

Is Fidel Castro Really an American President?

On Set Expansion

An Example



Google Sets

Google Sets

Barack Obama

Bill Clinton

George Bush

[\(clear all\)](#)

Large Set

Small Set (15 items or fewer)

Google Sets

The image shows the Google Sets interface. On the left, there is a vertical list of input boxes containing the following text: "Barack Obama", "Bill Clinton", "George Bush", an empty box, and another empty box. Below these boxes is a "(clear all)" link. At the bottom left, there are two buttons: "Large Set" and "Small Set (15 items or fewer)". A large blue arrow points from the input area to the right, where a vertical list of suggestions is displayed. The suggestions are: "gerald ford", "george hw bush", "democratic party", "john kennedy", "jfk", "fidel castro", "election", "approval rating", "economy", "health care", "harry reid", and "new york".

Barack Obama

Bill Clinton

George Bush

[\(clear all\)](#)

Large Set Small Set (15 items or fewer)

[gerald ford](#)

[george hw bush](#)

[democratic party](#)

[john kennedy](#)

[jfk](#)

[fidel castro](#)

[election](#)

[approval rating](#)

[economy](#)

[health care](#)

[harry reid](#)

[new york](#)

Google Sets

The image shows the Google Sets interface. On the left, there is a list of input terms: "Barack Obama", "Bill Clinton", "George Bush", and two empty text boxes. Below the input boxes is a "(clear all)" link. At the bottom left, there are two radio buttons: "Large Set" (selected) and "Small Set (15 items or fewer)". A large blue arrow points from the input area to the right, where a vertical list of suggestions is displayed. The suggestions are: "gerald ford", "george hw bush", "democratic party", "john kennedy", "jfk", "fidel castro" (highlighted in orange), "election", "approval rating", "economy", "health care", "harry reid", and "new york".

<input type="text" value="Barack Obama"/>
<input type="text" value="Bill Clinton"/>
<input type="text" value="George Bush"/>
<input type="text"/>
<input type="text"/>
(clear all)
<input checked="" type="radio"/> Large Set
<input type="radio"/> Small Set (15 items or fewer)

→

gerald ford
george hw bush
democratic party
john kennedy
jfk
fidel castro
election
approval rating
economy
health care
harry reid
new york

Notion

Notion

- Seeds: Barack Obama, Bill Clinton, George Bush

Notion

- Seeds: Barack Obama, Bill Clinton, George Bush
- Target Set: US-American presidents

Notion

- Seeds: Barack Obama, Bill Clinton, George Bush
- Target Set: US-American presidents
- Answer to query: more probable elements of the target set

Notion

- Seeds: Barack Obama, Bill Clinton, George Bush
- Target Set: US-American presidents
- Answer to query: more probable elements of the target set
- John F. Kennedy

Notion

- Seeds: Barack Obama, Bill Clinton, George Bush
- Target Set: US-American presidents
- Answer to query: more probable elements of the target set
 - John F. Kennedy
 - George Washington, etc.

SEAL

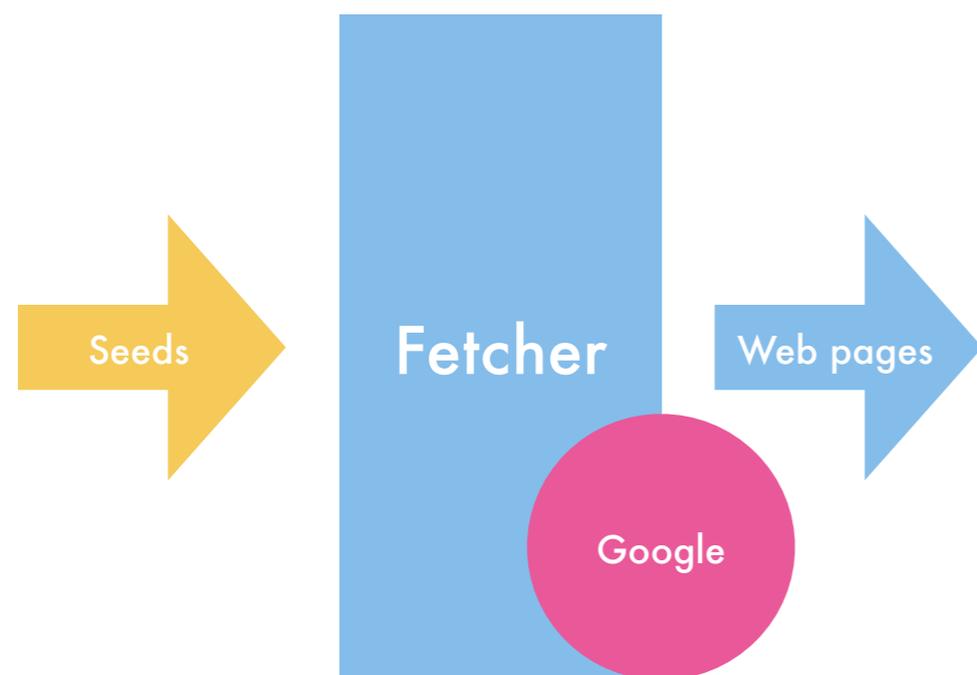


The SEAL System

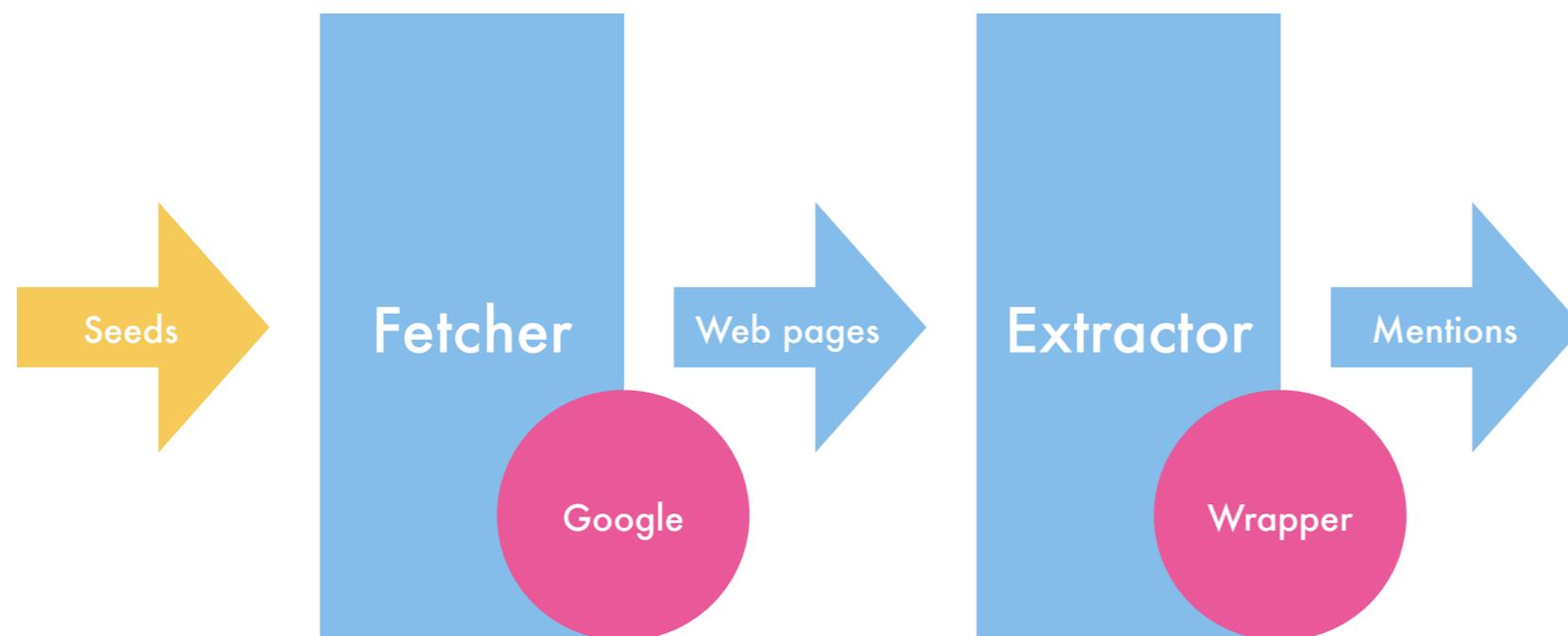
The SEAL System



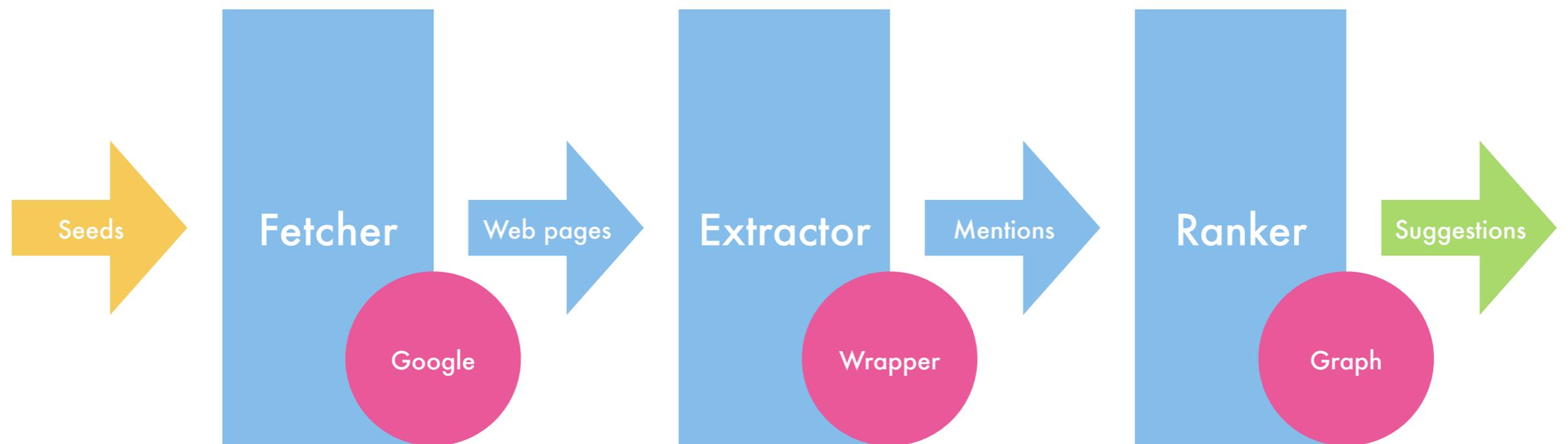
The SEAL System



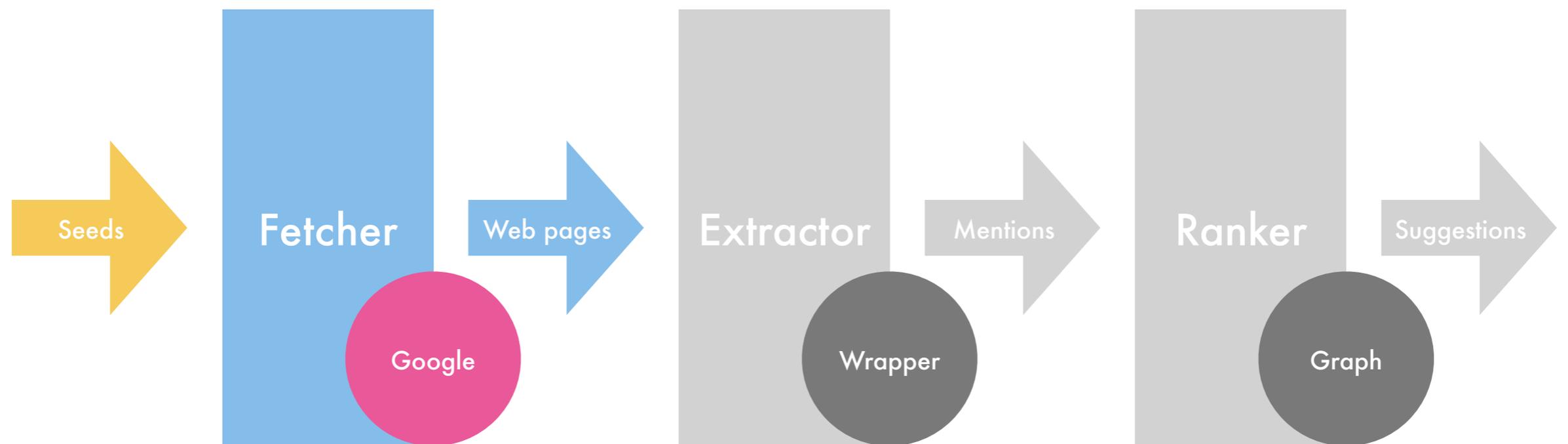
The SEAL System



The SEAL System



The SEAL System



Fetcher

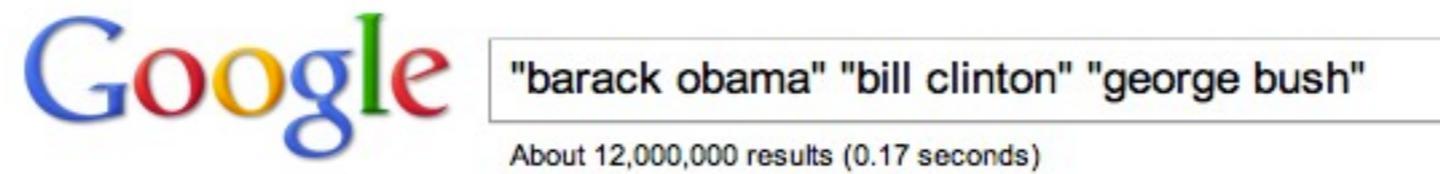
Fetcher



"barack obama" "bill clinton" "george bush"

