



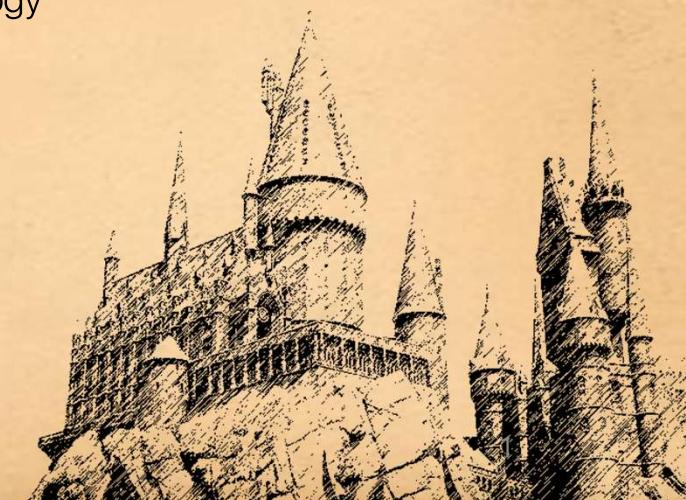
Harry Potter Character Network



Department of Artificial Intelligence and Software Technology
Sunmoon Univ.

Shane Oh, Dabin Kang, Jaehyeon Kim
{ohshane71, dabin0513, starpro99}@sunmoon.ac.kr

github.com/ohshane71/harry-potter-network



Content

1. Problem definition
2. Research goal
3. Methodology
4. Experiments
5. Results
6. Reference



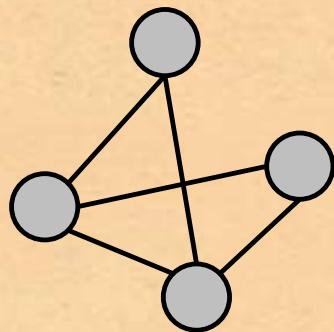
Problem definition

영화, 드라마, 책 등의 매체에서 등장인물 관계를 기반으로 접근하면 이해하기 쉬우며 이를 통해 내용에 집중 할 수 있다.

다만, 등장인물이 많을 경우 이해관계가 복잡하여 내용 파악에 어려움이 있다.

따라서 본 연구는 등장인물 간의 관계를 우선 도출 하고 더 나아가 등장인물의 소속들 간의 관계를 도출하여 내용 이해에 도움을 주고자 한다.

Research goal



Individual view

각 인물의 분석

등장 빈도수

인물의 중요도 (주인공 탐색)

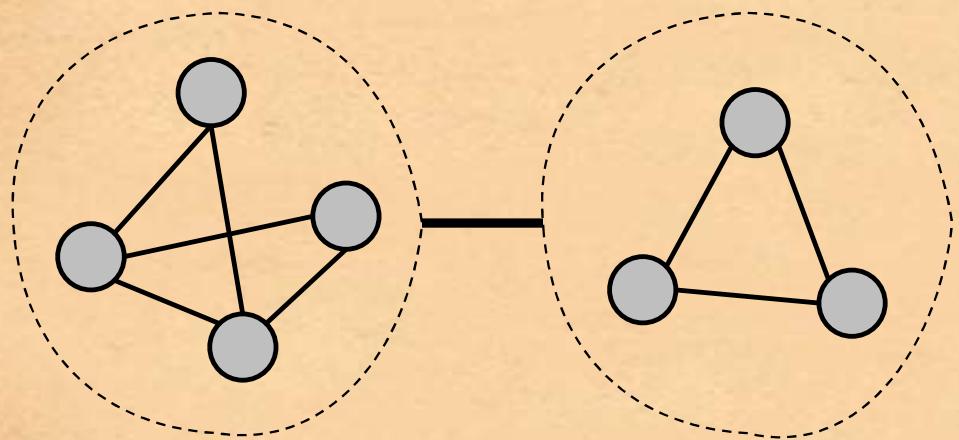
인물 간의 분석

친밀도

친구들 연결 수 (밀도)

우호관계/적대관계 도출

Research goal



Grouped view

각 그룹의 분석

중심 인물

밀도

그룹 간의 분석

우호 그룹/적대 그룹 도출

Methodology

Dataset - Harry Potter book

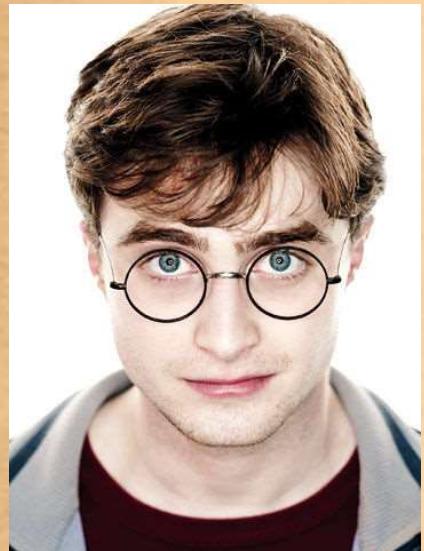
Harry Potter and the Philosopher's Stone

Harry Potter and the Chamber of Secrets

Harry Potter and the Prisoner of Azkaban

Methodology

Dataset - Harry Potter Wiki



Harry James Potter

Biographical information		Physical information	
Born	31 July, 1980 ^[1] Godric's Hollow, West Country, England, Great Britain	Species	Human ^[5]
Blood status	Half-blood ^[2]	Gender	Male ^[5]
Marital status	Married ^{[3][4]}	Hair colour	Jet-black ^{[36][37]}
Nationality	English	Eye colour	Emerald green ^[37]
Also known as	<ul style="list-style-type: none">The Boy Who Lived^{[5][6][7][8]}The Chosen One^{[9][7][10][11][12][13][14][15][16][17][18][19][3]}Undesirable No. 1^{[20][21][22]}Lightning (<i>Potterwatch</i>)^[23]The Boy Who Lied (<i>Daily Prophet</i>)^[24]Gregory Goyle^[25] (under disguise of Polyjuice)^[26]Neville Longbottom^[27] (the name he told Stanley Shunpike in his third year)Barney Weasley (under disguise of Polyjuice Potion)^[28]Vernon Dudley^[29] (the name he used to disguise his identity from Snatchers)Albert Runcorn (under disguise of Polyjuice Potion)^{[20][21]}Potty^{[30][31][32][33][34][35]} (by Peeves & Slytherins)	Skin colour	Light ^{[38][39][40]}
Title(s)	<ul style="list-style-type: none">Triwizard ChampionSeekerQuidditch CaptainMaster of Death	Relationship information	
Signature		Family members	
		<ul style="list-style-type: none">James Potter I^[41] (father) †Lily Potter^[41] (née Evans) (mother) †Ginevra Potter^[42] (née Weasley) (wife)James Potter II^[42] (son)Albus Potter^[42] (son)Lily Potter^[42] (daughter)Arthur Weasley^[42] (father-in-law)Molly Weasley^[42] (née Prewett) (mother-in-law)William Weasley^[42] (brother-in-law)Charles Weasley^[42] (brother-in-law)Percy Weasley^[42] (brother-in-law)Fred Weasley^[42] (brother-in-law)George Weasley^[42] (brother-in-law)Ronald Weasley^[42] (brother-in-law)Fleur Weasley^[42] (née Delacour) (sister-in-law)Angelina Weasley^[42] (née Johnson) (sister-in-law)Audrey Weasley^[42] (sister-in-law)Hermione Granger^[42] (sister-in-law)Victoire Weasley^[43] (niece)Dominique Weasley^[44] (niece)	

Methodology

Dataset - Harry Potter book (Harry Potter and the Philosopher's Stone)

Character	Sentence
Dumbledore	I should've known that you would be here, Professor McGonagall.
McGonagall	Good evening, Professor Dumbledore.
McGonagall	Are the rumors true, Albus?
Dumbledore	I'm afraid so, professor.
Dumbledore	The good and the bad.
McGonagall	And the boy?
Dumbledore	Hagrid is bringing him.
McGonagall	Do you think it wise to trust Hagrid with something as important as this?
Dumbledore	Ah, Professor, I would trust Hagrid with my life.
Hagrid	Professor Dumbledore, sir.
Hagrid	Professor McGonagall.
Dumbledore	No problems, I trust, Hagrid?
Hagrid	No, sir.
Hagrid	Little tyke fell asleep just as we were flying over Bristol.
Hagrid	Try not to wake him.
Hagrid	There you go.
Dumbledore	Albus, do you really think it's safe, leaving him with these people?
McGonagall	I've watched them all day.
McGonagall	They're the worst sort of Muggles, imaginable.
McGonagall	They really are...
Dumbledore	The only family he has.
McGonagall	This boy will be famous.

