

SCALEFREE

April 16, 2025

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[19]: import numpy as np
import matplotlib.pyplot as plt
import networkx as nx

nodes=100
bias=2
links=500
net=np.zeros((nodes,nodes))
for n in range(1,nodes):
    x=np.random.randint(nodes)
    while x==n:
        x=np.random.randint(nodes)
    break
    net[n,x]=1
    net[x,n]=1

net=net*np.linalg.inv(np.eye(1,1))
for n in range(1,int(0.1*nodes)):
    x=np.random.randint(nodes)
    y=np.random.randint(nodes)
    while x==y:
        y=np.random.randint(nodes)
    net[x,y]=1
    net[y,x]=1
net=net*np.linalg.inv(np.eye(1,1))
while np.count_nonzero(net/2)<links:
    PGedge=np.sum(net,axis=0)/nodes
    PGedge=PGedge**bias/sum(PGedge)
    choice=np.random.rand()
    criterion=0
    for nn in range(1,nodes):
        criterion=criterion+PGedge[nn]
        if choice<criterion:
            choice=nn
    for nnn in range(1,10000):
        i=int(choice);
        j=np.random.randint(nodes);
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        if net[i,j]==0:
            net[i,j]=1
            net[j,i]=1
net=net*np.linalg.inv(np.eye(1,1))
net=(net+net.T)>0
plt.ion()
plt.subplot(1, 3, 1)
[x,n]=np.histogram(np.sum(net.T),bins=10)
plt.hist([x,n])
plt.title('(Degree Distribution)', fontsize=6)

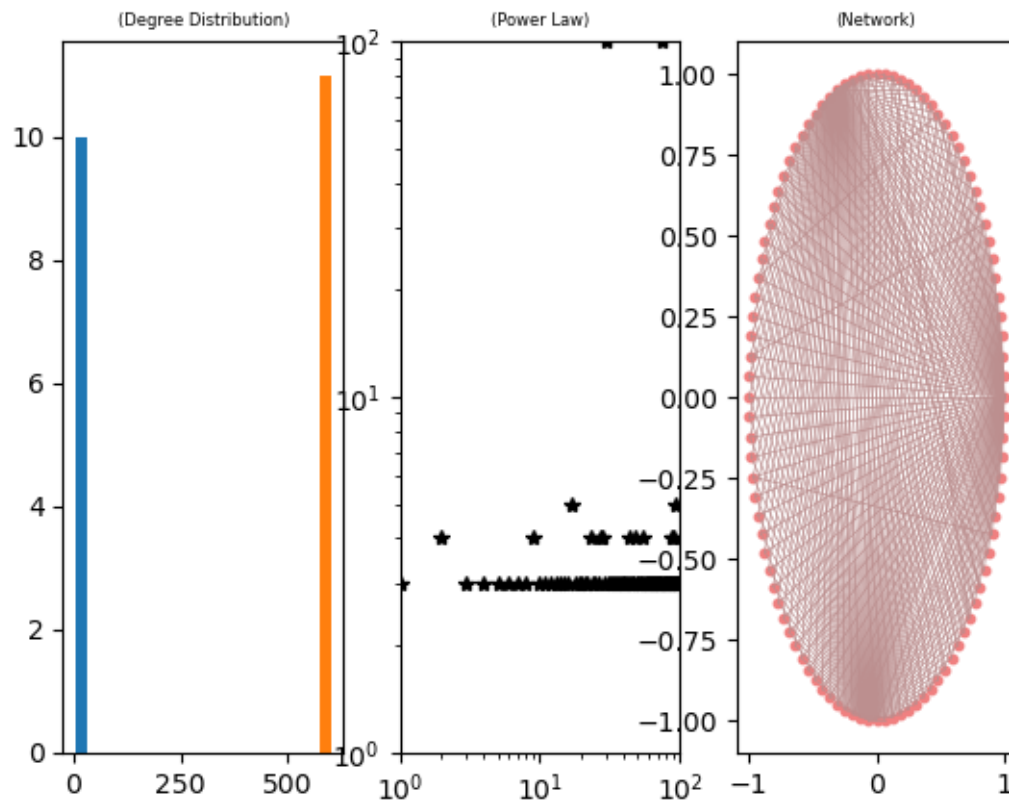
plt.subplot(1,3,2)
degree=np.sum(net,axis=1)
degree = degree[degree > 0]
plt.loglog(degree,'k*')
plt.axis([1, 100 ,1 ,100])
plt.title('(Power Law)', fontsize=6)

plt.subplot(1, 3, 3)

# Create circular layout
N = len(net)
theta = np.linspace(0, 2 * np.pi, N, endpoint=False)
xy = np.column_stack((np.cos(theta), np.sin(theta))) # shape: (N, 2)

for i in range(N):
    for j in range(i + 1, N):
        if net[i, j]:
            x_coords = [xy[i, 0], xy[j, 0]]
            y_coords = [xy[i, 1], xy[j, 1]]
            plt.plot(x_coords, y_coords, color='rosybrown', linewidth=0.5)
plt.scatter(xy[:, 0], xy[:, 1], color='lightcoral', s=10)
plt.title('(Network)', fontsize=6)
plt.show()

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