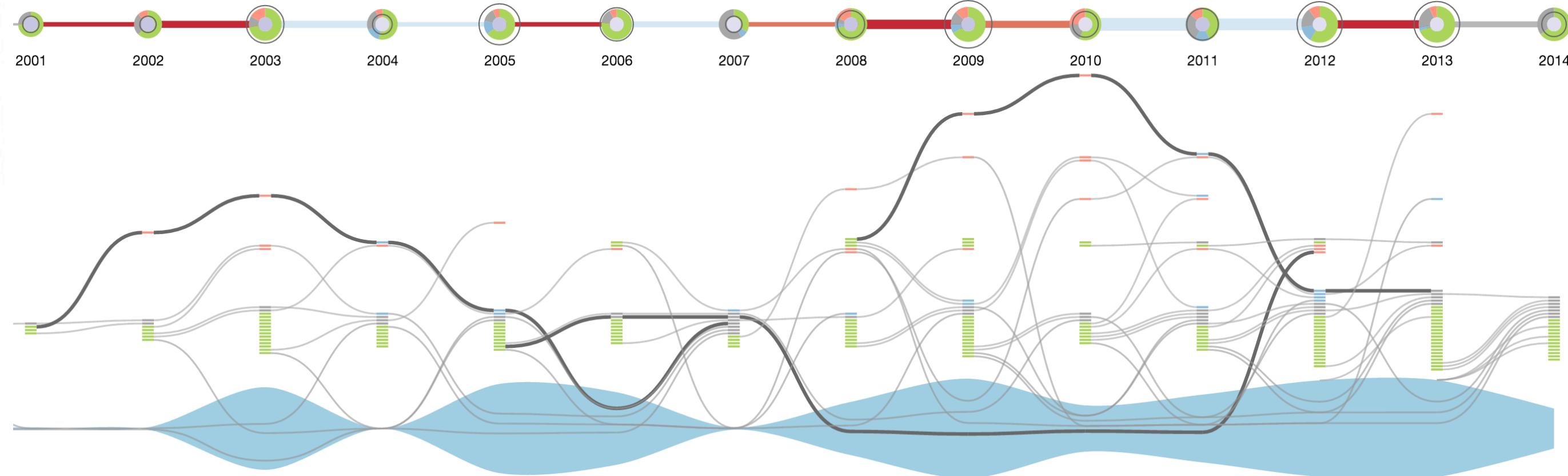
- Case Study



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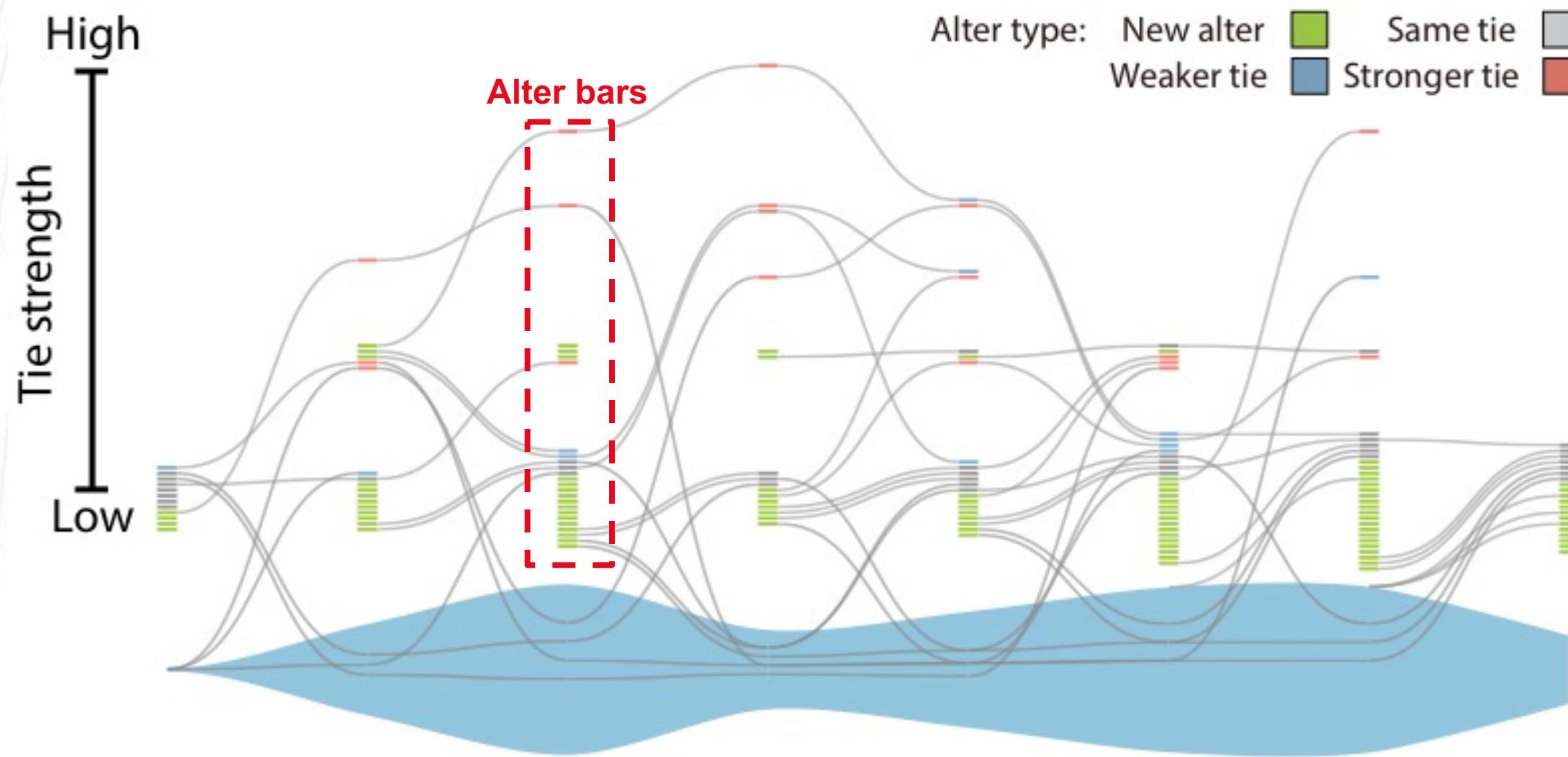
# Alter Timeline View – Microscopic