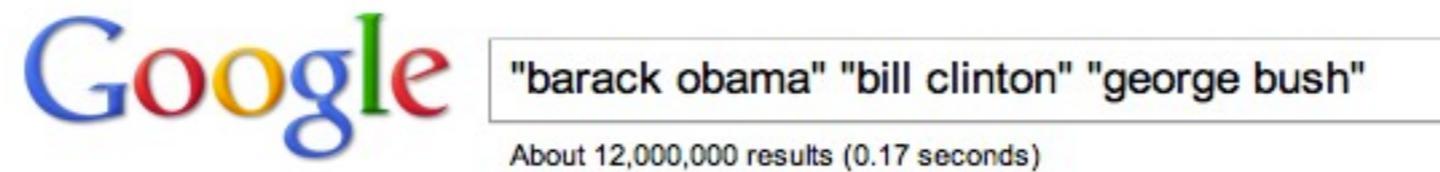
About 12,000,000 results (0.17 seconds)

Fetcher



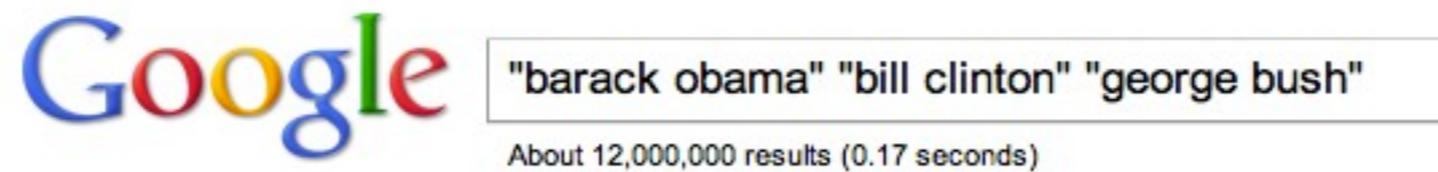
- Simple Google search

Fetcher



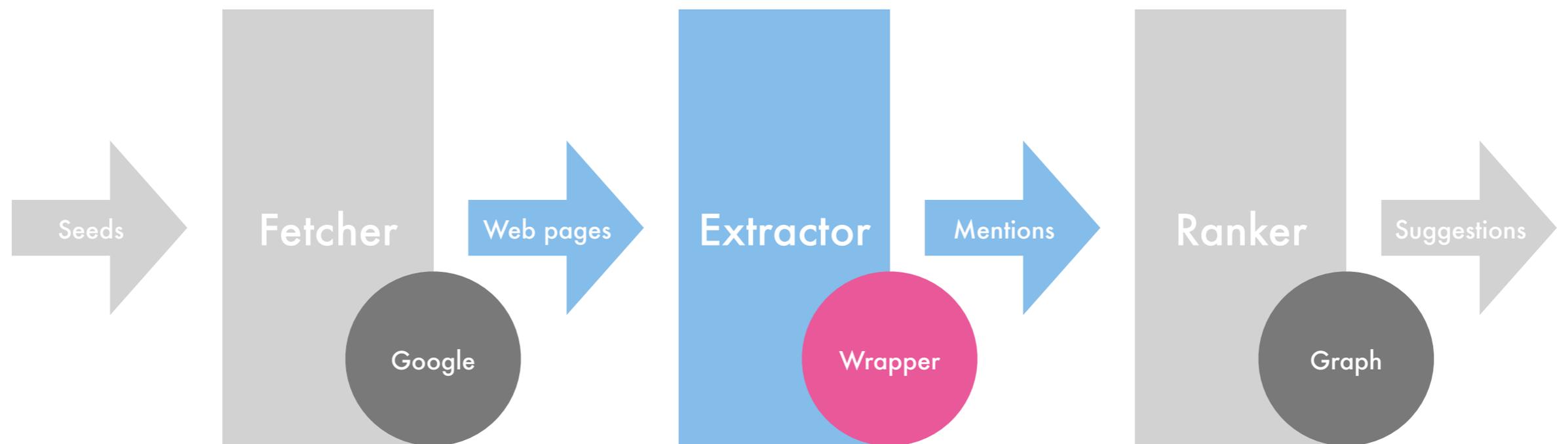
- Simple Google search
- Query: Concatenation of all seeds

Fetcher



- Simple Google search
- Query: Concatenation of all seeds
- Crawl top results

The SEAL System



Extractor

Extractor

- Idea:

Extractor

- Idea:
 - Find common contexts of all seeds

Extractor

- Idea:
 - Find common contexts of all seeds
 - Wrapper

Extractor

- Idea:
 - Find common contexts of all seeds
 - Wrapper
 - Derive new entities

Extractor

- Idea:
- Find common contexts of all seeds
 - Wrapper
- Derive new entities

```
<ul>  
  <li>Obama</li>  
  <li>Bush</li>  
  <li>Kennedy</li>  
</ul>
```

Document

prtoBamAxxaEsdSlkprtKenNed
yxSAprtCLinTOnxkhSlpUfgAob
AMagzPHMAcolLgAcLIntOnpfb
IRoiusWgoprtaAstrOxkLiTfgACI
nTongzUmXuSYfgAkEnneDygzil



Document

prtoBamAxxaEsdSlkprtKenNed
yxSAprtCLinTOnxkhSlpUfgAob
AMagzPHMAcolLgAcLIntOnpfb
IRoiusWgoprtaAstrOxkLiTfgACli
nTongzUmXuSYfgAkEnneDygzil

Seeds

Obama	0
Clinton	1
Obama	2
Clinton	3
Clinton	4



Document

prtoBamAxxaEsdSlkprtKenNed
yxSAprtCLinTOnxkhSlpUfgAob
AMagzPHMAcolLgAcLIntOnpfb
IRoiusWgoprtaAstrOxkLiTfgACli
nTongzUmXuSYfgAkEnneDygzil

Right Contexts

Seeds

Obama	0
Clinton	1
Obama	2
Clinton	3
Clinton	4



Document

prtoBamAxxaEsdSlkprtKenNed
yxSAprtCLinTOnxkhSlpUfgAob
AMagzPHMAcolLgAcLIntOnpfb
IRoiusWgoprtaAstrOxkLiTfgACli
nTongzUmXuSYfgAkEnneDygzil

Right Contexts

- xxaEsd...

Seeds

Obama	0
Clinton	1
Obama	2
Clinton	3
Clinton	4



Document

prtoBamAxxaEsdSlkprtKenNed
yxSAprtCLinTOnxkhSlpUfgAob
AMagzPHMAcolLgAcLIntOnpfb
IRoiusWgoprtaAstrOxkLiTfgACli
nTongzUmXuSYfgAkEnneDygzil

Right Contexts

- xxaEsd...
- xkhSlp...

Seeds

Obama	0
Clinton	1
Obama	2
Clinton	3
Clinton	4



Document

prtoBamAxxaEsdSlkprtKenNed
yxSAprtCLinTOnxkhSlpUfgAob
AMagzPHMAcolLgAcLIntOnpfb
IRoiusWgoprtaAstrOxkLiTfgACli
nTongzUmXuSYfgAkEnneDygzil

Right Contexts

- xxaEsd...
- xkhSlp...
- gzPHMA...

Seeds

Obama	0
Clinton	1
Obama	2
Clinton	3
Clinton	4



Document

prtoBamAxxaEsdSlkprtKenNed
yxSAprtCLinTOnxkhSlpUfgAob
AMagzPHMAcolLgAcLIntOnpfb
lRoiusWgoprtaAstrOxkLiTfgACli
nTongzUmXuSYfgAkEnneDygzil

Right Contexts

- xxaEsd...
- xkhSlp...
- gzPHMA...
- pfbLRo...

Seeds

Obama	0
Clinton	1
Obama	2
Clinton	3
Clinton	4



Document

prtoBamAxxaEsdSlkprtKenNed
yxSAprtCLinTOnxkhSlpUfgAob
AMagzPHMAcolLgAcLIntOnpfb
IRoiusWgoprtaAstrOxkLiTfgACli
nTongzUmXuSYfgAkEnneDygzil

Right Contexts

- xxaEsd...
- xkhSlp...
- gzPHMA...
- pfbIRo...
- gzUmXu...

Seeds

Obama	0
Clinton	1
Obama	2
Clinton	3
Clinton	4



Document

prtoBamAxxaEsdSlkprtKenNed
yxSAprtCLinTOnxkhSlpUfgAob
AMagzPHMAcolLgAcLIntOnpfb
lRoiusWgoprtaAstrOxkLiTfgACli
nTongzUmXuSYfgAkEnneDygzil

Seeds

Obama	0
Clinton	1
Obama	2
Clinton	3
Clinton	4

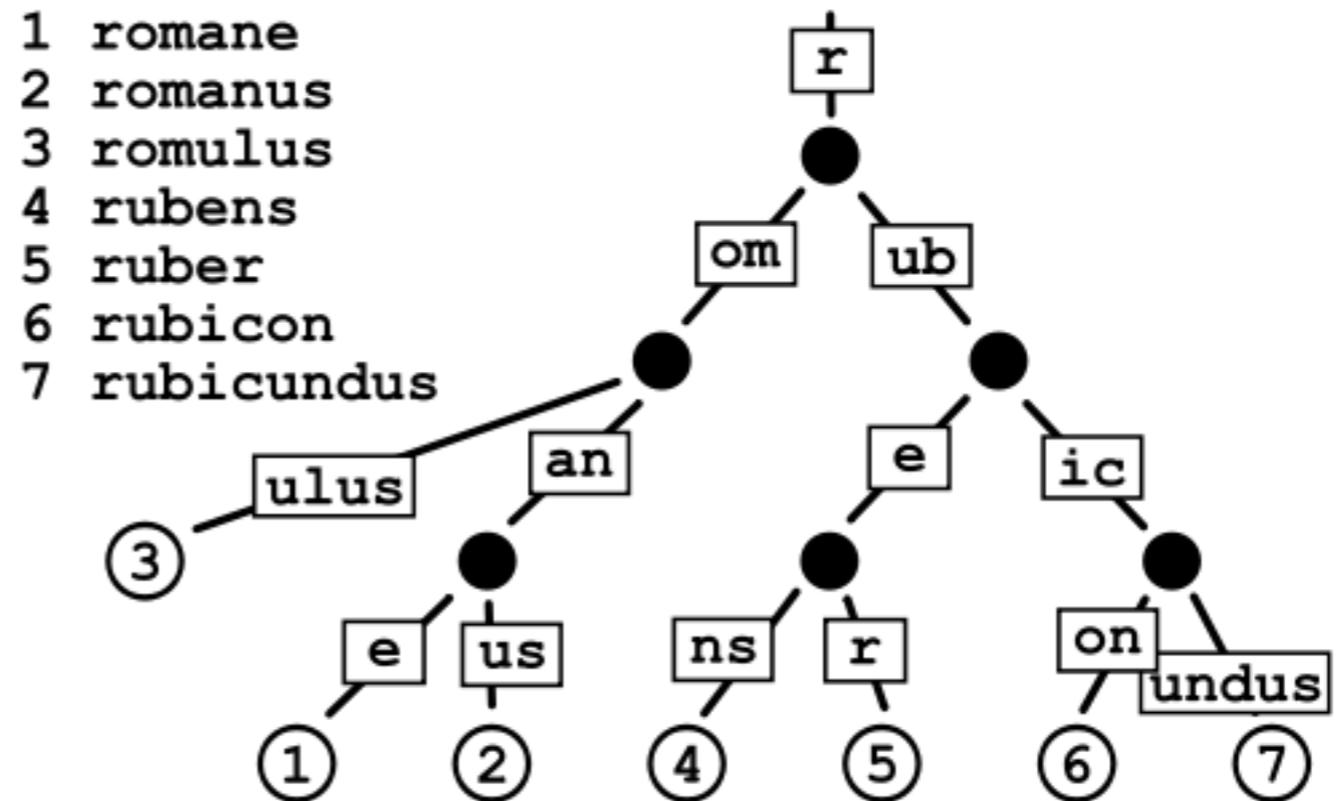
Right Contexts

- xxaEsd...
- xkhSlp...
- gzPHMA...
- pfb|Ro...
- gzUmXu...



