

# Evolving Networks in the Realm of **Ice** and **Fire**



A comparative Network Analysis of “Game  
of Thrones” Book One and Five

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Network Science  
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# 1. Introduction

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- “Game of Thrones” by George R.R. Martin
- “A Game of Thrones” (1) and “A Dance with the Dragon” (5)
- Evolution of network
- Shifting importance and roles of characters



## 2. Software and Dataset

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- *Python*
- *Gephi*



- The original dataset has been extracted from <https://www.kaggle.com/code/mmmarchetti/game-of-thrones-network-analysis/notebook>
- Selected 2 of 5 files (books)
- Book 1: 685 rows, 5 columns (*Source*, *Target*, *Type*, *Weight*, *Book*)
- Book 5: 761 rows, 5 columns

# 3. Network Structure

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## 3.1 Network Properties

### Book 1

- Number of nodes: 187
- Number of edges: 684
- Graph diameter: 7
- Av.Path Length: 2.912
- Graph density: 0.039

### Book 5

- Number of nodes: 317
- Number of edges: 760
- Graph diameter: 8
- Av.Path Length: 3.786
- Graph density: 0.015

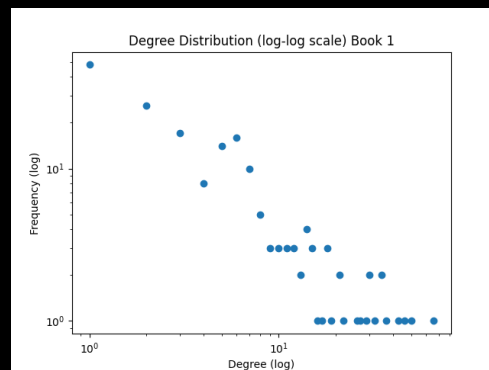
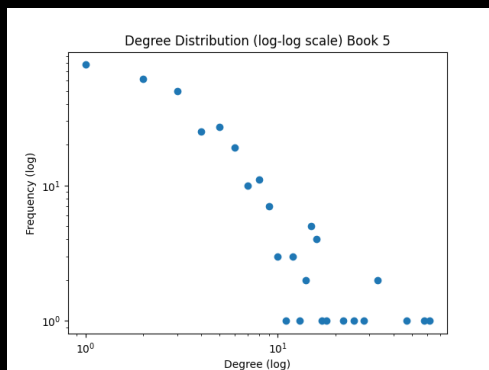
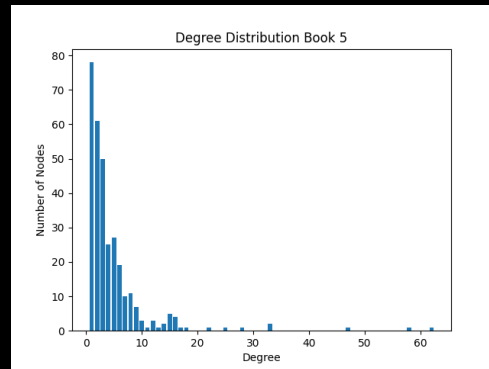
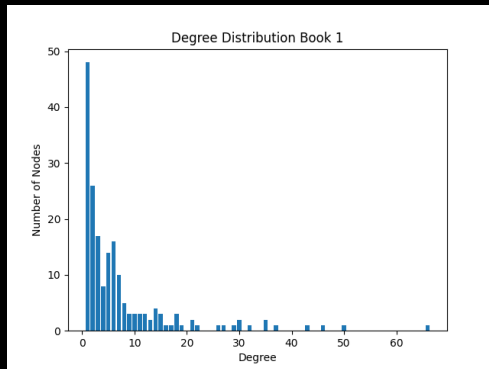
## 3.2 Centrality Measures: Degree

