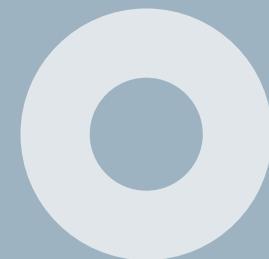


HI THERE

Welcome to
GROUP 2
presentation



GRAPH NETWORK

ANALYSIS

MARVEL HERO

NETWORK



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GRAPH NETWORK ANALYSIS / MARVEL HERO

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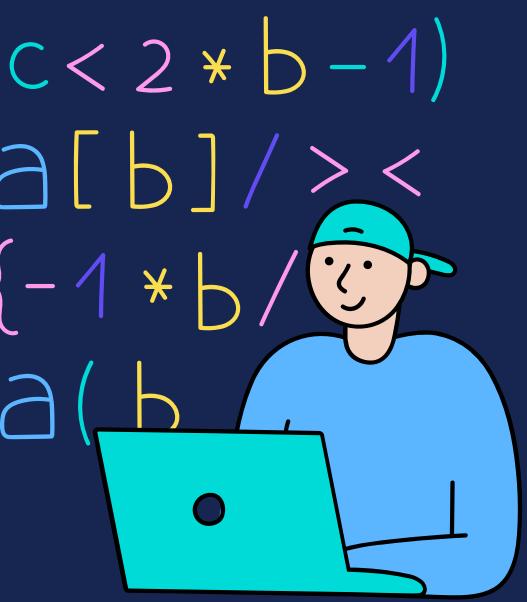
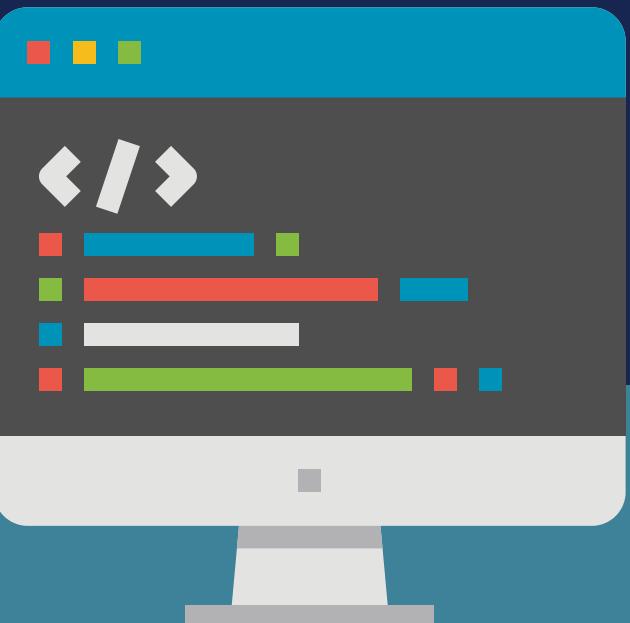
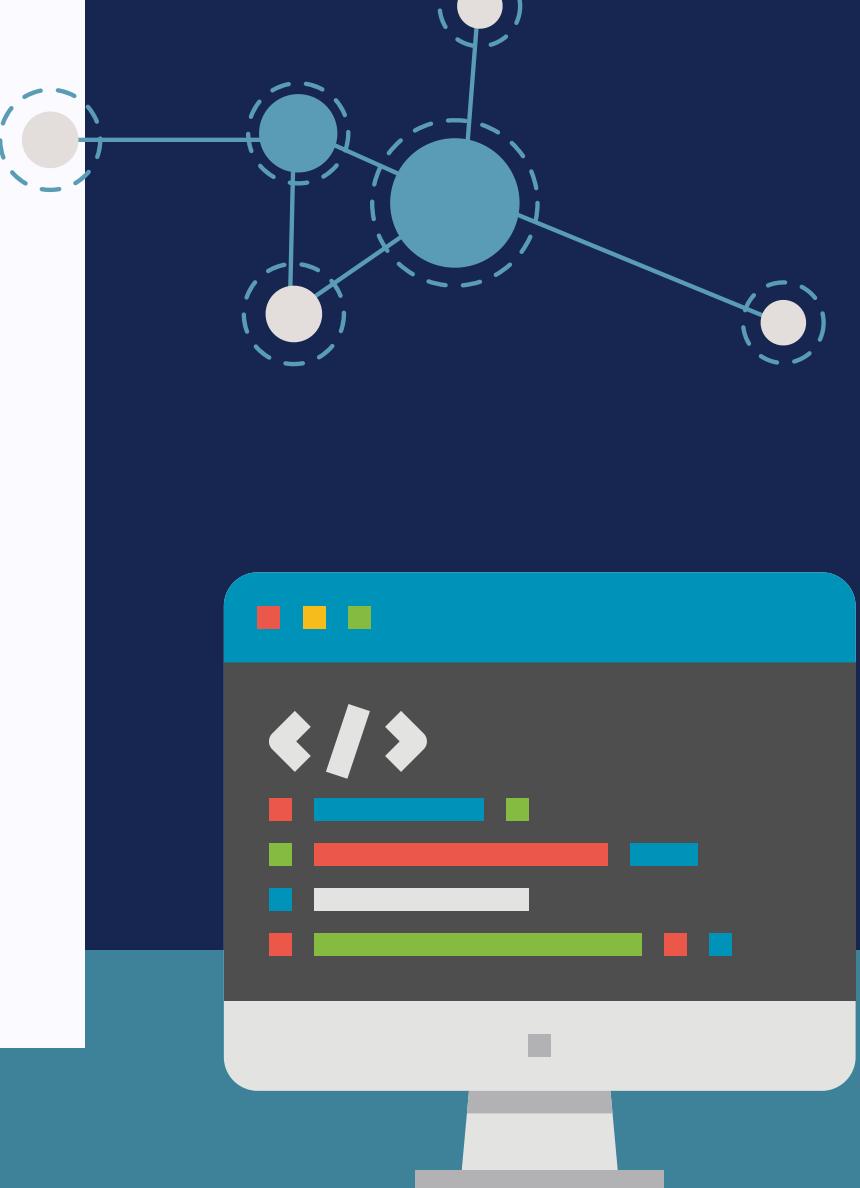
I