Patricia Trie

- Practical Algorithm To Retrieve Information Coded In Alphanumeric



Document

Seeds

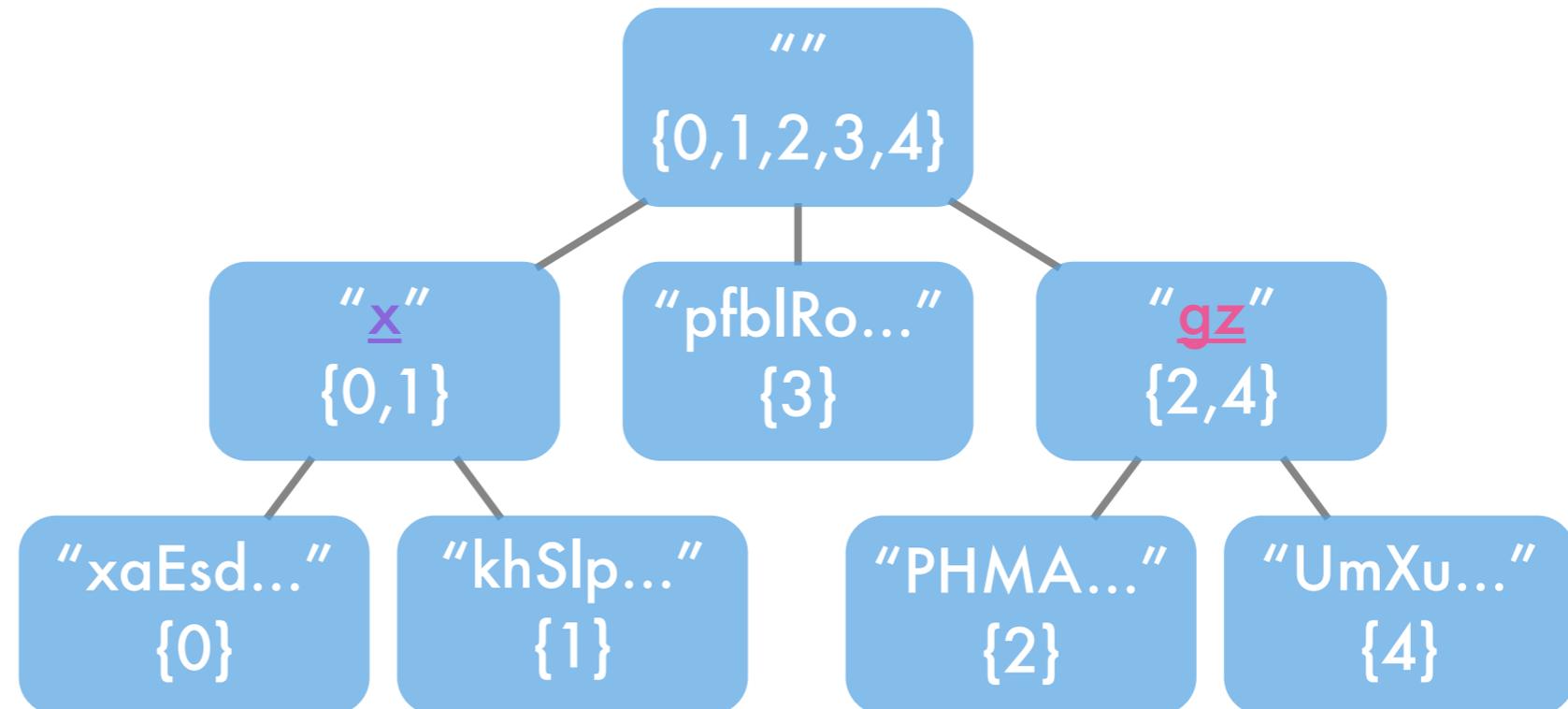
prtoBamAxxaEsdSlkprtKenNed
 yxSAprtCLinTOnxkhSlpUfgAob
 AMagzPHMAcolLgAcLIntOnpfb
 IRoiusWgoprtaAstrOxkLiTfgACli
 nTongzUmXuSYfgAkEnneDygzil

Obama	0
Clinton	1
Obama	2
Clinton	3
Clinton	4

Right Contexts

- xxaEsd...
- xkhSlp...
- gzPHMA...
- pfbIRo...
- gzUmXu...