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Label	Degree ▾
Eddard-Stark	66
Robert-Baratheon	50
Tyrion-Lannister	46
Catelyn-Stark	43
Jon-Snow	37
Robb-Stark	35
Sansa-Stark	35
Bran-Stark	32
Cersei-Lannister	30
Joffrey-Baratheon	30

Label	Degree ▾
Jon-Snow	62
Daenerys-Targary...	58
Stannis-Baratheon	47
Tyrion-Lannister	33
Theon-Greyjoy	33
Cersei-Lannister	28
Barristan-Selmy	25
Hizdahr-zo-Loraq	22
Asha-Greyjoy	18
Melisandre	17

## 3.2.1 Degree distribution



## 3.2 Centrality Measures

Label	Betweenness Centrality ▾	Closeness Centrality	Eigenvector Centrality
Eddard-Stark	4638.534951	0.563636	1.0
Robert-Baratheon	3682.391036	0.545455	0.910723
Tyrion-Lannister	3272.606016	0.510989	0.766746
Jon-Snow	2952.057282	0.493369	0.593371
Catelyn-Stark	2604.755647	0.505435	0.72392
Daenerys-Targaryen	1484.278023	0.405229	0.191335
Robb-Stark	1255.689656	0.497326	0.657239
Drogo	1115.094639	0.379592	0.108818
Bran-Stark	960.031914	0.486911	0.655156
Sansa-Stark	639.076914	0.489474	0.766845

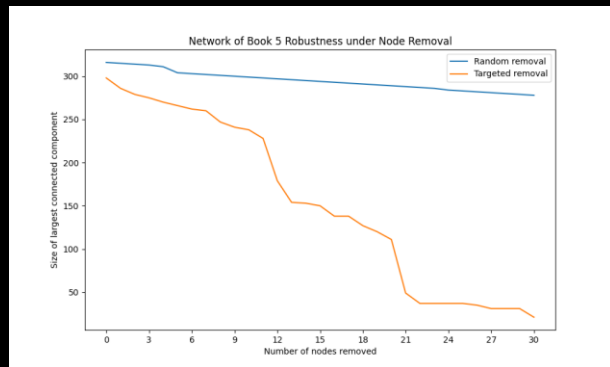
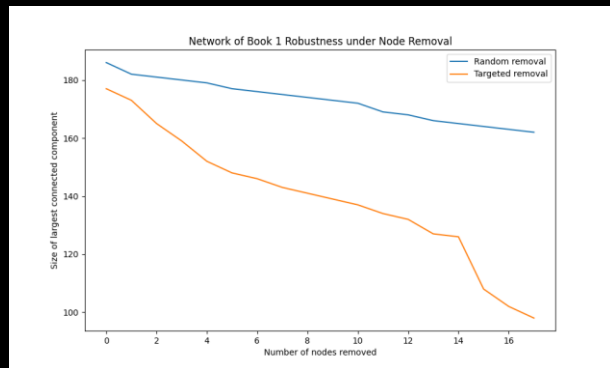
Label	Betweenness Centrality ▾	Closeness Centrality	Eigenvector Centrality
Stannis-Baratheon	22537.379305	0.432285	0.917393
Daenerys-Targary...	14729.227752	0.364055	1.0
Jon-Snow	12186.121627	0.355056	0.868419
Tyrion-Lannister	10432.594879	0.402548	0.630138
Robert-Baratheon	8817.70444	0.400507	0.433456
Cersei-Lannister	7747.065493	0.398487	0.488622
Theon-Greyjoy	5472.66494	0.33942	0.469836
Asha-Greyjoy	4450.323998	0.357871	0.259883
Eddard-Stark	3654.818929	0.37619	0.404728
Doran-Martell	2631.240453	0.329854	0.274406



