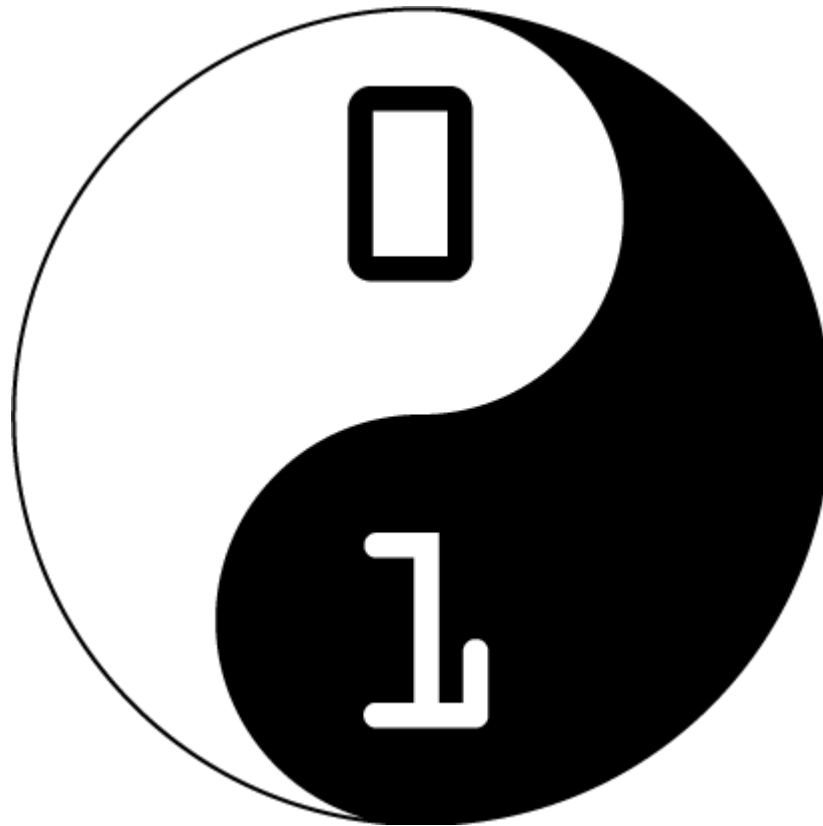
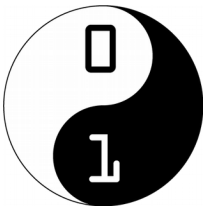


Coding Dojo



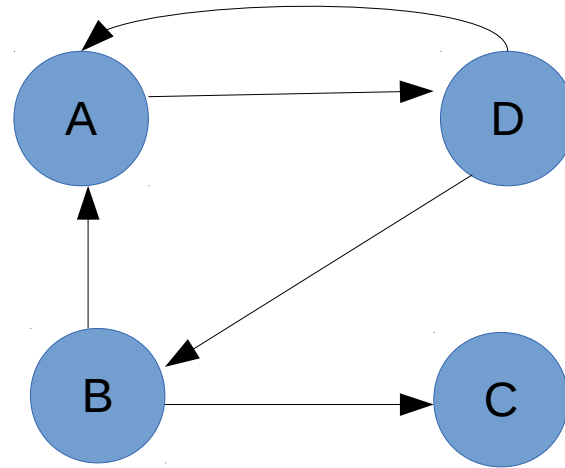


Coding Dojo - Regras

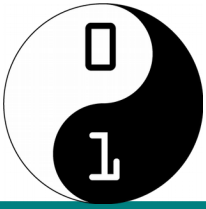
- Ponto de participação, poderá perdido se:
 - Indisciplina
 - Aluno atrasado
 - Recusar participação como piloto/copiloto
 - Ou não querer sair do computador, quando solicitado :-)
 - Demorar para sair quando solicitado
 - Parar de participar por:
 - Uso de outro computador
 - Uso de celular
 - Usar a internet
 - Conversa



