# Homework 10
MO412 - Network Science

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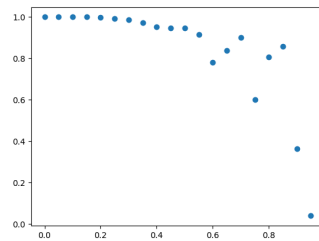**RA:** 234924

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(**Network robustness**) **Consider the undirected network given in the netA.txt file accompanying this homework. Each line in this file is a link. With the help of a computer, study the robustness of this network against random failures, plotting its $P_\infty(f)/P_\infty(0)$ ratio for f between 0 and 1 with 0.05 increments. Estimate the value f_h for which this ratio falls to 50%. Is this network robust against random failures, in your opinion? Please submit your plot and code for grading.**
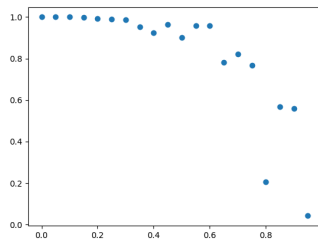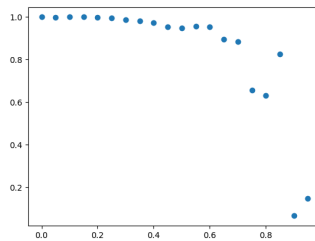
(a) Experiment 1   (b) Experiment 2   (c) Experiment 3

Figure 1: Three different experiments

$f_h \sim 0.8$
This network isn't robust at all. Because it have a critical point where f turns in zero.
Code

```python
import networkx as nx
import matplotlib.pyplot as plt
import pandas as pd
import random

net = pd.read_csv("netA.csv",header=None,sep='\t')
G = nx.from_pandas_edgelist(net, 0, 1)
```

```python
def n_max_component(G):
    largest_cc = len(max(nx.connected_components(G), key=len))
    return largest_cc

incre = 0.05
f = 0.0
size = len(G.nodes)
f_vec = []
p_vec = []

while f<1:
    newG = nx.from_pandas_edgelist(net, 0, 1)
    for n in G:
        nrandom = random.uniform(0,1)
        if (nrandom<=f):
            newG.remove_node(n)
    prob = n_max_component(newG)/len(newG.nodes)
    f_vec.append(f)
    p_vec.append(prob)

    f+=incre

plt.scatter(f_vec,p_vec)
plt.show()
```