

## Assign6 (Analysis)

(MT19111) Akshaj.

Q1:] o/p

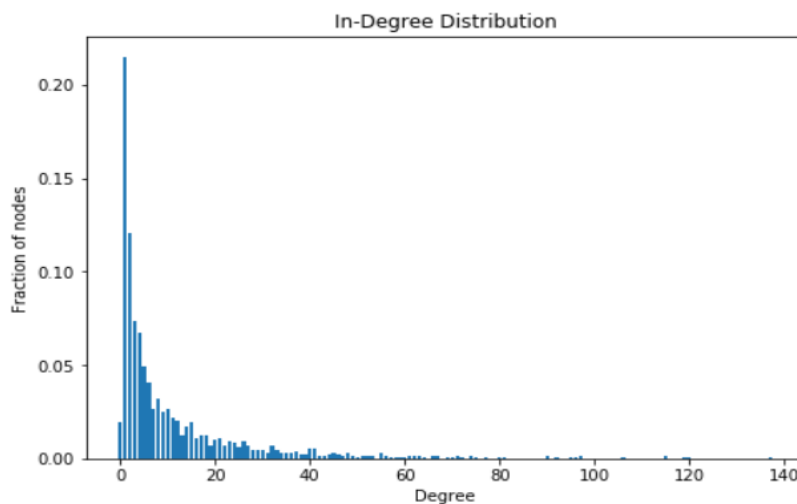
```
Total number of nodes 1899
Total Number of static edges 20296
Total Number of network edges 59835
```

```
Avg In-Degree 10.687730384412848
Avg Out-Degree 10.687730384412848
Node with max in-degree 32
Node with max out-degree 9
Density of Network is 0.005631048674611617
```

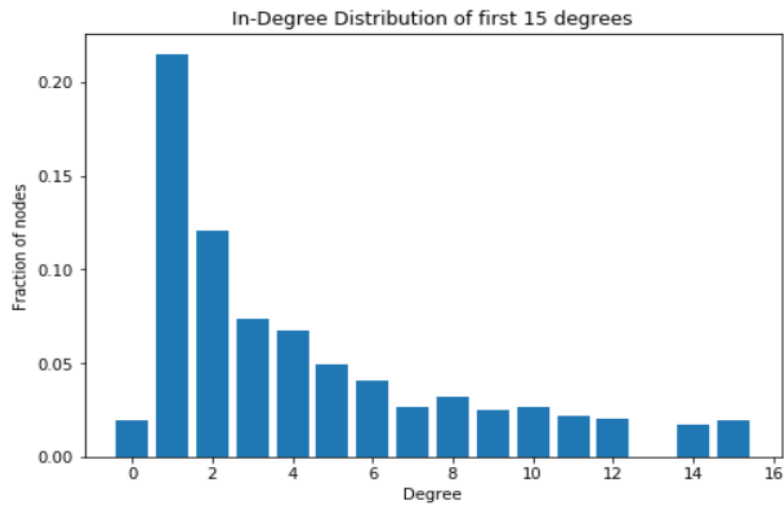
**Degree Distribution of network:**

**In-Degree Distribution:**

Distribution on over all dataset.



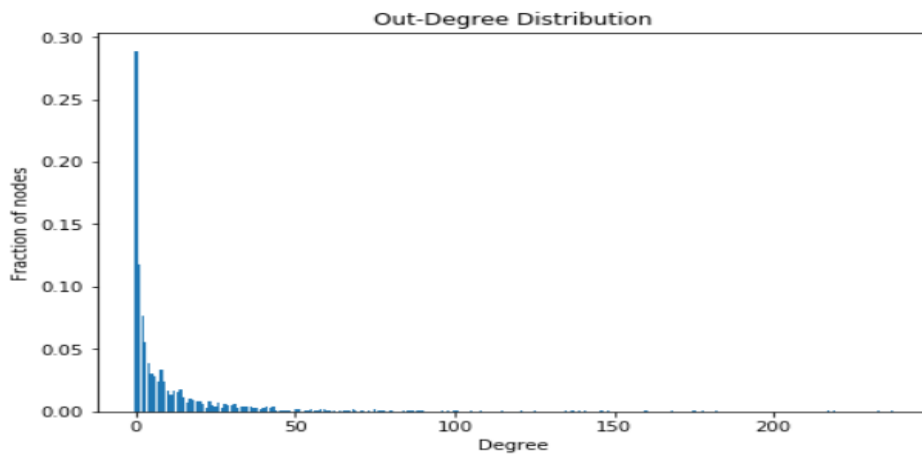
Distribution on first 15 values.