Introduction

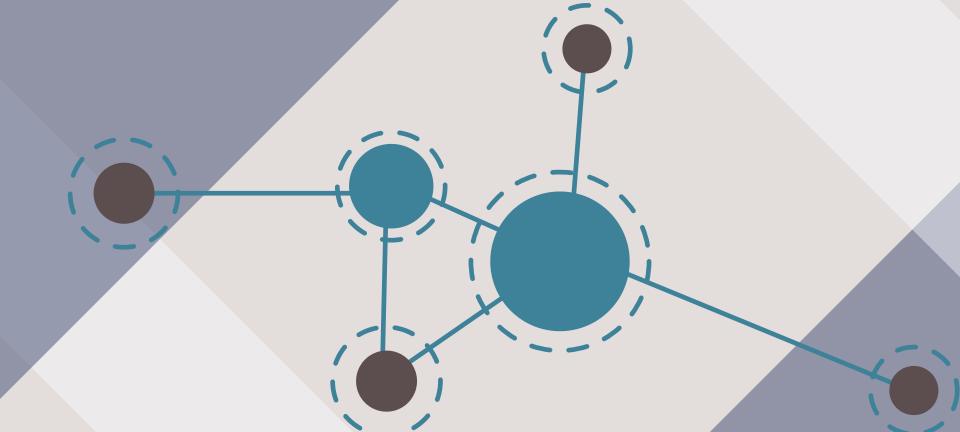
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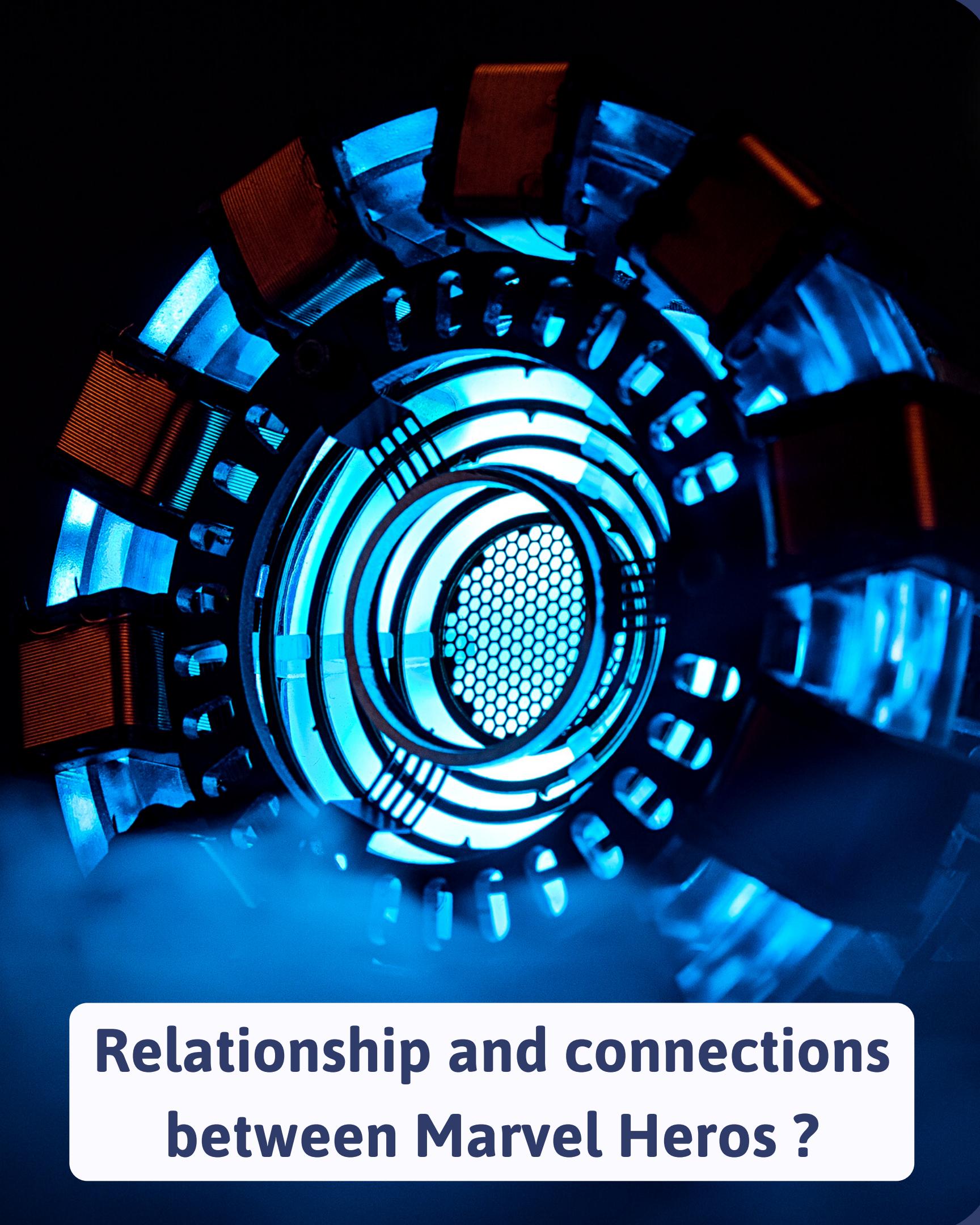
Detail Analysis

...



I, Introduction





**Relationship and connections
between Marvel Heros ?**

I, Introduction

We're all familiar with the Marvel Universe and its super heroes, but "What if they exist?" and "What if they have their own interaction?"



MARVEL COMICS, ORIGINALLY CALLED TIMELY COMICS INC., HAS BEEN PUBLISHING COMIC BOOKS FOR SEVERAL DECADES.

THE DATA COME FROM:
[HTTP://SYNTAGMATIC.GITHUB.IO/EXPOSED DATA/MARVEL/](http://syntagmatic.github.io/exposedata/marvel/)

THIS IS WHERE SOCIAL NETWORK ANALYSIS COMES IN
ALL OF THESE AMUSING QUESTIONS WILL BE ANSWERED
IN THE NEXT PART

I, Introduction



III, Detail Analysis



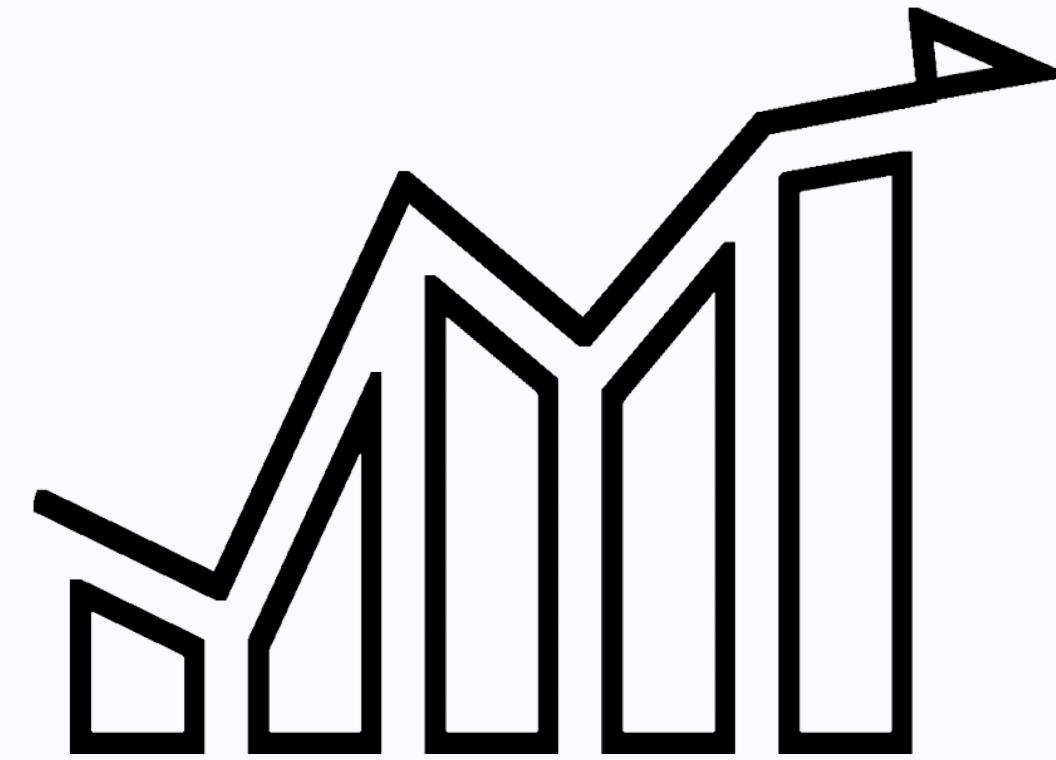
WHAT IS SOCIAL NETWORK ANALYSIS?