## 3.3-3.4 Assortativity and Robustness

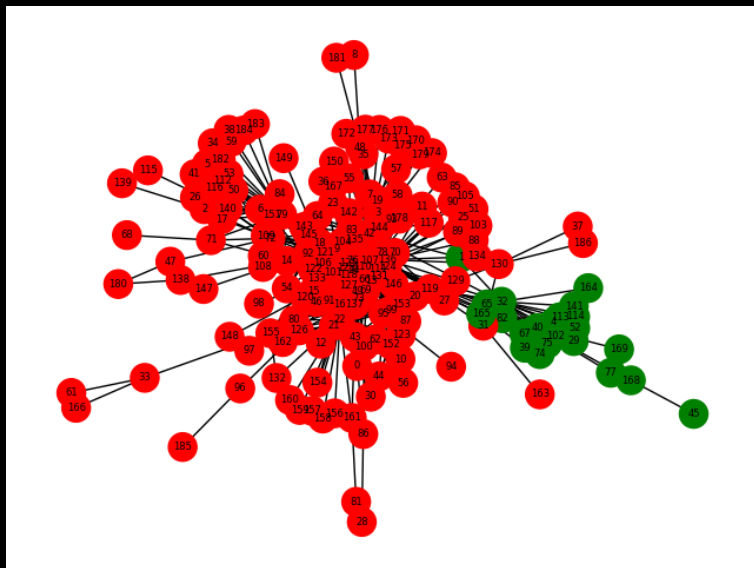
### Assortativity

- Book 1: -0.163
- Book 5: -0.211
- Few links between nodes of similar degree
- Hubs are more likely to link with nodes with lower degree

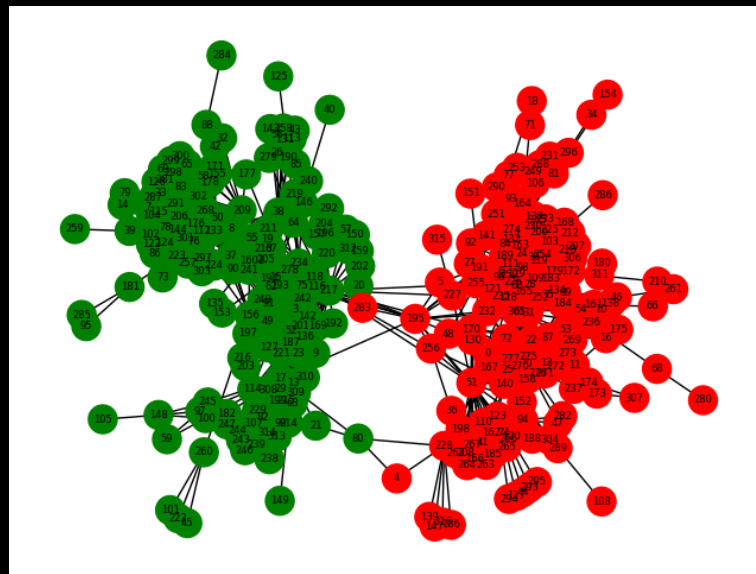


## 4.1 Community Detection: Girvan Newman

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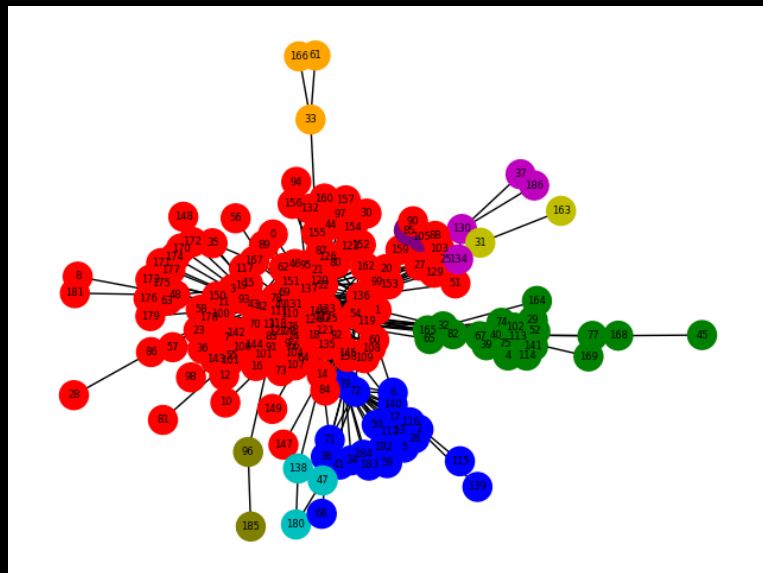