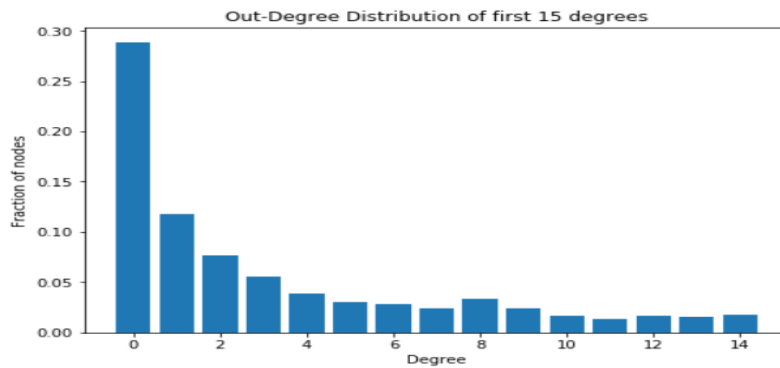
Here from above two graph we can clearly see that number of nodes with degree 1 are higher followed by degree 2 compared to other nodes.

### Out-Degree Distribution:

Distribution of whole dataset.



Distribution on first 15 values.



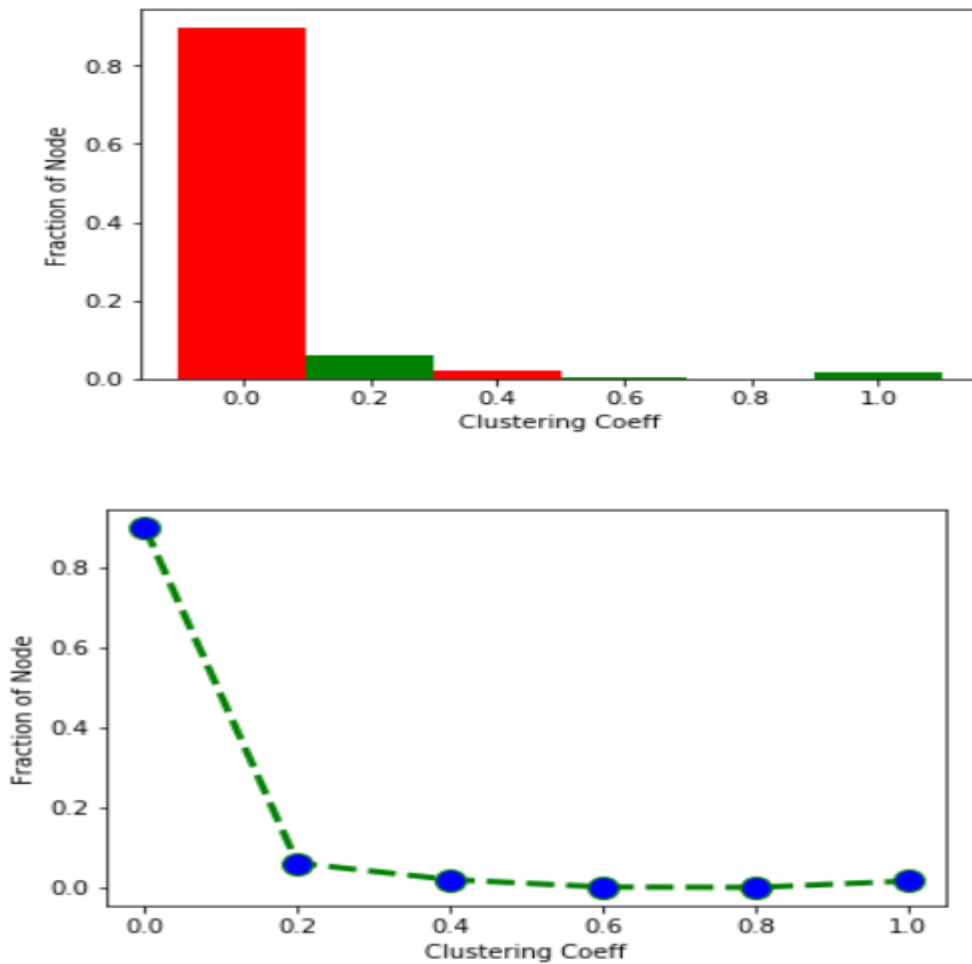
From above two graph we can see that number of nodes with out-degree 0 are high followed by out-degree 1. As it is communication network so we can say that one way communication are more.