Network analysis (NA) is a set of integrated techniques to depict relations among actors and to analyze the social structures that emerge from the recurrence of these relations



The basic assumption is that better explanations of social phenomena are yielded by analysis of the relations among entities

If actors are depicted as nodes, and their relations as lines among pairs of nodes, the concept of social network changes from being a metaphor to an operative analytical tool



WHAT IS SOCIAL NETWORK ANALYSIS?

What is social network analysis?

A **social network graph** contains points and lines connecting those points similar to a **connect-the-dot puzzle**

The points represent the actors and the lines define the relationships

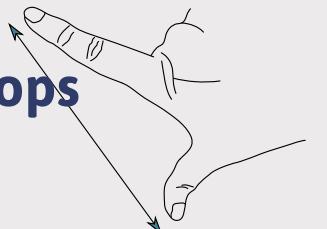


/PATH-LEVEL MEASURES/ NETWORK DISTANCE MEASURES

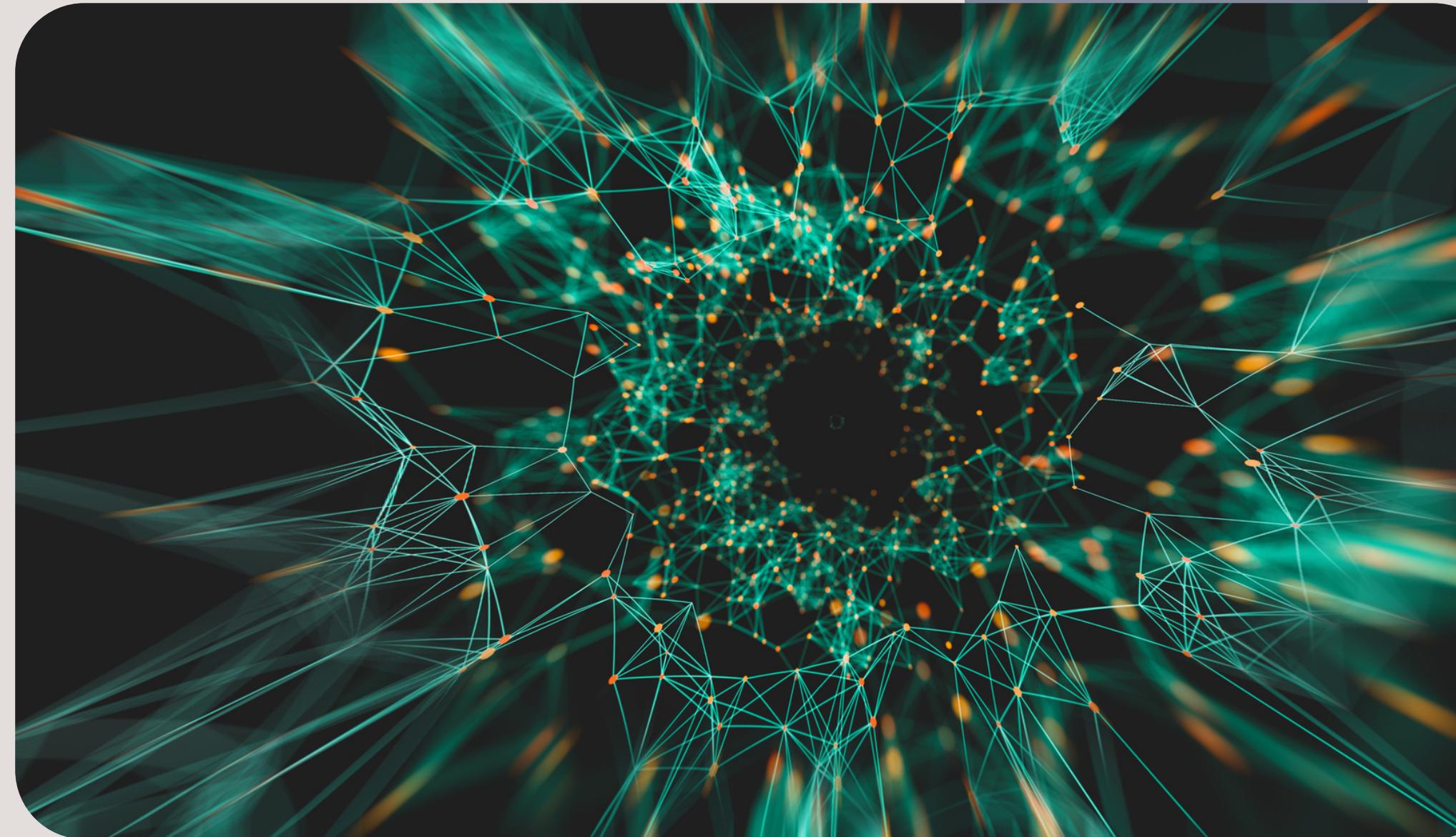
Path-level measures provide information for a path between one node and another node

There are also many different path-level measures, but we'll look at length and distance

Length: Length is the number of edges between the starting and ending nodes, known as hops



Distance: Distance is the number of edges or hops between the starting and ending nodes following the shortest path



A, Data and Why undirected graph

You can notice different sorts of connections for different heroes if you look at the Hero-Network-1.xlsx .

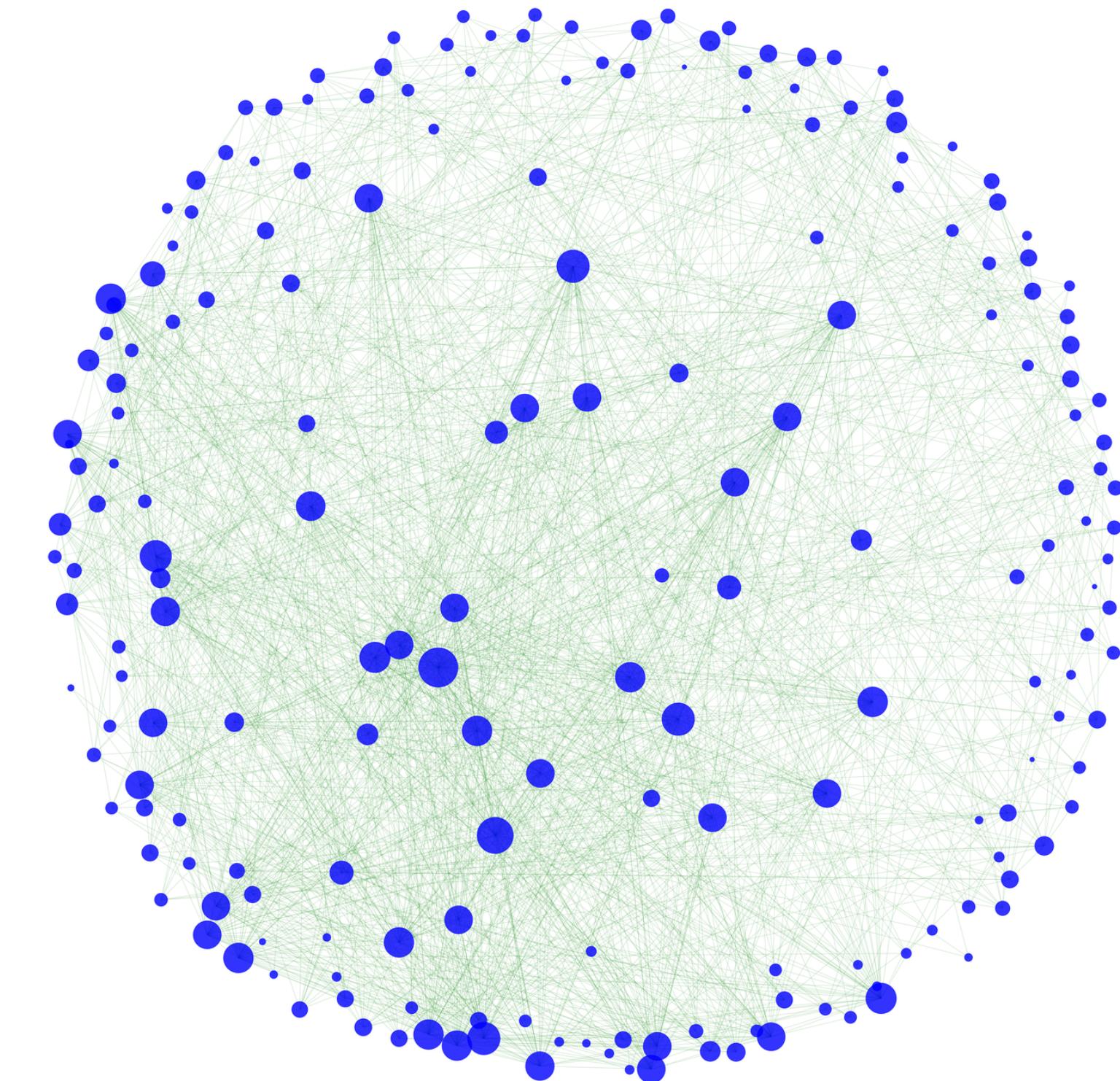
Undirected graphs have edges without a direction and two - way data relationships.