Level

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



# Alter Timeline View – Microscopic Level

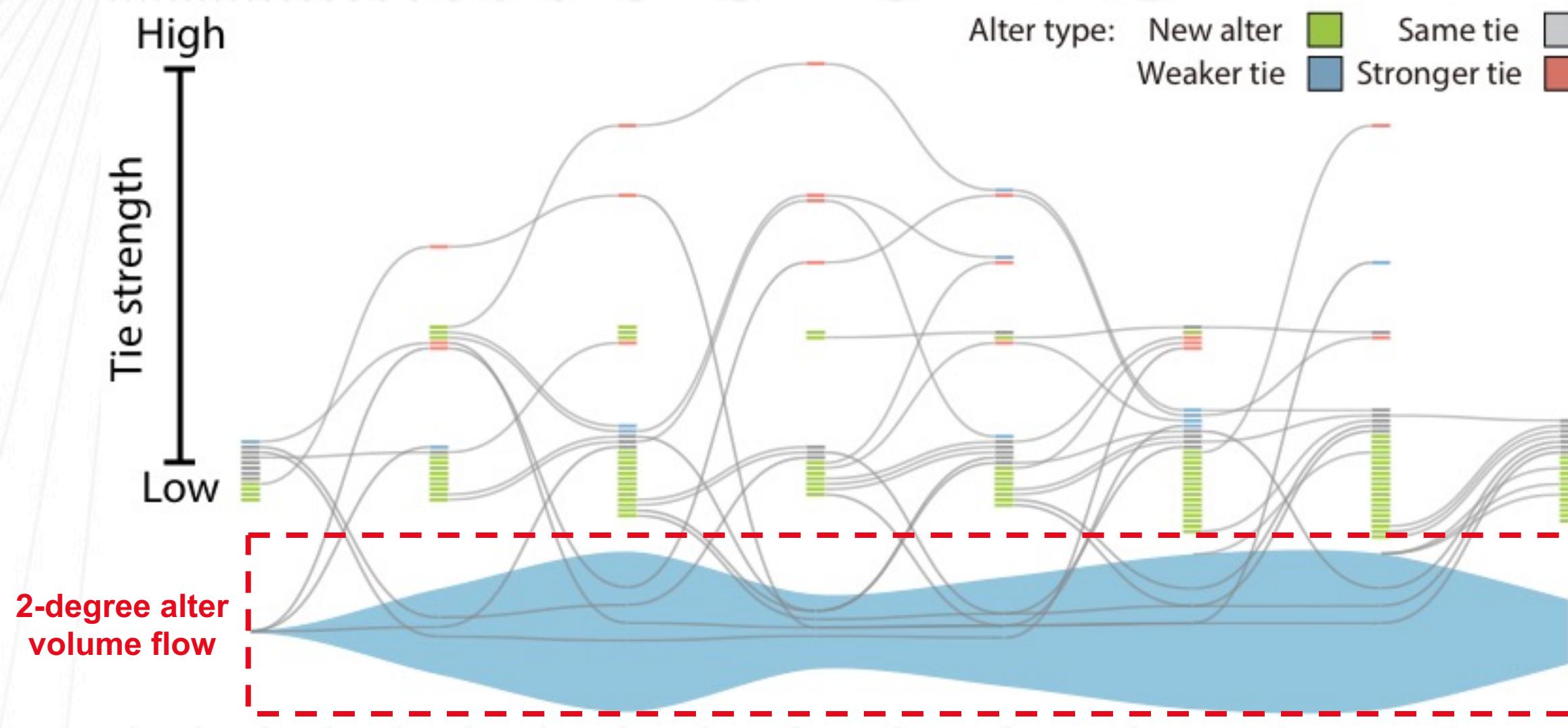
- Approach: timeline-based visualization



