Solidity in a Turbulent Flow: The Social Network of Aristocratic Families in the Eastern Jin Dynasty (317–420 C.E.) According to *A New Account of the Tales of the World (Shishuo Xinyu)*

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Background and Motivation

"The Politics of Powerful Families"[1] in the Eastern Jin Dynasty

- Politically: "The notable families occupied a superior political situation, the politics was controlled by the entire class of aristocrats."[2]
- Socially: "A social system where the widely existing class of aristocrats or powerful families hold a pivotal position."[3]

A New Account of the Tales of the World (Shishuo Xinyu)

- A collection of 1,130 historical anecdotes
- Compiled in the 5th century, soon after the Eastern Jin dynasty
- Focuses on social relationships among the aristocrats
- Naturally suitable for social network analysis

Motivation

- Explore the "solidity" among the relationships of the aristocratic families in the Eastern Jin dynasty

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[1] Tian Yuqing, *The Politics of the Powerful Families During the Eastern Jin*, (Beijing: Beijingdaxue chubanshe, 2012).

[2] Naitō Konan, *General Views on Tang and Song Eras*, in A Study of Oriental Cultural History, trans. Lin Xiaoguang (Shanghai: Fudandaxue chubanshe, 2016), 103–12

[3] Kawakatsu Yoshio, *A Study on Aristocratic Society in the Six Dynasties*, trans. Xu Gupeng and Li Jicang (Shanghai: Shanghai guji chubanshe, 2007), p. 53.

Research Questions

Main focus: How are the social relationships among the aristocrats correlated with their family attribution in the Eastern Jin dynasty?

- Network level: How did the network form?
    - Possible evolutionary dynamics
    - Homophily in family attribution
- Group level: Which families were closely connected?
    - Cumulative weights between families
    - Intensity of cum. weights of different groups of families
- Node level: Who was of greater importance?
    - Most important people
    - Cumulative importance of different families based on centralities of their members

Data Collection and Preprocessing: Procedures

1. Extract co-occurrences of figures in *Shishuo Xinyu*
   - Excerpt info suggestive of Pos or Neg relationships
   - 287 people, 979 relationships from 593 anectodes
2. Data cleaning and relationship categorization
   - Unify naming with real (instead of courtesy, Dharma) names
   - Assigning weights on the relationships based on their categories
     {Strong (3), Weak (1)} $\times$ {Positive (+1), Negative (-1)}
   - Output format: {Person i, Person j, Relationship Score (S_{ij}) }
3. Constructing social networks
   - Weighted: $WN_{AB} = \sum\limits_{i=A, j=B} S_{ij} + \sum\limits_{i=B, j=A} S_{ij}$ (636 edges)
   - Unweighted: $UN_{AB} = 1$ if $\exists S_{AB} \neq 0$ (653 edges)

A piece of anecdote from *Chapter 1: Virtuous Conduct*

"When Ch'ih Chien met with the devastation and upheavals of the Yung-chia era (307-312), he was living in his home village (Chin-hsiang, in Shantung) in extreme poverty and hunger. The villagers, because of his reputation and virtue, took turns sharing their food with him. At first Ch'ih always took along his elder brother's son, Ch'ih Mai, and his sister's son, Chou I, whenever he went to eat. But the villagers said, "All of us are hungry and hard-pressed ourselves. It's only because you're an important, worthy person that we want to share in helping you. But we're afraid we can't have everybody survive." Ch'ih thereafter went alone to eat, but each time would hold the rice in his mouth tucked against the sides of his two cheeks. When he got home he would spit it out and give it to the two boys. Afterward they all survived and crossed the Yangtze River together." "[4]

Person 1	Person 2	Support
Ch'ih Chien	Chou I	hold the rice … give it to the two boys

| Person 1	Person 2	Score
Xi Jian	Zhou Yi	+3

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[4] Liu I-ch'ing, Shih-Shuo Hsin-Yü: A New Account of Tales of the World, trans. Richard B. Mather, Second Edition (Ann Arbor: Center for Chinese Studies, The University of Michigan, 2002), p. 11.

Network Simulation with Preferential Attachment Model

1. Set #Nodes to be the same as our network
2. Adjust parameters to control the generation rate of new edges
3. Replicate simulation until #Edges meets that of our network

Degree distributions: Simulated vs Real
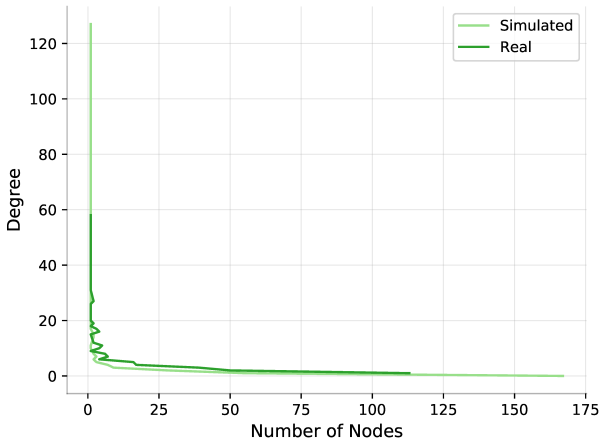
Network Prediction with ERGM