Each edge may be crossed in both directions, which indicates a two-way connection

The undirected Graph is the essential thing to start our detailed analysis

202
nodes

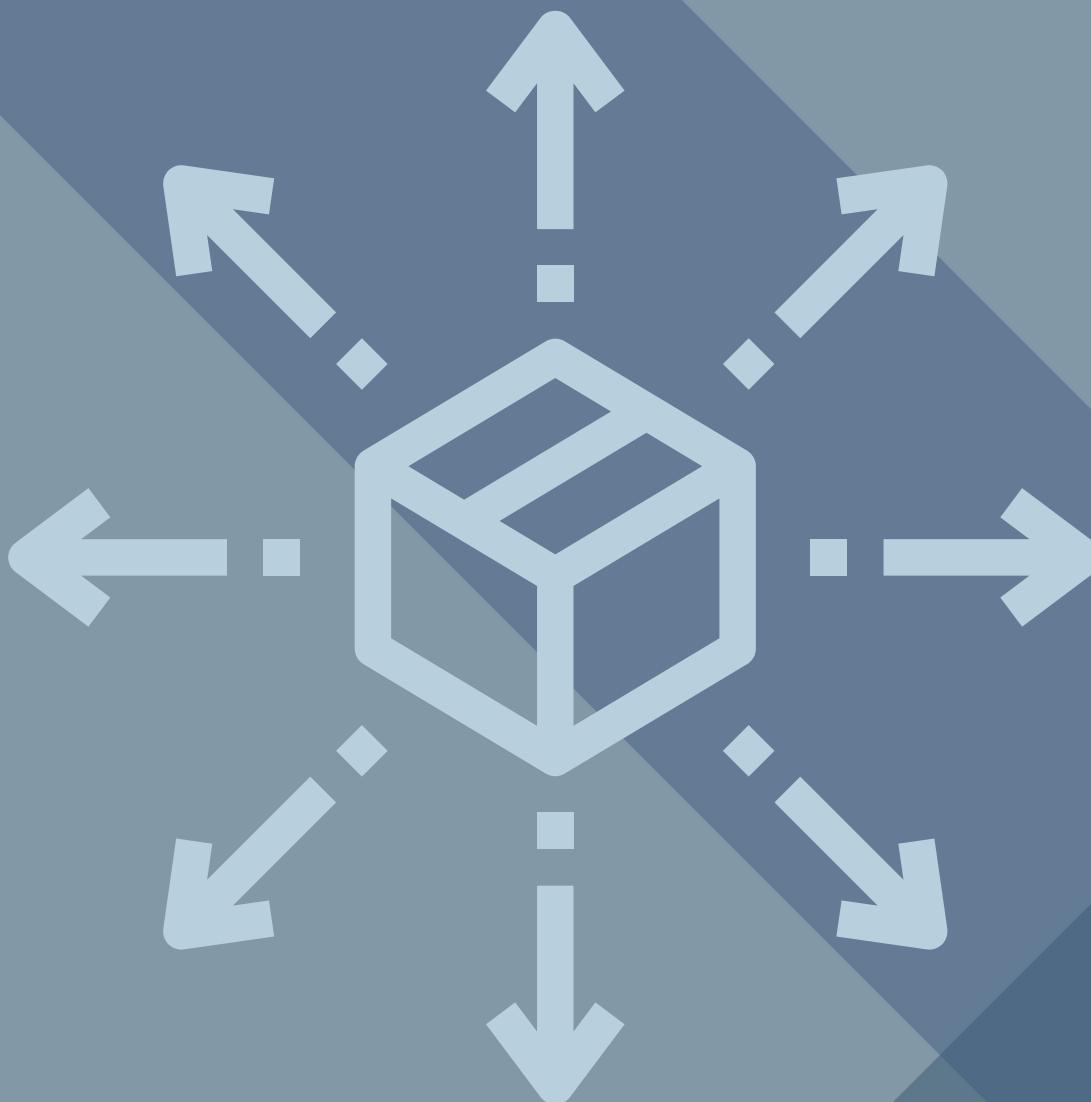
1592
edges



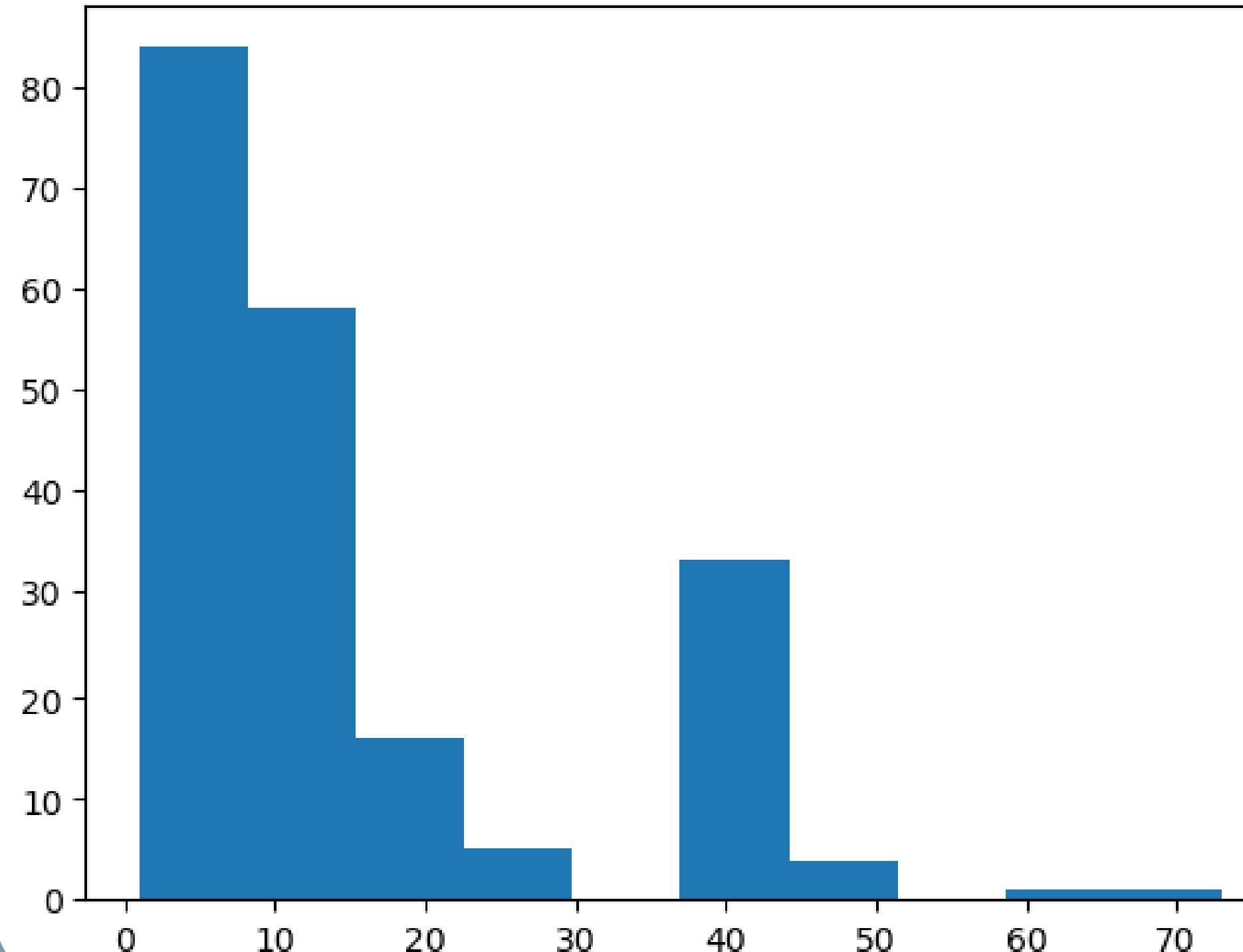
Undirected Graph

B, DISTRIBUTION OF DEGREES ?

The degree of a node in a network is the number of connections it has to other nodes and the *degree distribution* is the probability distribution of these degrees over the whole network