Communities: 2  
Modularity: 0.169

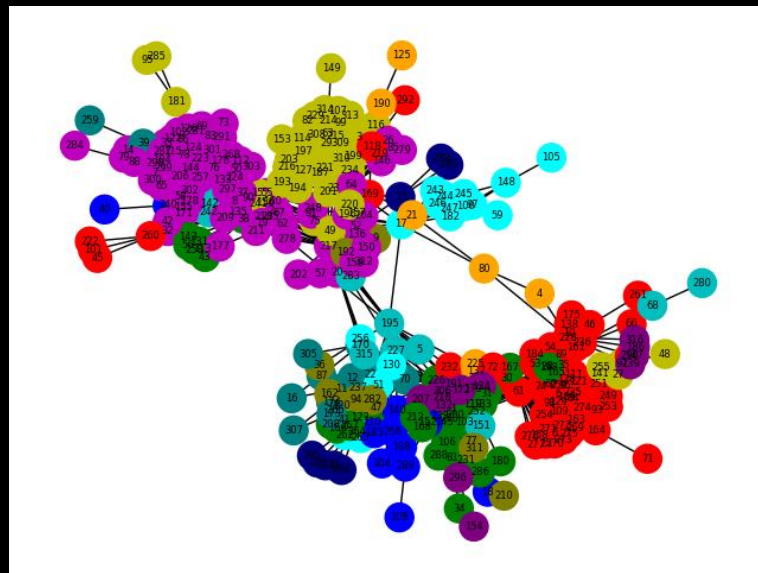


Communities: 2  
Modularity: 0.483

## 4.2 Community Detection: Label Propagation

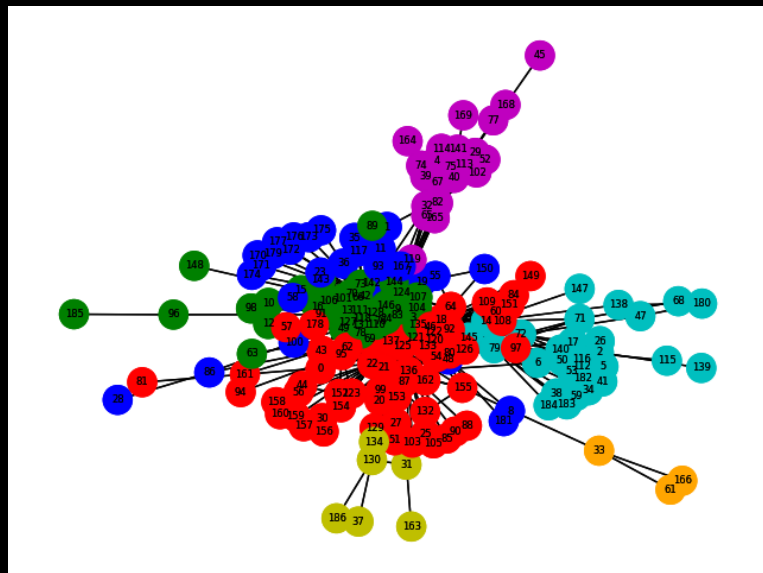


Communities: 9  
Modularity: 0.311

