

UCS1722 Social Network Analysis
Mini Project
Genre Dynamics in the Manhwa Industry

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Objective

This project aims to visually and analytically explore the intricate graph of the Manhwa (Korean Comics) landscape, focusing on the relationships between genres and the popularity of the associated comics through the utilization of two-mode networks.

Dataset Description

This project utilizes a dataset sourced from Kaggle (<https://www.kaggle.com/datasets/crxgom/manhwa-dataset>), which compiles all manhwa from MyAnimeList (MAL), a prominent anime and comic platform.

The dataset includes detailed information such as type, title, chapters, status, genres, favorites, popularity rank, score, members, synopsis, volumes, authors, and publish time.

For the sake of this project, the analysis focuses on the 'genre' and 'members' attributes to gain insights into the most popular genres based on the number of comics within each genre and the overall popularity of the comics within those genres.

Graph Structure

1 mode:

Every node is a manhwa and the edges represent the common genres between 2 manhwa, the weight being the number of common genres. Edges represented are restricted to those having more than 3 common genres.

Example node:

Manhwa	Type	Members
Solo Leveling	manhwa	431289

Example edge:

Source	Target	Weight
Solo Leveling	Tower of God	3

2 mode:

There are 2 types of nodes- manhwa nodes and genre nodes. The edges are a directed relationship between a manhwa and the genre it belongs to.

Example node:

Manhwa	Type	Members
Solo Leveling	manhwa	431289
Fantasy	genre	0

Example edge:

Source	Target
Solo Leveling	Fantasy

Gephi

Gephi is an open-source software for visualizing and analyzing large networks. It is particularly used for exploring and understanding complex relationships within datasets, such as social networks, biological networks, transportation networks, and more. Gephi provides a user-friendly interface that allows users to import, manipulate, and analyze network data, and then visualize the results in the form of graphs and charts.

Questions

What is the most abundant genre among comics?

How popular is each comic?

What are the communities?

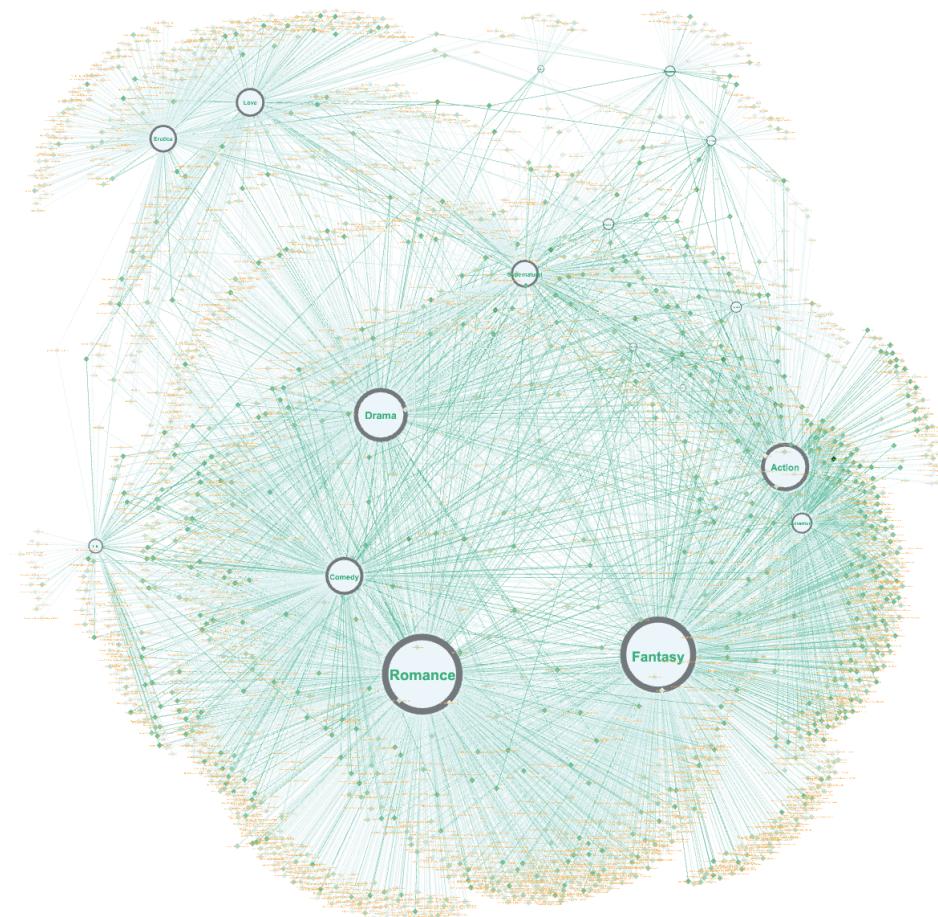
What is the most popular comic in each genre/Community?