Degree Distribution

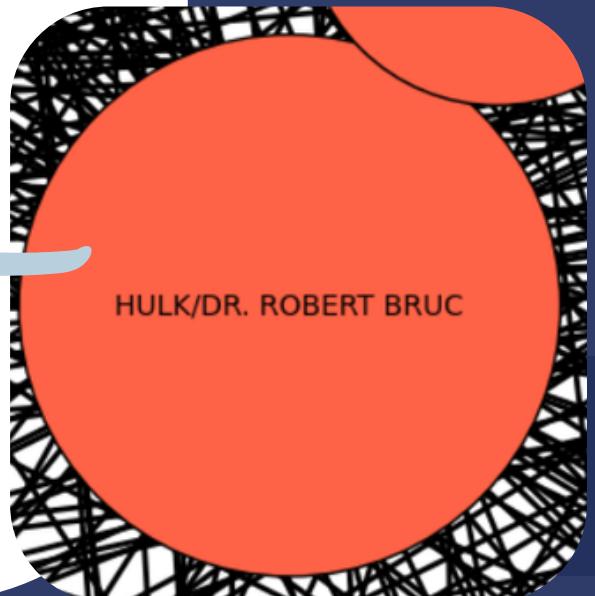
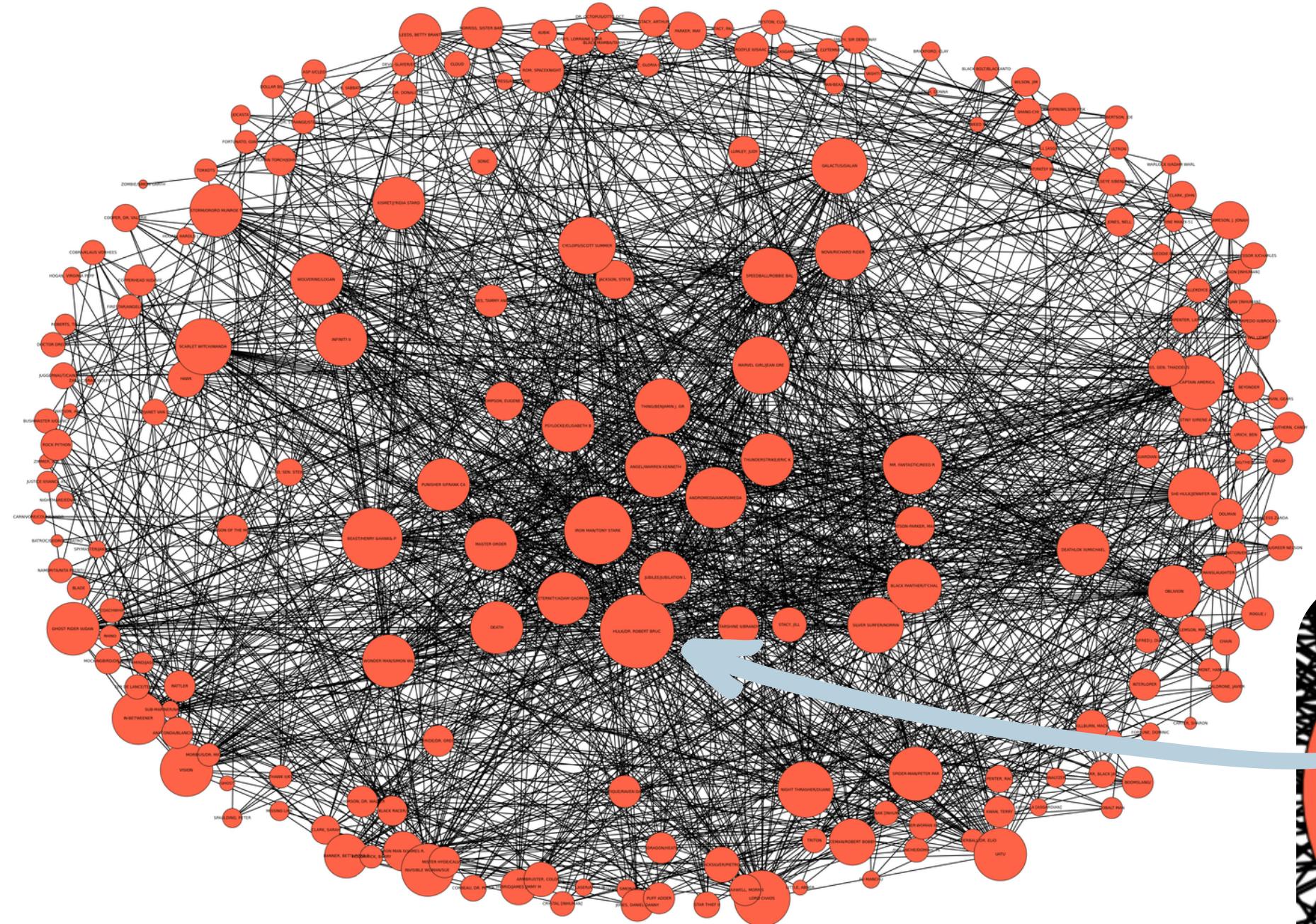


More than 80 people in the network have degrees close from 0 to 10, very few are having degrees more than 50 and just a small number of people who have degrees more than 60 and 70

DISTRIBUTION OF DEGREES :

DISTRIBUTION OF DEGREES

The node size is proportional to the degree



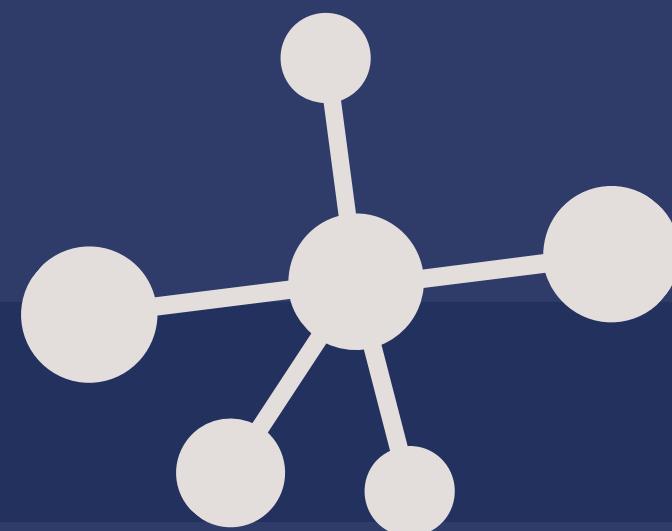
Which character has the most intersections between comics ?