Methodology

Dataset - Harry Potter book

Character	Sentence
Dumbledore	I should've known that you would be here, Professor McGonagall.
McGonagall	Good evening, Professor Dumbledore.
McGonagall	Are the rumors true, Albus?
Dumbledore	I'm afraid so, professor.
Dumbledore	The good and the bad.
McGonagall	And the boy?
Dumbledore	Hagrid is bringing him.
McGonagall	Do you think it wise to trust Hagrid with something as important as this?
Dumbledore	Ah, Professor, I would trust Hagrid with my life.
Hagrid	Professor Dumbledore, sir.
Hagrid	Professor McGonagall.
Dumbledore	No problems, I trust, Hagrid?
Hagrid	No, sir.
Hagrid	Little tyke fell asleep just as we were flying over Bristol.
Hagrid	Try not to wake him.
Hagrid	There you go.
Dumbledore	Albus, do you really think it's safe, leaving him with these people?
McGonagall	I've watched them all day.
McGonagall	They're the worst sort of Muggles, imaginable.
McGonagall	They really are...
Dumbledore	The only family he has.
McGonagall	This boy will be famous.

nltk.sentiment.vader
.SentimentIntensityAnalyzer

Value of polarity:
Negative – Neutral – Positive

[-1, 1]

Methodology

Density

Centrality

- Degree centrality
- Betweenness centrality

Clustering

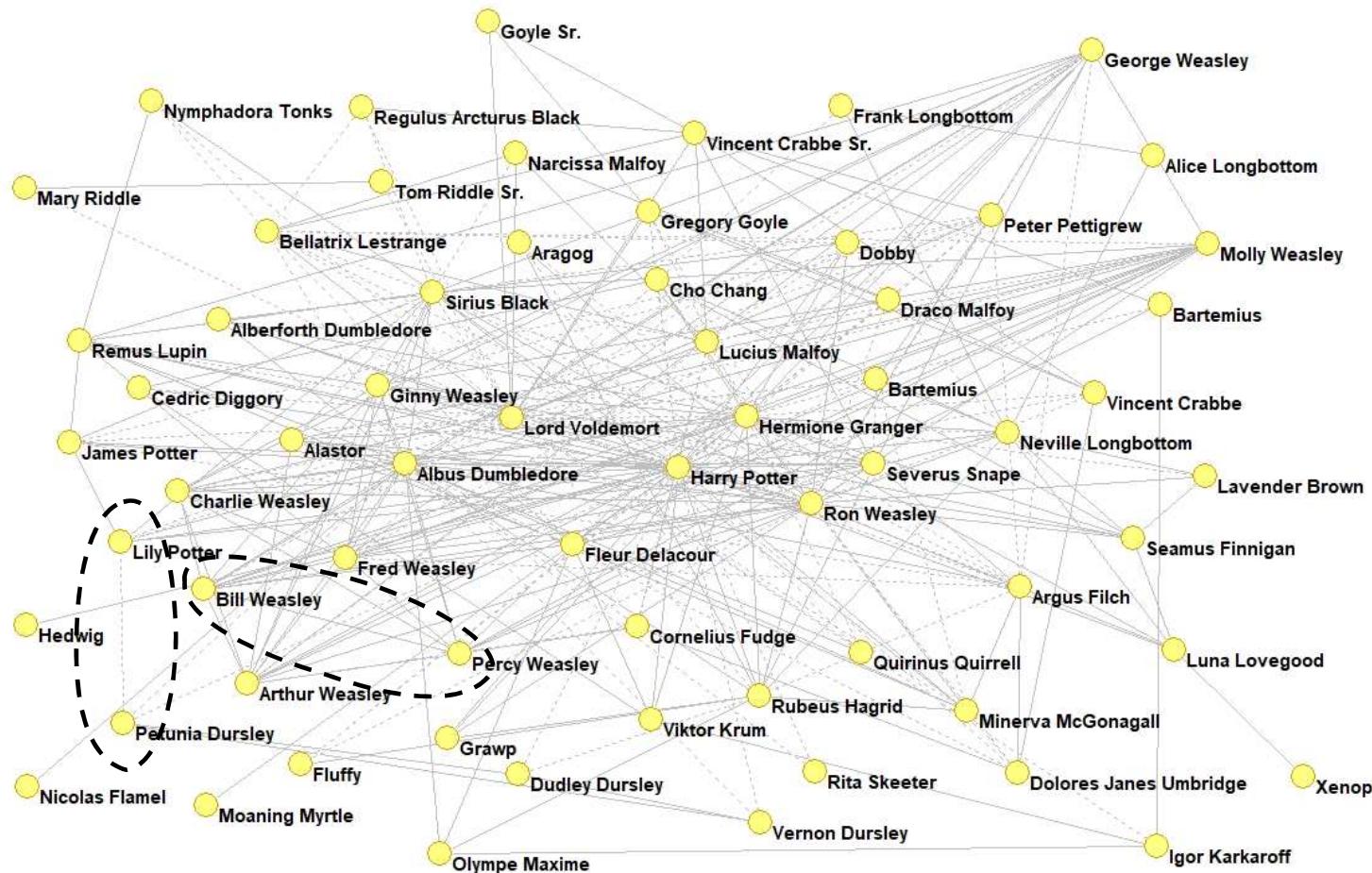
- Louvain community detection
- k-Core
- k-Neighbors