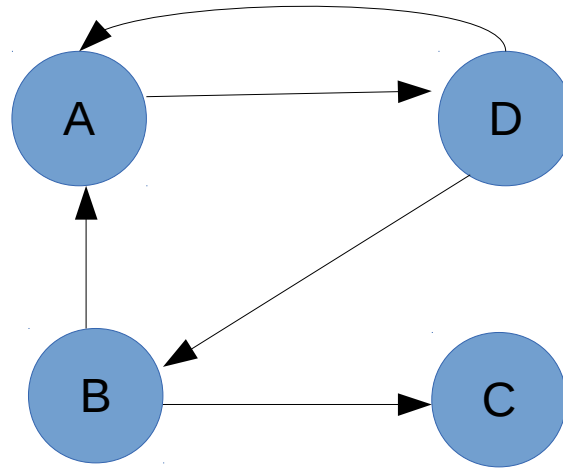
Calculo do Page Rank



$d=0.9$

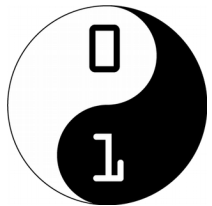


Calculo do Page Rank



$d=0.9$

	Inicialização	#1 iteração	#1 iteração normalizada
A	0,1	0,278	0,29
B	0,1	0,225	0,21
C	0,1	0,225	0,21
D	0,1	0,278	0,29
Soma		0,7	



