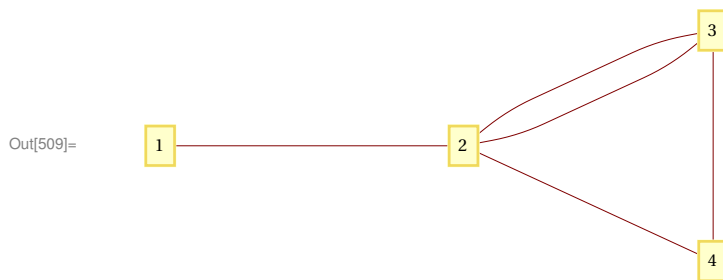


PageRank Linear Algebra Formulation

The Example Graph

```
In[507]:= n = 4;  
g = {1 -> 2, 2 -> 3, 3 -> 4, 3 -> 2, 4 -> 2};  
GraphPlot[g, VertexLabeling -> True]
```



The Stochastic Adjacency/Transition Matrix: M

```
In[510]:= M = {{0,0,0,0},{1,0,1/2,1},{0,1,0,0},{0,0,1/2,0}};
```

$$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 1 & 0 & \frac{1}{2} & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & \frac{1}{2} & 0 \end{pmatrix}$$

The Dampening Factor

```
In[511]:= d = 0.85;
```

The initial Distribution

In[512]:=

```
PR0 = {1/n,1/n,1/n,1/n};
```

$$\begin{pmatrix} \frac{1}{4} \\ \frac{1}{4} \\ \frac{1}{4} \\ \frac{1}{4} \end{pmatrix}$$

The Teleportation Vector

In[513]:=

```
P = {(1-d)/n, (1-d)/n, (1-d)/n, (1-d)/n};
```

$$\begin{pmatrix} 0.0375 \\ 0.0375 \\ 0.0375 \\ 0.0375 \end{pmatrix}$$

The Iterative Formula

$$PR_{i+1} = dM \cdot PR_i + P$$

```
MatrixForm[PageRankCentrality[g];
```

PageRank for the example graph:

$$\begin{pmatrix} 0.0375 \\ 0.394149 \\ 0.372527 \\ 0.195824 \end{pmatrix}$$

You can also compute the pagerank manually with the following code and not many iterations is necessary.

In[503]:=

```
iterations = 50;
PRI = PR0;
For[i=0,i<iterations,i++,PRI = ((d*M).PRI) + P];
PR = PRI;
```

PageRank for the example graph:

$$\begin{pmatrix} 0.0375 \\ 0.394149 \\ 0.372527 \\ 0.195824 \end{pmatrix}$$

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