Shrinking



Experiments

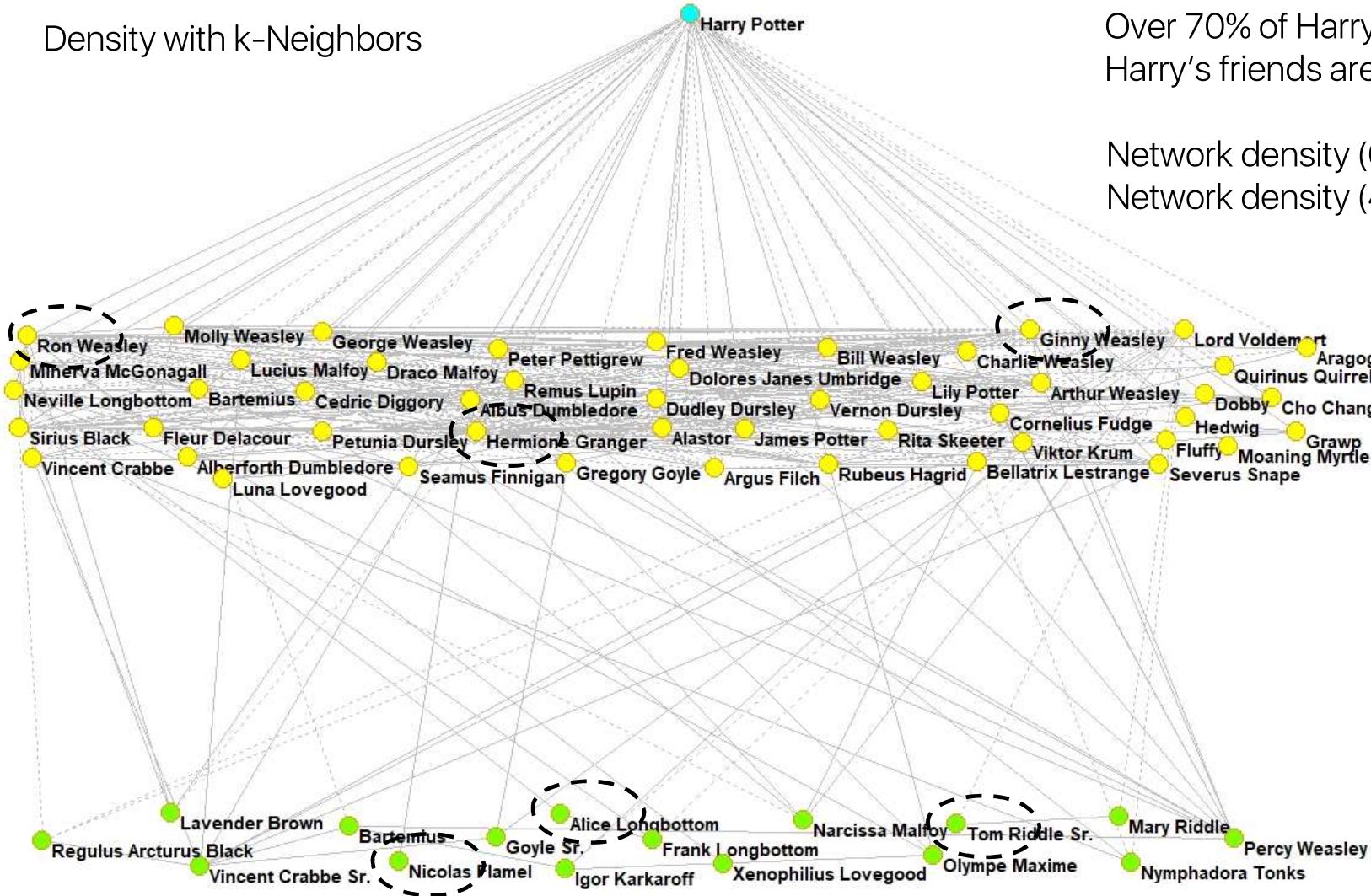
Signed character network



Number of vertices	65
Number of edges	513
└ Positive	356
└ Negative	157

Experiments

Density with k-Neighbors



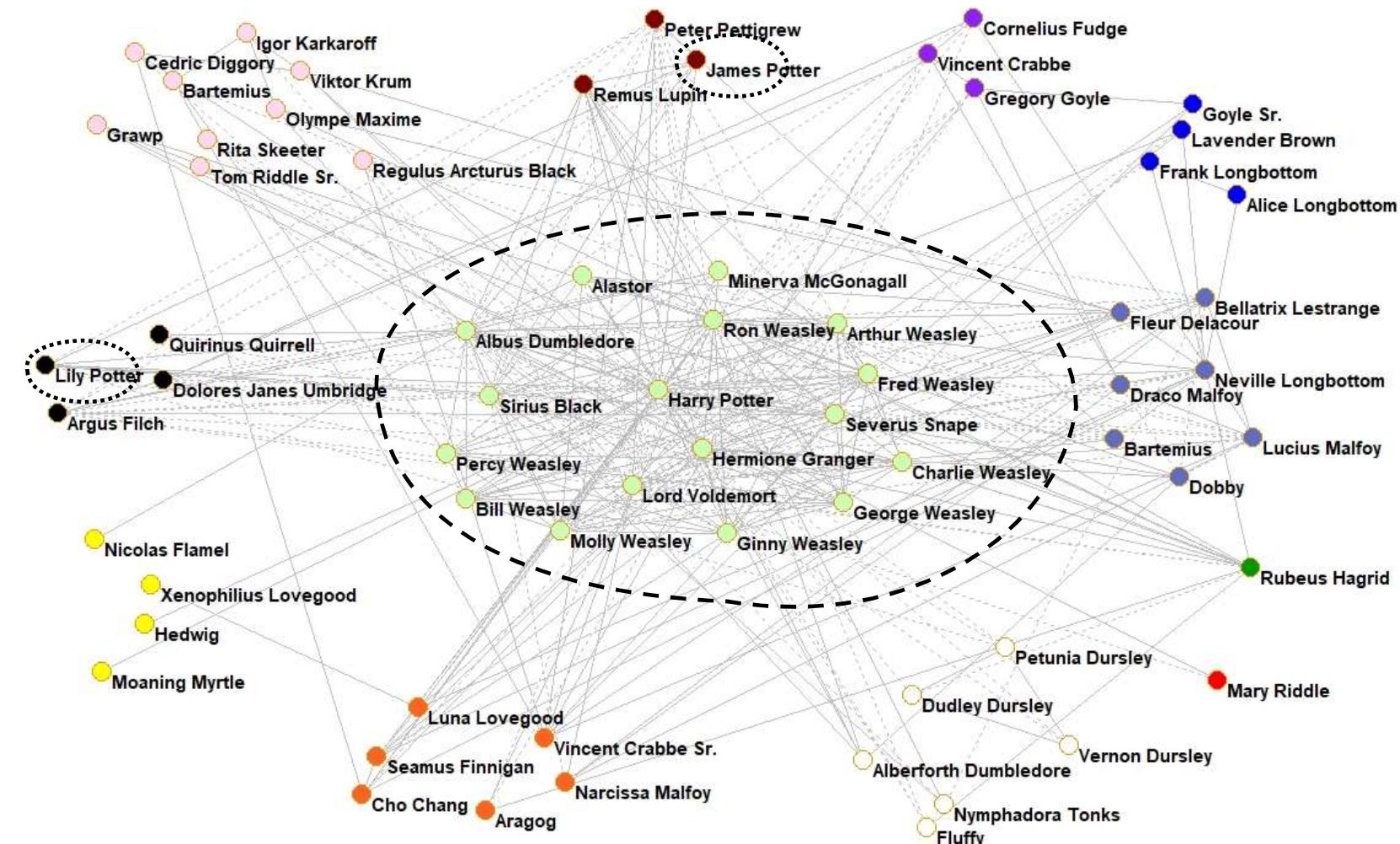
Over 70% of Harry's friends are one step away
Harry's friends are at most 2 steps away

Network density (65/65) (100%) 0.2466

Network density (46/65) (70.8%) 0.4068

Experiments

k-Core



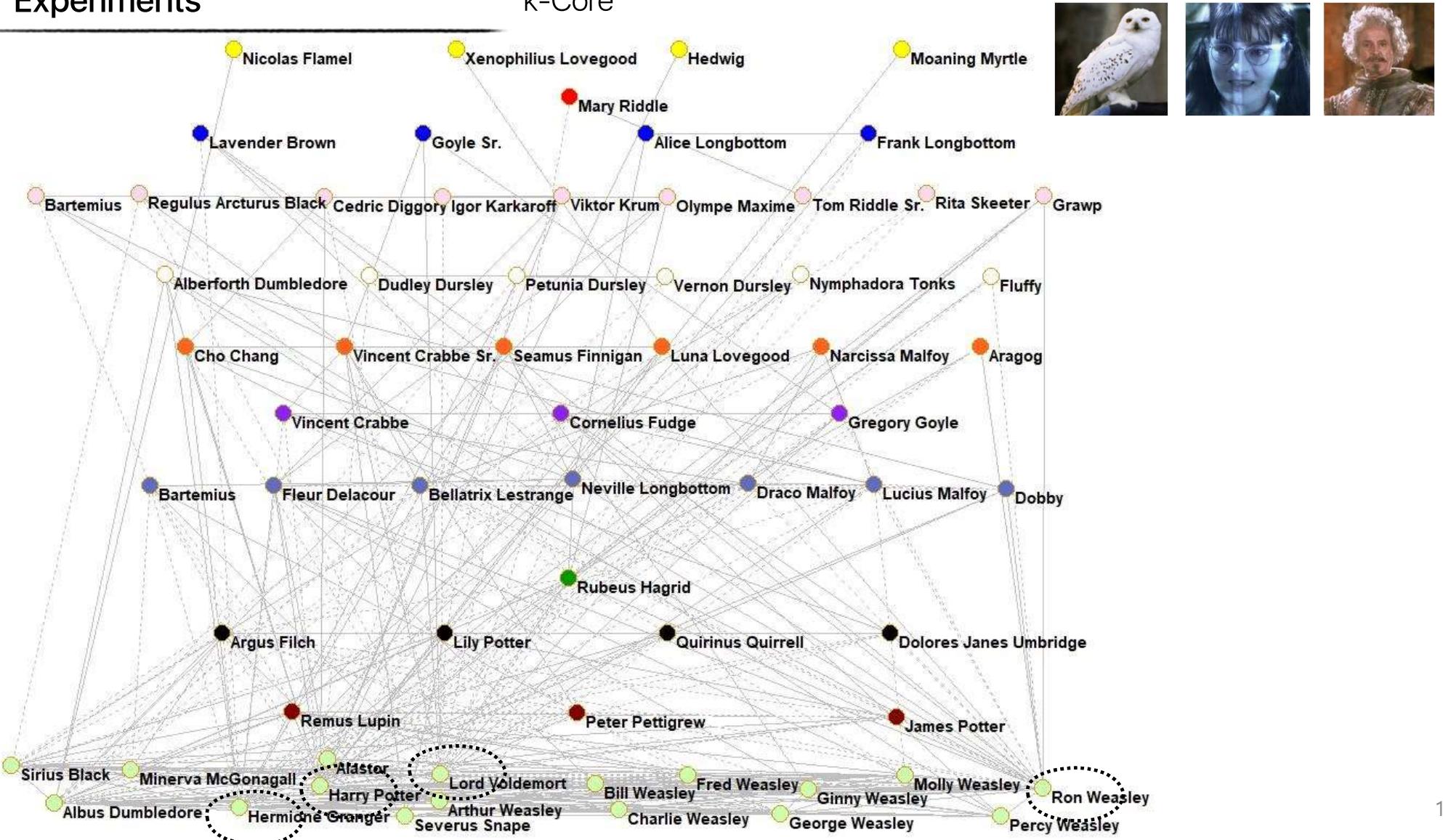
● k=15

Number of vertices 17

Central characters were found in the k-Core (k=15) cluster

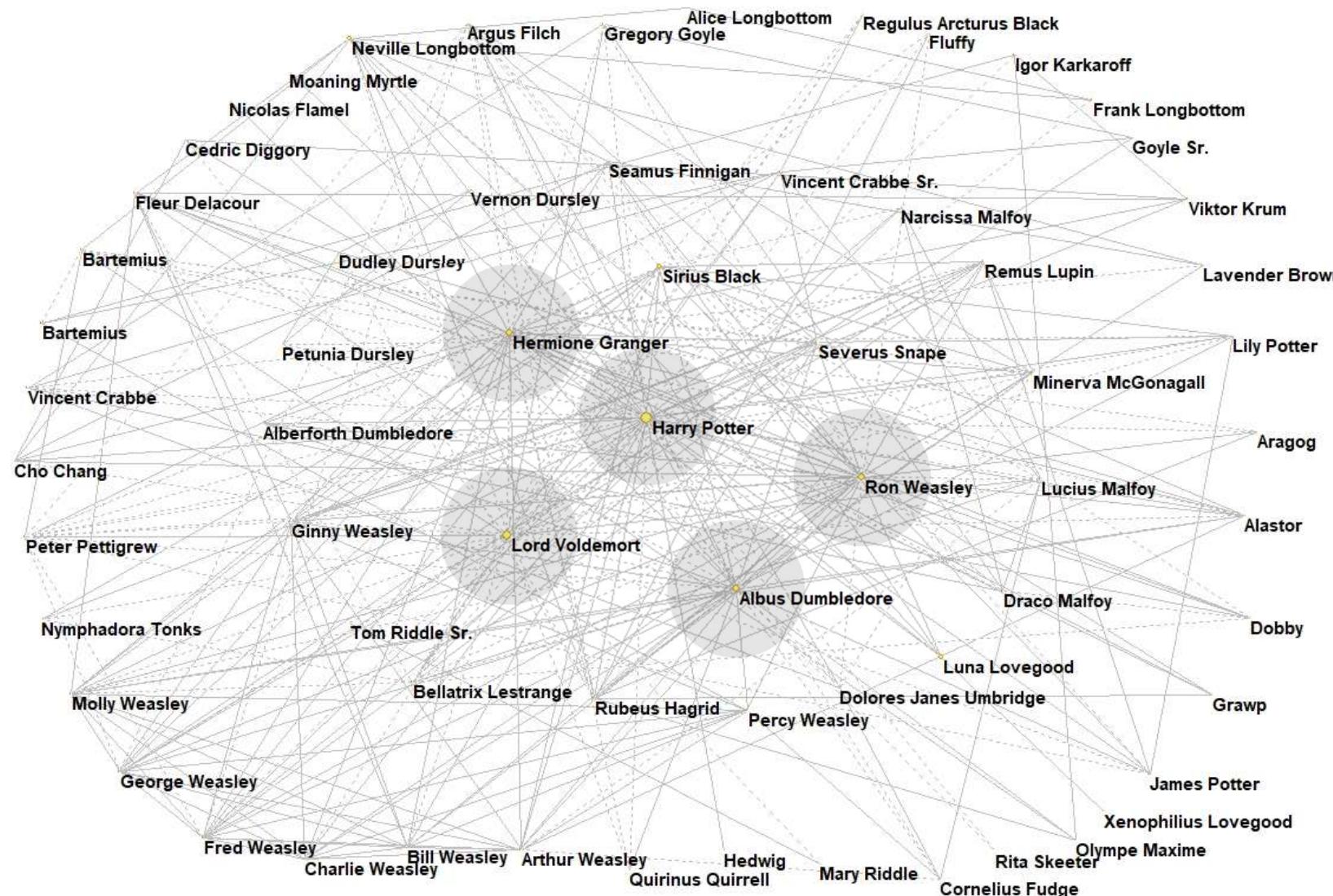
Experiments

k-Core



Experiments

Betweenness centrality



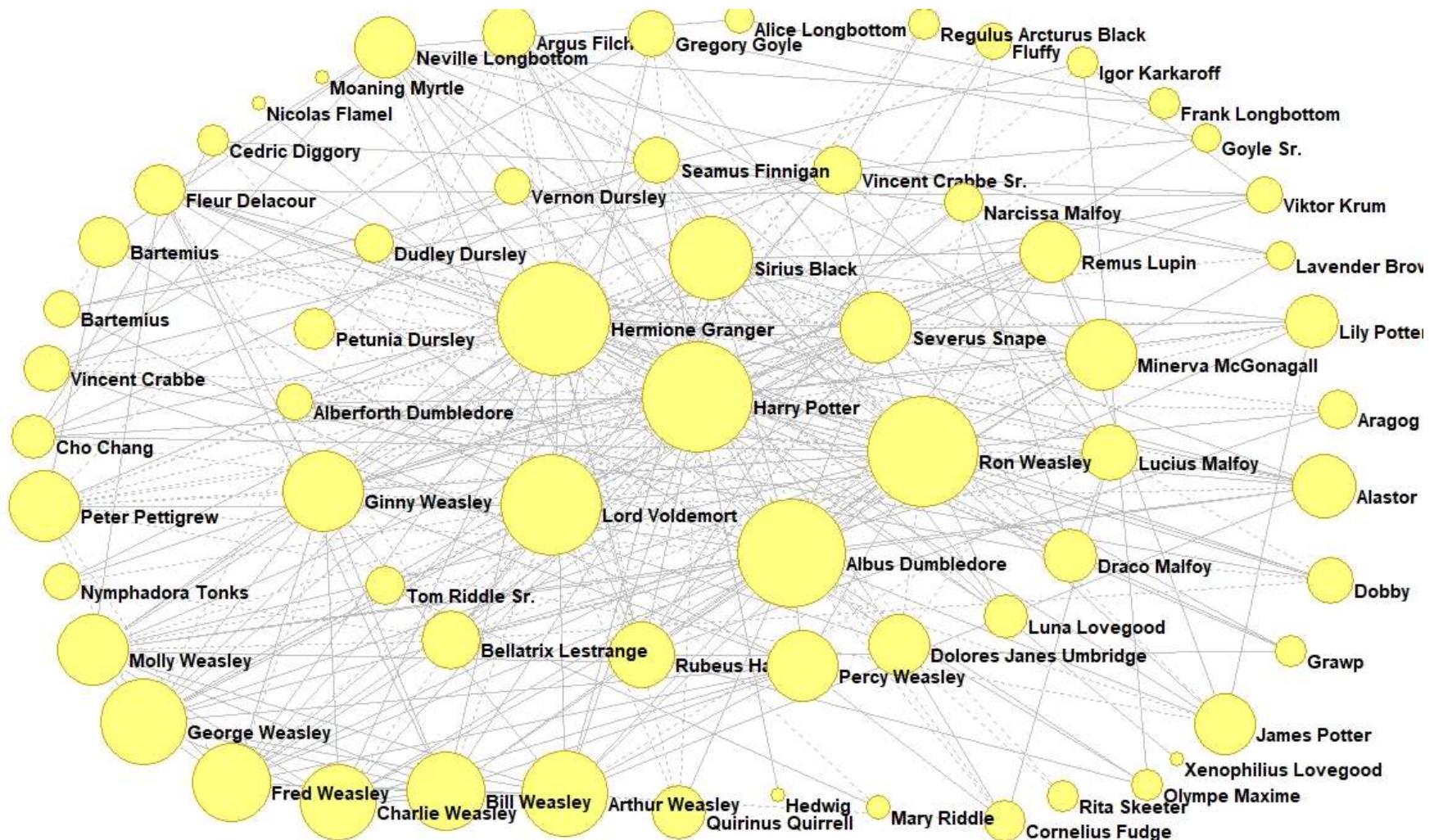
Top 5 Betweenness Centrality

Harry Potter	0.2391
Lord Voldemort	0.1917
Ron Weasley	0.1185
Albus Dumbledore	0.1121
Hermione Granger	0.1023

Central characters were found in the descending order of Betweenness centrality

Experiments

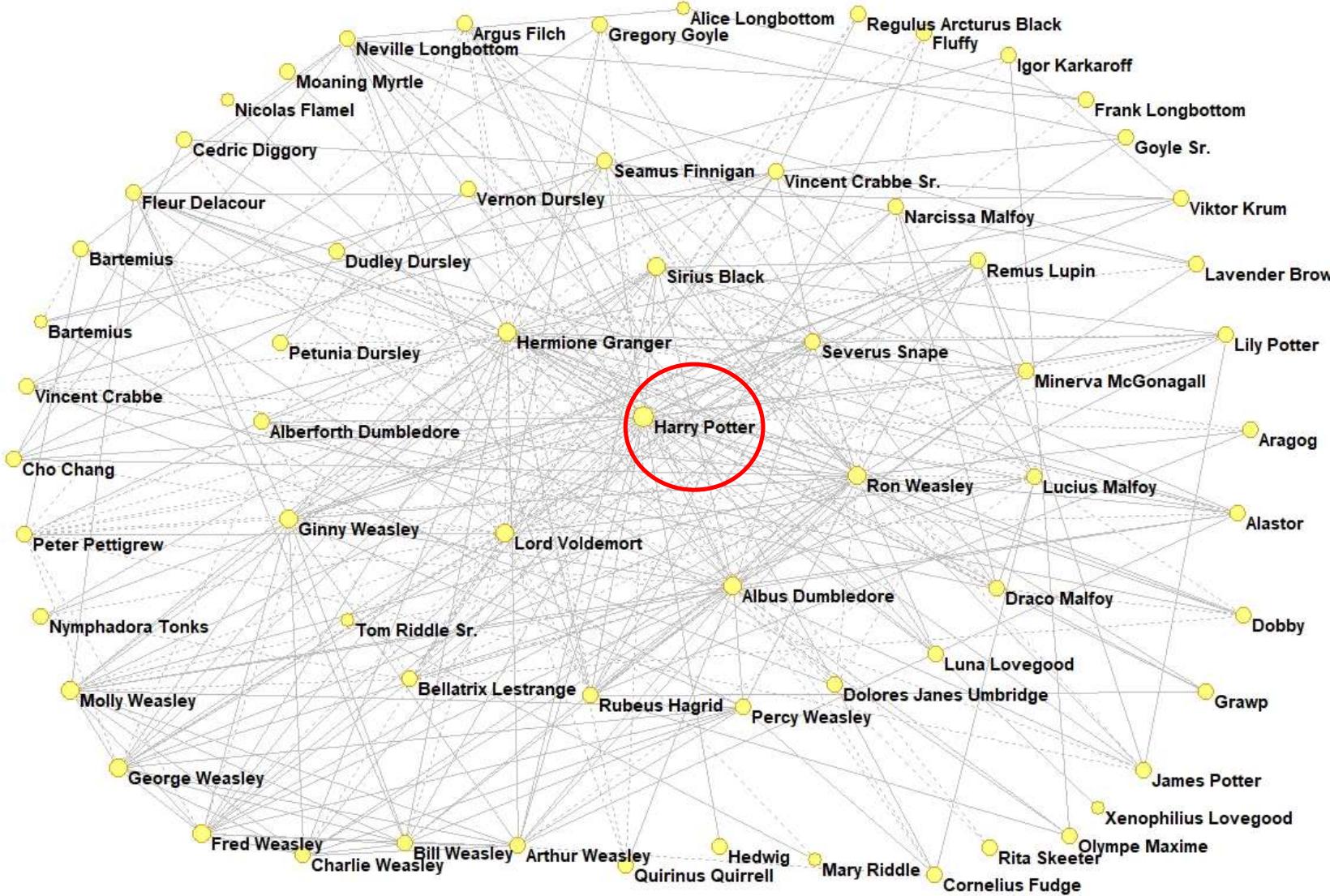
All degree centrality





4. Experiments based on real data

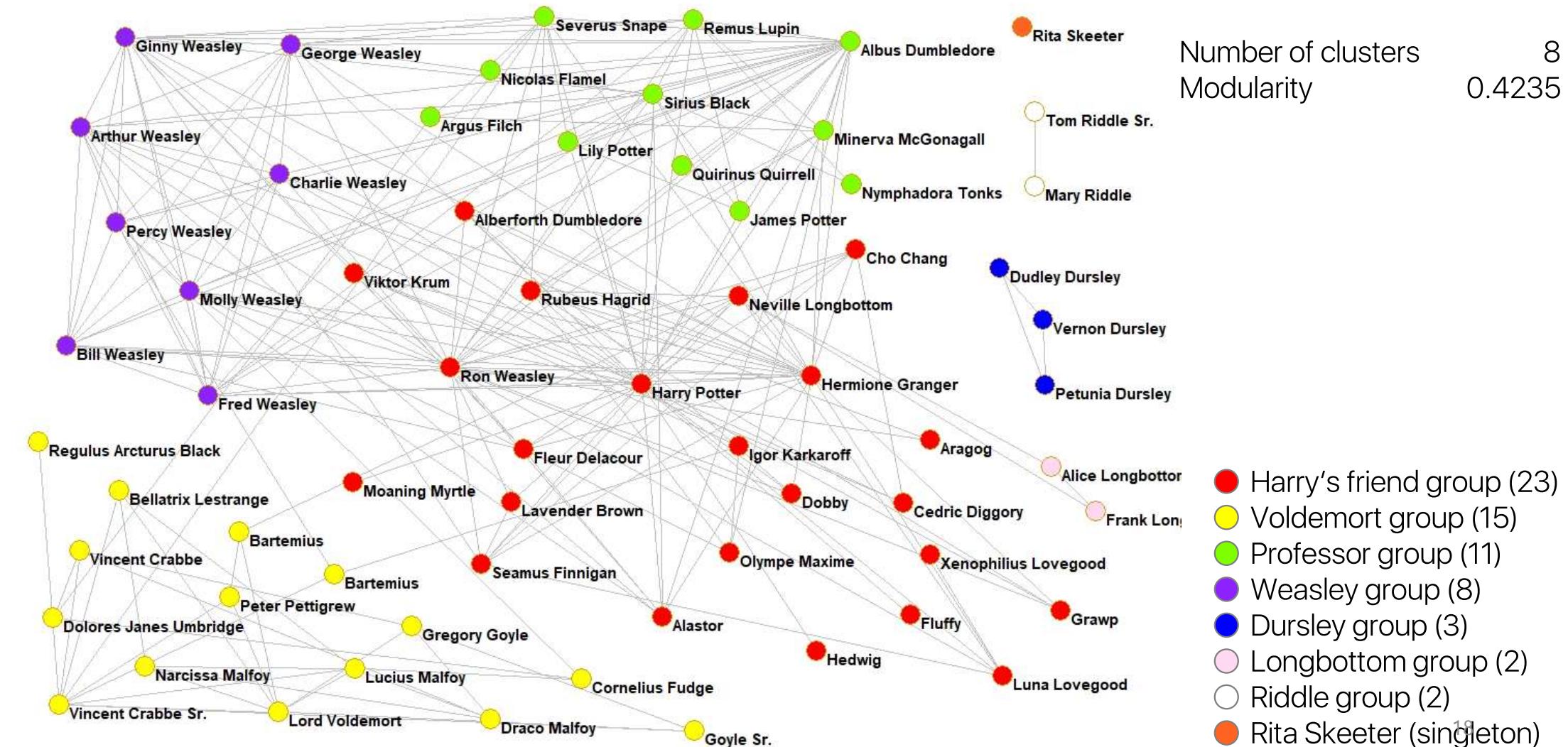
- Closeness centrality



다른 노드들과 얼마나 가깝
게 있는가?

