

1. Degree Distribution

1.1

The result for gnp1, gnp2, gnm1, gnm2 shown as follows perspective.

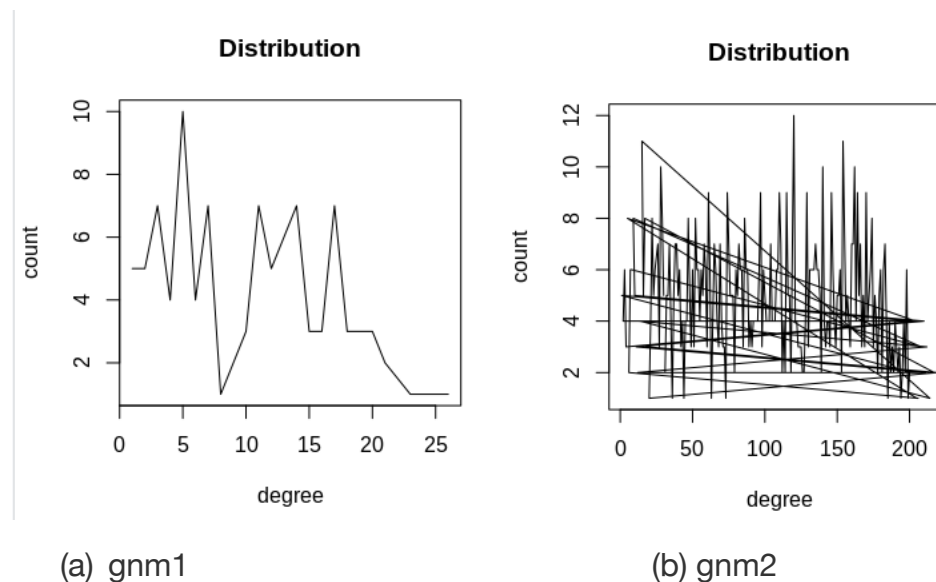
degree	count
1	26
2	15
3	15
4	11
5	9
6	2
7	3
8	2

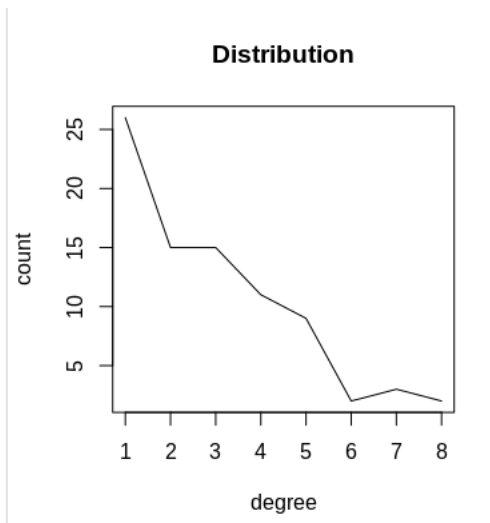
degree	count
32	1
1	99
2	115
3	93
4	88
5	110
6	96
7	95
8	103
9	105
10	93
11	101
12	91
13	73
14	84
15	86
16	91
17	76
18	75

degree	count
1	5
2	5
3	7
4	4
5	10
6	4
7	7
8	1
10	3
11	7
12	5
13	6
14	7
15	3
16	3
17	7
18	3
19	3
20	3

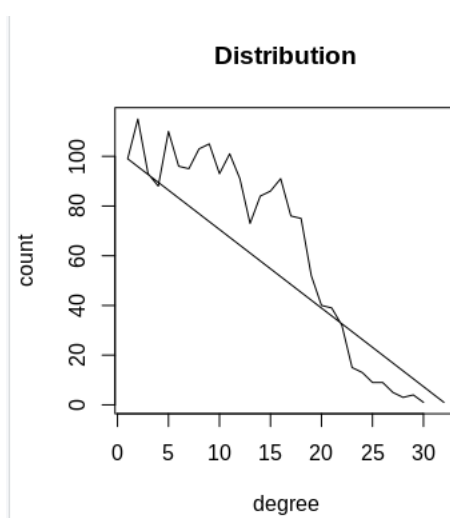
degree	count
31	2
32	5
33	5
34	7
35	4
36	1
37	5
38	7
39	7
40	5
41	6
42	3
43	4
44	1
45	4
46	4
47	8
48	5
49	3

We can plot (degree,count) to check whether they follow power laws. From the result below, none of them to be scale-free.





(c)gnp1



(d)gnp2

1.2

the result for Amazon large, Amazon small shown follows perspective,

```
+-----+-----+
|degree|count|
+-----+-----+
| 31| 1|
| 32| 1|
| 33| 1|
| 34| 2|
| 35| 3|
| 37| 1|
| 1| 3029|
| 2| 2849|
| 3| 2295|
| 4| 1963|
| 5| 1385|
| 6| 667|
| 7| 450|
| 8| 267|
| 9| 205|
| 10| 138|
| 11| 91|
| 12| 70|
| 13| 49|
| 14| 51|
+-----+-----+
only showing top 20 rows
```

```
+-----+-----+
|degree|count|
+-----+-----+
| 1| 428|
| 2| 402|
| 3| 350|
| 4| 314|
| 5| 239|
| 6| 133|
| 7| 68|
| 8| 44|
| 9| 27|
| 10| 29|
| 11| 14|
| 12| 12|
| 13| 7|
| 14| 8|
| 15| 2|
| 16| 3|
| 17| 2|
| 18| 2|
| 20| 1|
+-----+-----+
```