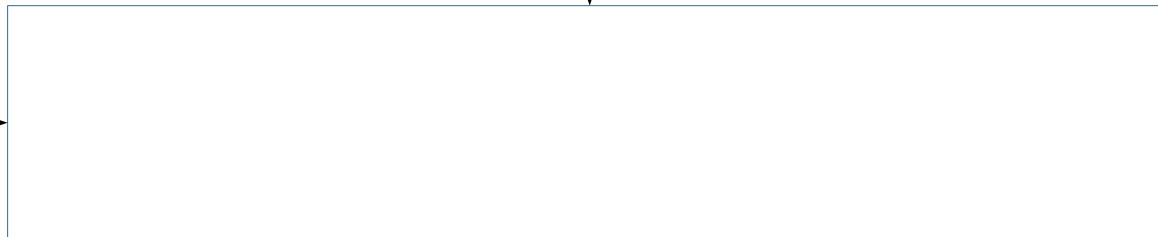
1 - inicialização

$\forall a \in V :$

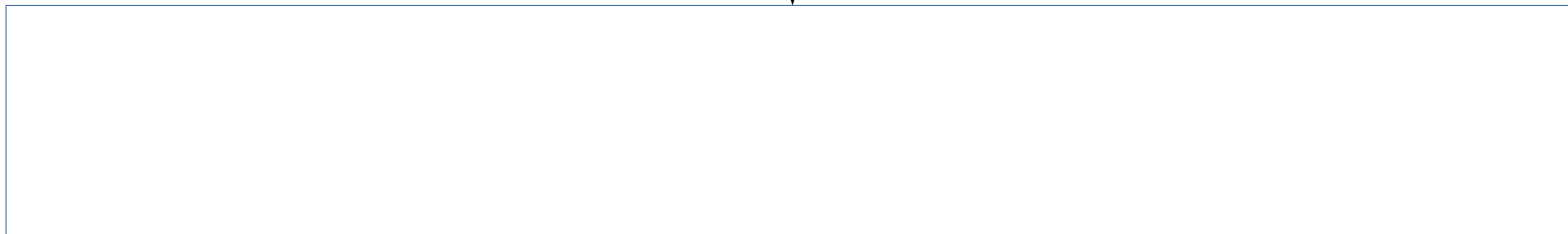
$$\mathbf{PR}[a] = \alpha$$

Ex: $\alpha = 1 - d$

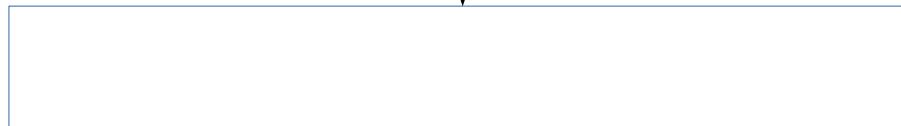
2 – Calculo do PageRank



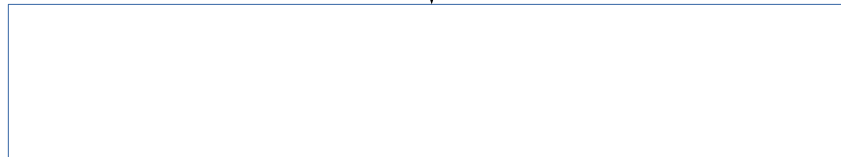
3 – Normalização



4 – Cálculo da convergência

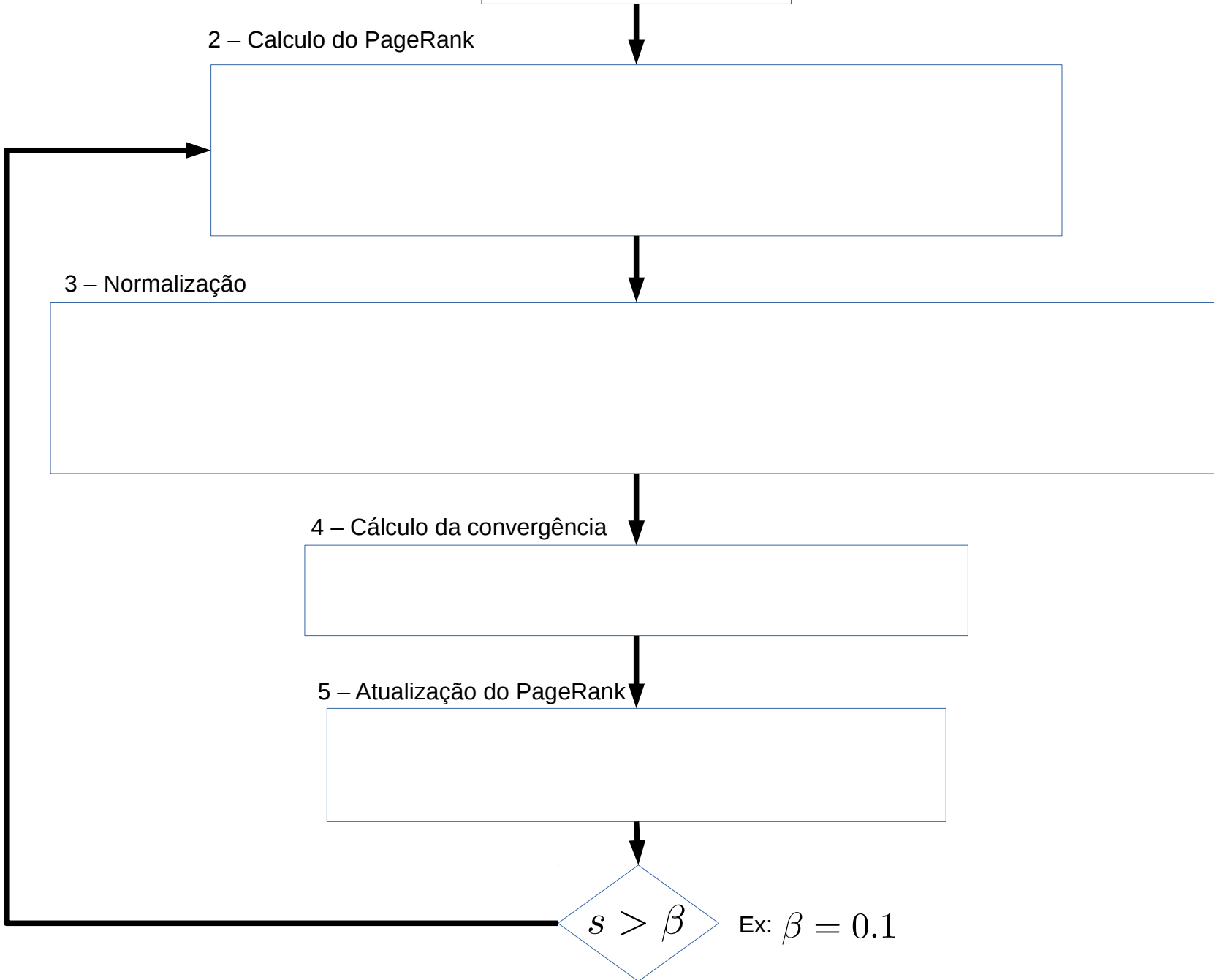


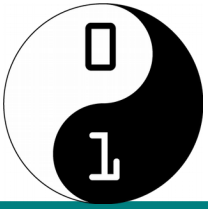
5 – Atualização do PageRank



$$s > \beta$$

Ex: $\beta = 0.1$

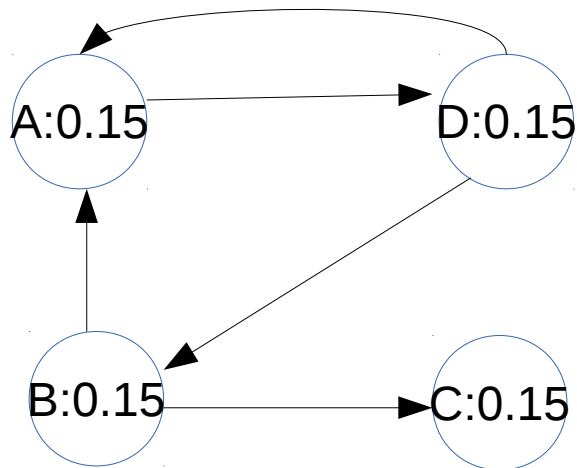




Inicialização

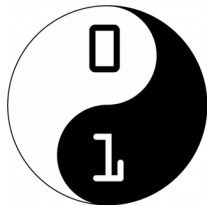
Considerando uma iteração qualquer (não inicial):

$$d=0.9$$



PageRank:

A	B	C	D
0.15	0.15	0.15	0.15



1 - inicialização

$\forall a \in V :$

$$\mathbf{PR}[a] = \alpha$$

Ex: $\alpha = 1 - d$

2 - Calculo do PageRank

$\forall a \in V :$

$$\mathbf{PR_atual}[a] = (1 - d) + d \times \sum_{\forall v \in V | v \rightarrow a} \frac{\mathbf{PR}[v]}{\text{outdegree}[v]}$$

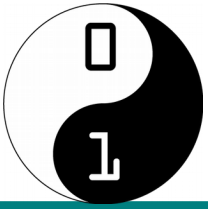
3 - Normalização

4 - Cálculo da convergência

5 - Atualização do PageRank

$$s > \beta$$

Ex: $\beta = 0.1$



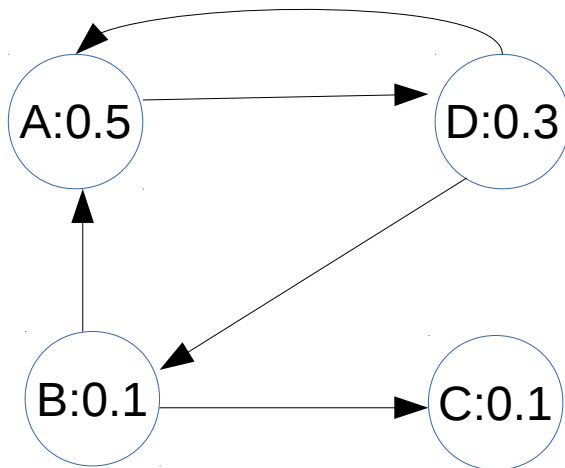
Calculo do Page Rank

Considerando uma iteração qualquer (não inicial):

* por isso os valores PageRank não são iguais a 0.10

$d=0.9$

$$PR(A) = (1 - d) + d \times \sum_{\forall V|V \rightarrow A} \frac{PR(V)}{outdegree(V)}$$



PageRank:

A	B	C	D
0.5	0.1	0.1	0.3

PageRank Atual:

A	B	C	D

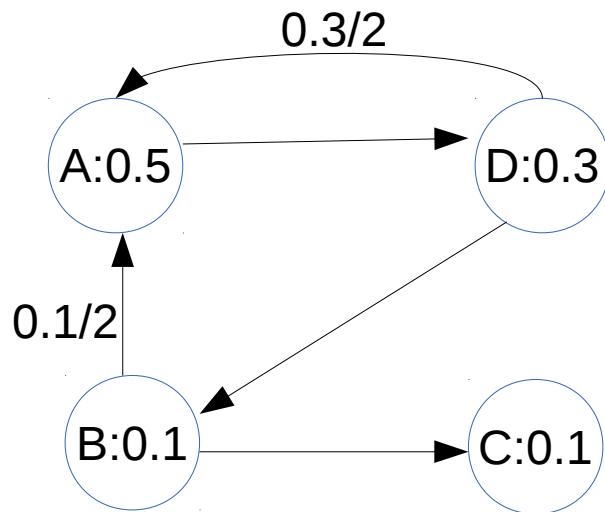


Calculo do Page Rank

Considerando uma iteração qualquer (não inicial):

$$d=0.9$$

$$PR(A) = (1 - d) + d \times \sum_{\forall V|V \rightarrow A} \frac{PR(V)}{outdegree(V)}$$



PageRank:

A	B	C	D
0.5	0.1	0.1	0.3

PageRank Atual:

A	B	C	D
0.28			



Calculo do Page Rank

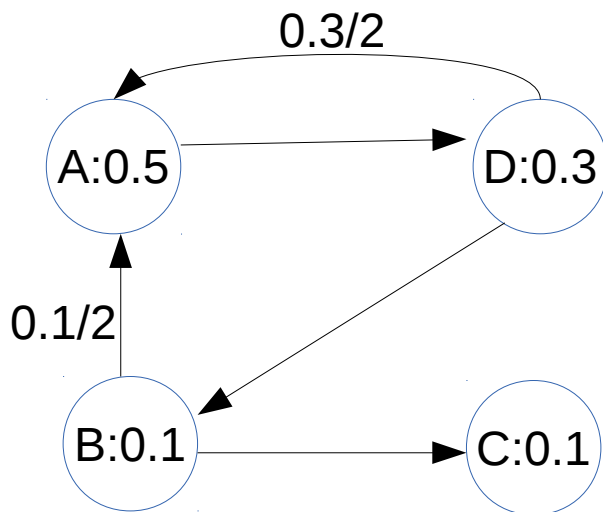
Considerando uma iteração qualquer (não inicial):

$$d=0.9$$

$$PR(A) = (1 - d) + d \times \sum_{\forall V|V \rightarrow A} \frac{PR(V)}{outdegree(V)}$$

$$PR(A) = (1 - 0.9) + 0.9 \times \left(\frac{PR(D)}{outdegree(D)} + \frac{PR(B)}{outdegree(B)} \right) =$$

$$PR(A) = (1 - 0.9) + 0.9 \times \left(\frac{0.3}{2} + \frac{0.1}{2} \right) = 0.28$$



PageRank:

A	B	C	D
0.5	0.1	0.1	0.3

PageRank Atual:

A	B	C	D
0.28			



Calculo do Page Rank

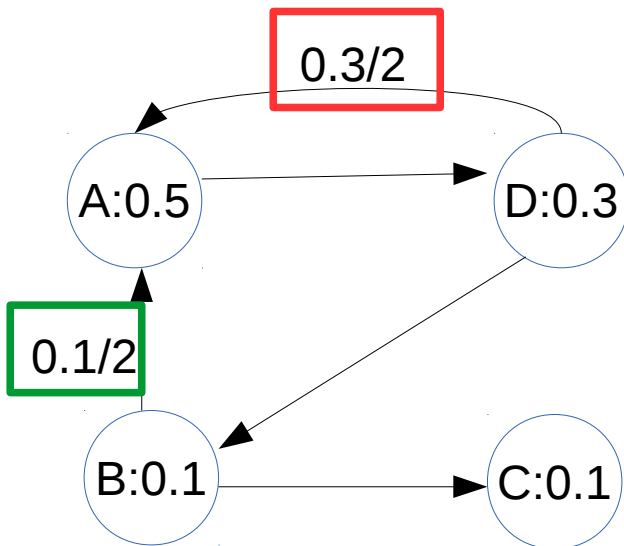
Considerando uma iteração qualquer (não inicial):

$$d=0.9$$

$$PR(A) = (1 - d) + d \times \sum_{\forall V|V \rightarrow A} \frac{PR(V)}{outdegree(V)}$$

$$PR(A) = (1 - 0.9) + 0.9 \times \left(\frac{PR(D)}{outdegree(D)} + \frac{PR(B)}{outdegree(B)} \right) =$$

$$PR(A) = (1 - 0.9) + 0.9 \times \left(\frac{0.3}{2} + \frac{0.1}{2} \right) = 0.28$$



PageRank:

A	B	C	D
0.5	0.1	0.1	0.3

PageRank Atual:

A	B	C	D
0.28			

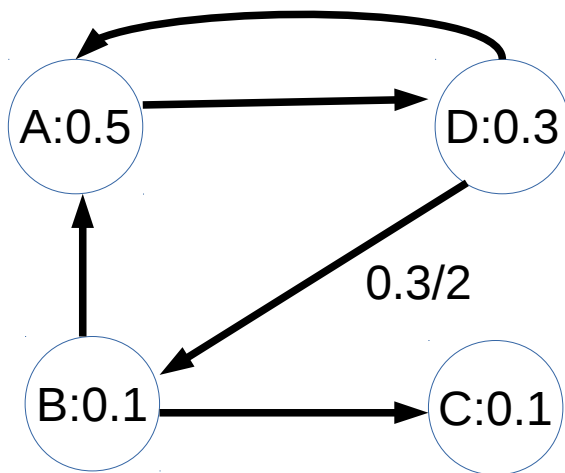


Calculo do Page Rank

Considerando uma iteração qualquer (não inicial):

$$PR(B) = (1 - d) + d \times \sum_{\forall V | V \rightarrow B} \frac{PR(V)}{outdegree(V)}$$