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# Alter Timeline View – Microscopic Level

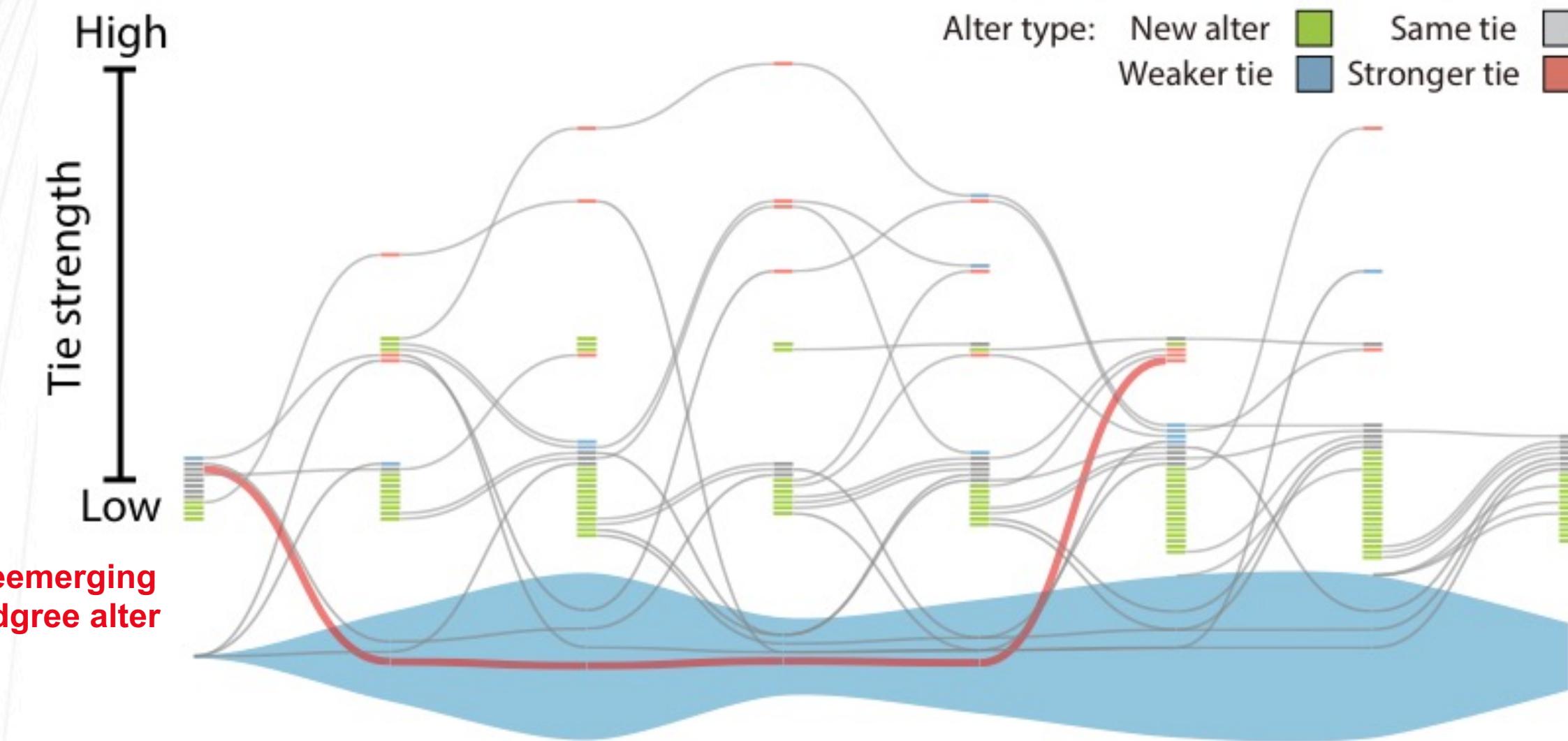
- Approach: timeline-based visualization