The result for youtube large, youtube small shown as follows perspective,

degree	count
31	51
231	1
32	66
33	45
34	54
35	57
36	45
37	51
38	50
39	37
40	41
41	22
42	22
43	28
44	22
45	22
46	25
47	26
48	15
49	23

only showing top 20 rows

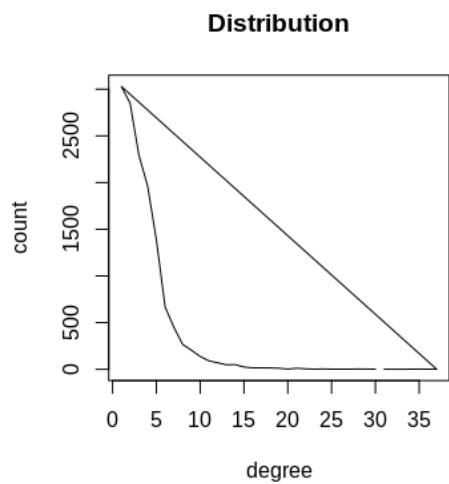
degree	count
1	1386
2	188
3	53
4	16
5	4
6	1
11	1

The result for dblp large and dblp small shown as follow perspective,

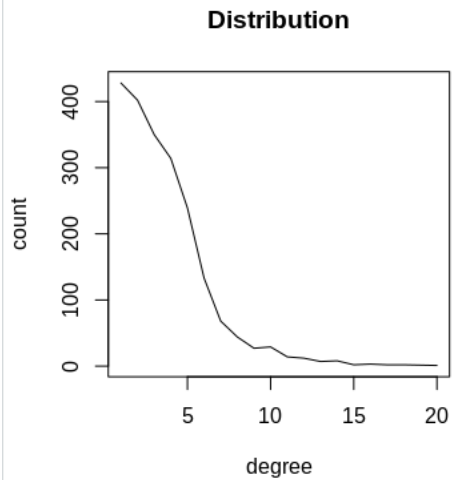
degree	count
31	13
32	16
33	14
34	10
35	6
36	9
37	6
38	11
39	5
40	5
41	6
42	2
43	6
44	3
45	4
46	3
47	4
53	1
54	2
1	15958

degree	count
1	444
2	476
3	419
4	328
5	246
6	113
7	46
8	27
9	16
10	9
11	8
12	8
13	6
14	3
15	1

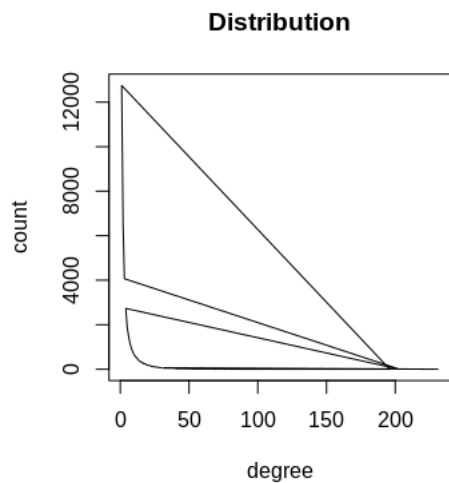
We plot (degree,count) to check whether they follow power law. from the result below.
We can concluded that they are all scale free



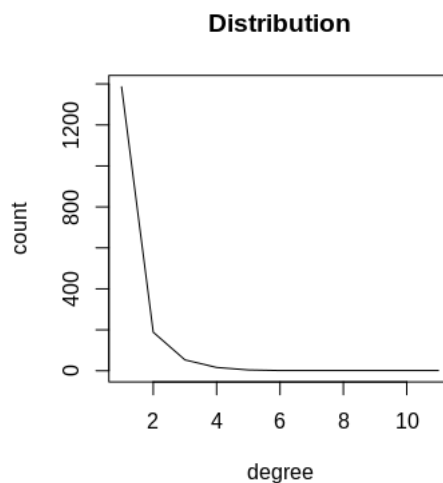
(a) Amazon larger



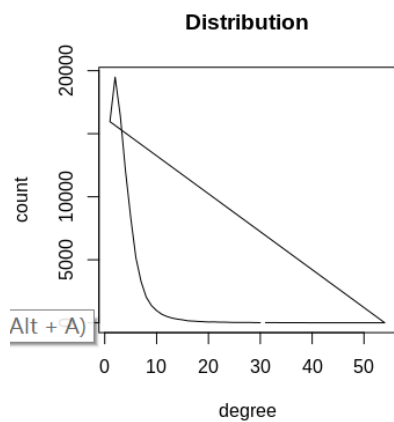
(b) amazon small



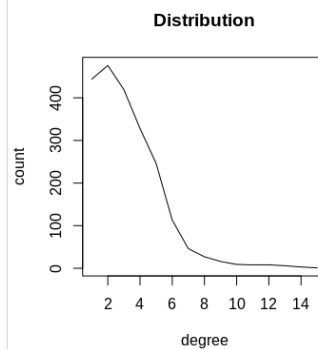
(c) Youtube larger



(d) youtube small



(e) dblp large.



(f) dblp small

2. Centrality

2.1

id	closeness
F	0.07142857142857142
C	0.07142857142857142
H	0.06666666666666667
D	0.06666666666666667
B	0.058823529411764705
E	0.058823529411764705
G	0.05555555555555555
A	0.05555555555555555
I	0.047619047619047616
J	0.034482758620689655

from the result above, we know $F = C > H = D > B = E > G = A > I > J$

2.2

F and C

3. Artiluation Points

Execution time: 256.471798897 seconds
Articulation points:

id	articulation
Mohamed Atta	1
Usman Bandukra	1
Mamoun Darkazanli	1
Essid Sami Ben Khemais	1
Djamal Beghal	1
Nawaf Alhazmi	1
Raed Hijazi	1

So the result is :

Mohamed Atta, Usman Bandukhra, Mamoun Darkazanli, Essid Sami Ben Khemais, Djmal Beghal, Nawaf alhazmi, Raed Hijazi