What is the most popular Genre/Community?

Is there a correlation between community size and popularity?

Given a comic, find other comic recommendations.

2 mode Graph Structure



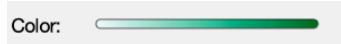
Number of nodes : 2842 (18 Genre Nodes + 2824 Manhwa Nodes)

Number of edges : 5876

Directed Graph (manhwa node) —>(genre node)

The size of the node is proportional to the in-degree of each node.

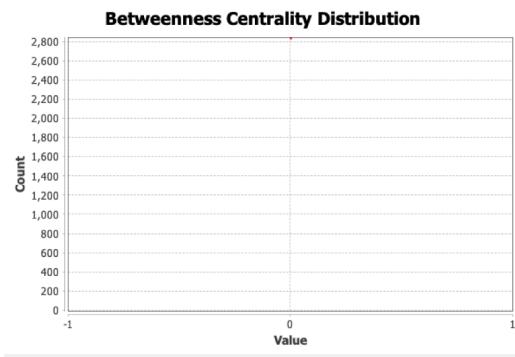
The color of the node is proportional to the popularity (no. of members) of the comic.



Parameters:

Considering the directed representation:

Betweenness centrality: how often a node appears in the shortest path to all other nodes.

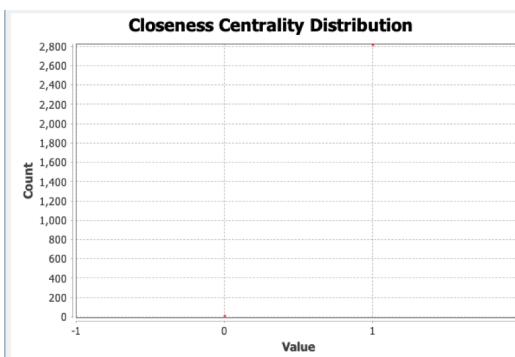


Interpretation :

The links in this graph are directed and between manhwa node and the genre node. There are no connected relationships between manhwa nodes or between genre nodes.

Hence the betweenness centrality for all the 2842 nodes is 0 and the average centrality is 0.

Closeness centrality: The average distance from a given node to all other nodes in the network.

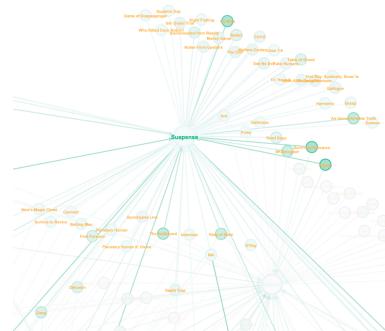


Interpretation :

Genre nodes will all have a closeness centrality measure of 0 because they have no outgoing edges to other nodes.

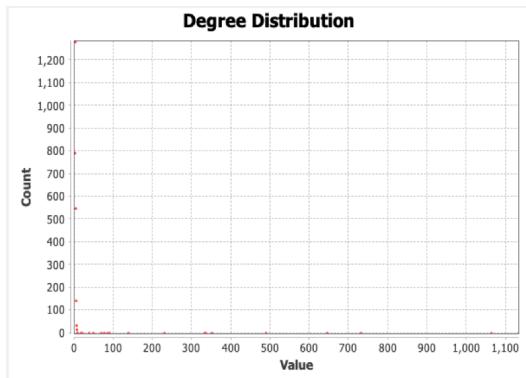
Manhwa nodes will have a closeness centrality measure of 1 because their edges are only directed terminally to a genre. Hence Average is 0.9.

Arbitrary manhwa node



Arbitrary genre node (suspense)

Degree centrality: For a directed graph, both indegree (the number of incoming edges) and outdegree (the number of outgoing edges) must be considered for finding the degree.