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# Alter Timeline View – Microscopic Level

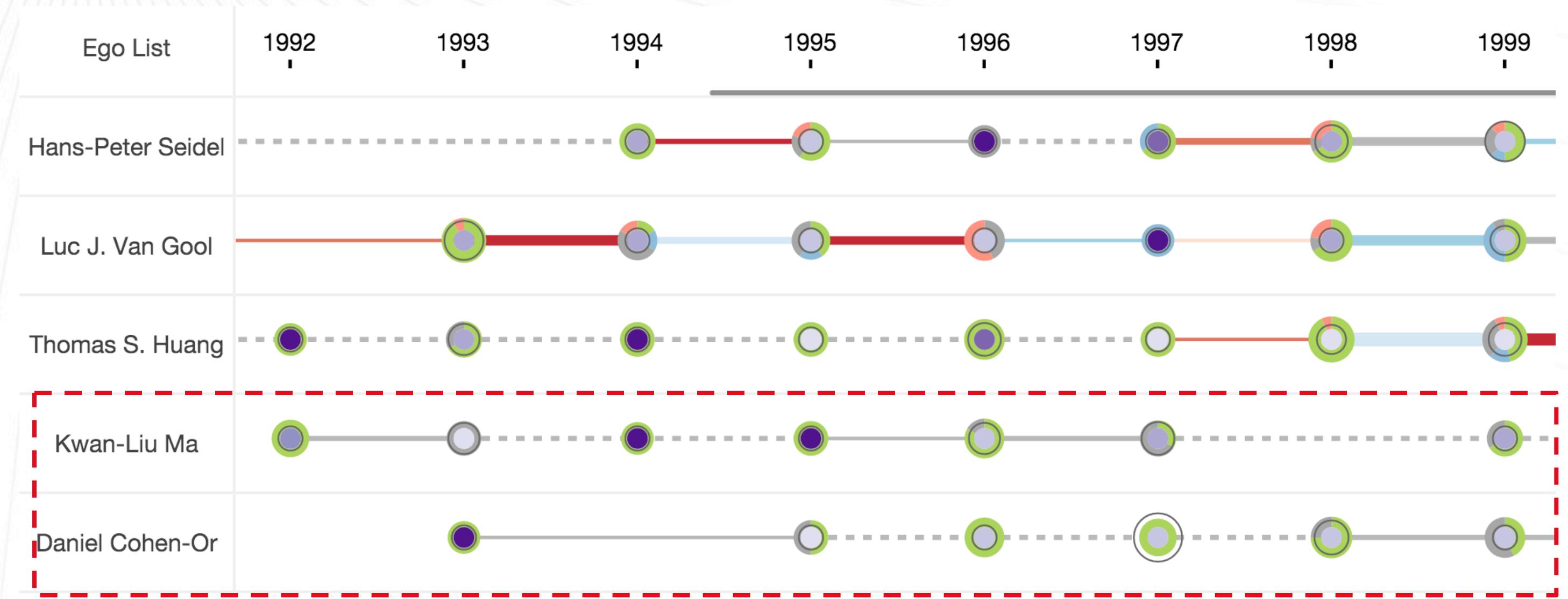
- Approach: timeline-based visualization