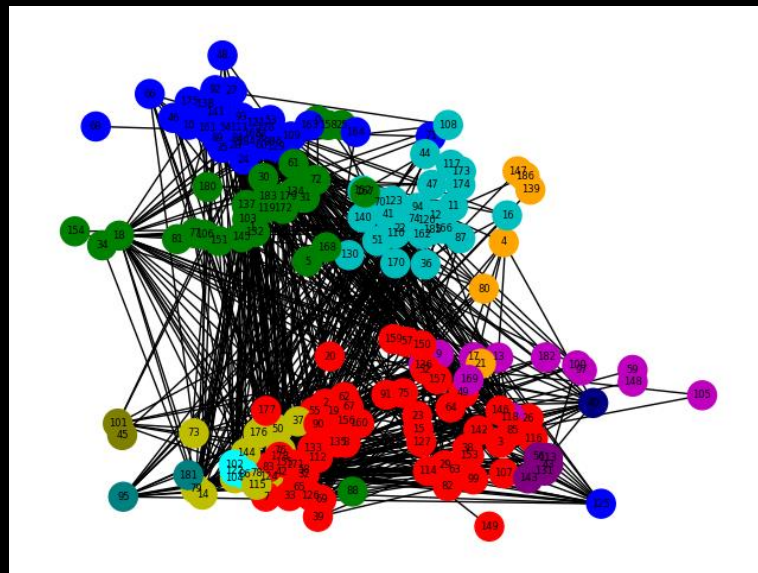


Communities: 33  
Modularity: 0.641

## 4.3 Community Detection: Clauset-Newman-Moore



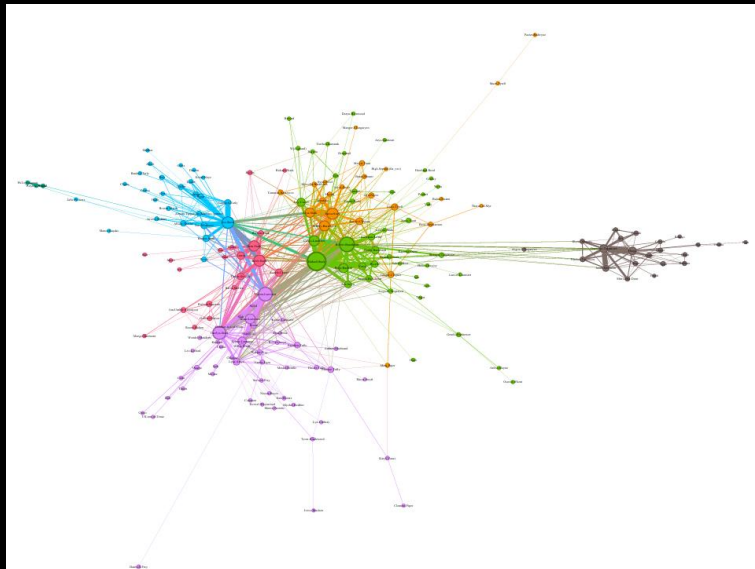
Communities: 7  
Modularity: 0.474