Hulk/DR Robert Bruc (75 degree)

What areas are there?

Consists of 2 areas:

- The central area
- The outer area



Degree centrality is one of the easiest to calculate

The degree centrality of a node is simply its degree - the number of edges it has

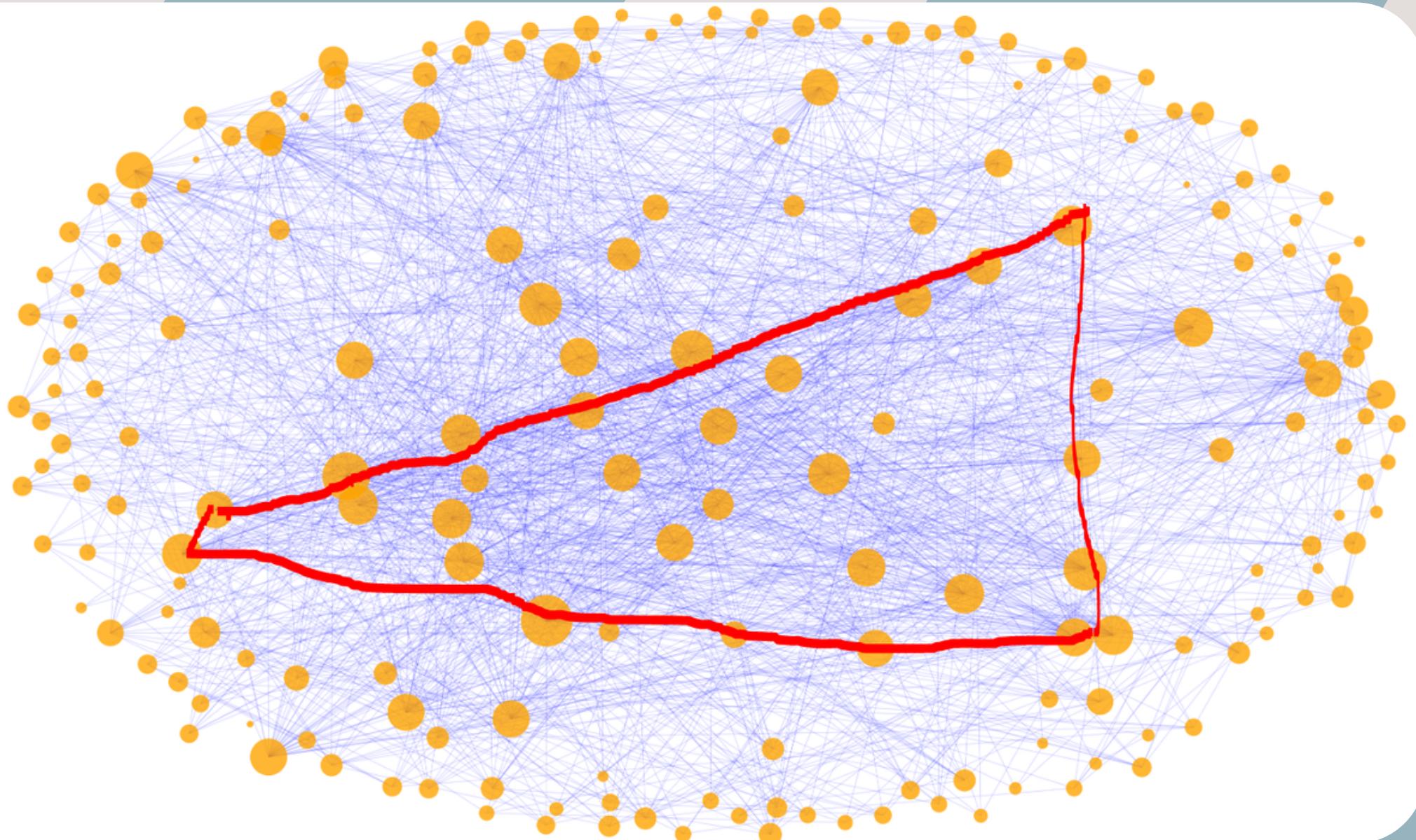
C, Degree Centrality ?



Degree Centrality

Which area is the central area?

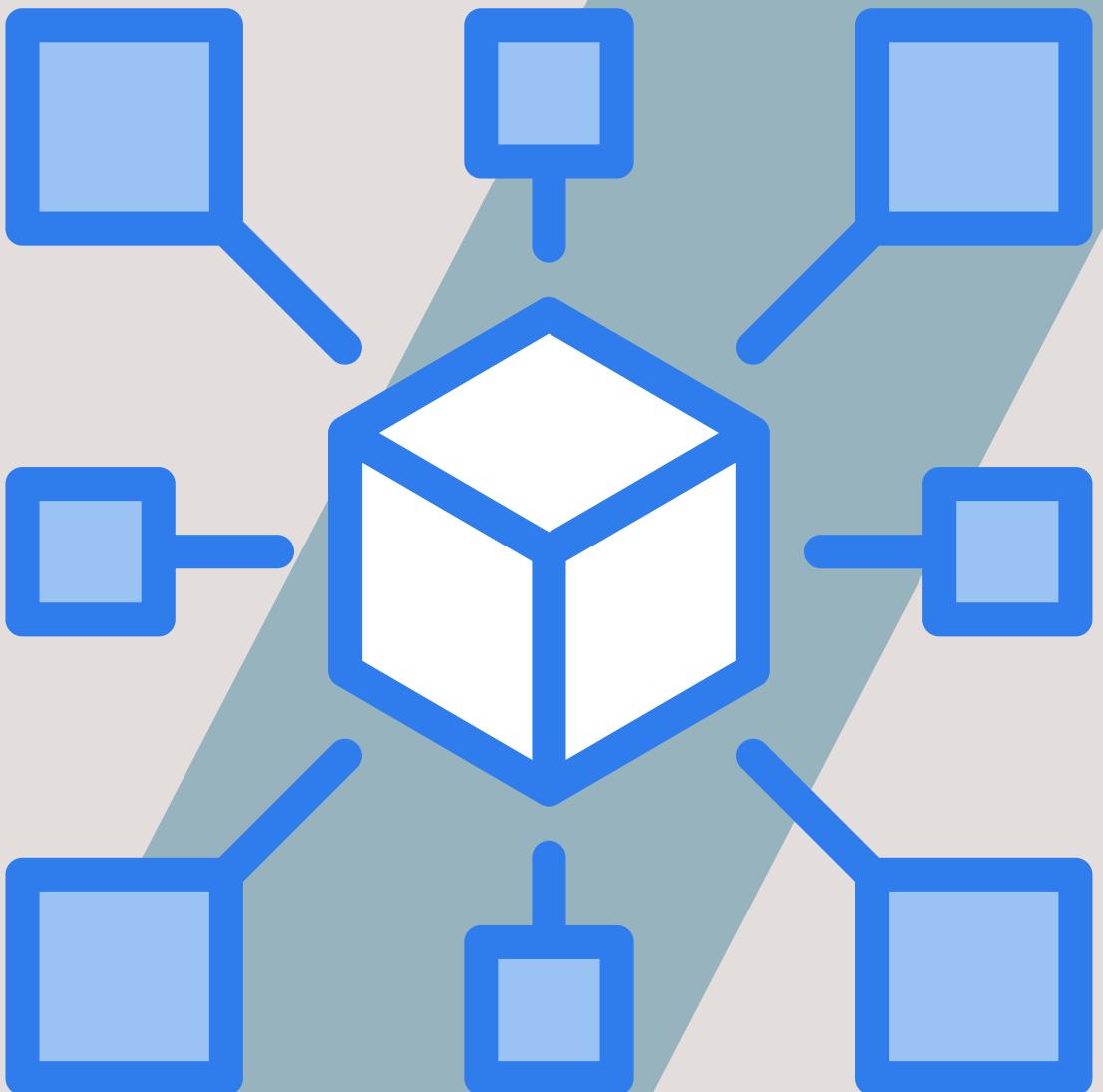
**The density is concentrated
in the triangle or the center area**