### Clustering Coefficient:

First 20 values of clustering coefficient.

```
Node 1 clustering coeff = 0.08067226890756303
Node 2 clustering coeff = 0.15
Node 3 clustering coeff = 0.03738970354853044
Node 4 clustering coeff = 0
Node 5 clustering coeff = 0
Node 6 clustering coeff = 0.051682692307692304
Node 7 clustering coeff = 0.1
Node 8 clustering coeff = 0.03670634920634921
Node 9 clustering coeff = 0.0197268326417704
Node 10 clustering coeff = 0.0
Node 11 clustering coeff = 0.0
Node 12 clustering coeff = 0.03890720207771452
Node 13 clustering coeff = 0.0
Node 14 clustering coeff = 0.0
Node 15 clustering coeff = 0.25
Node 16 clustering coeff = 0
Node 17 clustering coeff = 1.0
Node 18 clustering coeff = 0.0
Node 19 clustering coeff = 0.00909090909090909
Node 20 clustering coeff = 0.023809523809523808
```

### Clustering coefficient distribution graph.



From the above two graph we can see that clustering coefficient value distributed between 0.0 to 0.2 and high in numbers, which gradually decreases and slightly again increases from 0.8 to 1.0 than previous value.

### Centrality Measure.

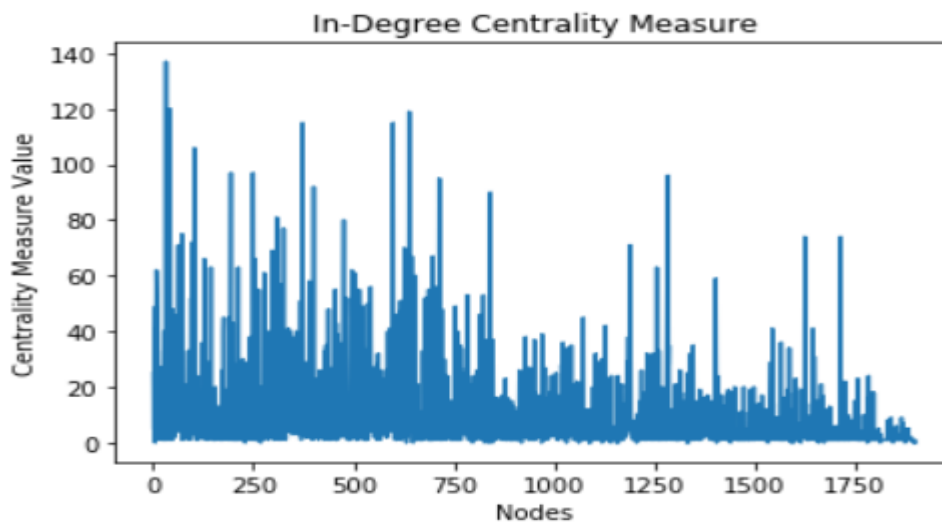
For centrality measure we have chosen degree centrality.

In-degree centrality Measure.

Indegree Centrality of first 20 nodes.