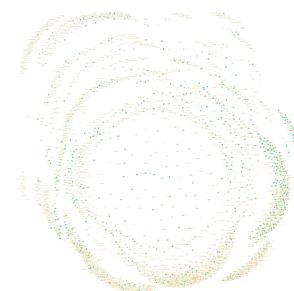


Interpretation :

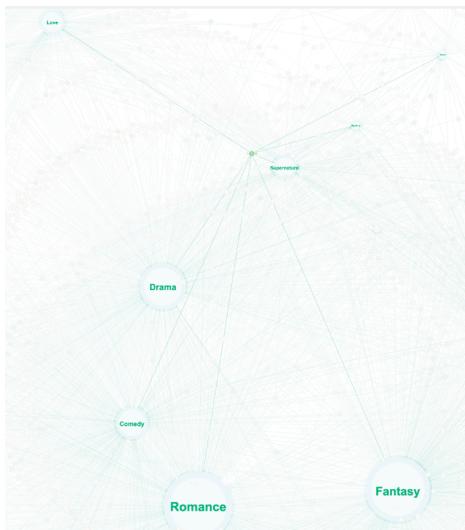
Genre nodes will have large in-degrees. Romance has the largest out-degree (and degree) of 1132.

Each manhwa node can at the maximum have an out-degree of 18. Here the maximum out degrees is actually 8 belonging to the manhwa The Tarot Cafe.

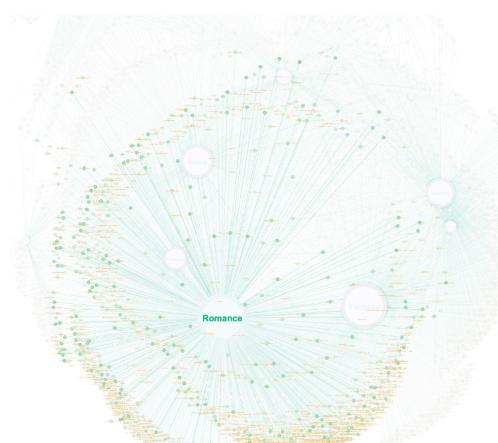
But by and large, due to the overwhelming number of nodes with degrees in the range of 1-6(2822), the degree centrality is 2.068



Nodes with degrees in the range 1-6



The Tarot Cafe node with degree 8



Romance genre node with the highest degree

Network Level Measures :

Network Density: Network density is the ratio of the actual number of edges in a network to the maximum possible number of edges = 0.001

Interpretation : With 2842 nodes, the maximum number of edges would have been 8074122. The number of edges is however 5876 => network density = $5876/8074122 = 0.00072775714$ = approx 0.01

Path level measures :

The links in this graph are directed terminal relationships between manhwa node and the genre node. There are no connected relationships between manhwa nodes or between genre nodes.

Diameter: How far apart are any two distant nodes = 1

Average Path length: the average number of steps along the shortest paths for all possible pairs of network nodes = 1.0

Characteristic Path length: the average length for all the paths for all possible pairs of network nodes = 1.0

Connected components :

Number of Weakly Connected Components: 2

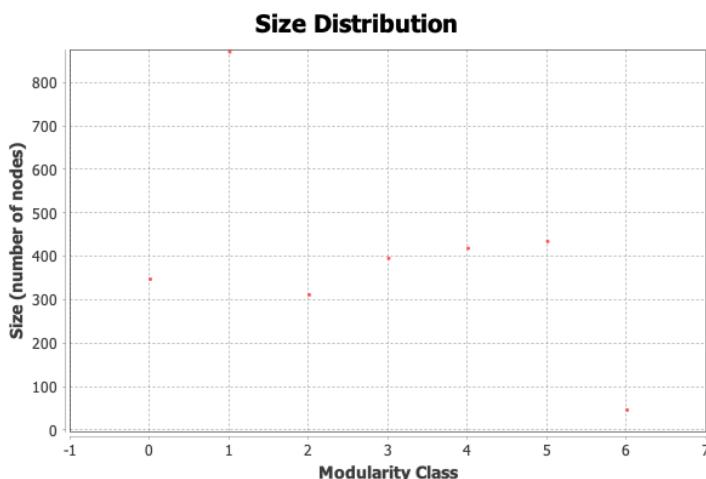
Number of Strongly Connected Components: 2842