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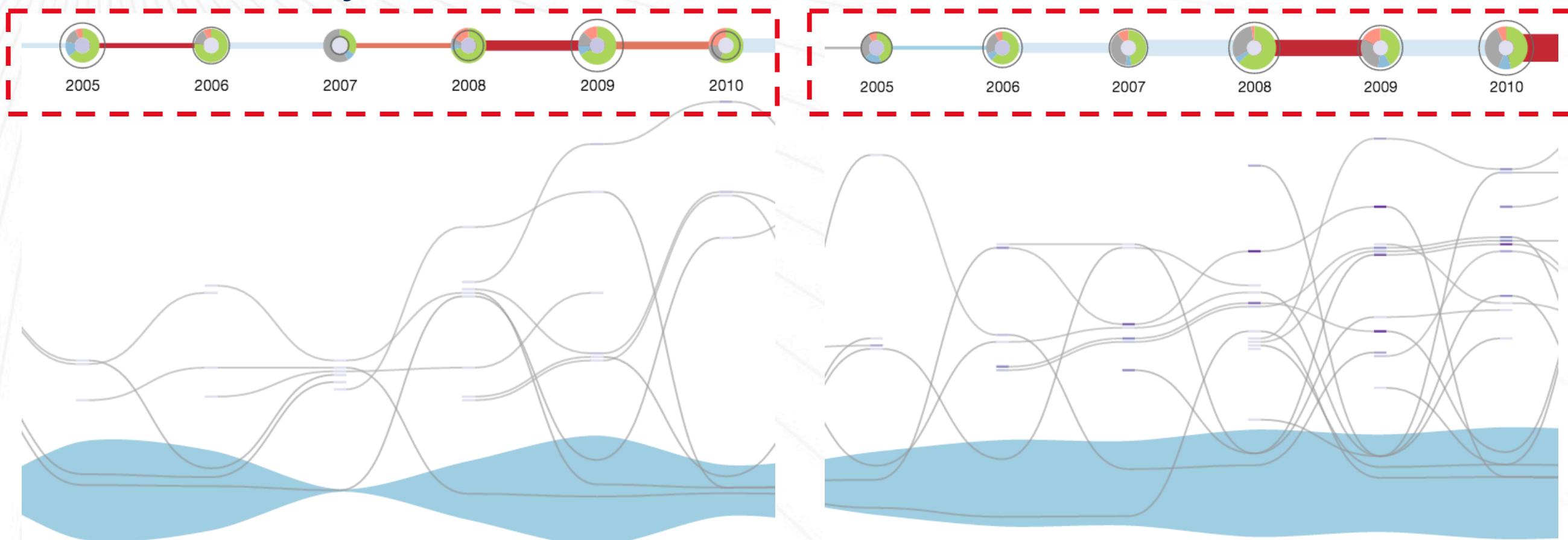
# Alter Timeline View – Microscopic Level

- Case Study



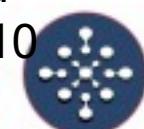
# Alter Timeline View – Microscopic Level

