Tokyo Tech

Network Analysis

～Facebook users’ relationship～

Analysis Target

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- SNS – Social Networking Service

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Use a dataset of Facebook friends lists

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- SNS – Social Networking Service

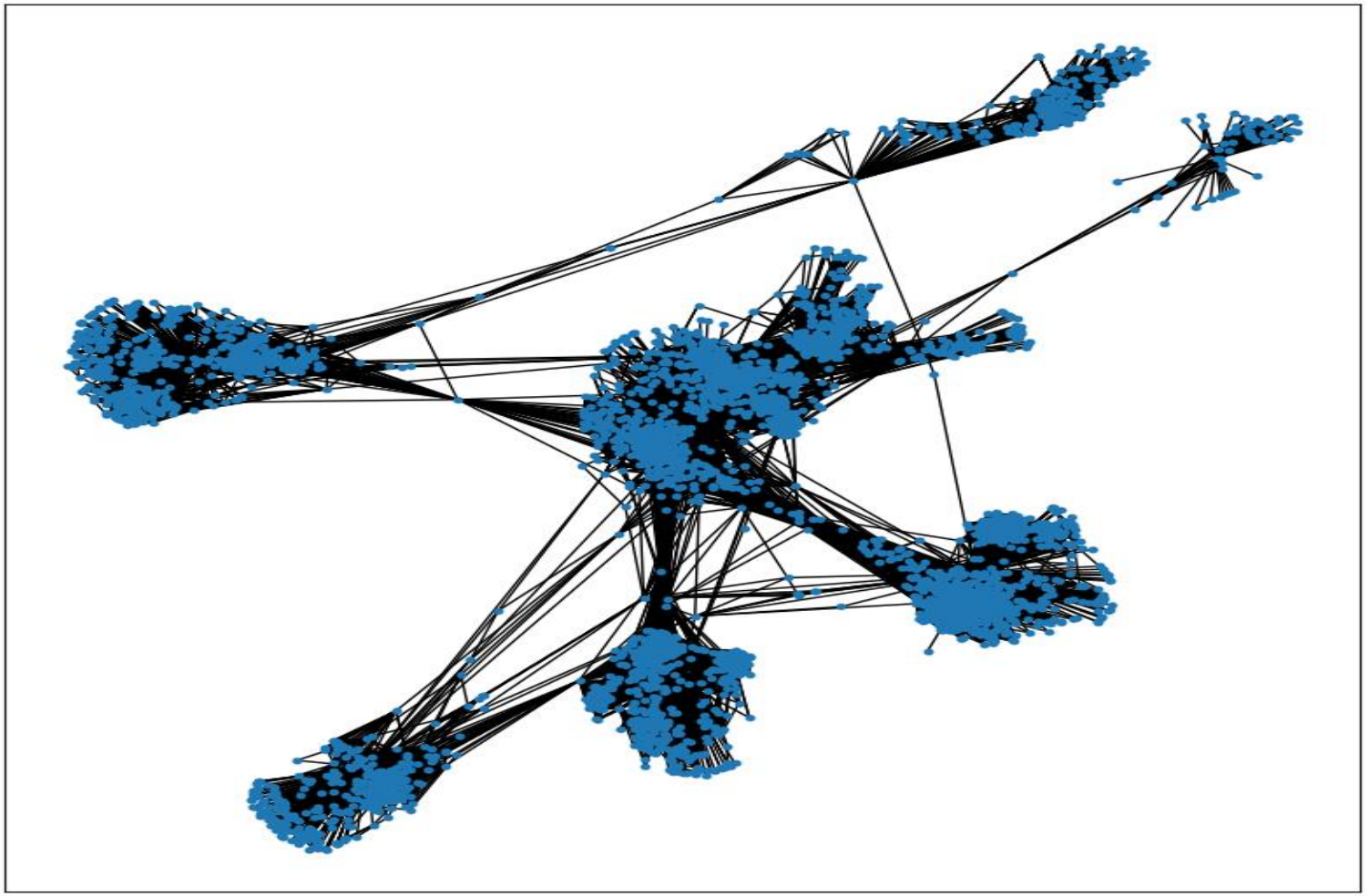
Use a dataset of Facebook friends lists

https://snap.stanford.edu/data/ego-Facebook.html

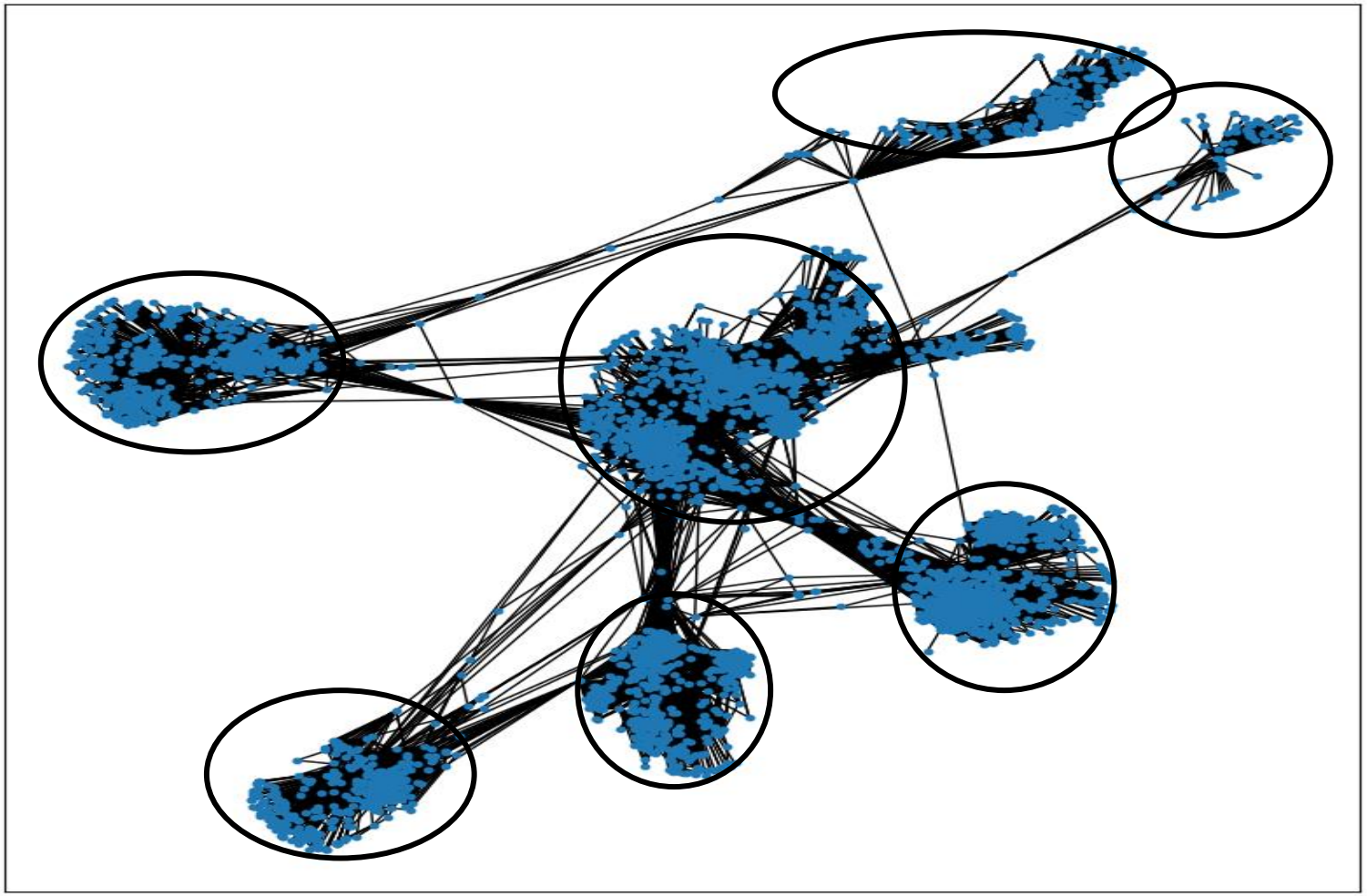
Details of the Facebook network