Node = 1	In-Degree Centrality Measure = 25
Node = 2	In-Degree Centrality Measure = 5
Node = 3	In-Degree Centrality Measure = 41
Node = 4	In-Degree Centrality Measure = 1
Node = 5	In-Degree Centrality Measure = 0
Node = 6	In-Degree Centrality Measure = 49
Node = 7	In-Degree Centrality Measure = 5
Node = 8	In-Degree Centrality Measure = 62
Node = 9	In-Degree Centrality Measure = 53
Node = 10	In-Degree Centrality Measure = 2
Node = 11	In-Degree Centrality Measure = 3
Node = 12	In-Degree Centrality Measure = 33
Node = 13	In-Degree Centrality Measure = 3
Node = 14	In-Degree Centrality Measure = 3
Node = 15	In-Degree Centrality Measure = 4
Node = 16	In-Degree Centrality Measure = 1
Node = 17	In-Degree Centrality Measure = 2
Node = 18	In-Degree Centrality Measure = 2
Node = 19	In-Degree Centrality Measure = 27
Node = 20	In-Degree Centrality Measure = 6

In-Degree Centrality .

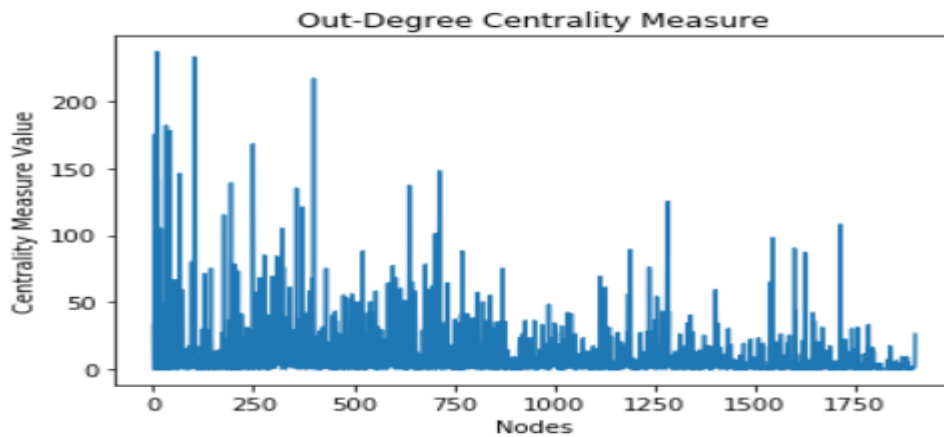


## Out Degree Centrality.

Out Degree centrality of first 20 nodes.

```
Node = 1   Out-Degree Centrality Measure = 25
Node = 2   Out-Degree Centrality Measure = 5
Node = 3   Out-Degree Centrality Measure = 41
Node = 4   Out-Degree Centrality Measure = 1