$d=0.9$



PageRank:

A	B	C	D
0.5	0.1	0.1	0.3

PageRank Atual:

A	B	C	D
0.28			



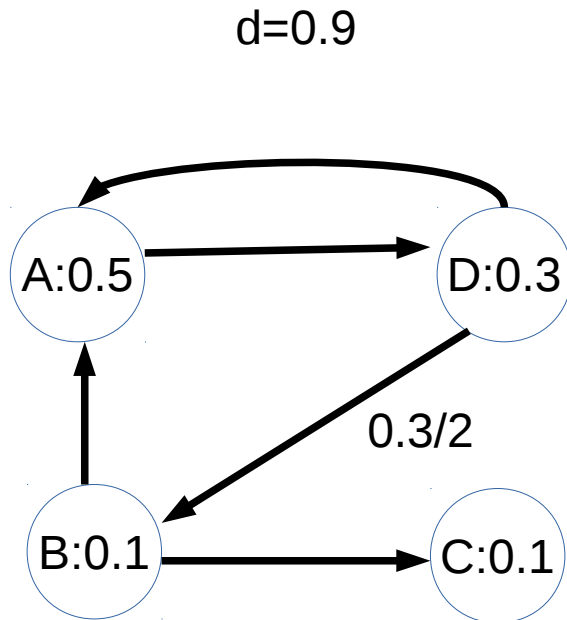
Calculo do Page Rank

Considerando uma iteração qualquer (não inicial):

$$PR(B) = (1 - d) + d \times \sum_{\forall V | V \rightarrow B} \frac{PR(V)}{outdegree(V)}$$

$$PR(B) = (1 - 0.9) + 0.9 \times \frac{PR(D)}{outdegree(D)}$$

$$PR(B) = (1 - 0.9) + 0.9 \times \frac{0.3}{2} = 0.235$$

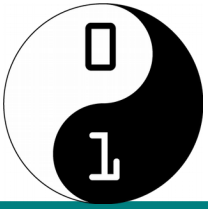


PageRank:

A	B	C	D
0.5	0.1	0.1	0.3

PageRank Atual:

A	B	C	D
0.28	0.235		

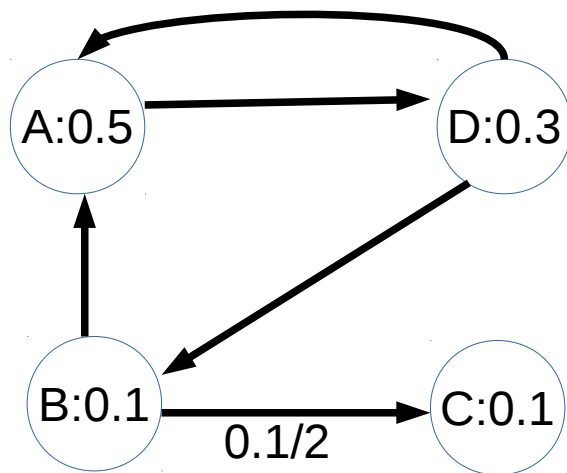


Calculo do Page Rank

Considerando uma iteração qualquer (não inicial):

$$PR(C) = (1 - d) + d \times \sum_{\forall V | V \rightarrow C} \frac{PR(V)}{outdegree(V)}$$

d=0.9



PageRank:

A	B	C	D
0.5	0.1	0.1	0.3

PageRank Atual:

A	B	C	D
0.28	0.235		

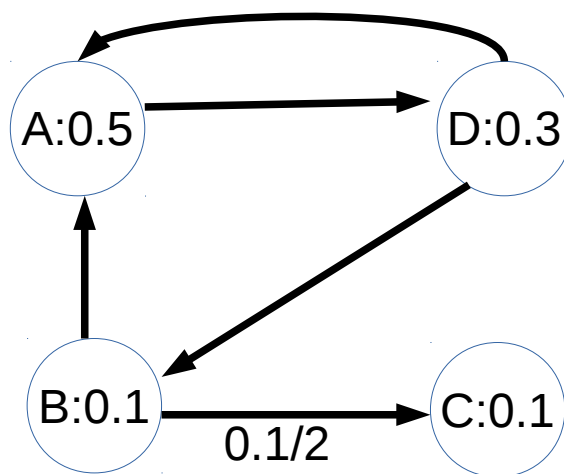


Calculo do Page Rank

Considerando uma iteração qualquer (não inicial):

$$PR(C) = (1 - d) + d \times \sum_{\forall V | V \rightarrow C} \frac{PR(V)}{outdegree(V)}$$

$d=0.9$



$$PR(C) = (1 - 0.9) + 0.9 \times \frac{PR(B)}{outdegree(B)}$$

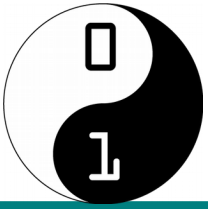
$$PR(C) = (1 - 0.9) + 0.9 \times \frac{0.1}{2} = 0.145$$

PageRank:

A	B	C	D
0.5	0.1	0.1	0.3

PageRank Atual:

A	B	C	D
0.28	0.235	0.145	

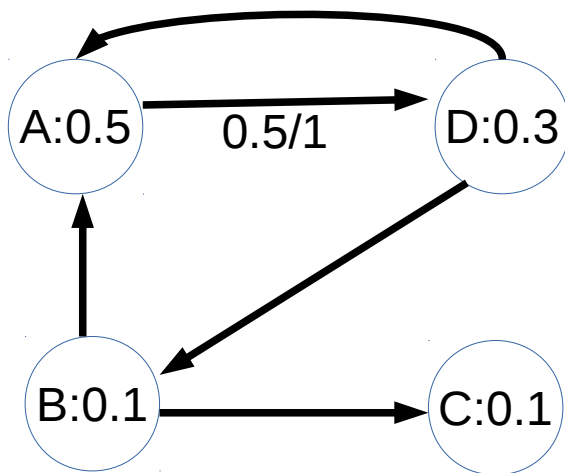


Calculo do Page Rank

Considerando uma iteração qualquer (não inicial):

$$PR(D) = (1 - d) + d \times \sum_{\forall V | V \rightarrow D} \frac{PR(V)}{outdegree(V)}$$

d=0.9



PageRank:

A	B	C	D
0.5	0.1	0.1	0.3

PageRank Atual:

A	B	C	D
0.28	0.235	0.145	

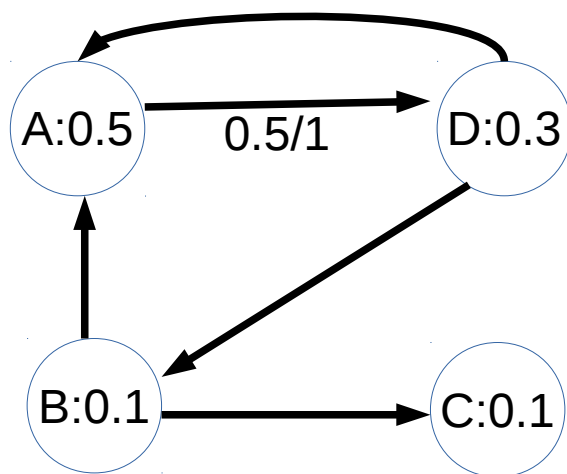


Calculo do Page Rank

Considerando uma iteração qualquer (não inicial):

$$PR(D) = (1 - d) + d \times \sum_{\forall V | V \rightarrow D} \frac{PR(V)}{outdegree(V)}$$

$d=0.9$



$$PR(D) = (1 - 0.9) + 0.9 \times \frac{PR(D)}{outdegree(D)}$$

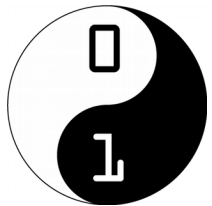
$$PR(D) = (1 - 0.9) + 0.9 \times \frac{0.5}{1} = 0.55$$

PageRank:

A	B	C	D
0.5	0.1	0.1	0.3

PageRank Atual:

A	B	C	D
0.28	0.235	0.145	0.55



1 - inicialização

$\forall a \in V :$

$$\mathbf{PR}[a] = \alpha$$

Ex: $\alpha = 1 - d$

2 - Calculo do PageRank

$\forall a \in V :$

$$\mathbf{PR_atual}[a] = (1 - d) + d \times \sum_{\forall v \in V | v \rightarrow a} \frac{\mathbf{PR}[v]}{\text{outdegree}[v]}$$