- Nodes : 4039
- Edges : 88234
- Average degree : 43.6910

Details of the Facebook network



Details of the Facebook network



Centrality

- Degree Centrality

Good : show many connections

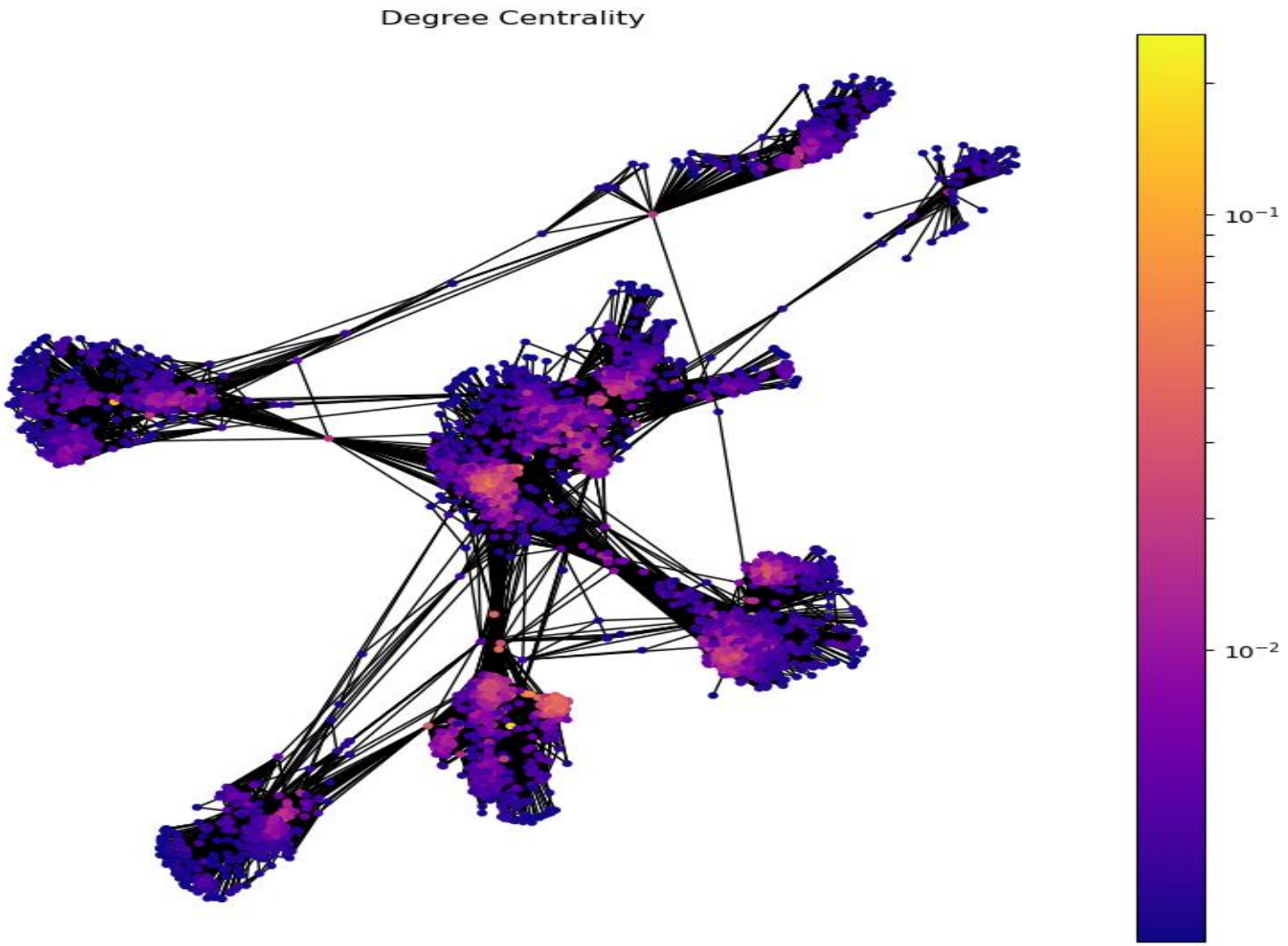
Bad : do not consider value of each node