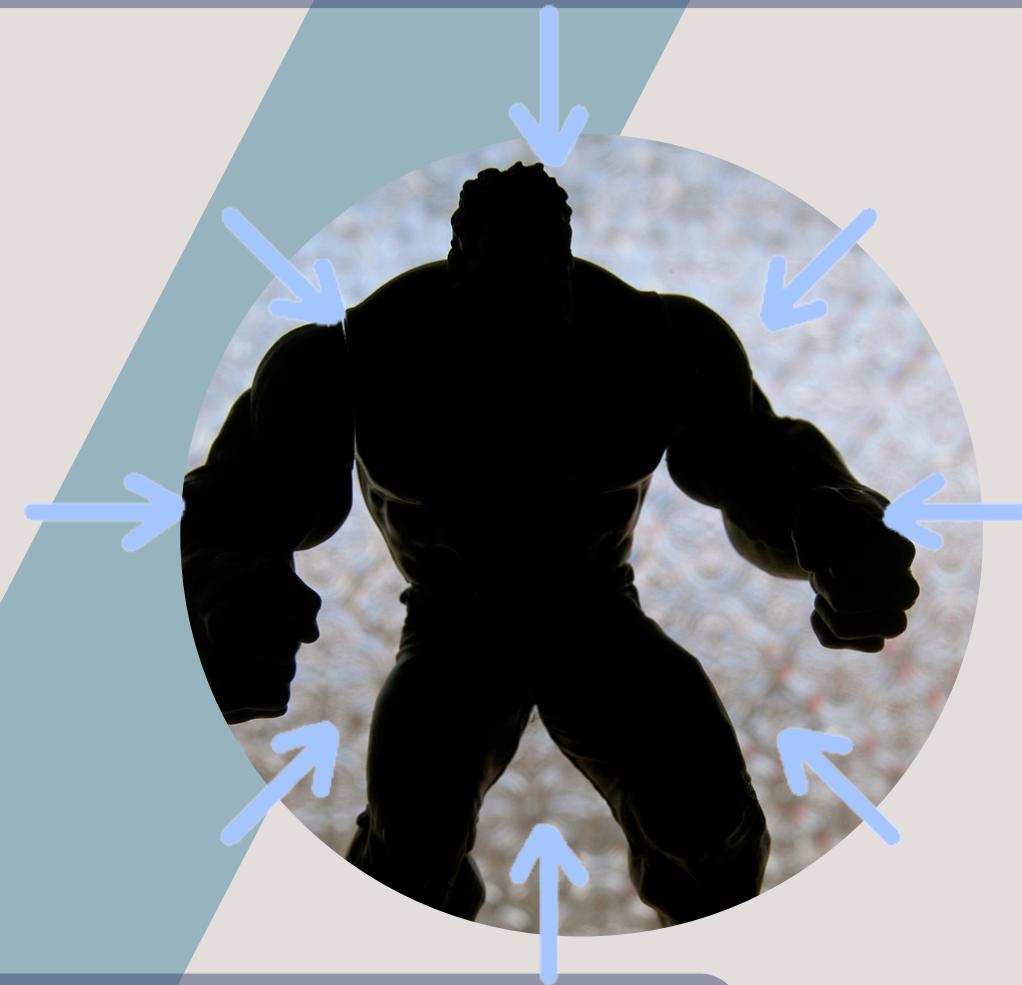
D, BETWEENNESS CENTRALITY ?

The betweenness centrality measures the number of times a node lies on the shortest path between other nodes

Betweenness measures the importance of a node's connections in allowing nodes to reach other nodes (in a hop)



THE QUESTION IS “WHO KNOWS EVERYONE AND CAN GET WHAT YOU NEED?”

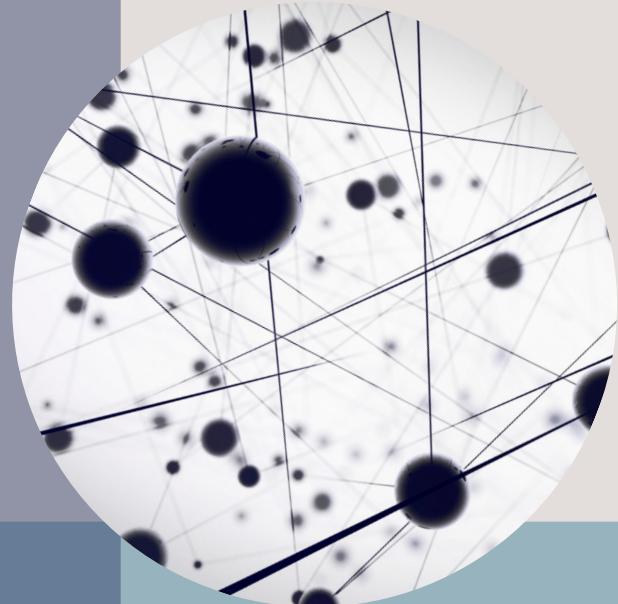


HULK plays a significant role in the communication / information flow in the marvel universe society

HULK/DR. ROBERT BRUC	0.1835
SPIDER-MAN/PETER PAR	0.1590
IRON MAN/TONY STARK	0.1348
ICEMAN/ROBERT BOBBY	0.0444
THING/BENJAMIN J. GR	0.0363
NOVA/RICHARD RIDER	0.0262
SPEEDBALL/ROBBIE BAL	0.0262
NIGHT THRASHER/DUANE	0.0262
BLACK PANTHER/T'CHAL	0.0221

BETWEENNESS CENTRALITY

E, EIGENVECTOR CENTRALITY ?



Eigenvector centrality measures a node's importance while giving consideration to the importance of its neighbors.

It is sometimes used to measure a node's influence in the network.