Hypothesis

- People from the same family were more likely to be connected

R Code

```
f = ergm(ssxy ~ edges + nodematch('family'))
```

Results

	Estimate	Std.Error	MCMC%	z-value	$Pr(> |z|)$
edges	-4.21	0.04	0	-100.96	<1e-04***
nodematch('family')	1.52	0.13	0	11.69	**<1e-04***

- Homophily in family attribution is significant, but the effect isn't strong

Cumulative Weights Between Families

Family A	Family B	Cum. weight	Avg. weight
The Xie's family of Chenjun	The Wang's family of Langya	42	0.091
The Xie's family of Chenjun	The Huan's family of Qiaoguo	27	0.175
The Xie's family of Chenjun	The Wang's family of Taiyuan	27	0.138
The Xie's family of Chenjun	The Xie's family of Chenjun	24	0.264
The Wang's family of Langya	The Wang's family of Langya	23	0.044

- The five most powerful families were very likely to develop social relations with members from other powerful families
- Particularly true for the members of the Xie's family of Chenjun, who is not an old family

Groups of families	Group total	Five most powerful
The major local families	2.695	0.896
All local families	2.134	1.086
The secondary immigrated families	1.972	1.450
The five most powerful families	1.616	1.616

Contrasting trends in the two types of intensity

- Local families tended to consolidate the relationships with other local families, but limited the relationships with the powerful families
- Secondary immigrated families acted as "adhesives" in the society
- Most powerful families had to interact with a variety of families

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[5] The Intensity of cumulative weights between two groups A and B is defined as: $I_{AB} = \frac{CW_{AB}/CW_{A\cdot}}{n_B/(n_A(n-n_A)+\binom{n_A}{2})}$, where CW denotes cumulative weights of edges and n denotes the number of nodes in a particular group.

Rank of Node Centralities

| Person	Deg	Wt. Deg	Eig	Wt.Eig	Bet	Cls
Xie An	1	1	1	2	1	1
Wang Dao	2	4	9	46	2	5
Huan Wen	3	6	4	5	3	2
Liu Tan	4	2	2	1	6	3
Sun Chuo	5	9	3	11	7	4
Yu Liang	6	6	11	16	4	10

- Different measures of centrality are often inter-correlated
- People with the highest value are generally from the powerful families
- Unusual phenomena

Rank of Family Cumulative Centralities

Family	Deg	Wt. Deg	Eig	Wt. Eig	Bet	Cls
The Wang's family of Langya	1	2	1	4	1	1
The Xie's family of Chenjun	2	1	2	1	2	4
The Wang's family of Taiyuan	3	3	3	2	6	2
The Huan's family of Qiaoguo	4	5	5	5	3	6
The Yu's family of Yingchuan	6	6	6	10	5	3
The Gu's family of Wujun	14	11	18	14	14	9
The Kong's family of Kuaiji	17	41	19	47	25	12
…	…	…	…	…	…	…

- Members of different powerful immigrated families show unusual high and low ranks in particular types of node centrality measures
- Members of the local families have a high rank in closeness centrality, and a low rank in weighted eigenvector centrality in general

Community Detection with Louvain Algorithm
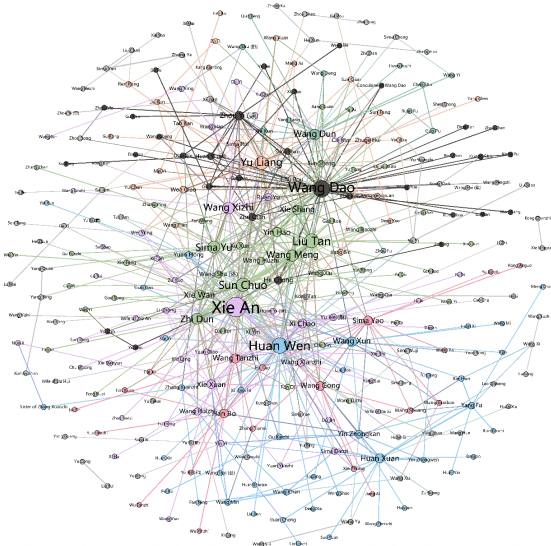
The five most powerful families have good control over the entire network, while the similarity between detected communities and families cannot be consider as strong.

Conclusions, Limitations and Future Works

Conclusions
- The homophily in family attribution did exist in the aristocratic society in the Eastern Jin dynasty, but such homophily was quite weak
- There was a "solidity" in the "turbulent flow" in the aristocratic society, through which the aristocratic families had maintained a general "stability" in the society

Limitations and Future Works
- The synthetization unavoidably inherited the biases of *Shishuo Xinyu* and cannot be considered as completely comprehensive and objective
- Investigating other aspects of the social network of aristocratic families such as structural equivalence and balance of triads

General Contribution
- Network methods can abstract relationships from complex archives into a manageable graph model based on a well-defined set of rules
- With the help of social network analysis methods in aggregating and integrating historical materials, more latent veins in the medieval history can be excavated

Thanks! ☺