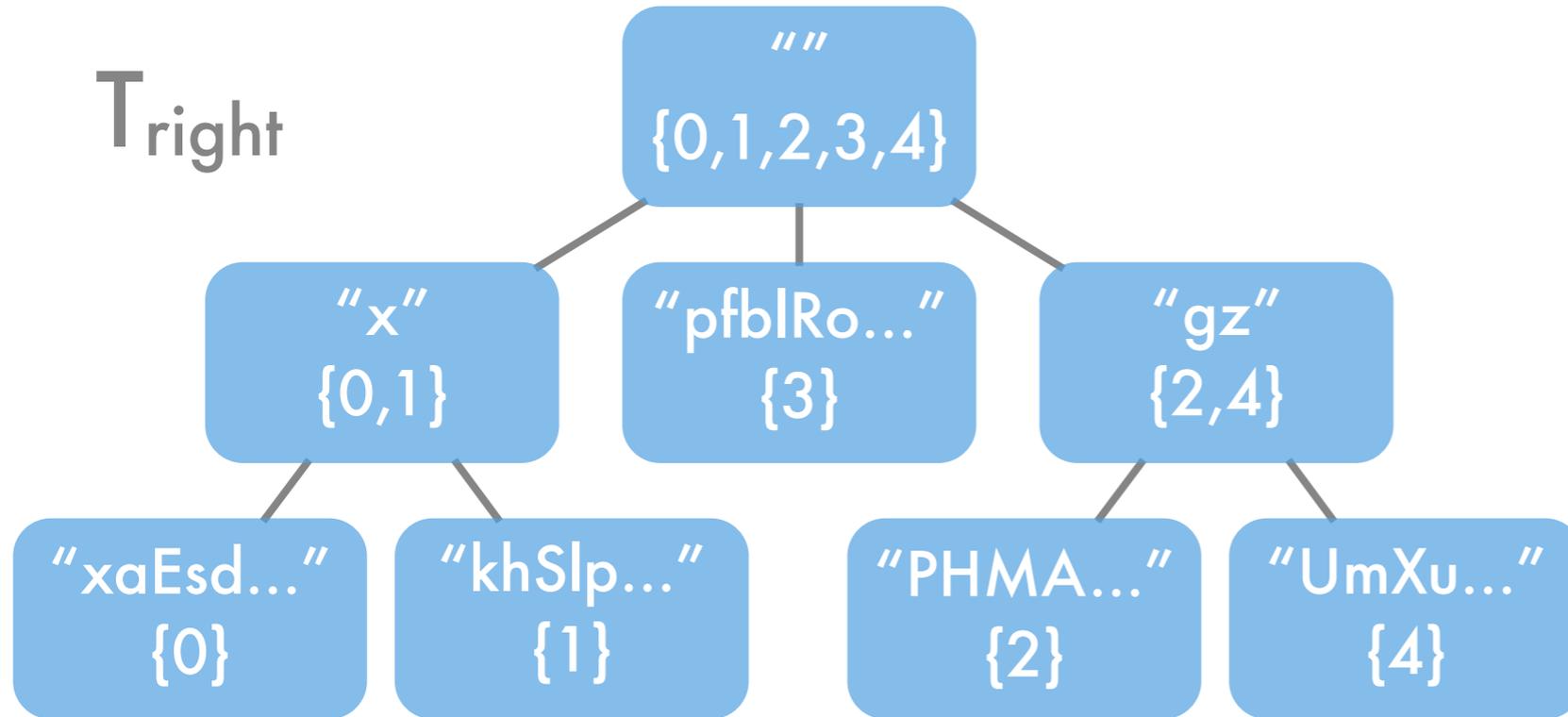
Trie T_{right}



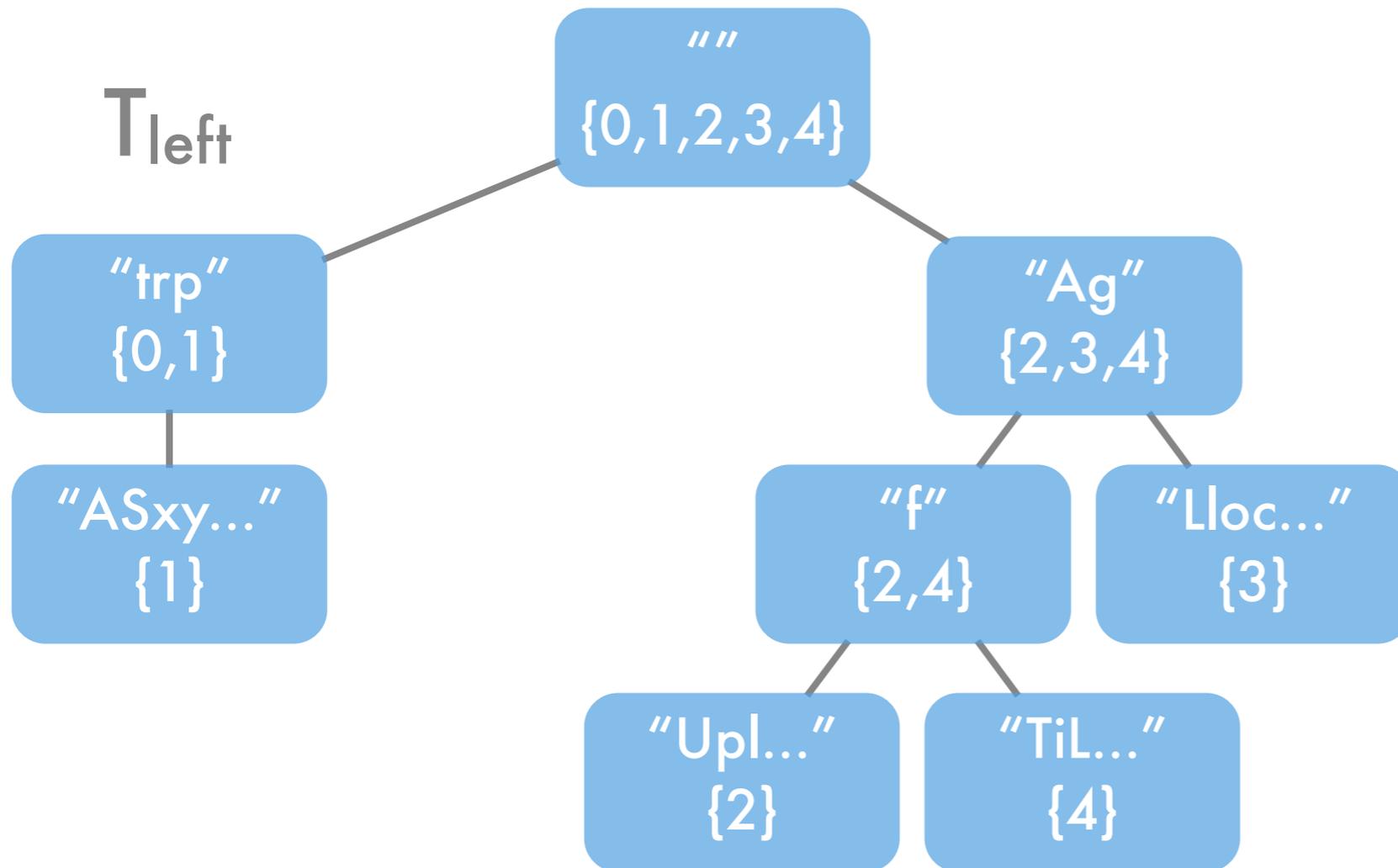
Seeds

Obama	0
Clinton	1
Obama	2
Clinton	3
Clinton	4

T_{right}



T_{left}



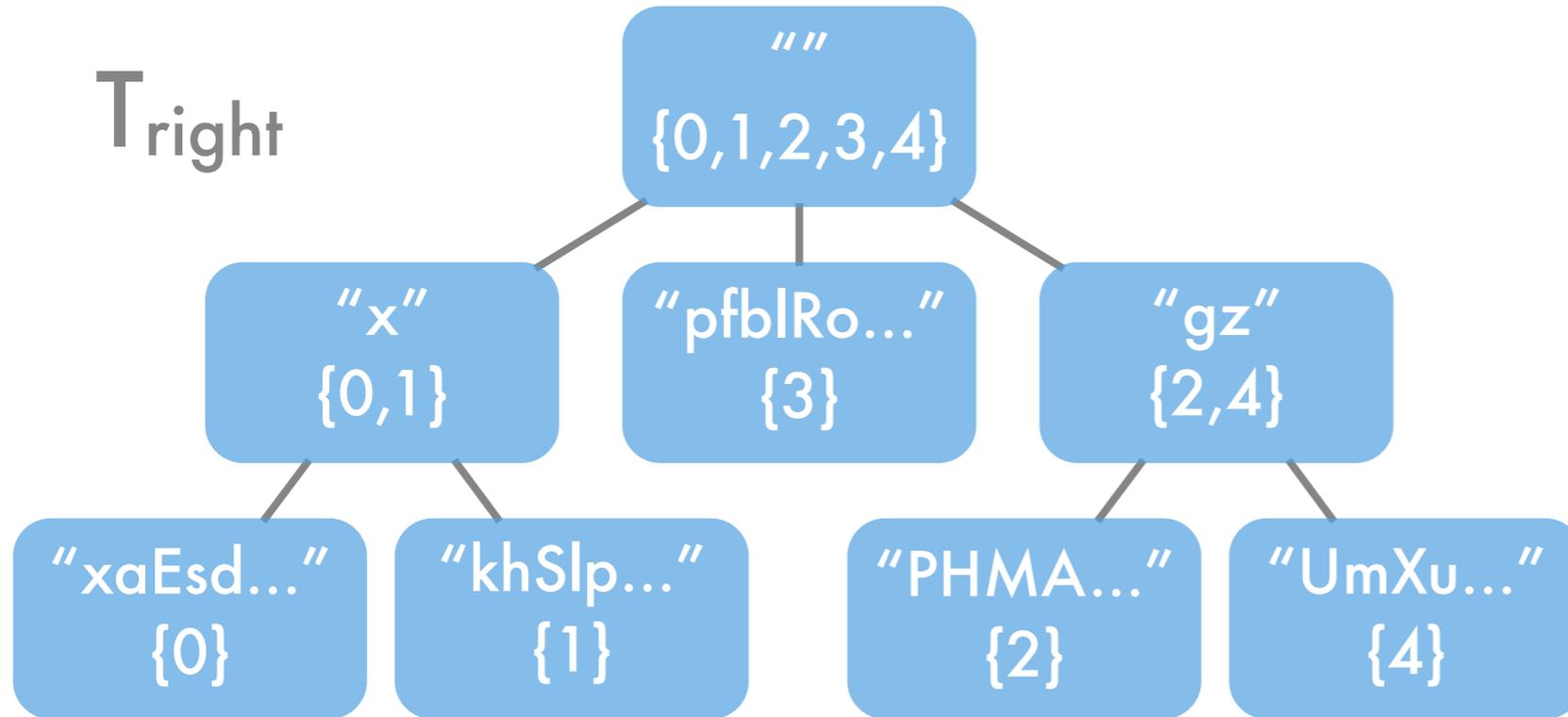
Seeds

Obama	0
Clinton	1
Obama	2
Clinton	3
Clinton	4

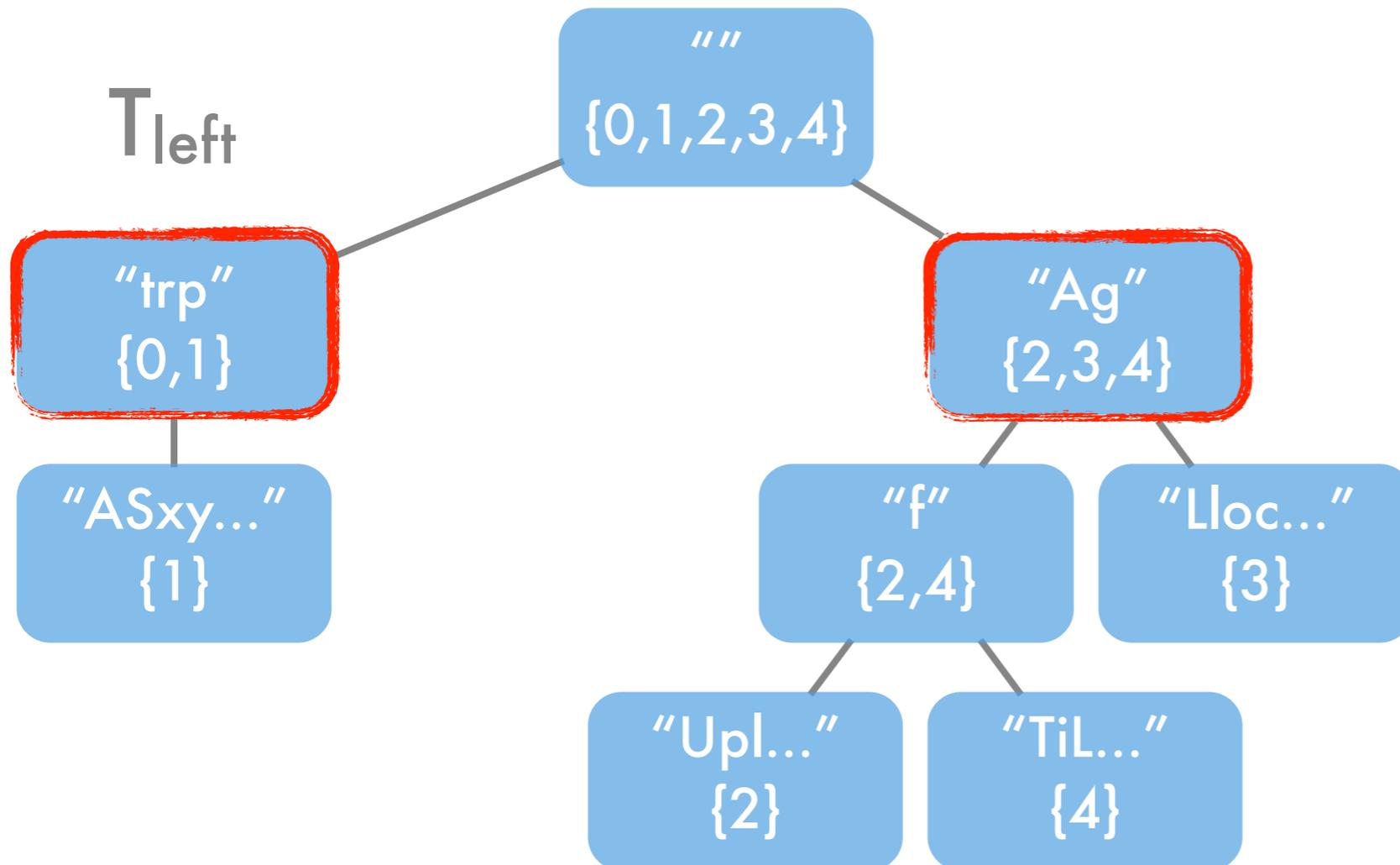
Algorithm

1. TopNodes

T_{right}



T_{left}

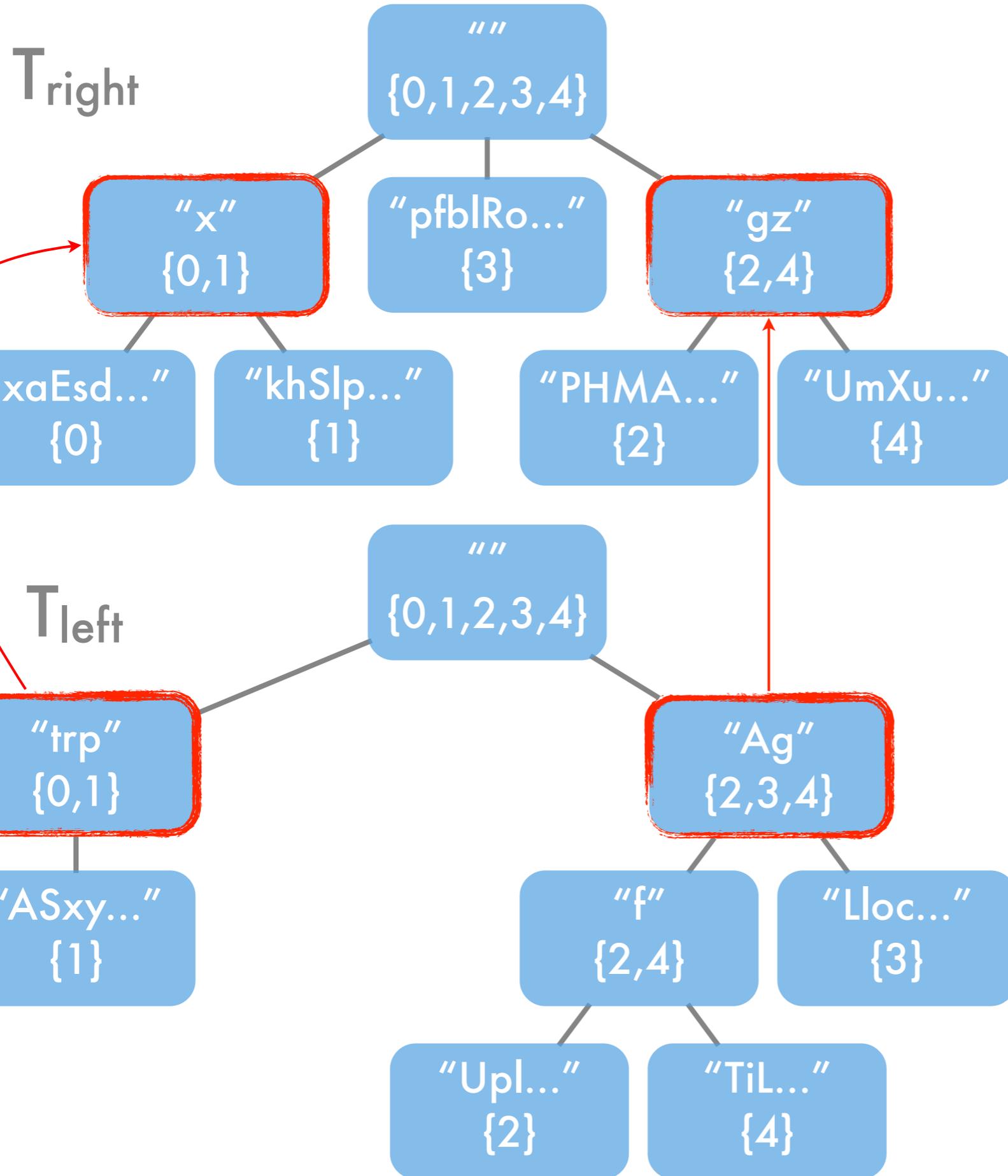


Seeds

Obama	0
Clinton	1
Obama	2
Clinton	3
Clinton	4

Algorithm

1. TopNodes
2. Match



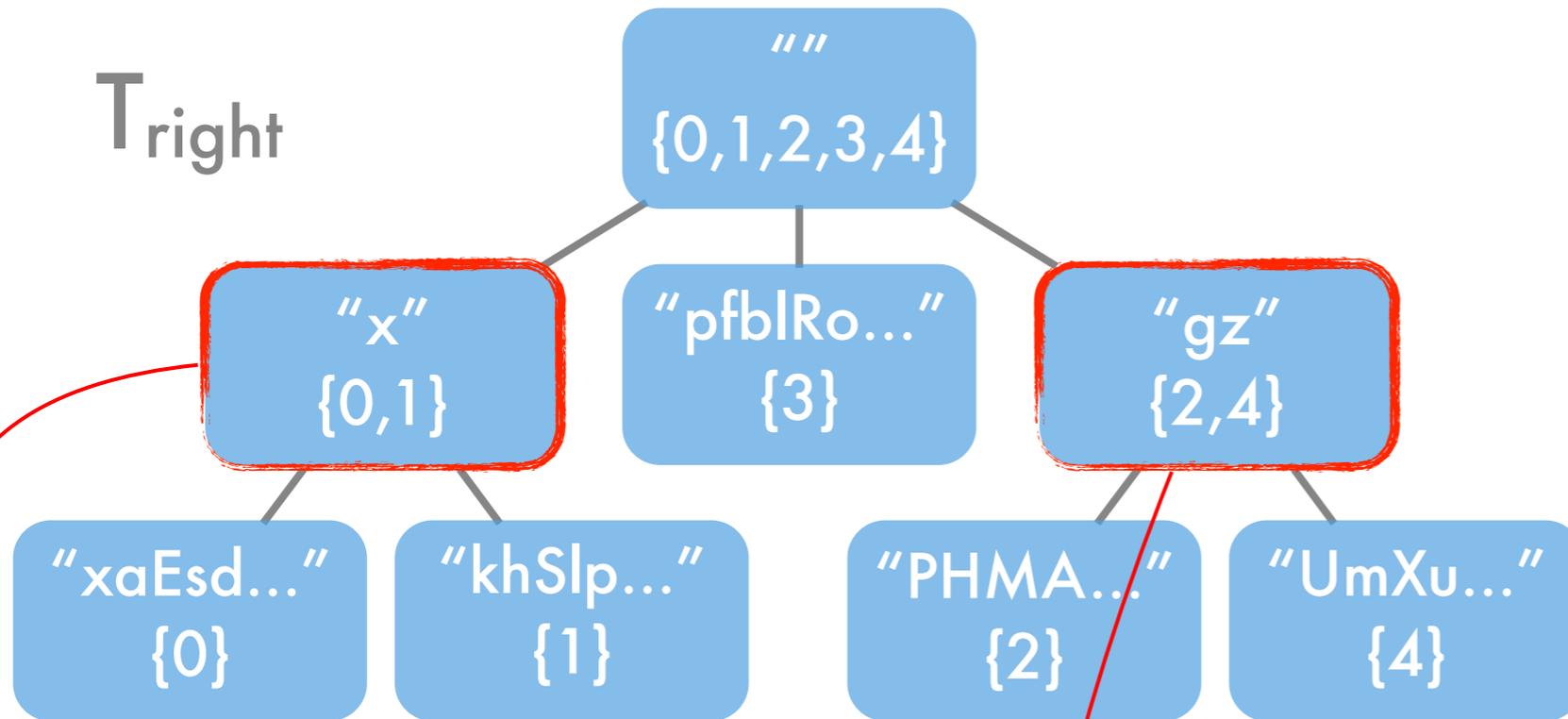
Seeds

Obama	0
Clinton	1
Obama	2
Clinton	3
Clinton	4

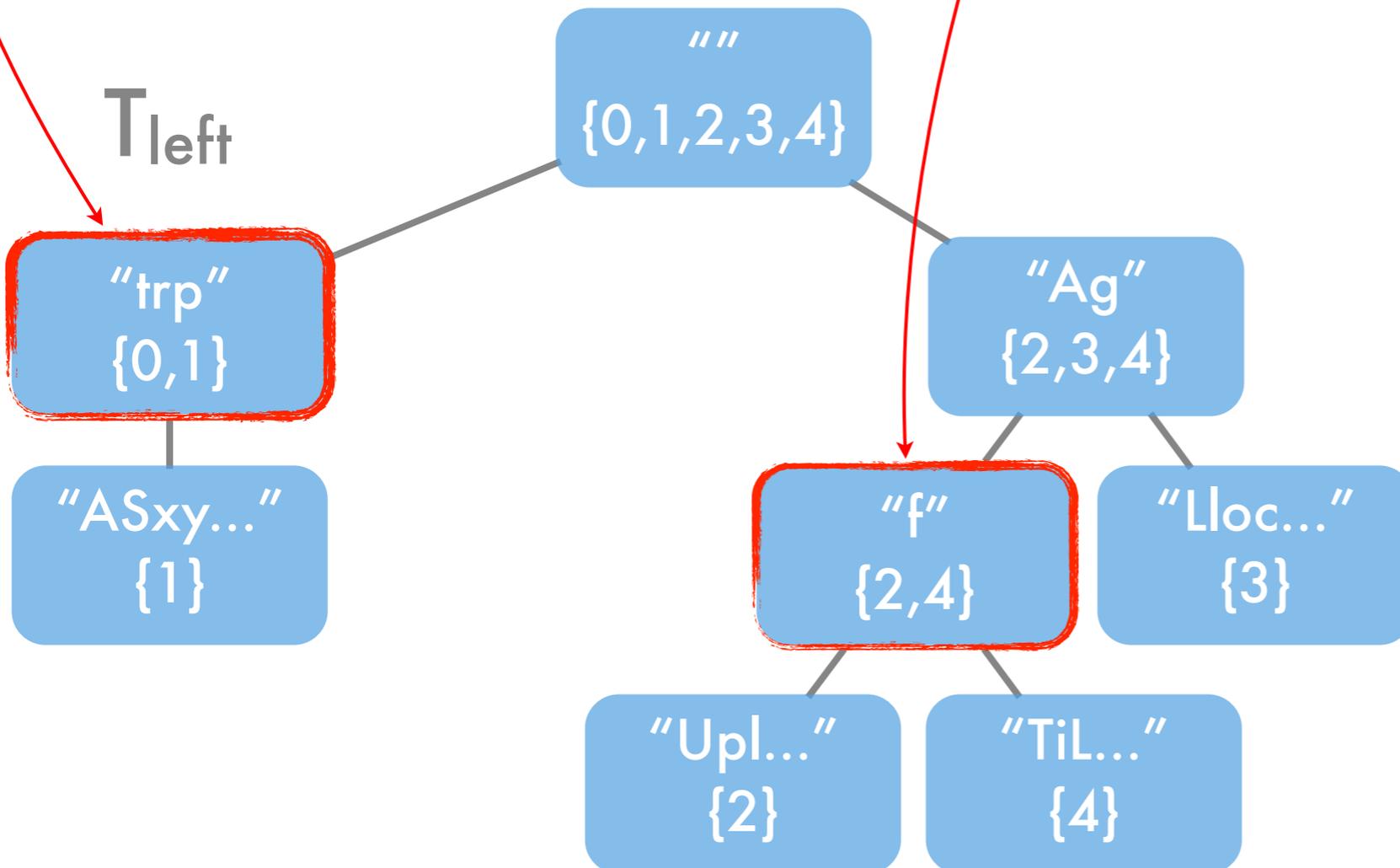
Algorithm

1. TopNodes
2. Match
3. Match back

T_{right}



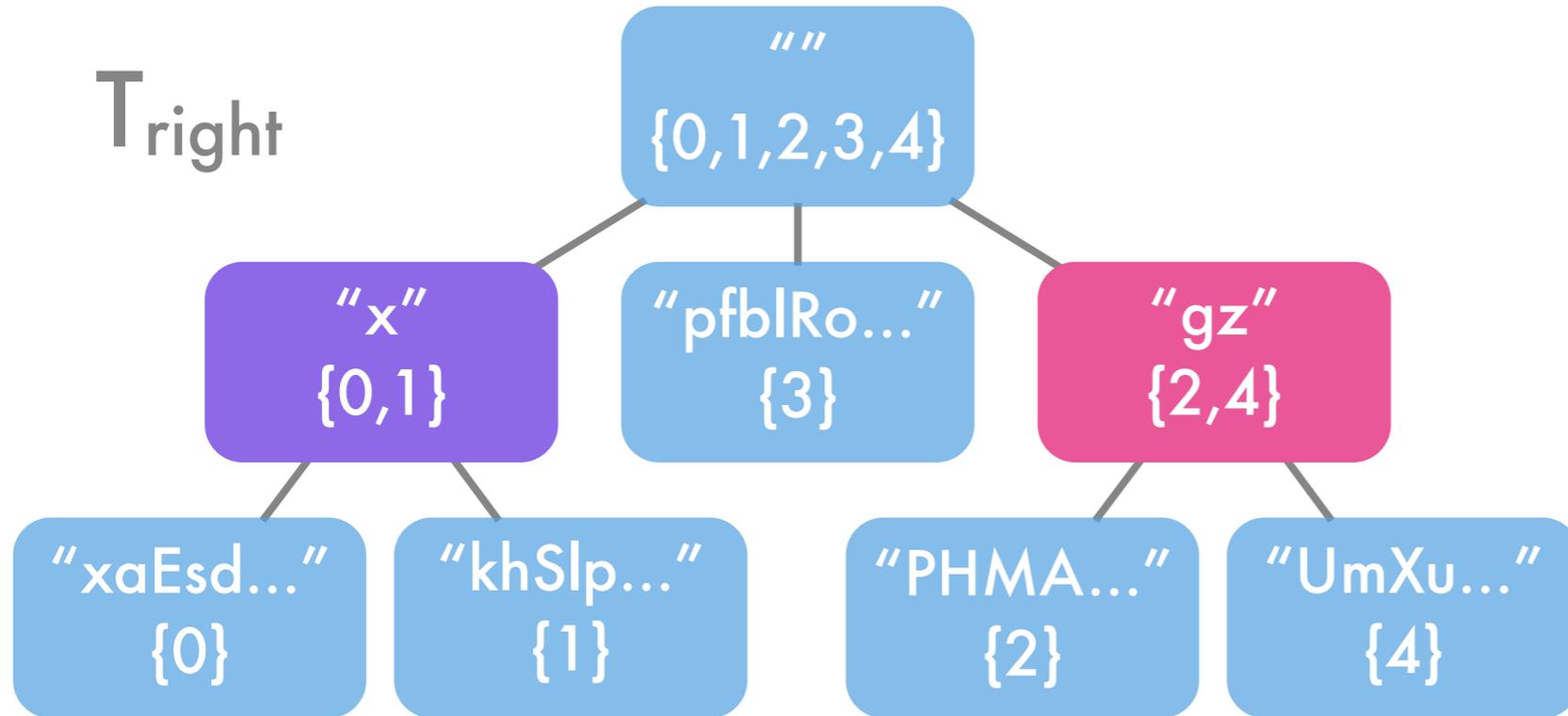
T_{left}



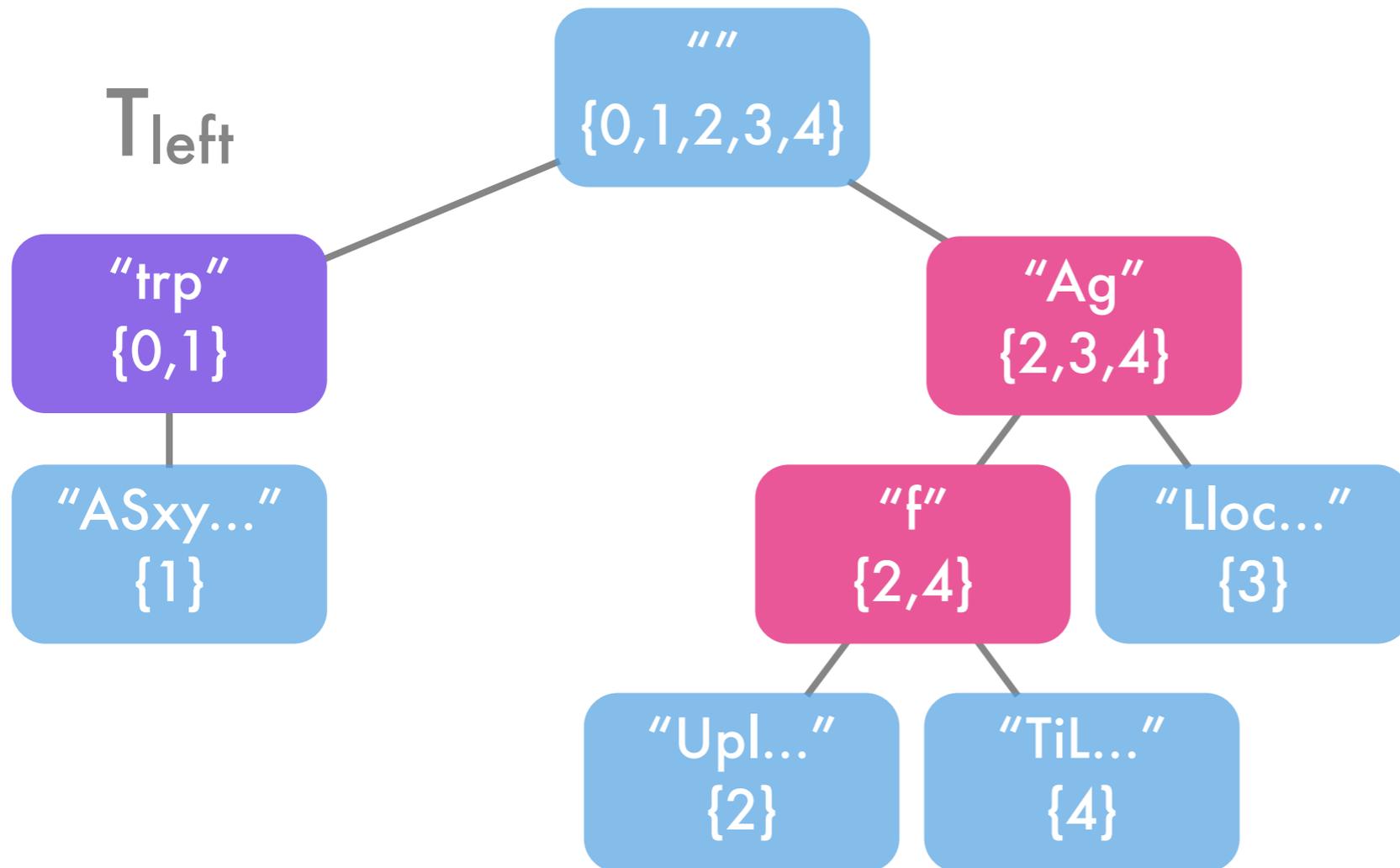
Seeds

Obama	0
Clinton	1
Obama	2
Clinton	3
Clinton	4

T_{right}



T_{left}



Document

