C2_Jeong,wonryeol

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```
import numpy as np
import pandas as pd


P = np.array([[0.7,0.5,0.3,0.5]]).reshape(2,2,order = 'F')

eigen_val , eigen_vec = np.linalg.eig(P)

P
```

```
## array([[0.7, 0.3],
##        [0.5, 0.5]])
```

```
eigen_val
```

```
## array([1. , 0.2])
```

```
eigen_vec
```

```
## array([[ 0.70710678, -0.51449576],
##        [ 0.70710678,  0.85749293]])
```

```
X_1 = eigen_vec[:,0]
print(X_1)
```

```
## [0.70710678 0.70710678]
```

```
v = X_1/np.sum(X_1)

print(np.sum(X_1))
```

```
## 1.414213562373095
```

```
print(v)
```

```
## [0.5 0.5]
```

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```
P = np.array([0.7,0.5,0.3,0.5]).reshape((2,2))

n = P.shape[0]

I = np.eye(n)
print(np.ones(n))
```

```
## [1. 1.]
```

```
A = np.column_stack([P-I,np.ones(n).T])

b = np.append(np.repeat(0,n),np.array([1]))

v = np.linalg.solve(np.dot(A,A.T),np.dot(A,b.T))
```

```
A
```

```
## array([[-0.3,  0.5,  1. ],
##        [ 0.3, -0.5,  1. ]])
```

```
b
```

```
## array([0, 0, 1])
```

```
v
```

```
## array([0.5, 0.5])
```

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```
from numpy.linalg import matrix_power

P = np.array([0.7,0.5,0.3,0.5]).reshape(2,2, order ='F')

print(P)
```

```
## [[0.7 0.3]
##  [0.5 0.5]]
```

```
np.dot(P,P)
```

```
## array([[0.64, 0.36],
##        [0.6 , 0.4 ]])
```

```
matrix_power(P,3)
```

```
## array([[0.628, 0.372],
##        [0.62 , 0.38 ]])
```

```
matrix_power(P,4)
```

```
## array([[0.6256, 0.3744],
##        [0.624 , 0.376 ]])
```

```
matrix_power(P,20)
```

```
## array([[0.625, 0.375],
##        [0.625, 0.375]])
```

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```
p = np.array([0,1,1,0]).reshape(2,2,order='F')

p
```

```
## array([[0, 1],
##        [1, 0]])
```

```
matrix_power(p,2)
```

```
## array([[1, 0],
##        [0, 1]])
```

```
matrix_power(p,3)
```

```
## array([[0, 1],
##        [1, 0]])
```