- Case Study



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

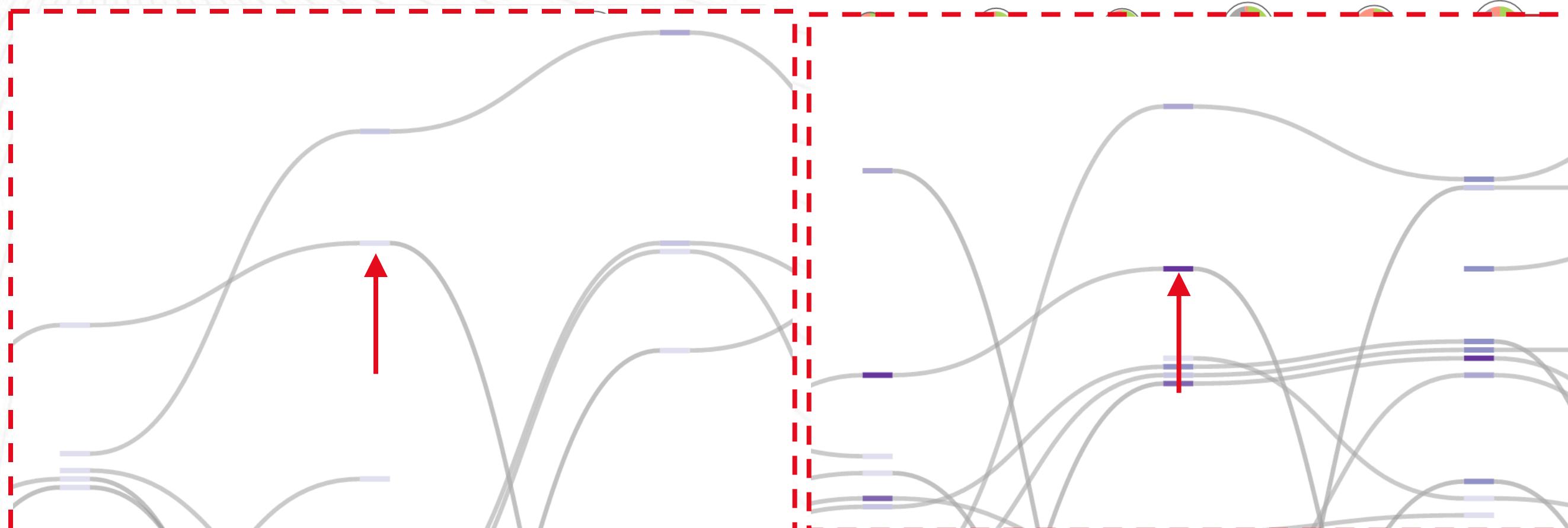
Prof. Daniel Cohen-Or's filtered  
ego-network between 2005 - 2010



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# Alter Timeline View – Microscopic Level

- Case Study

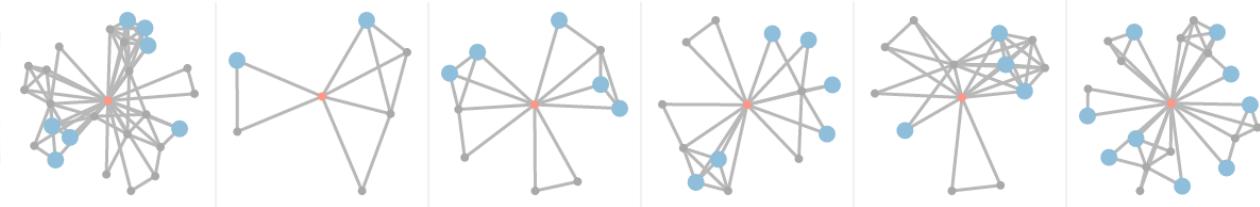


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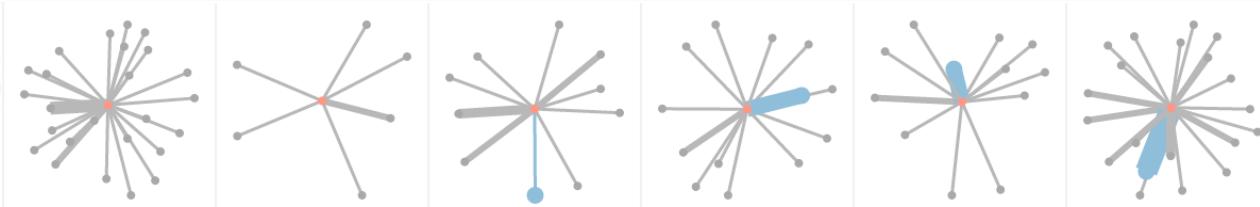
# Evaluation