- Betweenness Centrality

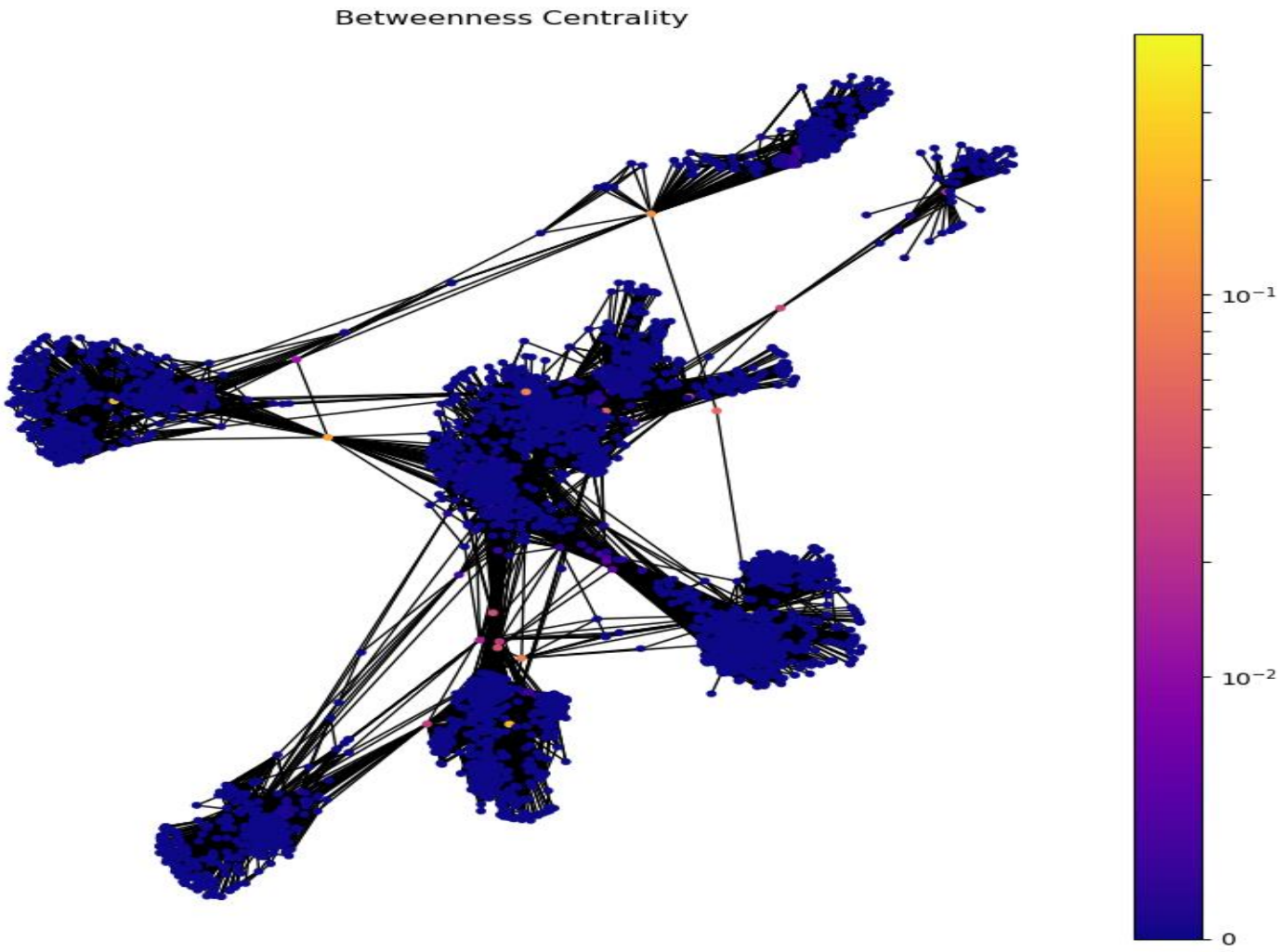
Good : detect nodes which connect groups