Node = 5   Out-Degree Centrality Measure = 0
Node = 6   Out-Degree Centrality Measure = 49
Node = 7   Out-Degree Centrality Measure = 5
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```

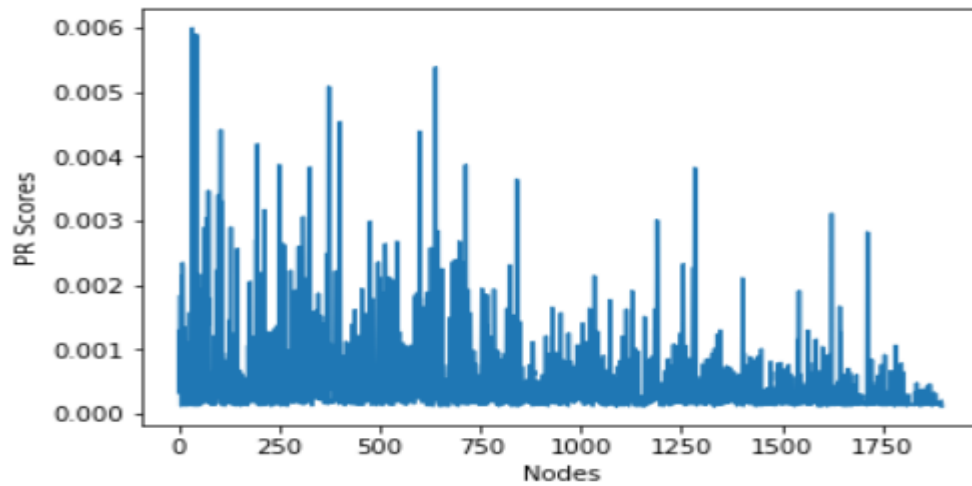
Out Degree Centrality.



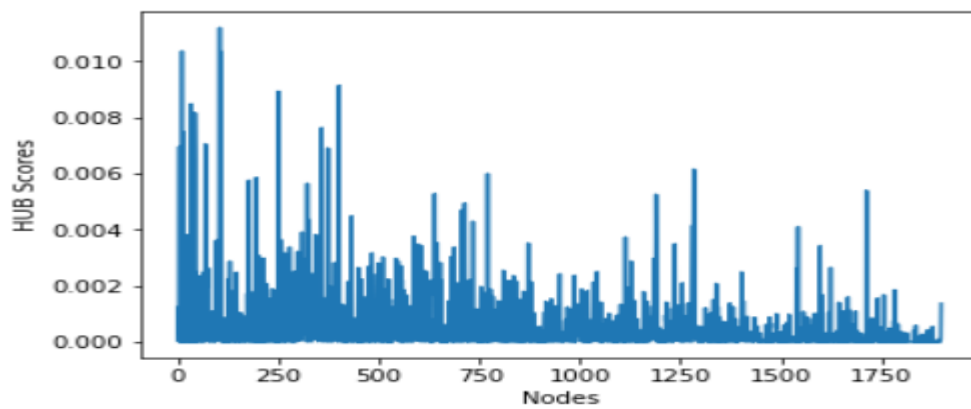
From In-Degree centrality we can always see number of communications received to particular node.

From Out-Degree centrality we can always see that number of communications (messages) sent from particular node.

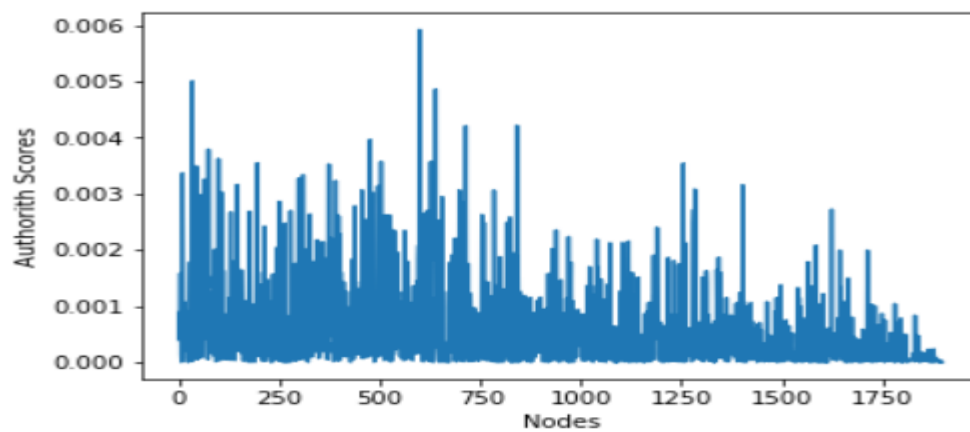
**Page Rank:**



**HUB:**



**Authority:**

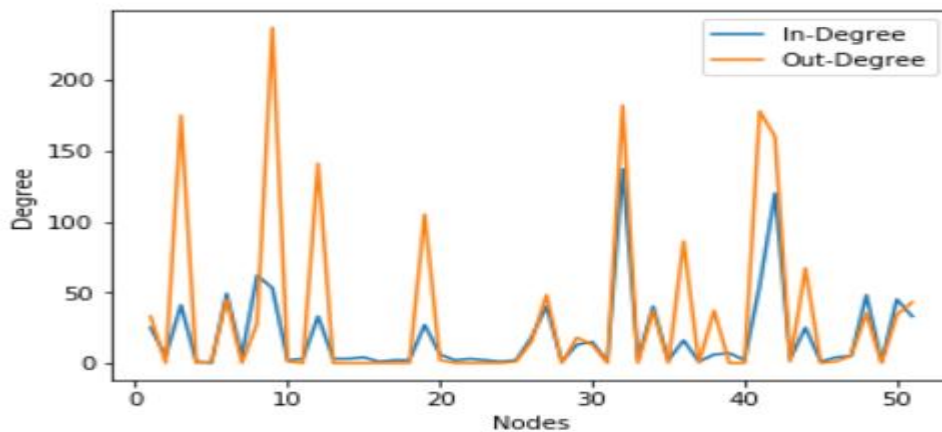


**First 11 scores of pagerank hub and authority are.**

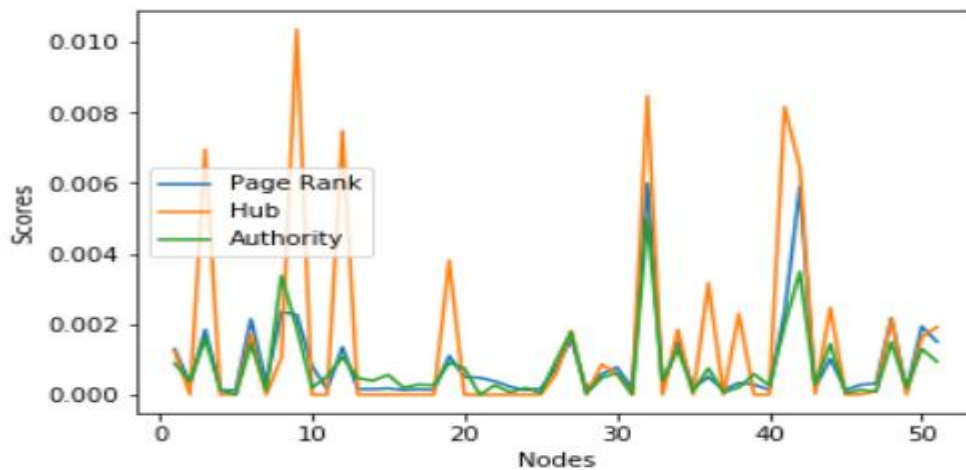
page rank	0.0012912178017785933	Hub	0.0012308840591603028	Authority	0.0008836016620782827
page rank	0.0003153141579405256	Hub	0.0	Authority	0.00038218496245988104
page rank	0.0018450571276085641	Hub	0.0069598274859080074	Authority	0.0015862062504226303
page rank	0.00013250525647919923	Hub	0.0	Authority	0.00013163300413063193
page rank	0.00012354503234410322	Hub	1.298092978321069e-05	Authority	0.0
page rank	0.002144903638934677	Hub	0.0017088179623851113	Authority	0.0014422757324190475
page rank	0.00034415299196656555	Hub	0.0	Authority	0.00012579753389383257
page rank	0.00234922296358969	Hub	0.0010550103414933088	Authority	0.003367084698386315
page rank	0.002267890497827034	Hub	0.010362488921315133	Authority	0.0018955710303599526
page rank	0.0008083356288284902	Hub	6.881135355484356e-96	Authority	0.0001961143953129519

### Comparison Between Page-Rank HUB and Authority Score.

In-Degree and Out-Degree for first 50 nodes.



Page-Rank HUB and authority score for first 50 nodes.





Hub and Authority is computed using HITS algorithm and are query dependent where as page-rank is query independent.

Page-Rank is computed on basis on incoming link to the node. HUB is calculated on basis of out-going links and Authority score is calculated on basis of incoming links.

From Above two graphs we can see that Page-Rank and authority score increases and decreases according to incoming links.

Where as HUB score increases and decreases according to out-going links.

Therefore we can see that page-rank and authority score is based on in-degree and HUB score is based on out-degree.