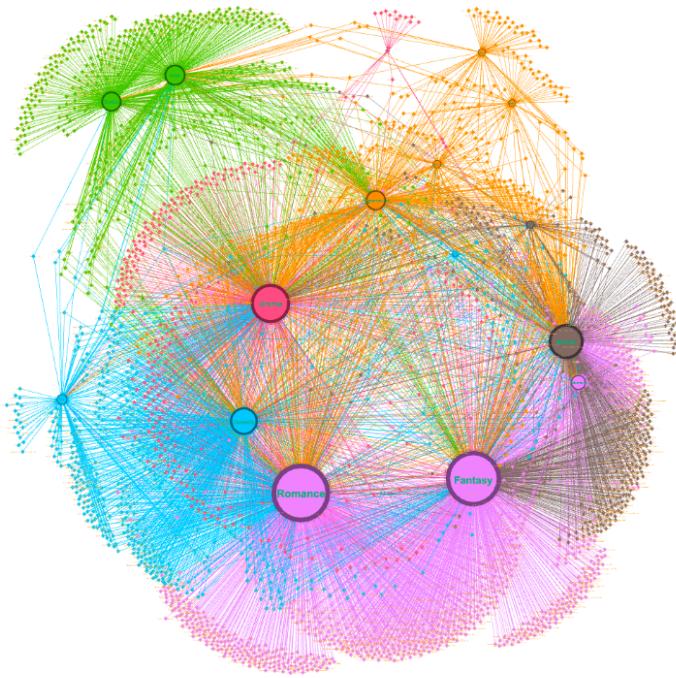
Community detection :

Modularity: 0.439

Modularity with resolution: 0.439

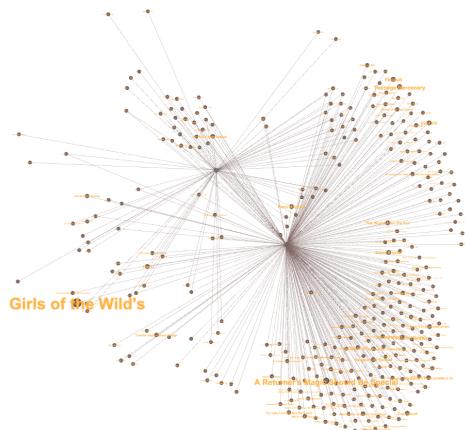
Number of Communities: 7





Communities represented by graph coloring

Note: Size of text and node is proportional to the popularity



Community 0

12.32% of the nodes.

Encompasses Action and Sci-fi genres.

Most popular manhwa in the community based on members: Girls of the Wild's

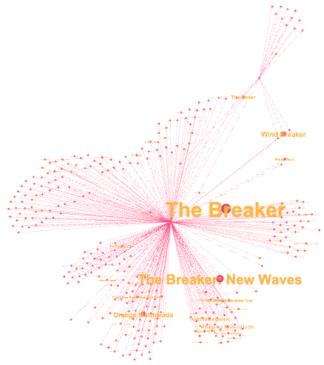


Community 1

30.72% of the nodes.

Encompasses Adventure, Fantasy, Gourmet, Romance.

Most popular manhwa in the community based on members: Solo Leveling

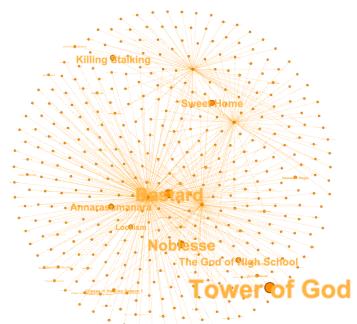


Community 2 :

11.05% of the nodes

Encompasses Drama and Sports Genres

Most popular manhwa in the community based on members:
The Breaker

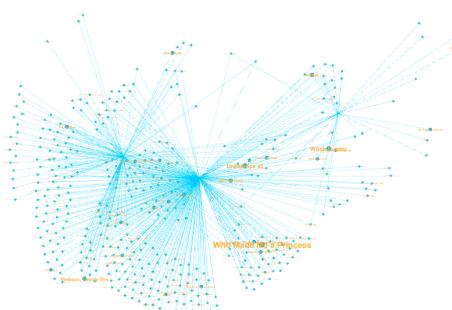


Community 3 :

14% of the nodes

Encompasses Horror, Mystery, Supernatural and Suspense

Most popular manhwa in the community based on members:
Tower of God

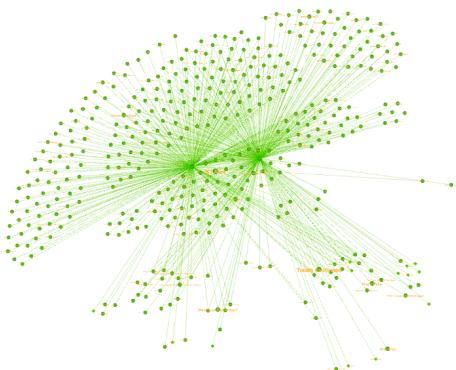


Community 4 :

14.81% of the nodes.

