f-24-jupyter-page-rank

April 29, 2021

[1]:
```
import numpy as np
```

[2]:
```
m = np.array([[  0., 1/4.,  0., 1/2.,   0., 1/6.],
              [1/3.,   0.,  0.,   0., 1/2., 1/6.],
              [  0., 1/4.,  0.,   0.,   0., 1/6.],
              [1/3.,   0.,  0.,   0., 1/2., 1/6.],
              [1/3., 1/4.,  0., 1/2.,   0., 1/6.],
              [  0., 1/4., 1.0,   0.,   0., 1/6.]])
```

[3]:
```
p = 0.85
n = m.shape[0]
a = p * m + ((1-p)/n) * np.ones_like(m)
```

[4]:
```
a
```

[4]:
```
array([[0.025     , 0.2375    , 0.025     , 0.45      , 0.025     ,
        0.16666667],
       [0.30833333, 0.025     , 0.025     , 0.025     , 0.45      ,
        0.16666667],
       [0.025     , 0.2375    , 0.025     , 0.025     , 0.025     ,
        0.16666667],
       [0.30833333, 0.025     , 0.025     , 0.025     , 0.45      ,
        0.16666667],
       [0.30833333, 0.2375    , 0.025     , 0.45      , 0.025     ,
        0.16666667],
       [0.025     , 0.2375    , 0.875     , 0.025     , 0.025     ,
        0.16666667]])
```

[6]:
```
rng = np.random.default_rng()

v = rng.random((n, 1))
v /= np.linalg.norm(v)

tolerens = 1e-9

while True:
    v_ny = a @ v
    v_ny /= np.linalg.norm(v_ny)
```

```
    if np.vdot(v_ny, v) > 1.0 - tolerens:
        print(v_ny)
        break
    else:
        v = v_ny
```

```
[[0.3964695 ]
 [0.44276113]
 [0.20828913]
 [0.44276113]
 [0.50879702]
 [0.38532887]]
```

[7]:
```
(v_ny.T @ (a @ v_ny))[0,0]
```

[7]:
```
1.0000009615773882
```

[8]:
```
np.argmax(v_ny)
```

[8]:
```
4
```

[9]:
```
np.argsort(v_ny, axis=0)
```

[9]:
```
array([[2],
       [5],
       [0],
       [1],
       [3],
       [4]])
```

[10]:
```
np.flip(np.argsort(v_ny, axis=0))
```

[10]:
```
array([[4],
       [3],
       [1],
       [0],
       [5],
       [2]])
```

[ ]: