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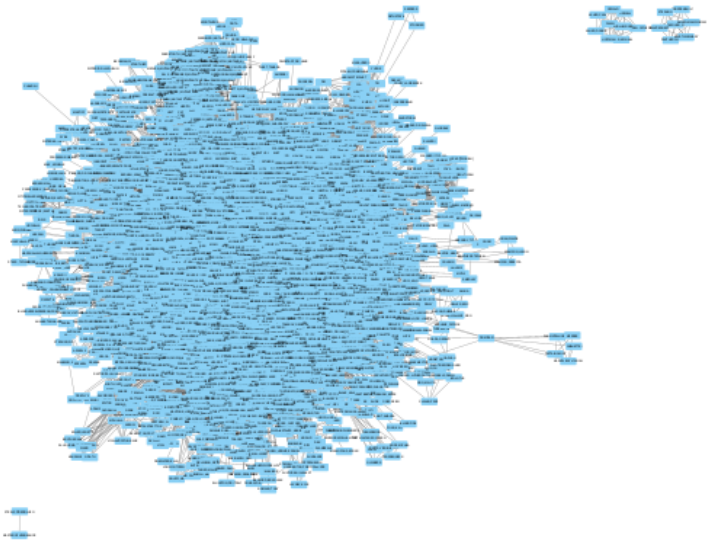
Practice session 2 report

1) Marvel Network

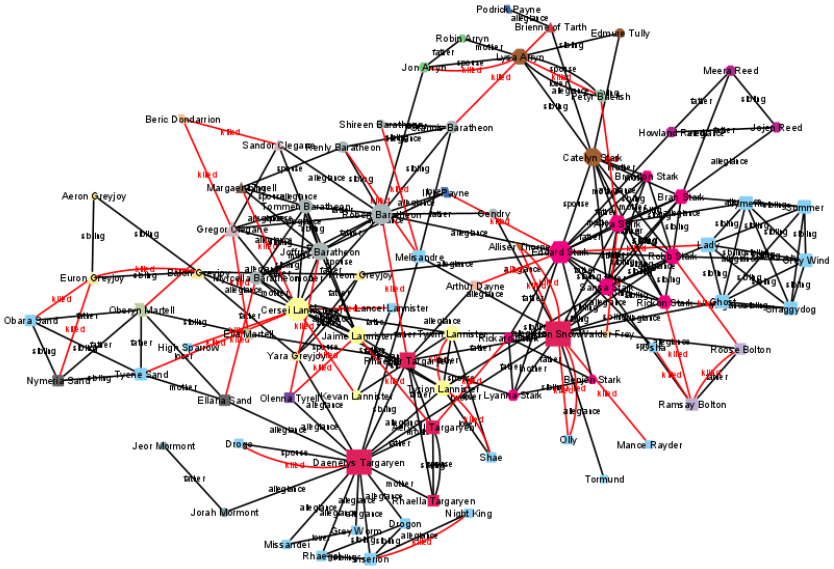


The small disconnected components could represent communities or groups of characters that appear in a specific comic by themselves and are not quite popular.

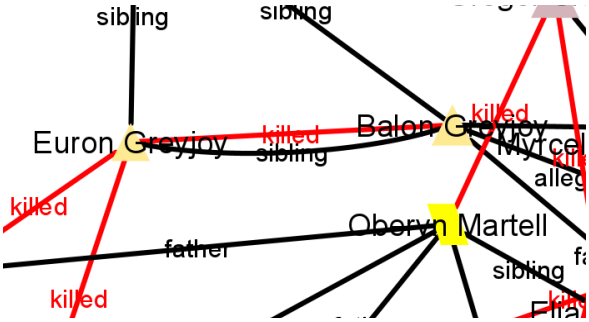
Subnetwork	Nodes, N	Edges, L	Average Degree	L_{max}	$L/L_{max}\ ratio$
BLACK PANTHER	712	37696	105.9	253116	0.1489
ENCHANTRESS	320	14271	89.2	51040	0.2796
KANE SUGAR	11	55	10	55	1

First, we observe the popularity of the 3 characters by the number of neighbors they are connected to (N - 1). In this case, Black Panther seems to interact with more actors than Enchantress and Kane Sugar. From the $L/L_{max}\ ratio$, we can see that the KANE SUGAR network is a complete graph as $L = L_{max}$ and its average degree is therefore N - 1, meaning that all neighbors interact with each other. From the rest of the subnetworks, this ratio is lower but for me they are densely connected with evidence of the high average degrees of 105 and 89. This could be related to Metcalfe's Law that a system's value increases asymptotically as N^2 with the number of its nodes, and in social networks the value grows as N log N, therefore these ratios are higher than expected according to this. Overall, these table values can be explained from the interaction between characters in the same comic, focusing on the neighbors of the three characters mentioned.

2) Game of Thrones Network



One example of a multi-edge in this graph can be found in the relation between Euron Greyjoy and Balon Greyjoy, located at the left. As we can see from the amplified picture below, these characters from the Greyjoy house are brothers and also one was killed by the other.



An interesting phenomenon in this graph could be that there is a high number of connections between the Stark house members and noticeable high degrees in two members of the Targaryen house (Daenerys and Jon Snow). Also, there are houses which are more distant than others in terms of the path lengths, like Mermont and Reed houses.

3) F1 Drivers Network

The graph created contains 20 nodes, where each one represents an actual Formula 1 driver, and 23 edges showing that two drivers have been teammates since the start of their career. The attributes csv file contains the node id, driver name, car number, actual team, age, number of race wins, podiums, poles and races participated. The network file includes the source and target id nodes, the type of relation (if they are teammates at present time or were in the past) and the amount of annual seasons they have been or are together at the same team. Finally the graph is illustrated with nodes labeled by driver name and a legend that shows the mapping between node fill color and the actual team. In addition, the size of each node is proportional to the number of races performed, and edges are distinguished by color, red if teammates relationship or grey if ex-teammates, and size proportional to the racing seasons together.

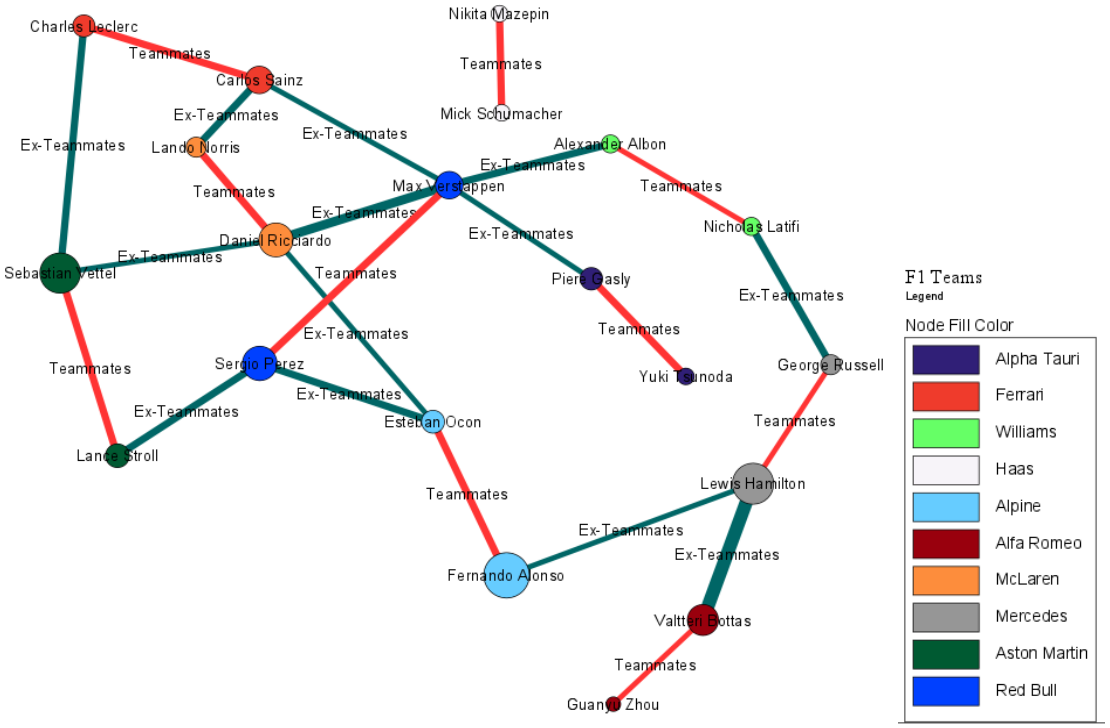
Attributes:

id	name	number	team	age	wins	podiums	poles	races
0	Lewis Hamilton	44	Mercedes	37	103	182	103	288
1	George Russell	63	Mercedes	23	0	1	0	60
2	Max Verstappen	33	Red Bull	24	20	61	13	141
3	Sergio Perez	11	Red Bull	32	2	15	0	216
4	Carlos Sainz	55	Ferrari	27	0	6	0	141
5	Charles Leclerc	16	Ferrari	24	2	13	9	81
6	Lando Norris	4	McLaren	22	0	5	1	60
7	Daniel Ricciardo	3	McLaren	32	8	32	3	211
8	Fernando Alonso	14	Alpine	40	32	98	22	334
9	Esteban Ocon	31	Alpine	25	1	2	0	90
10	Sebastian Vettel	5	Aston Martin	34	53	122	57	280
11	Lance Stroll	18	Aston Martin	23	0	3	1	100
12	Piere Gasly	10	Alpha Tauri	26	1	3	0	86
13	Yuki Tsunoda	22	Alpha Tauri	21	0	0	0	22
14	Valtteri Bottas	77	Alfa Romeo	32	10	67	20	179
15	Guanyu Zhou	24	Alfa Romeo	22	0	0	0	0
16	Nicholas Latifi	6	Williams	26	0	0	0	39
17	Alex Albon	23	Williams	25	0	2	0	38
18	Mick Schumacher	47	Haas	22	0	0	0	22
19	Nikita Mazepin	9	Haas	22	0	0	0	21

Network:

source	destination	relation	seasons
0	1	Teammates	1
0	8	Ex-Teammates	1
0	14	Ex-Teammates	5
1	16	Ex-Teammates	2
2	3	Teammates	2
2	4	Ex-Teammates	1
2	7	Ex-Teammates	3

2	12	Ex-Teammates	1
2	17	Ex-Teammates	2
3	9	Ex-Teammates	2
3	11	Ex-Teammates	2
4	5	Teammates	2
4	6	Ex-Teammates	2
5	10	Ex-Teammates	2
6	7	Teammates	2
7	9	Ex-Teammates	1
7	10	Ex-Teammates	1
8	9	Teammates	2
10	11	Teammates	2
12	13	Teammates	2
14	15	Teammates	1
16	17	Teammates	1
18	19	Teammates	2



I hereby declare that, except for the code provided by the course instructors, all of my code, report, and figures were produced by myself.