

Homework 9

1.

```
%load data/incomp.mat
%load univ_cn.mat
cd code
[score,totalIncon,harmIncon] = Hodgerank(incomp);
```

```
lsqr converged at iteration 9 to a solution with relative residual 5.1e-07.
lsqr converged at iteration 20 to a solution with relative residual 9.6e-07.
lsqr converged at iteration 9 to a solution with relative residual 4.7e-07.
lsqr converged at iteration 20 to a solution with relative residual 7.3e-07.
lsqr converged at iteration 9 to a solution with relative residual 4.8e-07.
lsqr converged at iteration 20 to a solution with relative residual 7.9e-07.
lsqr converged at iteration 9 to a solution with relative residual 5e-07.
lsqr converged at iteration 20 to a solution with relative residual 9.1e-07.
```

harmIncon/totalIncon

```
ans = 4x4
10-11 x
    0.2249    0    0    0
    0.1553    0    0    0
    0.1669    0    0    0
    0.1980    0    0    0
```

```
v = rank_cn;           % research rank of universities
webpage = univ_cn;     % webpage of universities in mainland china
W = W_cn;              % Link weight matrix

D = sum(W,2);
n = length(D);
idnz = find(D>0);
T = zeros(n,n);
T(idnz,idnz) = diag(1./D(idnz)) * W(idnz,idnz);

alpha = 0.85
```

```
alpha = 0.8500
```

```
T1 = alpha * T + (1-alpha)*ones(n,1)*ones(1,n)/n;
[evect,eval] = eigs(T1',1);
[score_page]=evect/sum(evect); % pagerank score
```

```
W_re=reshape(W,[2888,2]);
[score_hodge,totalIncon_hodge,harmIncon_hodge] = Hodgerank(W_re);
```

```
lsqr stopped at iteration 16 without converging to the desired tolerance 1e-06
because the maximum number of iterations was reached.
The iterate returned (number 16) has relative residual 0.0039.
lsqr stopped at iteration 20 without converging to the desired tolerance 1e-06
because the maximum number of iterations was reached.
The iterate returned (number 20) has relative residual 0.19.
```

lsqr stopped at iteration 16 without converging to the desired tolerance 1e-06 because the maximum number of iterations was reached.
The iterate returned (number 16) has relative residual 0.012.
lsqr stopped at iteration 20 without converging to the desired tolerance 1e-06 because the maximum number of iterations was reached.
The iterate returned (number 20) has relative residual 0.068.
lsqr stopped at iteration 16 without converging to the desired tolerance 1e-06 because the maximum number of iterations was reached.
The iterate returned (number 16) has relative residual 0.0099.
lsqr stopped at iteration 20 without converging to the desired tolerance 1e-06 because the maximum number of iterations was reached.
The iterate returned (number 20) has relative residual 0.093.
lsqr stopped at iteration 16 without converging to the desired tolerance 1e-06 because the maximum number of iterations was reached.
The iterate returned (number 16) has relative residual 0.0059.
lsqr stopped at iteration 20 without converging to the desired tolerance 1e-06 because the maximum number of iterations was reached.
The iterate returned (number 20) has relative residual 0.15.

```
[~,idp]=sort(score_page, 'descend');  
webpage{idp(1:5)}
```

```
ans =  
'tsinghua.edu.cn'  
ans =  
'pku.edu.cn'  
ans =  
'sjtu.edu.cn'  
ans =  
'nju.edu.cn'  
ans =  
'uestc.edu.cn'
```

```
[~,idh]=sort(score_hodge, 'descend');  
webpage{idh(1:5)}
```

```
ans =  
'ruc.edu.cn'  
ans =  
'jlu.edu.cn'  
ans =  
'hit.edu.cn'  
ans =  
'hust.edu.cn'  
ans =  
'bnu.edu.cn'
```