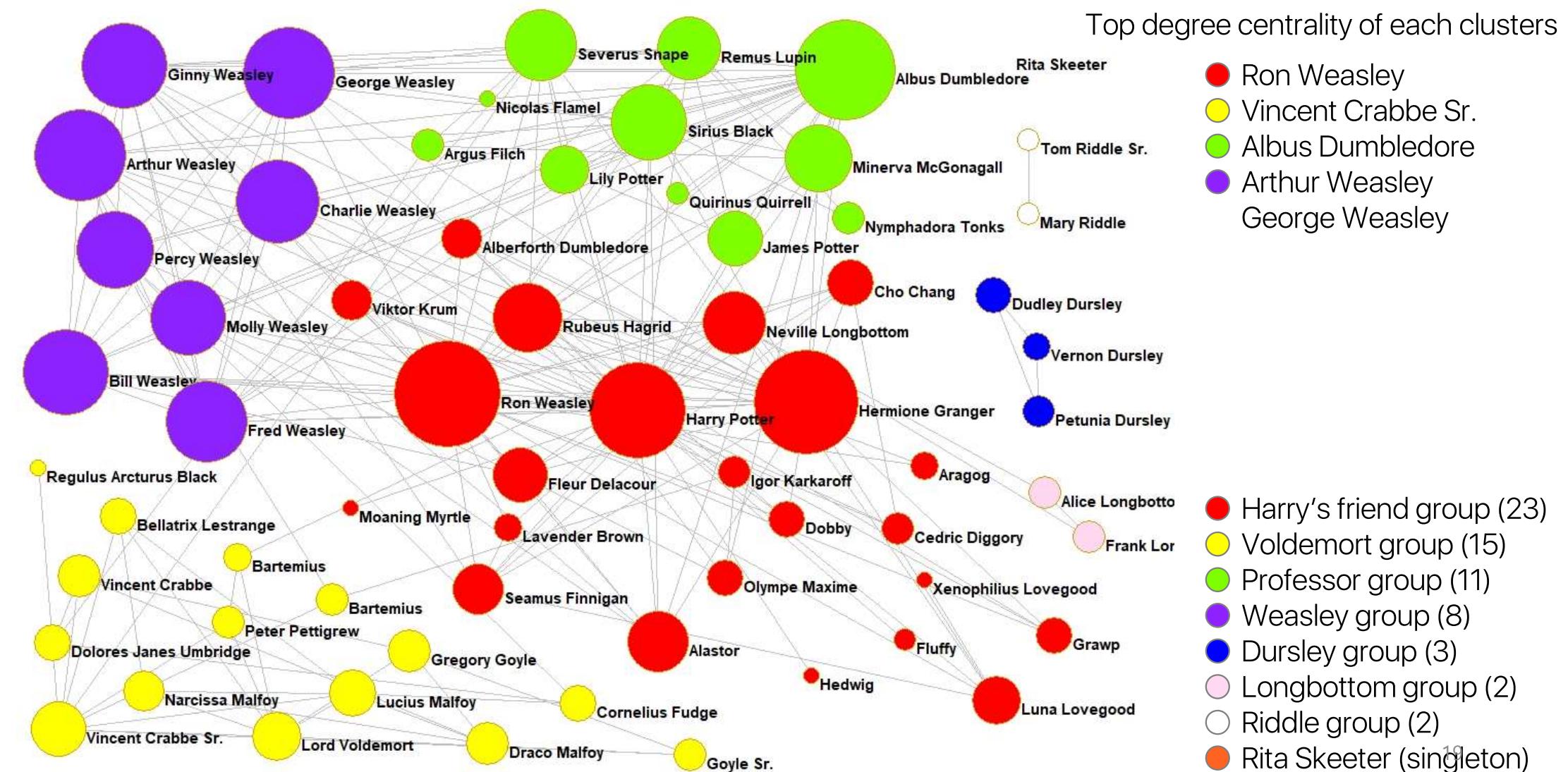
Experiments

Unsigned network - Louvain community detection



Experiments

All degree centrality

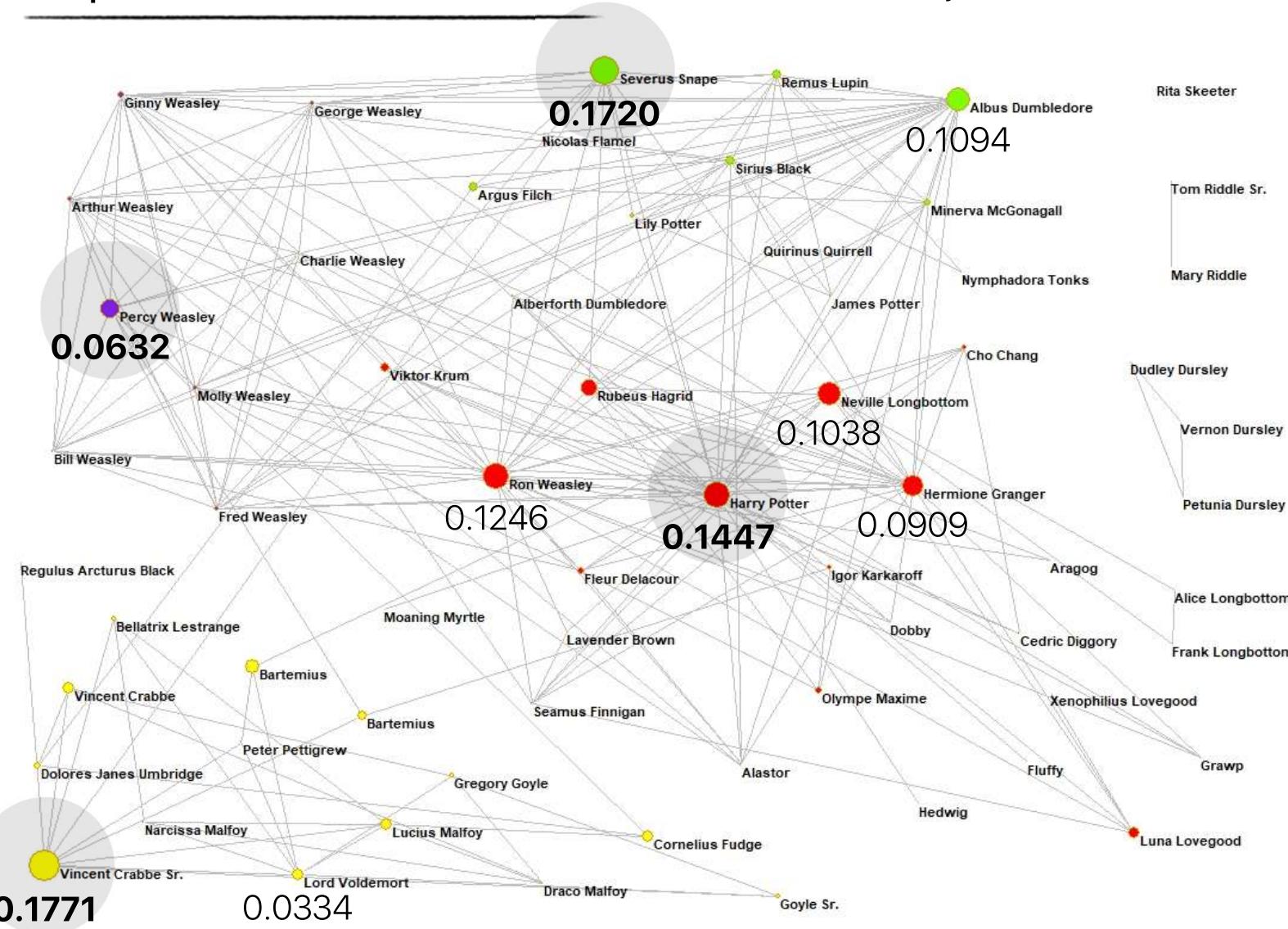


Top degree centrality of each clusters

- Ron Weasley
- Vincent Crabbe Sr.
- Albus Dumbledore
- Arthur Weasley
- George Weasley
- Harry's friend group (23)
- Voldemort group (15)
- Professor group (11)
- Weasley group (8)
- Dursley group (3)
- Longbottom group (2)
- Riddle group (2)
- Rita Skeeter (singleton)

Experiments

Betweenness centrality



Number of clusters 8
Modularity 0.4235

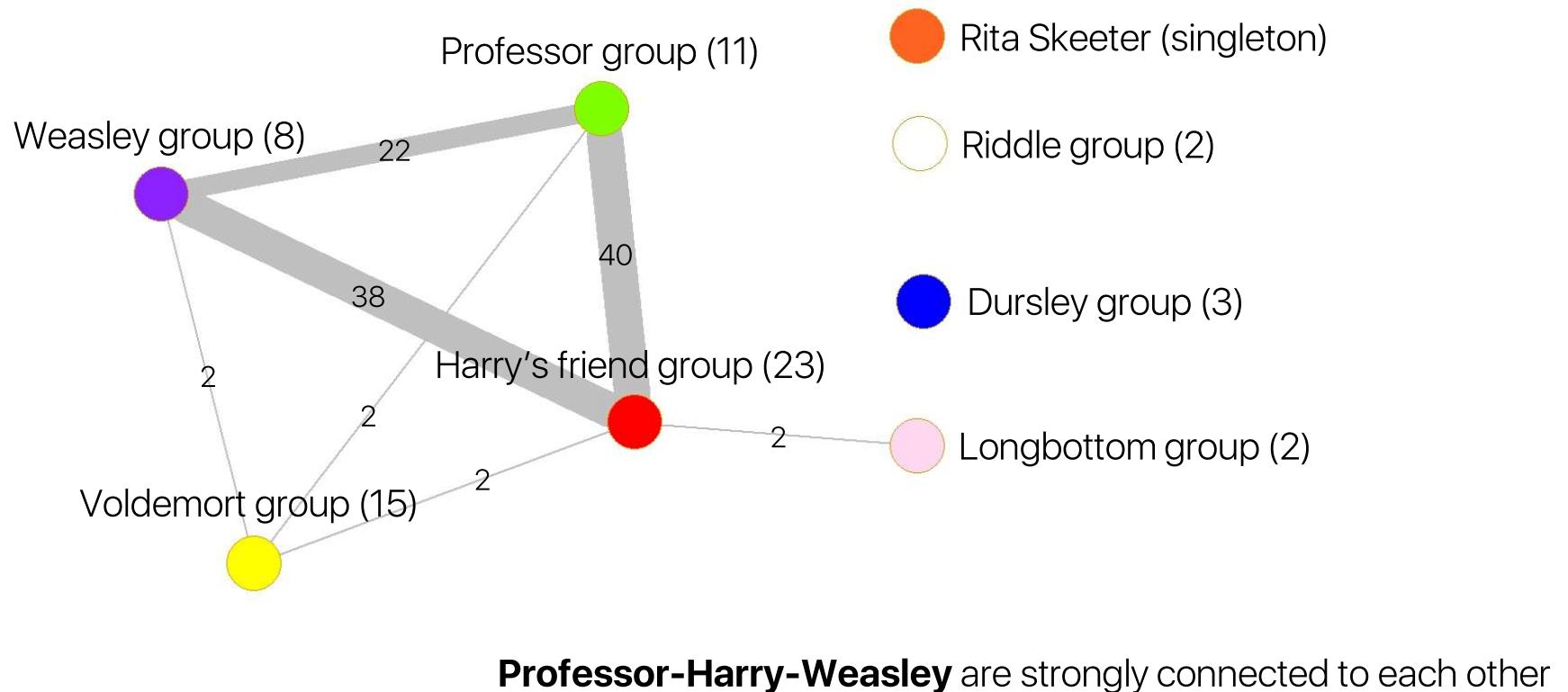
Top betweenness centrality in each cluster