prtoBamAxxaEsdSlkprtKenNed
yxSAprtCLinTOnxkhSlpUfgAob
AMagzPHMAcolLgAcLIntOnpfb
IRoiusWgoprtaAstrOxkLiTfgACli
nTongzUmXuSYfgAkEnneDygzil

Wrapper: prt[...]

Content: obama, clinton

Wrapper: fgA[...]

Content: obama, clinton

Document

prtoBamAxxaEsdSlkprtKenNed
yxSAprtCLinTOnxkhSlpUfgAob
AMagzPHMAcolLgAcLIntOnpfb
IRoiusWgoprtcAstrOxkLiTfgAClI
nTongzUmXuSYfgAkEnneDygzil

Wrapper: prt[...]

Content: obama, clinton, kennedy, castro

Wrapper: fgA[...]

Content: obama, clinton, kennedy

Characters vs Tags

Characters vs Tags

```
<ul>  
  <li>Obama</li>  
  <li>Bush</li>  
  <li>Kennedy</li>  
</ul>
```

Characters vs Tags

```
<ul>  
  <li>Obama</li>  
  <li>Bush</li>  
  <li>Kennedy</li>  
</ul>
```

- Exploit (HTML) tags

Characters vs Tags

```
<ul>  
  <li>Obama</li>  
  <li>Bush</li>  
  <li>Kennedy</li>  
</ul>
```

- Exploit (HTML) tags
- Good idea?

Characters vs Tags

```
<ul>  
  <li>Obama</li>  
  <li>Bush</li>  
  <li>Kennedy</li>  
</ul>
```

- Exploit (HTML) tags
- Good idea?
 - Apparently not

Characters vs Tags

Characters vs Tags

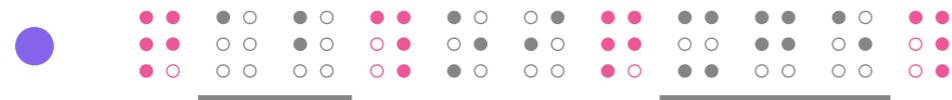
- No parser

Characters vs Tags

- No parser
- Language-independent

Characters vs Tags

- No parser
- Language-independent



Characters vs Tags

- No parser
- Language-independent
- 
- Other meta language (e.g. TeX)

Characters vs Tags

- No parser
- Language-independent
- 
- Other meta language (e.g. TeX)
- Seeds in unusual places

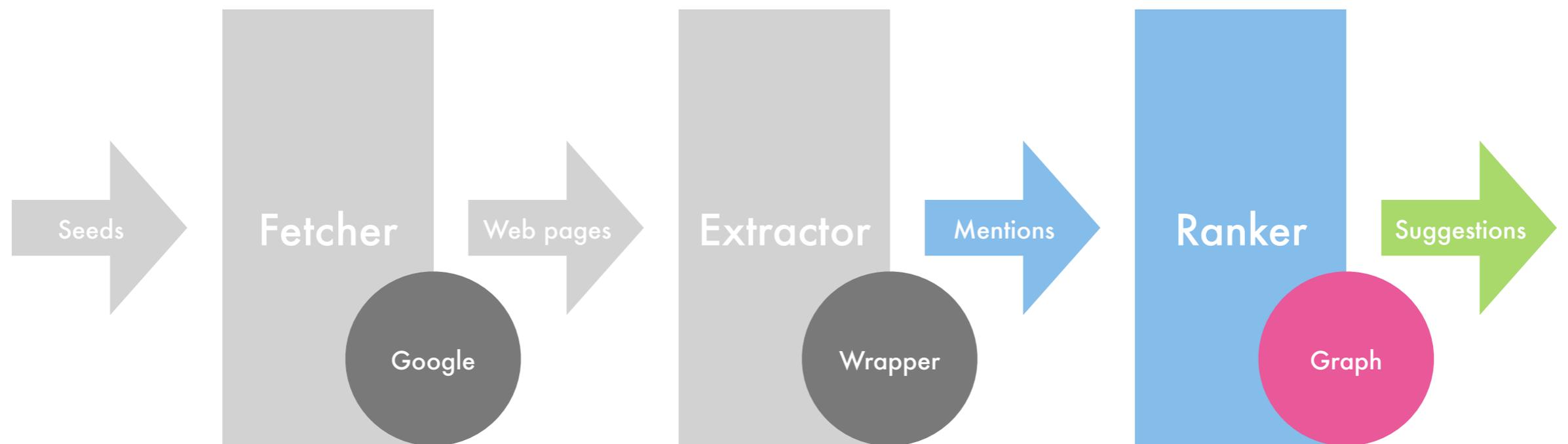
Characters vs Tags

- No parser
- Language-independent
- 
- Other meta language (e.g. TeX)
- Seeds in unusual places
- ``

Characters vs Tags

- No parser
- Language-independent
- 
- Other meta language (e.g. TeX)
- Seeds in unusual places
- ``
- More restrictions \Rightarrow lower performance

The SEAL System



Ranker

Ranker

- Problem: Noise

Ranker

- Problem: Noise
- Solution: Similarity measure between seeds and mentions

Ranker

- Problem: Noise
- Solution: Similarity measure between seeds and mentions
- Ranked output

Ranker

- Problem: Noise
- Solution: Similarity measure between seeds and mentions
 - Ranked output
- Understand relation

Analysis

Analysis

The Google logo is displayed in its characteristic multi-colored font (blue, red, yellow, blue, green, red).

"barack obama" "bill clinton" "george bush"

About 12,000,000 results (0.17 seconds)

Analysis

Google

"barack obama" "bill clinton" "george bush"

About 12,000,000 results (0.17 seconds)



Analysis

Google

"barack obama" "bill clinton" "george bush"

About 12,000,000 results (0.17 seconds)



Analysis

Google

"barack obama" "bill clinton" "george bush"

About 12,000,000 results (0.17 seconds)



Analysis

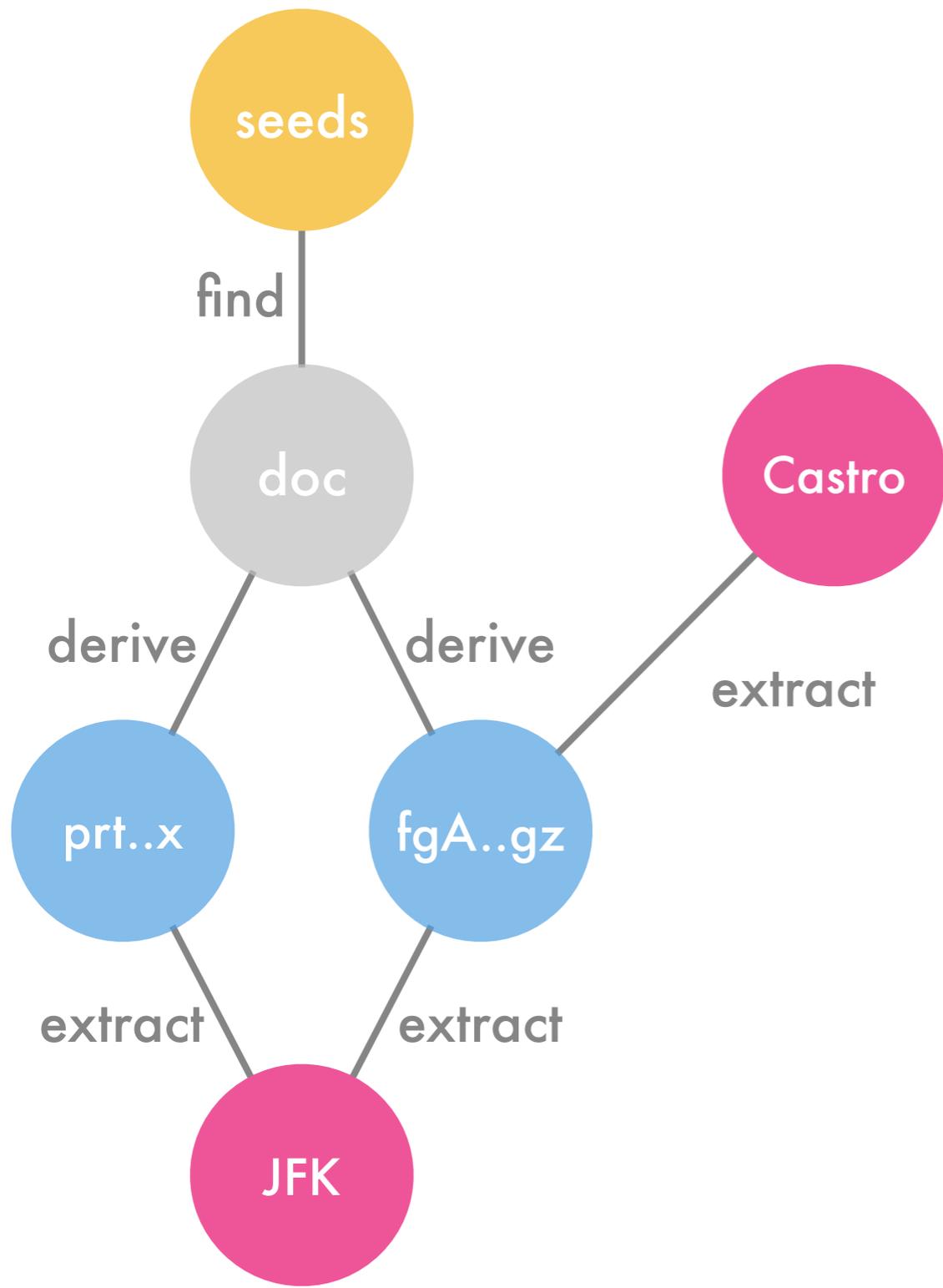
Google

"barack obama" "bill clinton" "george bush"

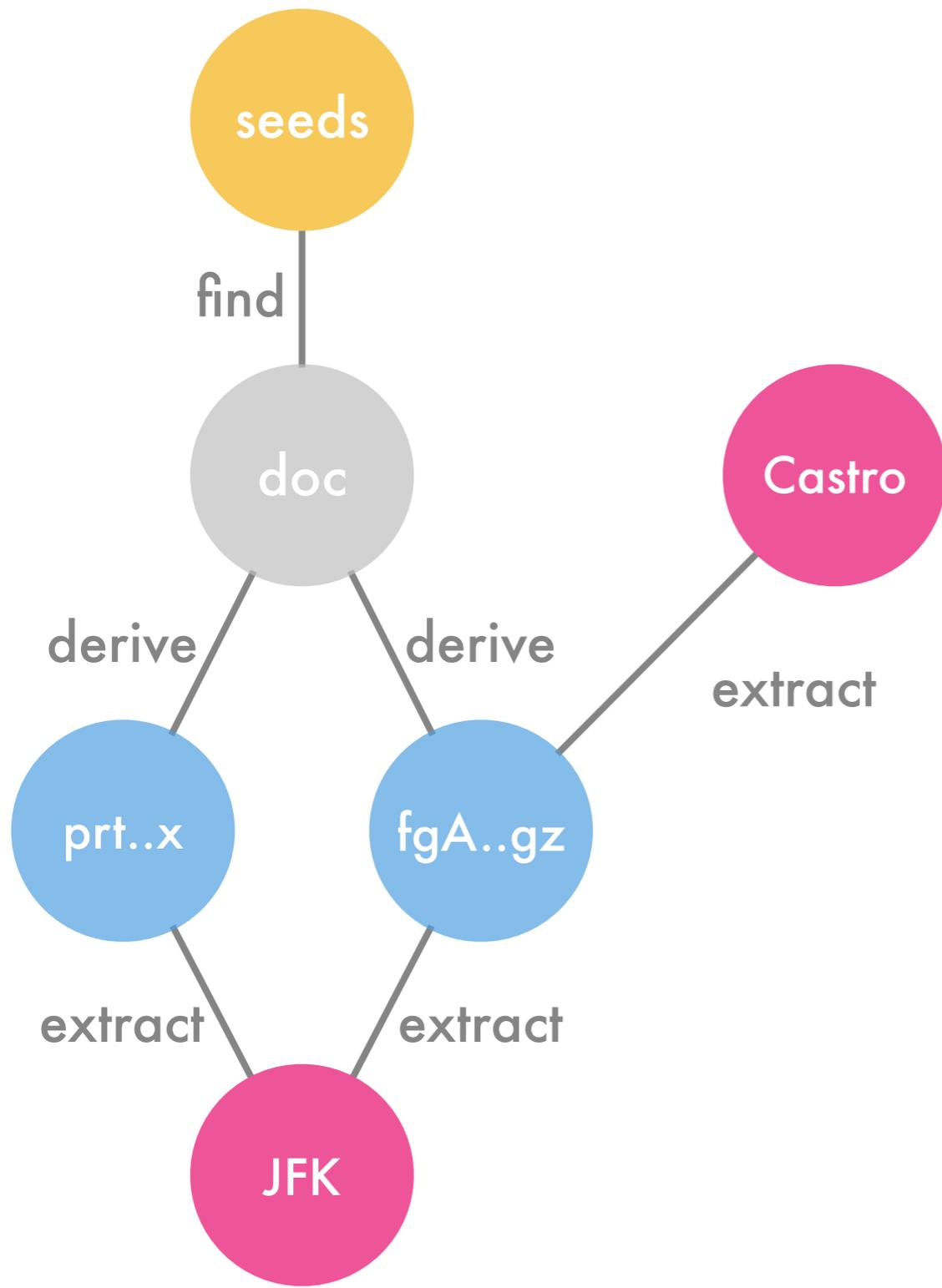
About 12,000,000 results (0.17 seconds)



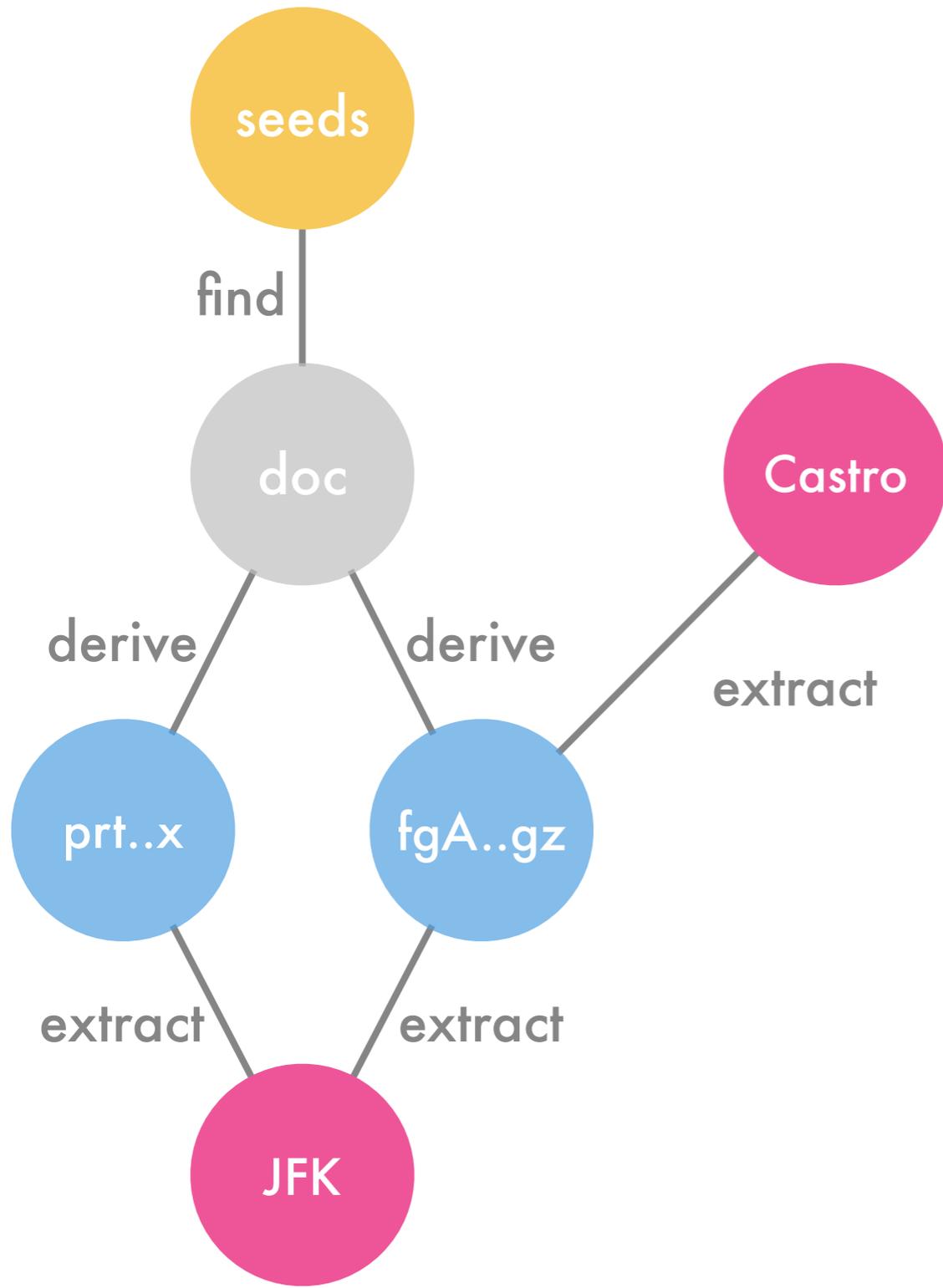
- 4 source types:
- document
- seed
- wrapper
- mention



Graph-walk (Page rank)



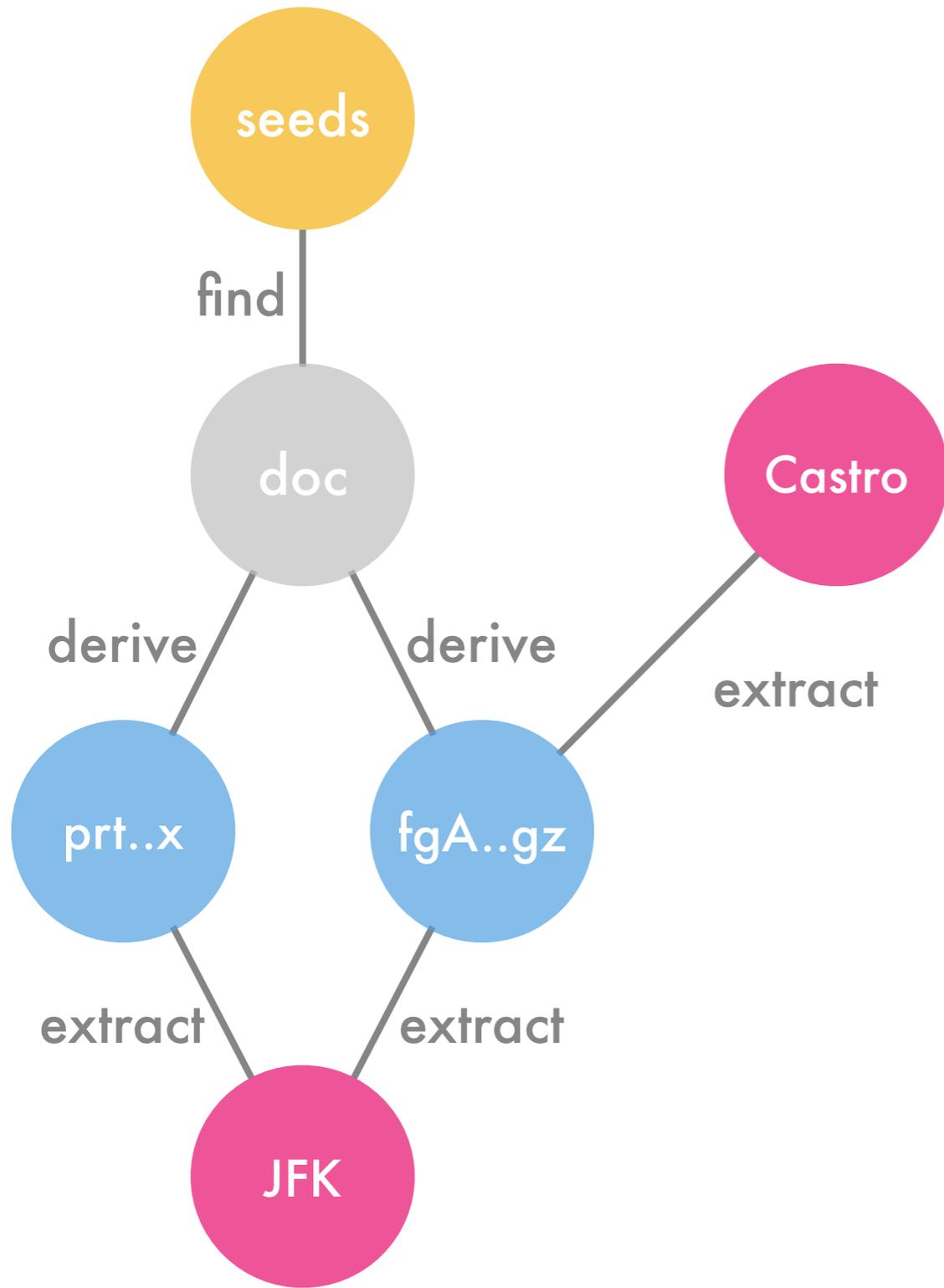
Graph-walk (Page rank)



$$P(\text{find} \mid \text{doc}) = 0.5$$



Graph-walk (Page rank)

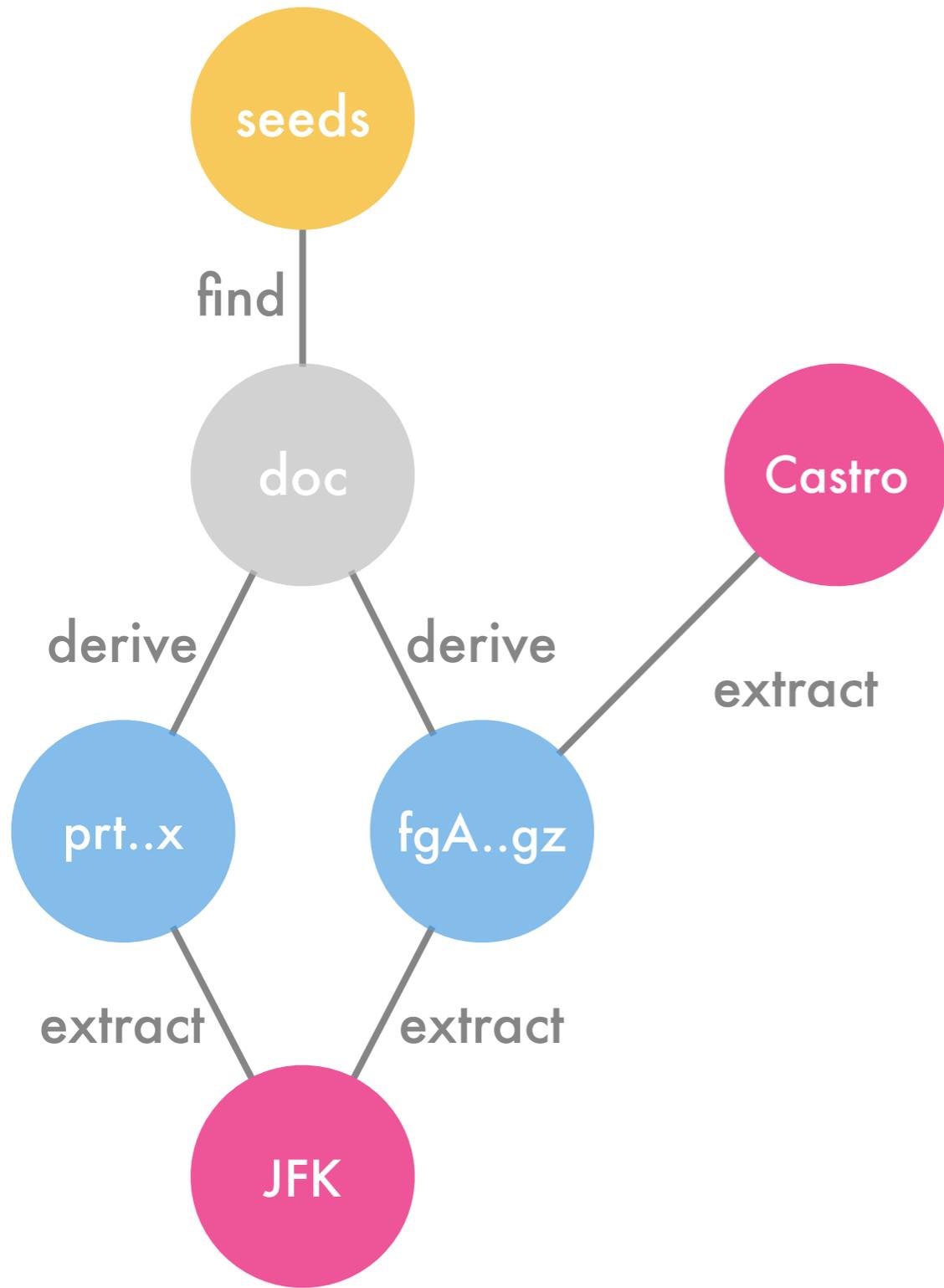


$$P(\text{find} \mid \text{doc}) = 0.5$$

$$P(\text{derive} \mid \text{doc}) = 0.5$$



Graph-walk (Page rank)



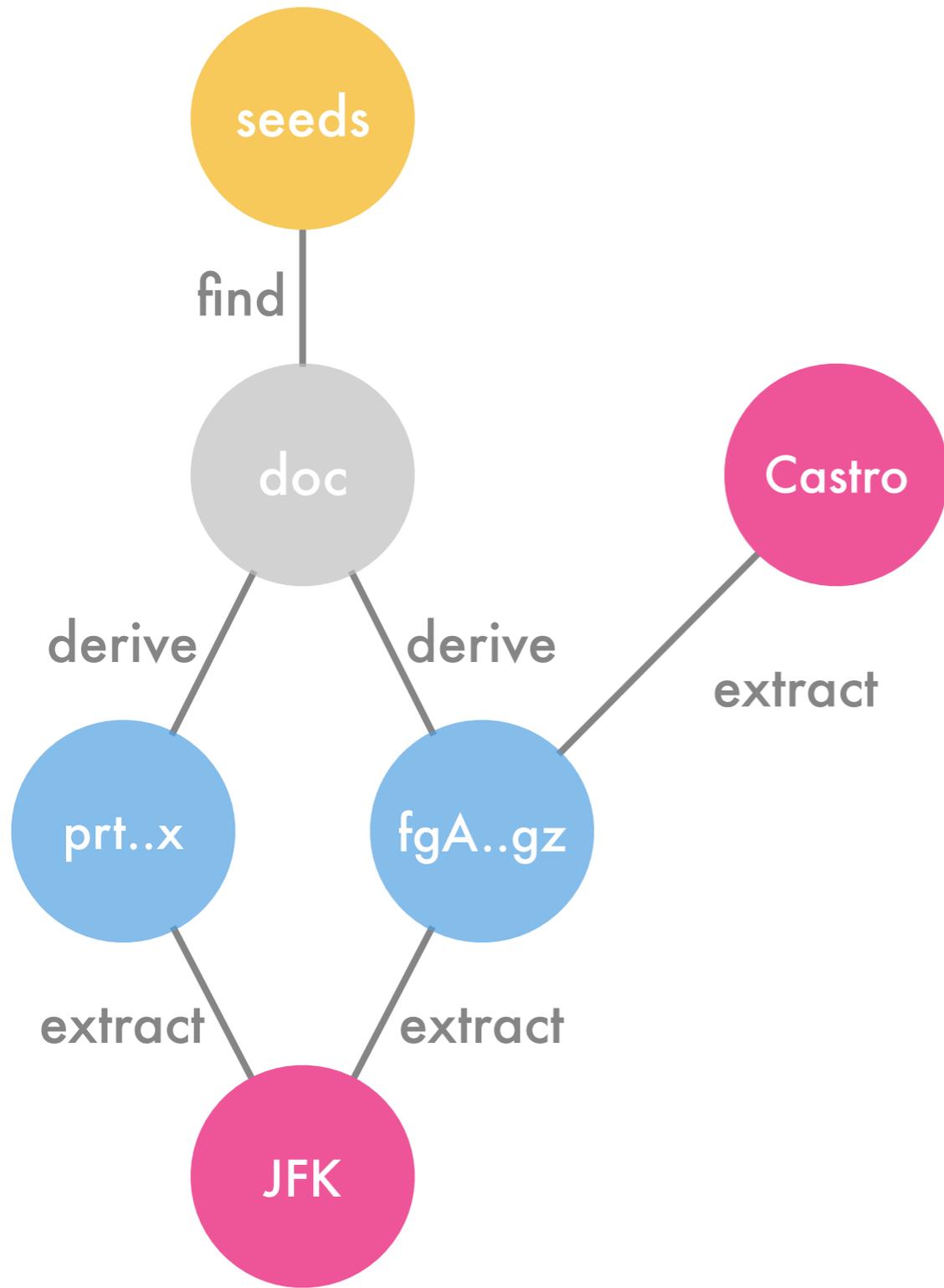
$$P(\text{find} \mid \text{doc}) = 0.5$$

$$P(\text{derive} \mid \text{doc}) = 0.5$$

$$P(\text{seeds} \mid \text{doc}, \text{find}) = 1$$



Graph-walk (Page rank)