Bad : Low degree node may have a high betweenness centrality

Degree Centrality

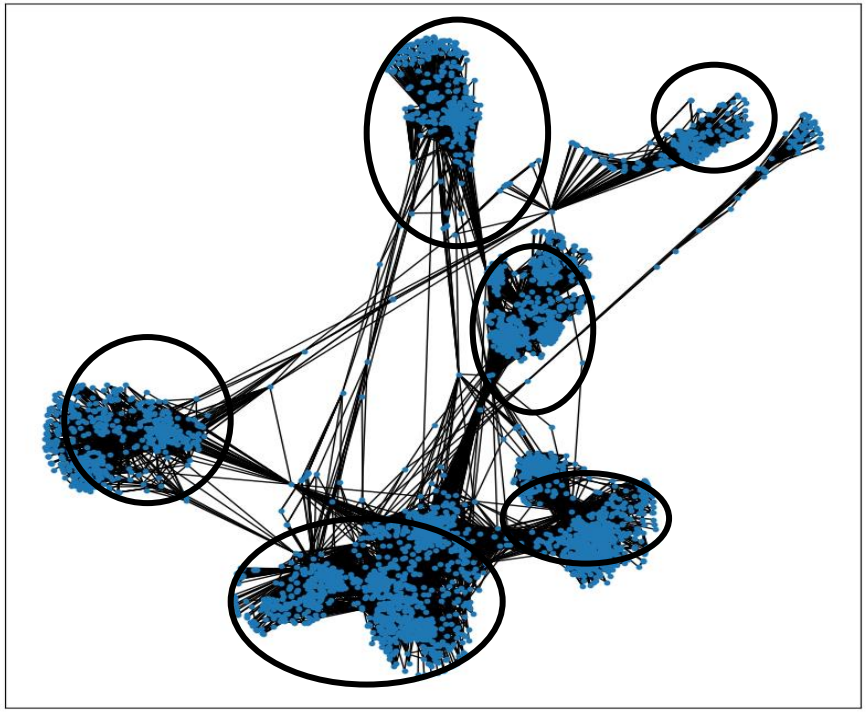


Betweenness Centrality

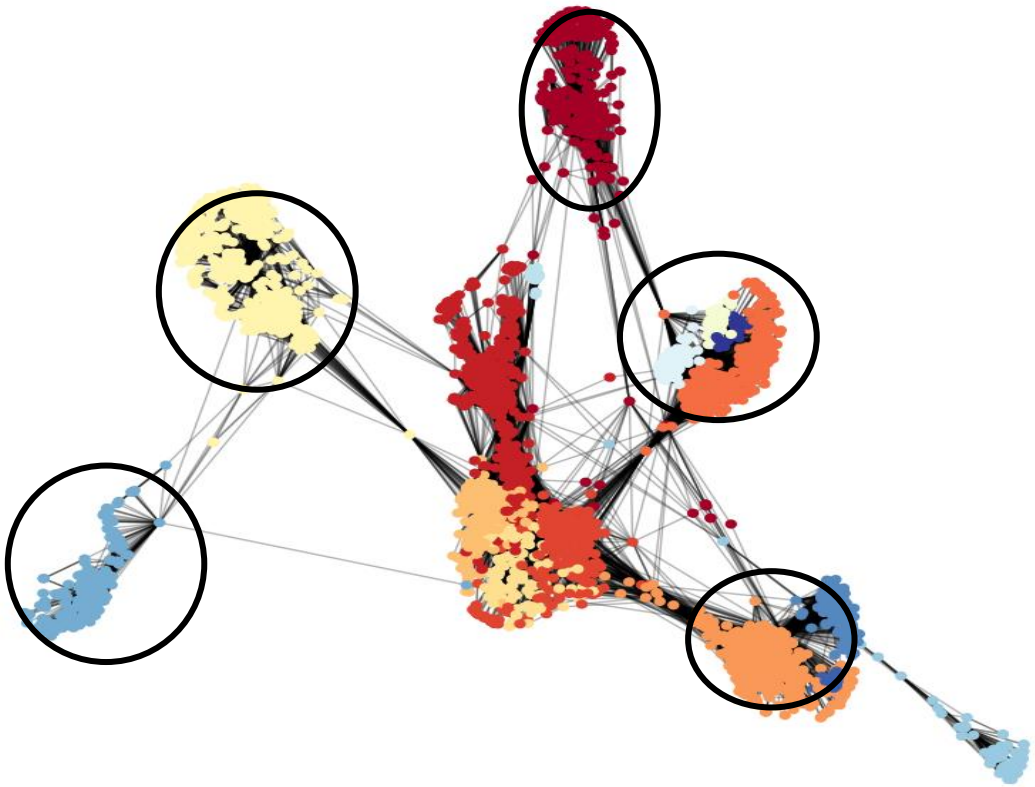


Extraction of Communities

- You can see mass groups of nodes in this network



Extraction of Communities



Six degree of separation ???

```
depth 6: [(686, 740), (686, 806), (686, 731), (686, 789), (686, 718), (686, 855), (686, 701), (686, 842), (686, 767), (686, 688), (686, 75
4), (686, 812), (686, 737), (686, 724), (686, 790), (686, 715), (686, 848), (686, 773), (686, 702), (686, 839), (686, 760), (686, 826), (6
86, 751), (686, 809), (686, 738), (686, 796), (686, 721), (686, 787), (686, 845), (686, 699), (686, 832), (686, 757), (686, 744), (686, 73
5), (686, 793), (686, 722), (686, 780), (686, 705), (686, 846), (686, 771), (686, 692), (686, 829), (686, 758), (686, 816), (686, 741), (6
86, 807), (686, 728), (686, 794), (686, 852), (686, 777), (686, 706), (686, 843), (686, 764), (686, 689), (686, 755), (686, 813), (686, 74
2), (686, 725), (686, 791), (686, 712), (686, 849), (686, 778), (686, 836), (686, 761), (686, 690), (686, 827), (686, 748), (686, 814), (6
86, 739), (686, 797), (686, 726), (686, 784), (686, 709), (686, 850), (686, 775), (686, 696), (686, 833), (686, 762), (686, 687), (686, 82
0), (686, 732), (686, 723), (686, 781), (686, 710), (686, 847), (686, 768), (686, 693), (686, 834), (686, 759), (686, 817), (686, 746), (6