- Harry Potter
- Vincent Crabbe Sr.
- Severus Snape
- Percy Weasley

- Harry's friend group (23)
- Voldemort group (15)
- Professor group (11)
- Weasley group (8)
- Dursley group (3)
- Longbottom group (2)
- Riddle group (2)
- Rita Skeeter (singleton)

Experiments

Network shrinking

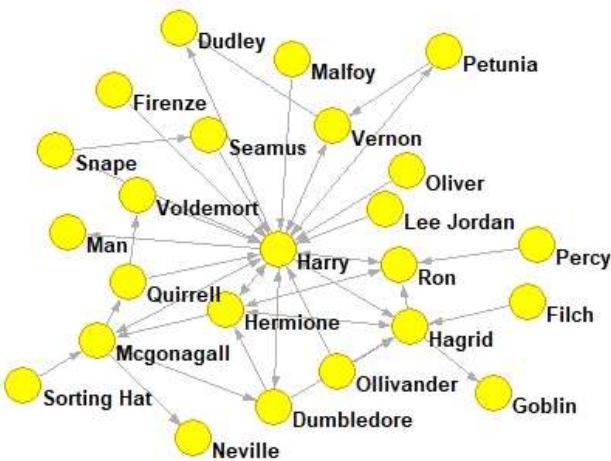


Experiments

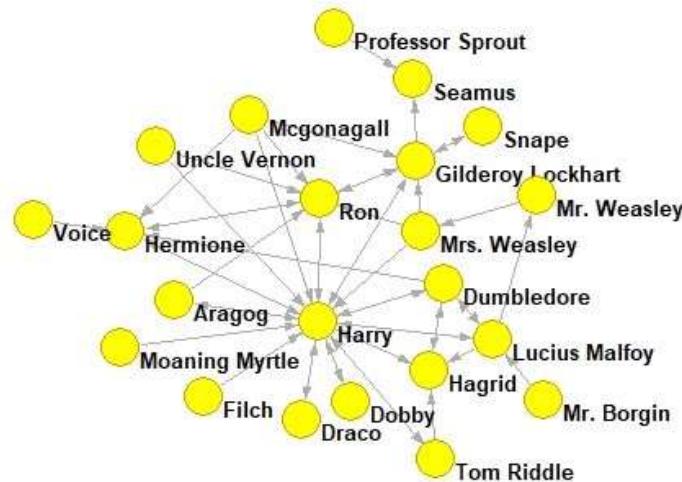
Conversation

Character

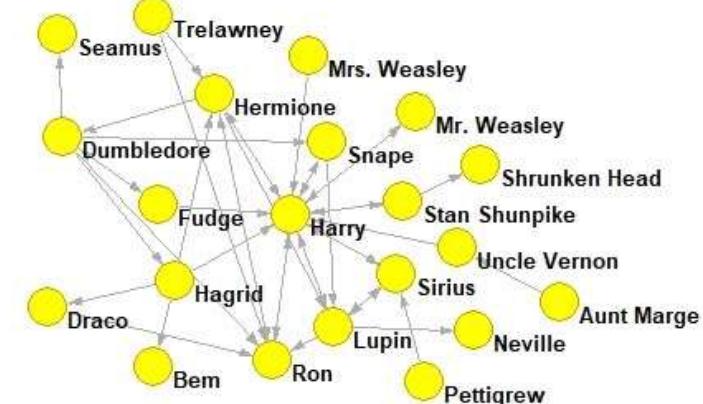
Conversation



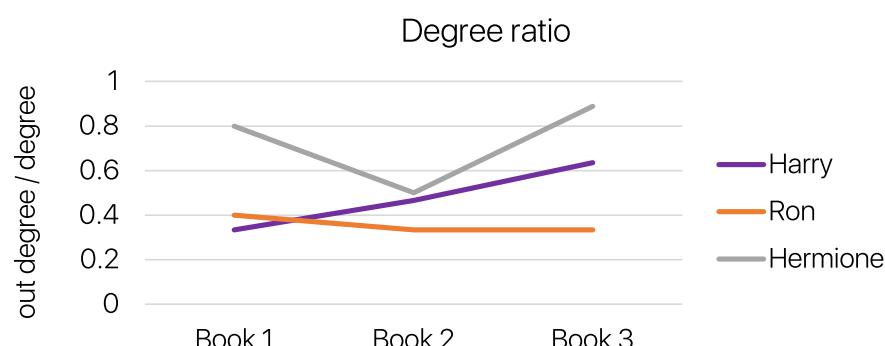
Book 1 (Philosopher's Stone)



Book 2 (Chamber of Secrets)



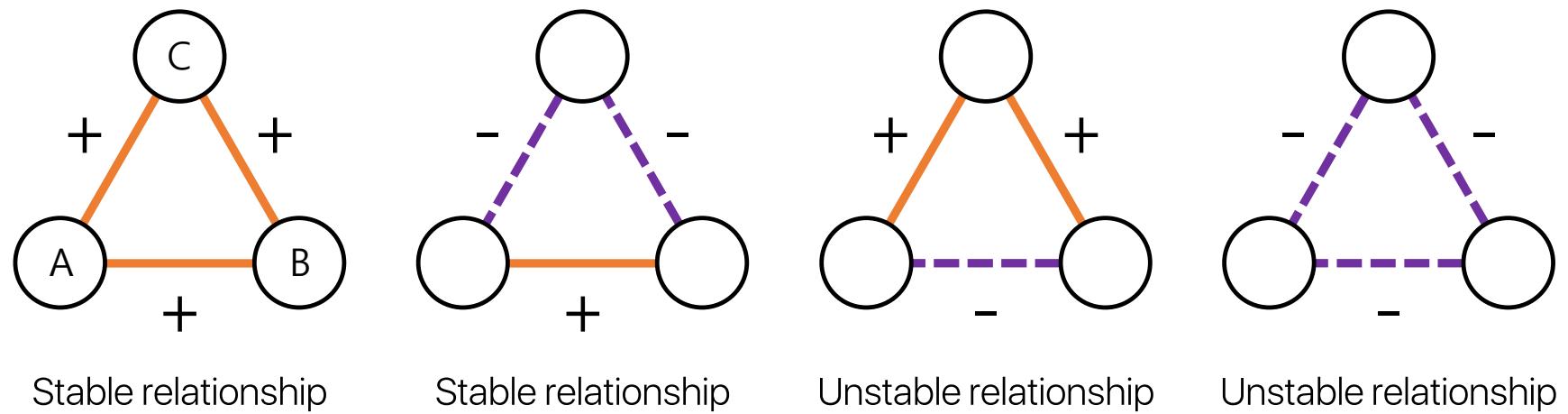
Book 3 (Prisoner of Azkaban)



Harry's k_{out} / k has increased = Harry is getting more active
Ron's k_{out} / k has decreased = Ron is getting more inactive