IN OUR DATA, IT CAN BE UNDERSTOOD THAT “THIS IS
ABOUT WHICH SUPERHERO KNOWS MORE SUPERHEROES”

HULK/DR. ROBERT BRUC 0.1697
ANGEL/WARREN KENNETH 0.1667
ANDROMEDA/ANDROMEDA 0.1667
BEAST/HENRY &HANK& P 0.1667
MR. FANTASTIC/REED R 0.1654
IRON MAN/TONY STARK 0.1652
GALACTUS/GALAN 0.1623
SILVER SURFER/NORRIN 0.1623
LORD CHAOS 0.1623

The top 5 of knowing more superheroes for (appeared, helped, fight along, etc) are Hulk, Angel, Andromeda, Beast, and Mr. Fantastic.

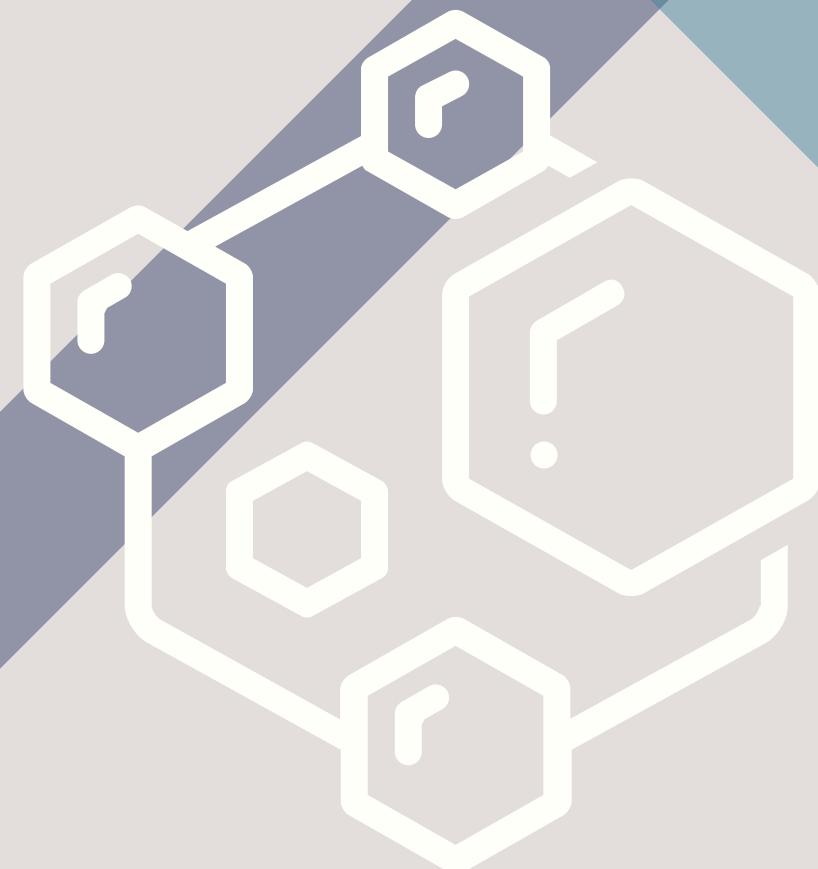


EIGENVECTOR CENTRALITY

F, Community

Communities are groups of nodes within a network that are more densely connected to one another than to other nodes

Modularity is a metric that quantifies the quality of an assignment of nodes to communities



F, Community

Number of communities ?

7 communities

Top communities having larger members?

Top three of communities having larger members are 1,4,3

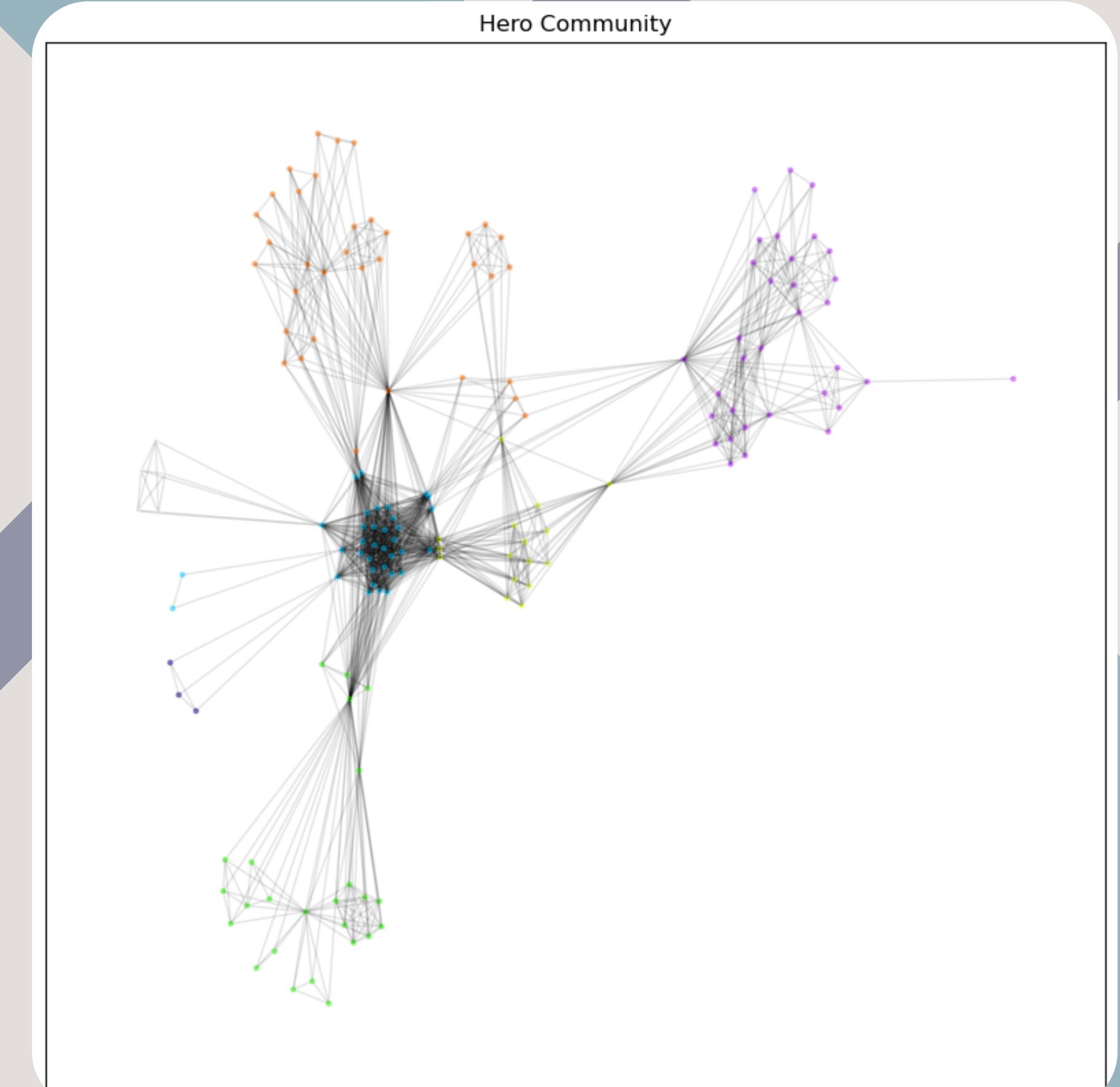
```
# Number of communities
print('Number of communities (Hero): ', partition_hero_df)
```

```
Number of communities (Hero): 7
```

```
# Top communities having Larger members
community_rank_hero = pd.DataFrame(partition_hero_df.value_counts())
print('TOP communities (Hero): ', community_rank_hero.head(10))
```

```
TOP communities (Hero):          Count
```

Community	Count
1	35
4	35
3	33





Thank you
for participating!

THANK
YOU!

LOVE

Have a great day ahead.