- 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

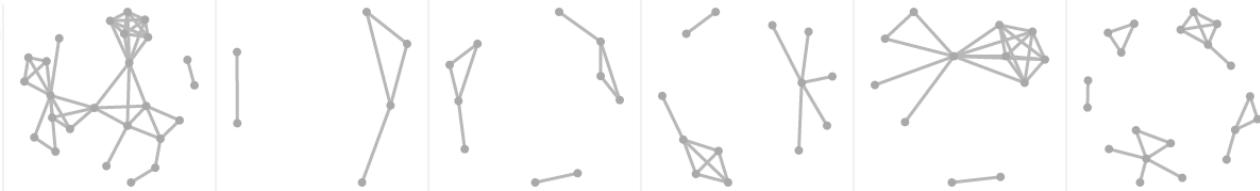
(a) Highlighting nodes



(b) Highlighting edges

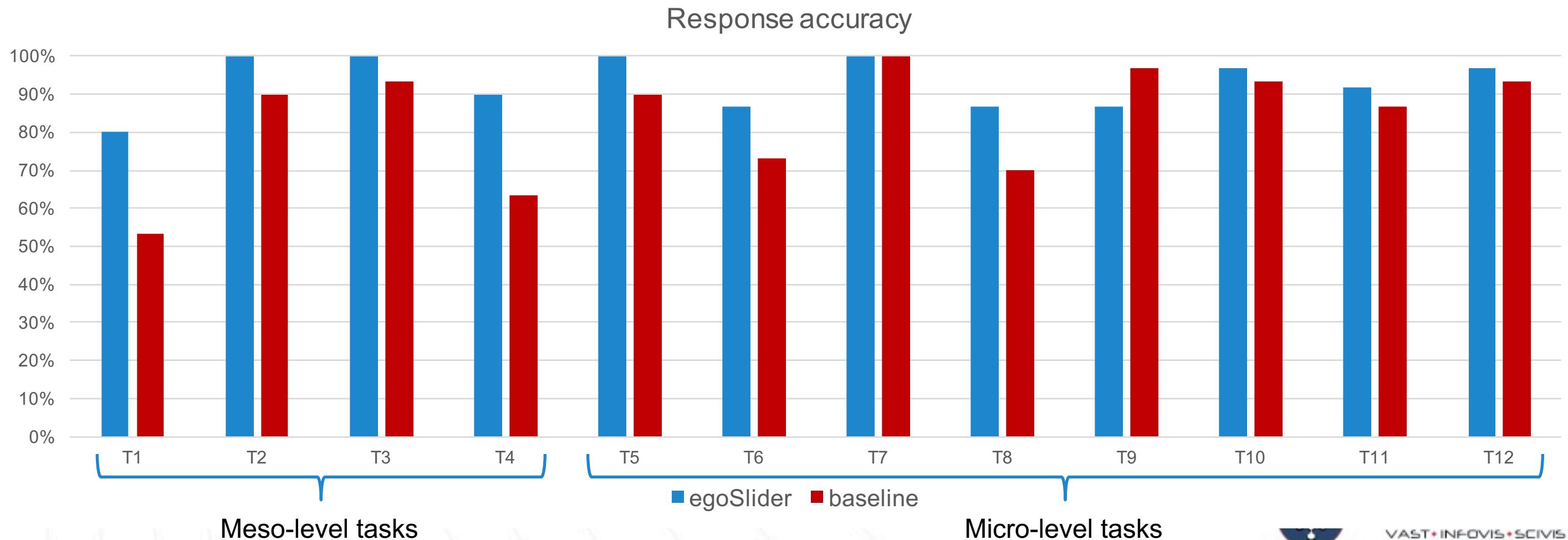


(c) Highlighting clusters



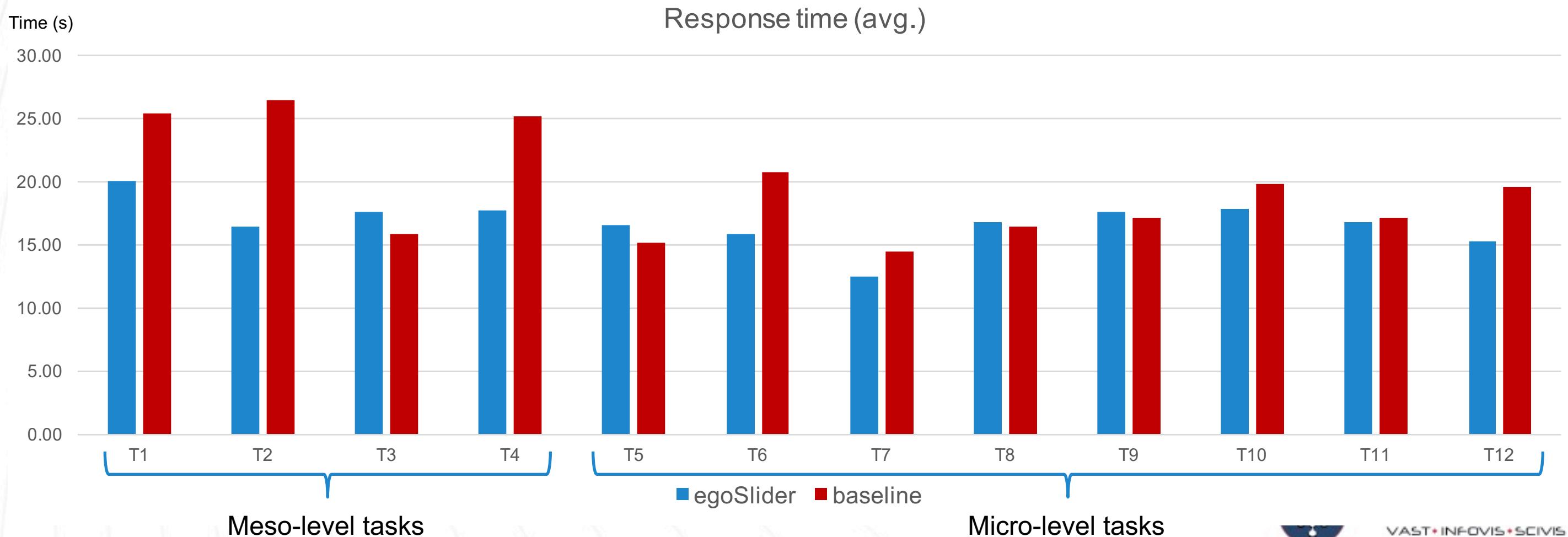
# User Study - Results

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