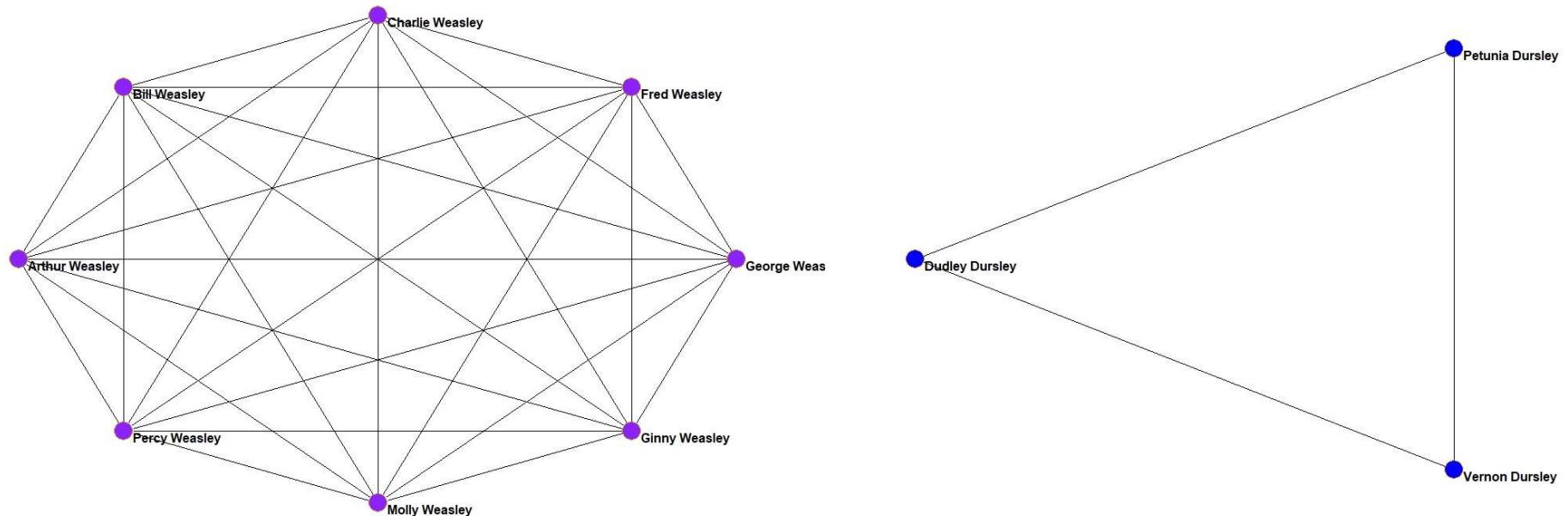
Experiments

Relationship stableness



Experiments

Relationship stabilities



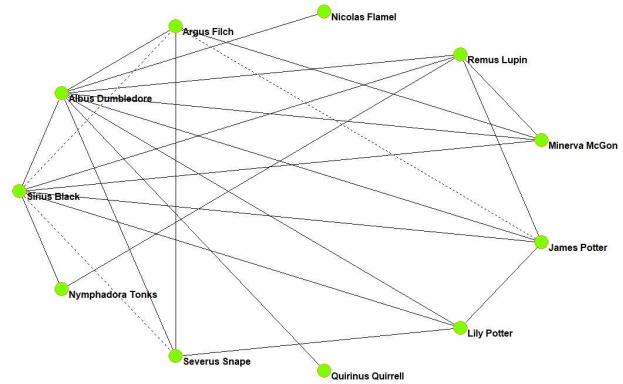
Weasley group
($|V|=8$)

Dursley group
($|V|=3$)

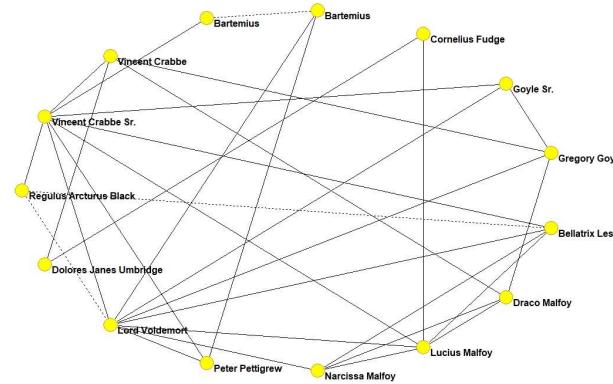
Positive value clique = Stable community
Weasley/Dursley group = Family group

Experiments

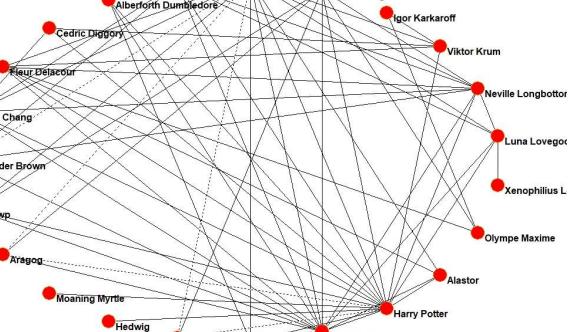
Relationship stabilities



Professor group
($|V|=11$)

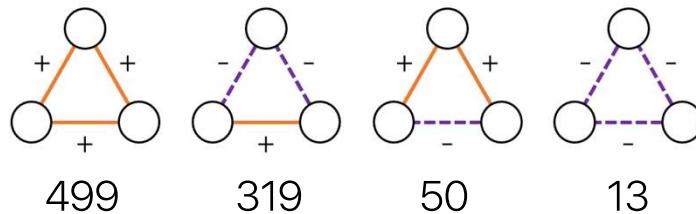


Voldemort group
($|V|=15$)



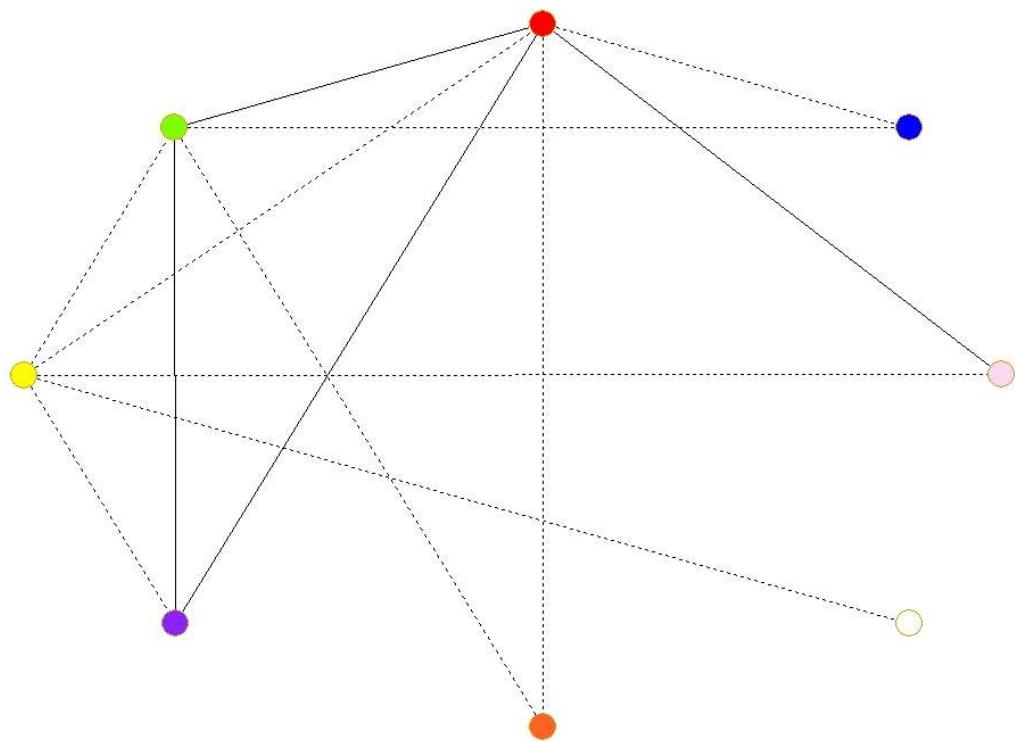
Harry's friend group
($|V|=23$)

Individual view



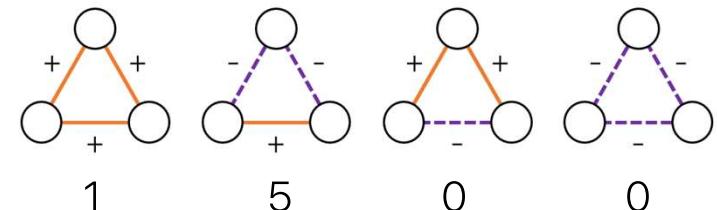
Experiments

Relationship stabilities



Harry-Professor-Weasley group is working as a stable relationship
While Voldemort group has no stable relationship

Group view



- Harry's friend group (23)
- Voldemort group (15)
- Professor group (11)
- Weasley group (8)
- Dursley group (3)
- Longbottom group (2)
- Riddle group (2)
- Rita Skeeter (singleton)

Results



- 1) 인물 간의 적대관계와 우호관계를 알 수 있었다.
- 2) 그룹 간의 적대관계와 우호관계를 알 수 있었다.
- 3) 생성한 네트워크가 실제 해리포터의 내용과 일치할 만큼 좋은 성능을 내줬다.
- 4) 추후 캐릭터 네트워크를 이용한 정보 검색 및 추천 시스템 개발 기대할 수 있다.



Reference



https://www.researchgate.net/publication/305779617_Mining_and_modeling_character_networks
<https://harrypotter.fandom.com/>
<https://www.wizardingworld.com/>
https://en.wikipedia.org/wiki/Harry_Potter
https://dpmartin42.github.io/projects/Harry_Potter/Harry_Potter_Network.html
http://rstudio-pubs-static.s3.amazonaws.com/470892_9691f61838f64eaabd51319f139437e2.html
<https://www.stats.ox.ac.uk/~snijders/siena/HarryPotterData.html>
<https://github.com/sctyner/geomnet#harry-potter-peer-support-network>