3 - Normalização

$$norma = \sum_{\forall v \in V} \mathbf{PR_atual}[v]$$

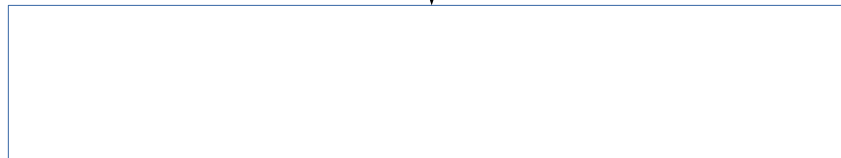
$\forall a \in V :$

$$\mathbf{PR_atual}[a] = \frac{\mathbf{PR_atual}[a]}{norma}$$

4 - Cálculo da convergência

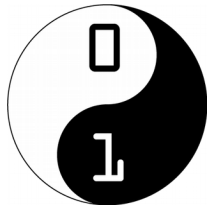


5 - Atualização do PageRank



$$s > \beta$$

Ex: $\beta = 0.1$



Calculo do Page Rank

Normalização do vetor PageRank Atual

Considerando uma iteração qualquer (não inicial):

PageRank Atual:

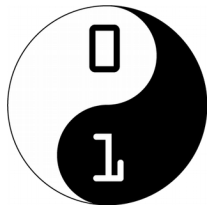
A	B	C	D
0.28	0.235	0.145	0.55

Uma possibilidade: somatório $0.28 + 0.235 + 0.145 + 0.55 = 1.21$

A	B	C	D
$0.28 / 1.21$	$0.235 / 1.21$	$0.145 / 1.21$	$0.55 / 1.21$

PageRank Atual (normalizado):

A	B	C	D
0.23	0.19	0.12	0.46



1 - inicialização

$\forall a \in V :$

$$\mathbf{PR}[a] = \alpha$$

Ex: $\alpha = 1 - d$

2 - Calculo do PageRank

$\forall a \in V :$

$$\mathbf{PR_atual}[a] = (1 - d) + d \times \sum_{\forall v \in V | v \rightarrow a} \frac{\mathbf{PR}[v]}{\text{outdegree}[v]}$$

3 - Normalização

$$norma = \sum_{\forall v \in V} \mathbf{PR_atual}[v]$$

$\forall a \in V :$

$$\mathbf{PR_atual}[a] = \frac{\mathbf{PR_atual}[a]}{norma}$$

4 - Cálculo da convergência

$$s = \sum_{\forall v \in V} |\mathbf{PR_atual}[v] - \mathbf{PR}[v]|$$

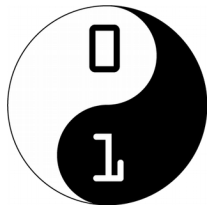
5 - Atualização do PageRank

$\forall a \in V :$

$$\mathbf{PR}[a] = \mathbf{PR_atual}[a]$$

$$s > \beta$$

Ex: $\beta = 0.1$



Calculo do Page Rank Convergiu?

Considerando uma iteração qualquer (não inicial):

	A	B	C	D
PageRank:	0.5	0.1	0.1	0.3

	A	B	C	D
PageRank Atual (normalizado):	0.23	0.19	0.12	0.46

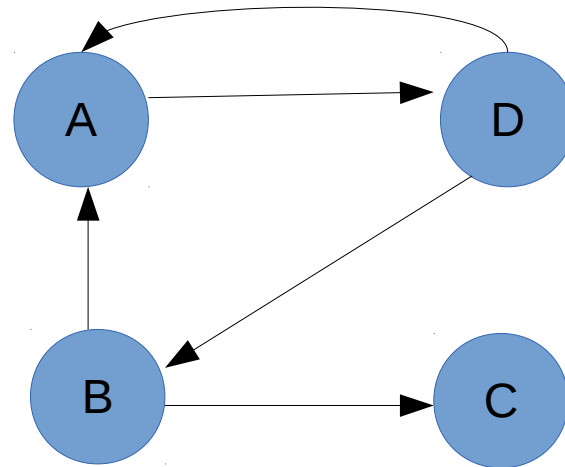
	A	B	C	D
Diferença (valor absoluto/modulo):	0.27	0.09	0.02	0.16

somatório da diferença: 0,54

O critério para verificar se convergiu é um parâmetro do algoritmo. Caso essa soma tivesse que ser, por exemplo, menor $<$ que 0.01, então o PageRank não normalizou e será necessário outra iteração.



Calculo do Page Rank - Teste



$d=0.85$

	Ini.	#1	#1 norm	#2	#2 norm	#3	#3 norm.
A	0,15	0,214	0,193	0,281	0,194	0,309	0,213
B	0,15	0,405	0,365	0,477	0,329	0,479	0,330
C	0,15	0,341	0,307	0,542	0,374	0,512	0,353
D	0,15	0,15	0,135	0,15	0,103	0,15	0,103