Encompasses Life, Ecchi, Comedy Genres

Most popular manhwa in the community based on members: Who made me a princess

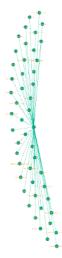


Community 5 :

15.38% of the nodes

Encompasses Love and Erotica

Most popular manhwa in the community based on members: BJ Alex



Community 6 :

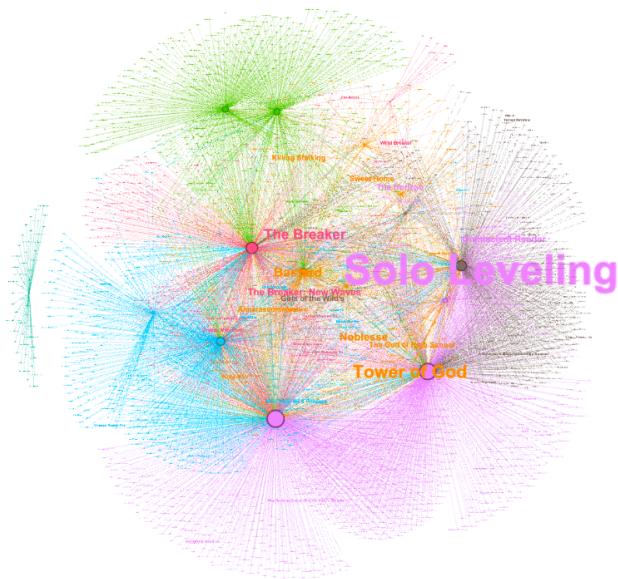
1.72% of the nodes

Encompasses Unknown Genres

Most popular manhwa in the community based on members:
Forbidden Kiss

Overall Popularity:

Note: Text Color Denotes the Community



Measures of the top 10 popular Manhwa:

Label	members ▾	Out-Degree	Eccentricity	Closeness Centrality	Betweenness Centrality	Modularity Class
Solo Leveling	431289	3	1.0	1.0	0.0	1
Tower of God	175863	5	1.0	1.0	0.0	3
The Breaker	138540	3	1.0	1.0	0.0	2
Bastard	126088	4	1.0	1.0	0.0	3
Noblesse	104380	4	1.0	1.0	0.0	3
The Breaker: New Waves	90598	4	1.0	1.0	0.0	2
Omniscient Reader	87035	3	1.0	1.0	0.0	1
The Horizon	75806	2	1.0	1.0	0.0	1
Girls of the Wild's	69555	4	1.0	1.0	0.0	0
The God of High School	69497	4	1.0	1.0	0.0	3
Sweet Home	69394	4	1.0	1.0	0.0	3
Killing Stalking	68664	4	1.0	1.0	0.0	3
Annarasumanara	65898	3	1.0	1.0	0.0	3
Lookism	48723	4	1.0	1.0	0.0	3
Who Made Me a Princess	44428	3	1.0	1.0	0.0	4
Wind Breaker	42434	3	1.0	1.0	0.0	2
Orange Marmalade	40844	2	1.0	1.0	0.0	2
A Retuner's Magic Sho...	31631	2	1.0	1.0	0.0	0
Witch Hunter	29886	6	1.0	1.0	0.0	4
The Boxer	29404	2	1.0	1.0	0.0	2
Unbalance x2	29245	3	1.0	1.0	0.0	4
Why Raeliana Ended U...	27488	2	1.0	1.0	0.0	1
Something About Us	27017	1	1.0	1.0	0.0	1
The Legend of the North...	25716	3	1.0	1.0	0.0	1
Cheese in the Trap Sea...	24952	4	1.0	1.0	0.0	3

On average considering the top 25 manhwa :

0.08% Community 0 (Action and Sci-fi)

0.24% Community 1 (Adventure, Fantasy, Gourmet, Romance)

0.2% Community 2 (Drama and Sports)

0.32% Community 3 (Horror, Mystery, Supernatural and Suspense)

0.08% Community 4 (Life, Ecchi, Comedy)

0% Community 5 (Love and Erotica)

0% Community 6 (Unknown)

Inferences:

What is the most abundant genre among comics?

The most abundant genre among the comics is Romance with 1132 comics.

How popular is each comic?