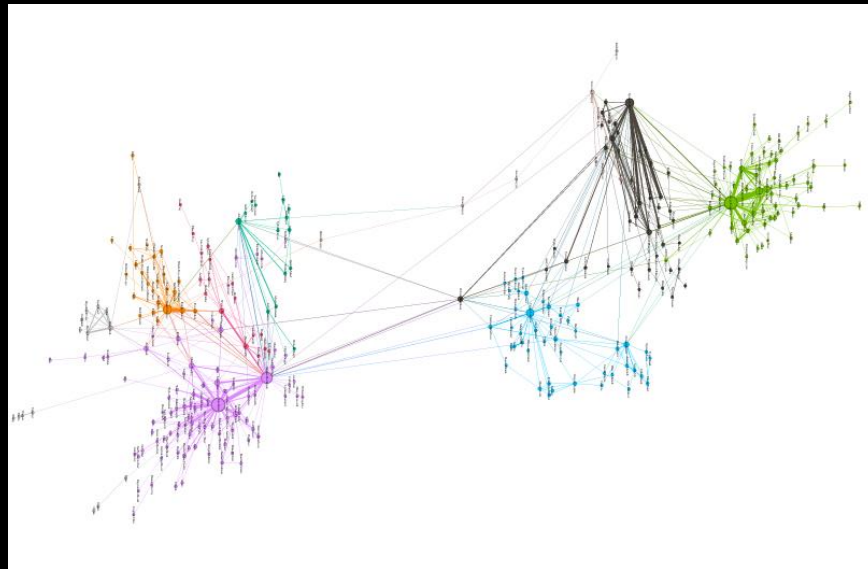
Communities: 15  
Modularity: 0.629

## 4.4 Community Detection: Louvain

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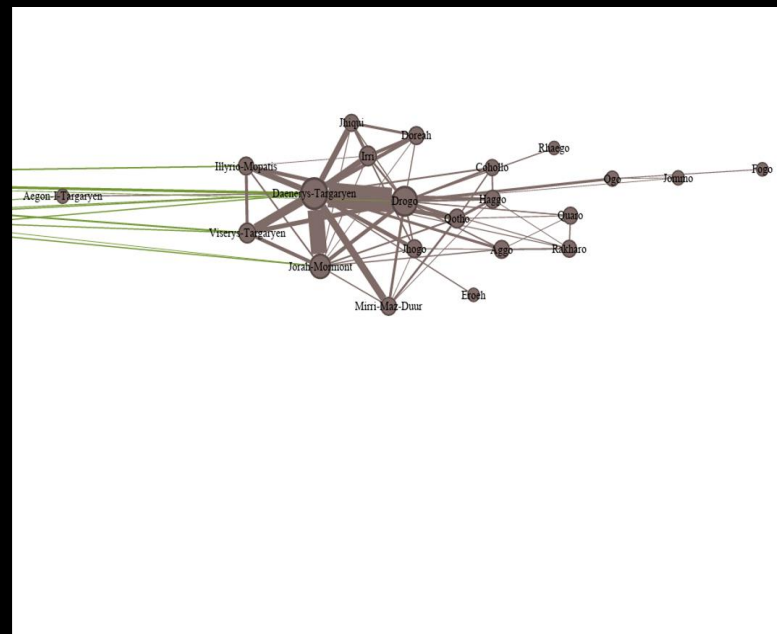
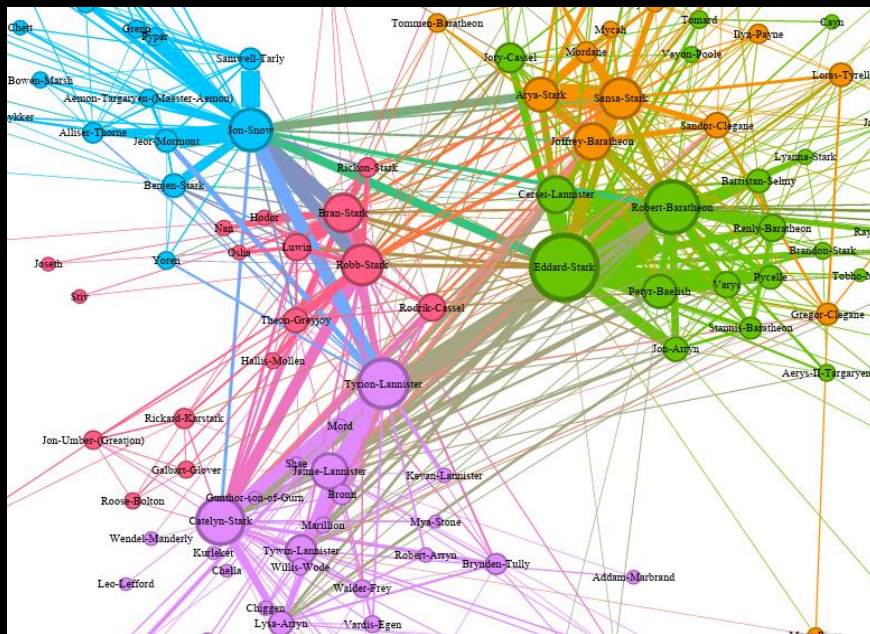