86, 795), (686, 716), (686, 853), (686, 782), (686, 707), (686, 765), (686, 694), (686, 831), (686, 752), (686, 818), (686, 743), (686, 80
1), (686, 730), (686, 788), (686, 854), (686, 779), (686, 700), (686, 837), (686, 766), (686, 691), (686, 824), (686, 749), (686, 815), (6
86, 736), (686, 802), (686, 727), (686, 785), (686, 714), (686, 851), (686, 838), (686, 763), (686, 821), (686, 750), (686, 808), (686, 73
3), (686, 799), (686, 720), (686, 786), (686, 711), (686, 844), (686, 835), (686, 756), (686, 822), (686, 734), (686, 792), (686, 717), (6
86, 783), (686, 704), (686, 841), (686, 770), (686, 695)]
depth 7: []
depth 8: []
```

- According to the BFS search, depth 8 is the maximum distance between nodes

➡ It may be true in this network

Link prediction

- Using network embedding, you can predict who will connect to who.
- This technology can apply to the Suggestion of new friends
- By using vector, calculate distance between nodes
- Top 5 probability to link

[(3096, 3146, 0.040353734), (2989, 3032, 0.06527955), (2944, 3125, 0.06642463), (3018, 3265, 0.06787003), (3135, 3146, 0.06807642)] 値が小さいほど近い

広告について

- ネットワーク分析を行いグループ抽出すること、および中心性を利用することでより効果の高い広告を打つことができる。各グループの属性を割り出して、それぞれに沿ったものを流す。誰に打つかについても中心性を利用できるが必ずしも中心性の高い人（ノード）に広告を打てばいいわけではないらしい。この先までは及ばなかった。

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Thank you for Listening