The popularity is indicated by the size of the text in the overall popularity figure.

What are the communities?

There are 7 generated communities

- Community 0 (Action and Sci-fi)
- Community 1 (Adventure, Fantasy, Gourmet, Romance)
- Community 2 (Drama and Sports)
- Community 3 (Horror, Mystery, Supernatural and Suspense)
- Community 4 (Life, Ecchi, Comedy)
- Community 5 (Love and Erotica)
- Community 6 (Unknown)

What is the most popular comic in each genre/Community?

Indicated in the community-wise descriptions in page 7,8,9.

What is the most popular Genre/Community?

The most popular Genre/Community is Community 3 (Horror, Mystery, Supernatural and Suspense) covering 0.32% of the top 25 popular comics as a heuristic.

Is there a correlation between community size and popularity?

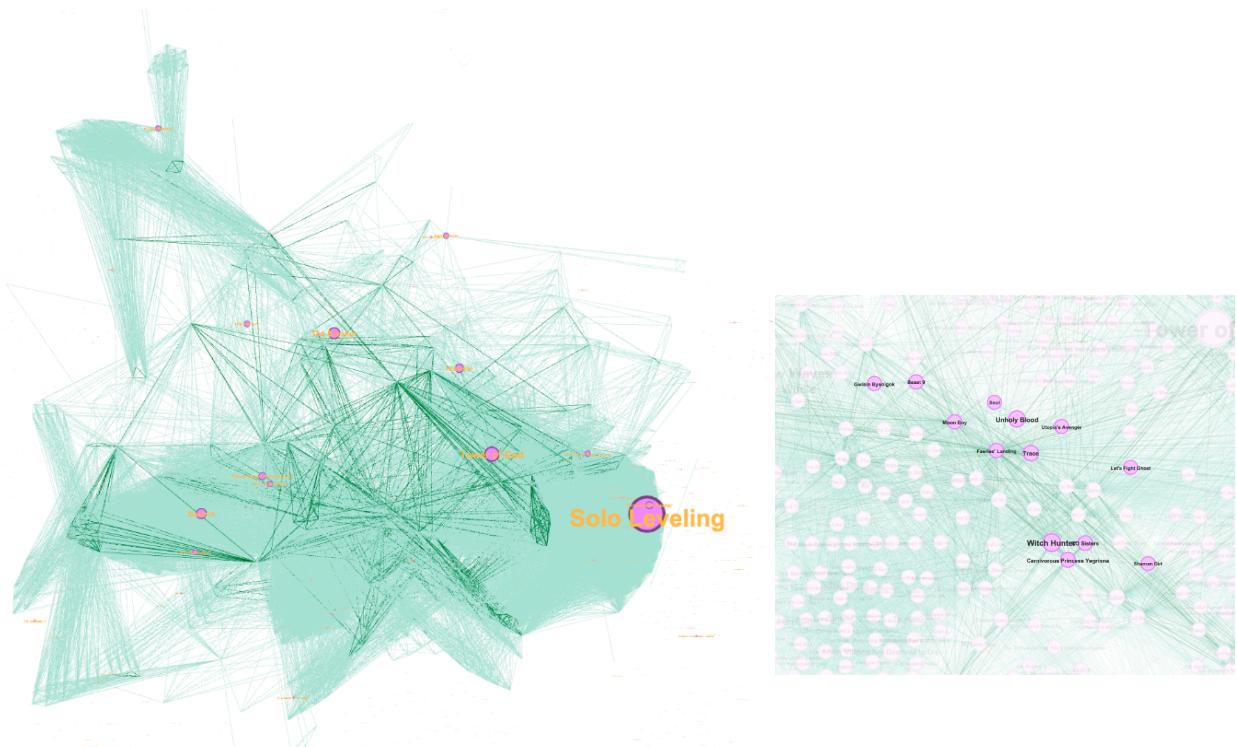
Although the largest community is Community 1 covering 30% of the nodes, the most popular community seems to be Community 3.

Hence there doesn't seem to be an apparent correlation between the community size and the popularity.

Given a comic, find other comic recommendations.

In the 2 mode network, for a query node, the other nodes in the community would serve as recommendations

In a one mode graph structure where the edge is defined by the presence of common genres and the weight is the number of common genres, all the nodes connected to a particular node would serve as recommendations.



Suppose the query node is 'unholy blood', all the nodes it is connected to would serve as recommendations.

Result: Thus the dynamics of the manhwa landscape was analysed.