Communities: 7  
Modularity: 0.514



Communities: 11  
Modularity: 0.704

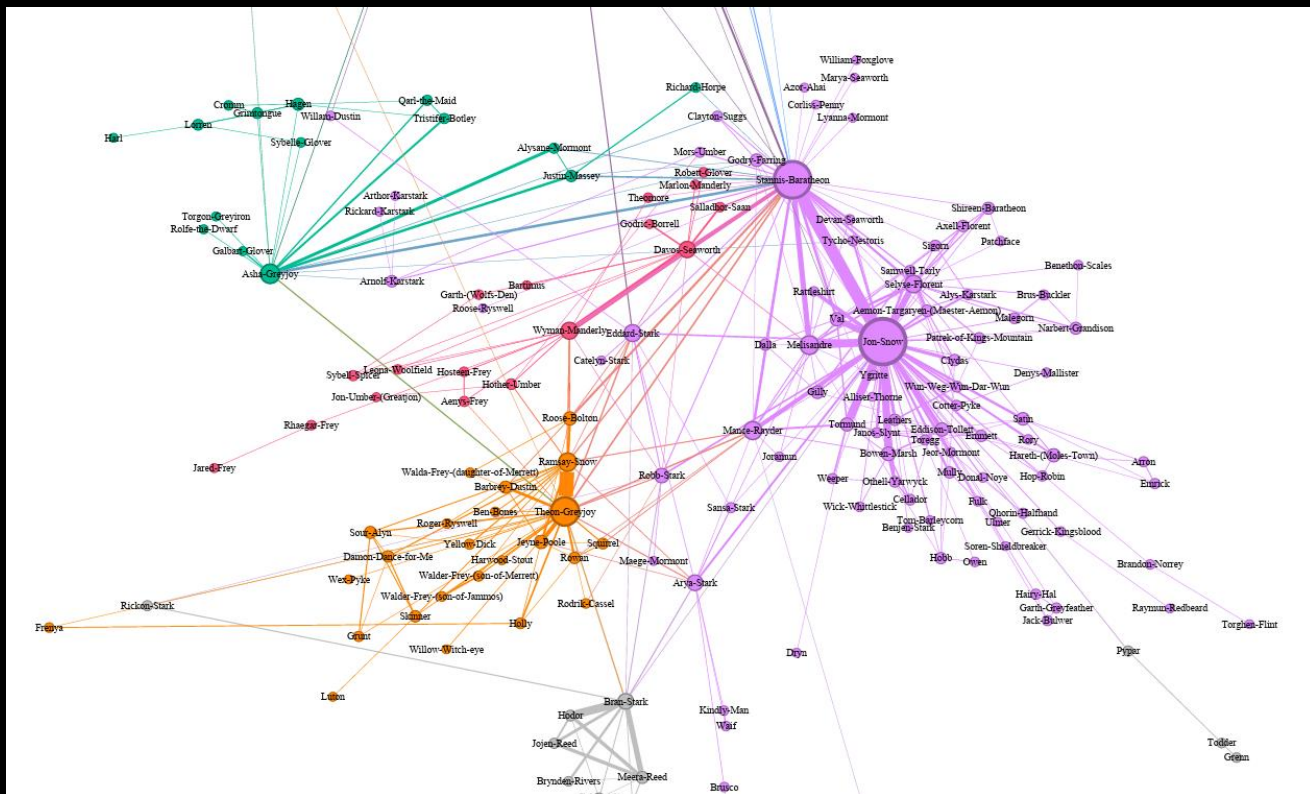
## 4.4 Community Detection: Louvain book 1