# User Study - Results

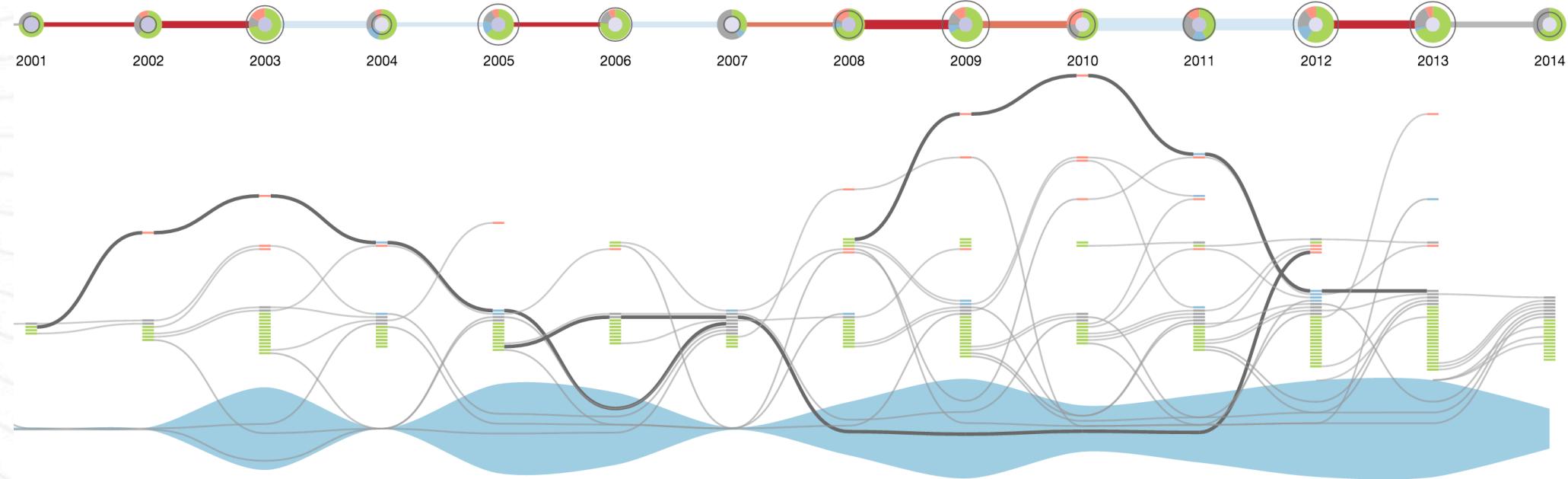
- 12 tasks in mesoscopic and microscopic level
  - 6 significantly better in both response accuracy and response time



# Future Work

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

# Q & A



## egoSlider: Visual Analysis of Egocentric Network Evolution

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