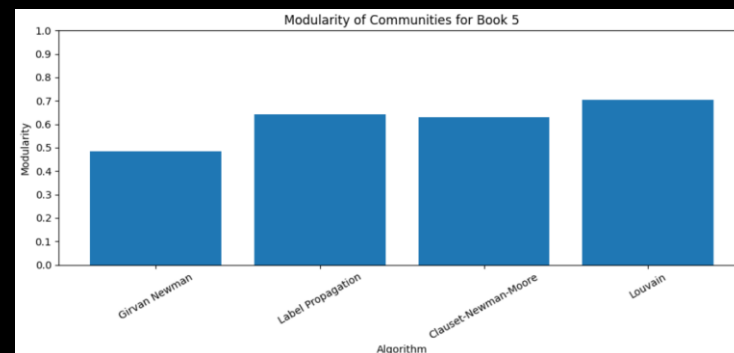
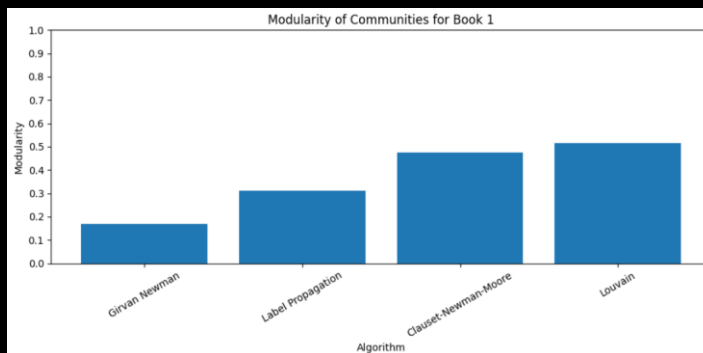
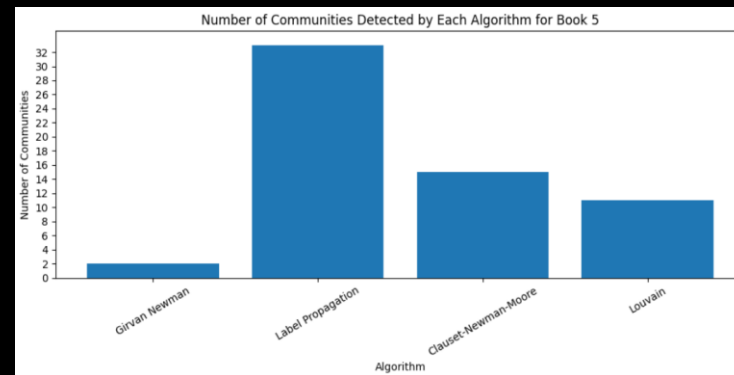
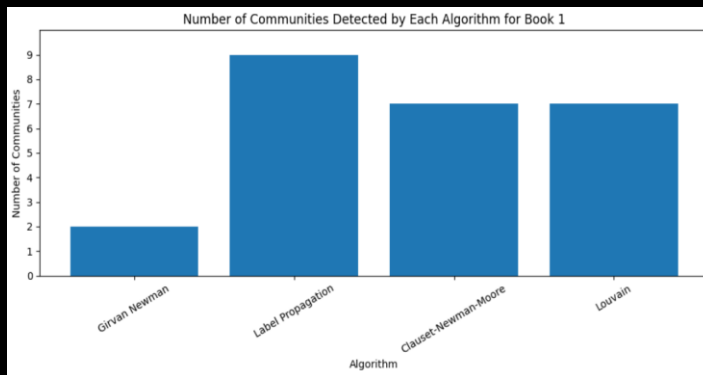


## 4.4 Community Detection: Louvain book 5





## 4.5 Comparison



# 5. Conclusion

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- Significant shifts in the network structure
- Changes in the importance of the characters (Daenerys rise, Eddard Stark fall and the list of ruthless murders of heroes)
- Alliances and fights through Community detection
- Potential of Network Science to illuminate the underlying structures and dynamics of complex literary works



# GAME OF THRONES