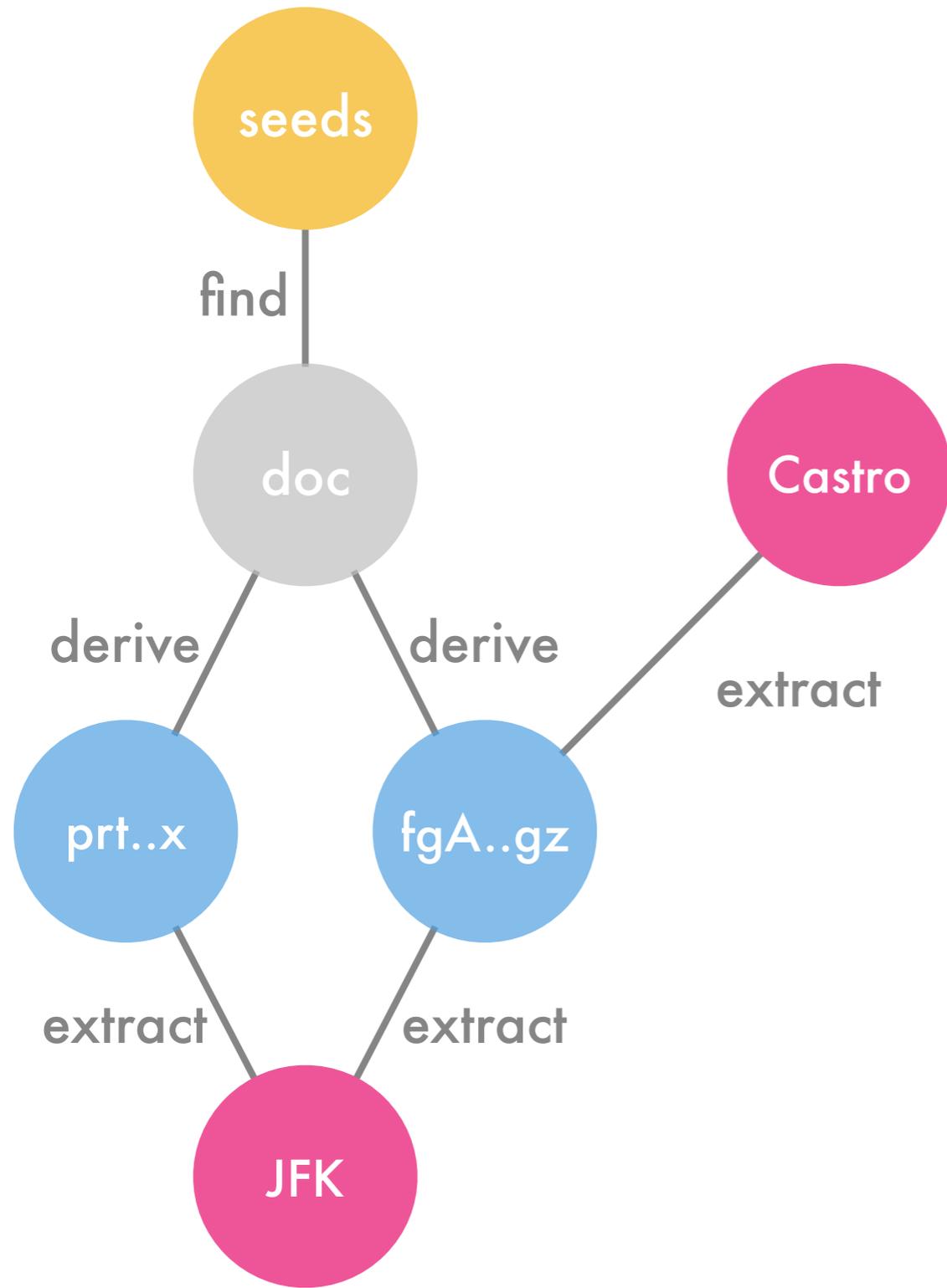
$$P(\text{find} \mid \text{doc}) = 0.5$$

$$P(\text{derive} \mid \text{doc}) = 0.5$$

$$P(\text{seeds} \mid \text{doc}, \text{find}) \\ = 1$$

$$P(\text{prt..x} \mid \text{doc}, \text{derive}) \\ = 0.5$$

Graph-walk (Page rank)



$$P(\text{find} \mid \text{doc}) = 0.5$$

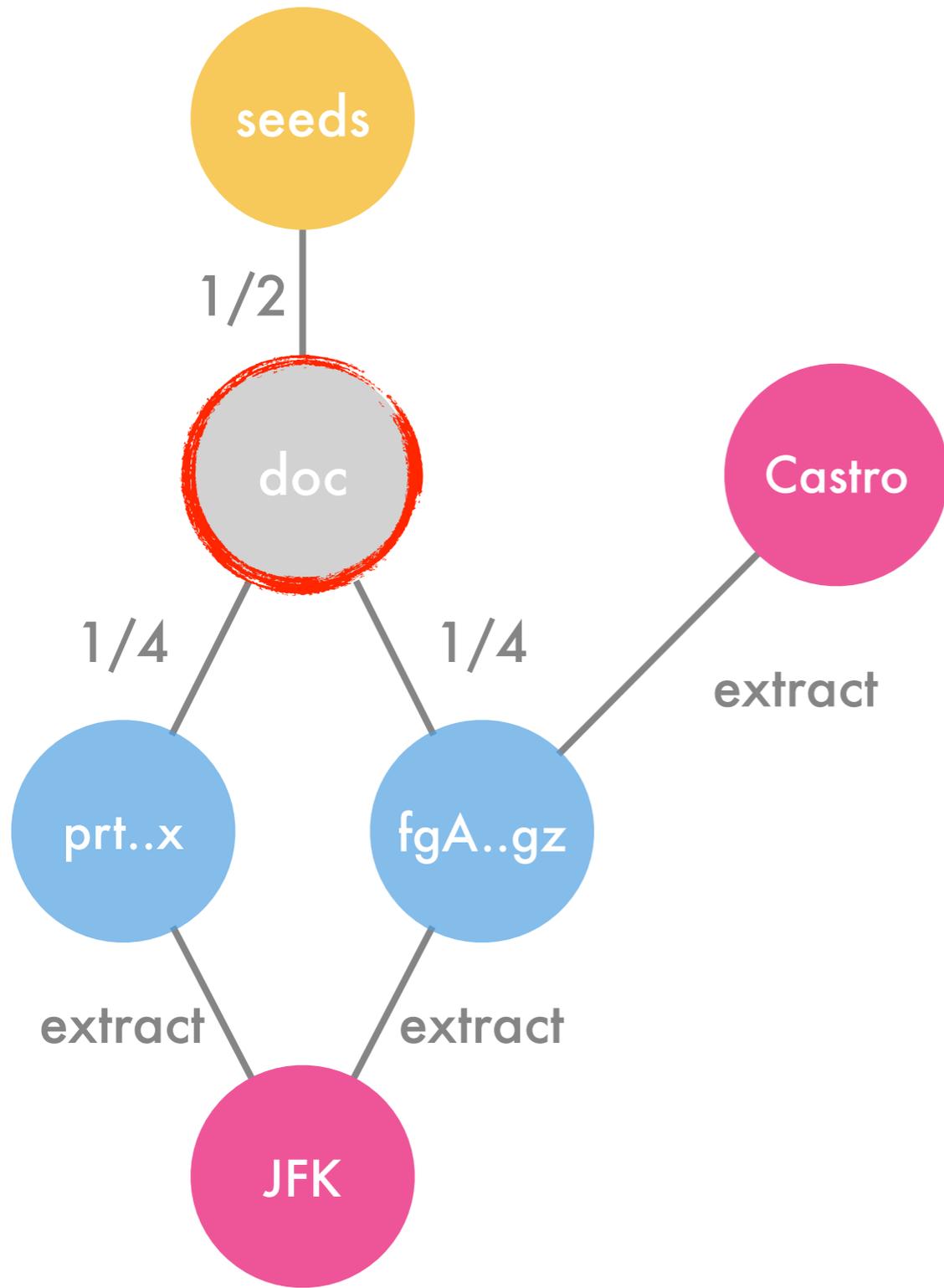
$$P(\text{derive} \mid \text{doc}) = 0.5$$

$$P(\text{seeds} \mid \text{doc}, \text{find}) = 1$$

$$P(\text{prt..x} \mid \text{doc}, \text{derive}) = 0.5$$

$$P(\text{fgA..gz} \mid \text{doc}, \text{derive}) = 0.5$$

Graph-walk (Page rank)



$$P(\text{find} \mid \text{doc}) = 0.5$$

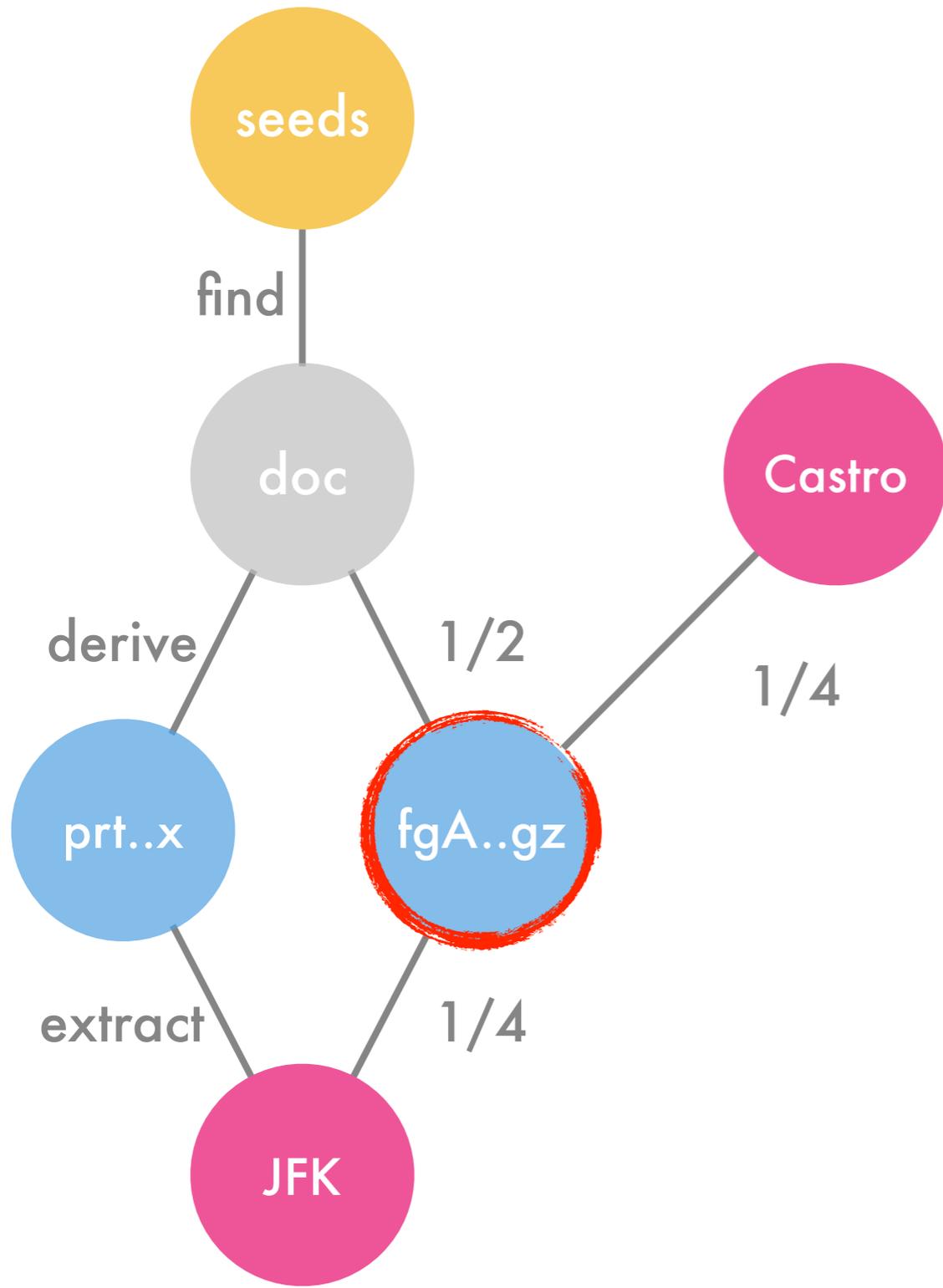
$$P(\text{derive} \mid \text{doc}) = 0.5$$

$$P(\text{seeds} \mid \text{doc}, \text{find}) = 1$$

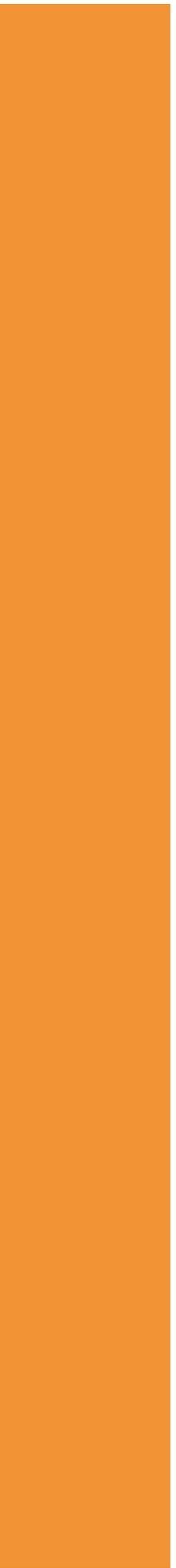
$$P(\text{prt..x} \mid \text{doc}, \text{derive}) = 0.5$$

$$P(\text{fgA..gz} \mid \text{doc}, \text{derive}) = 0.5$$

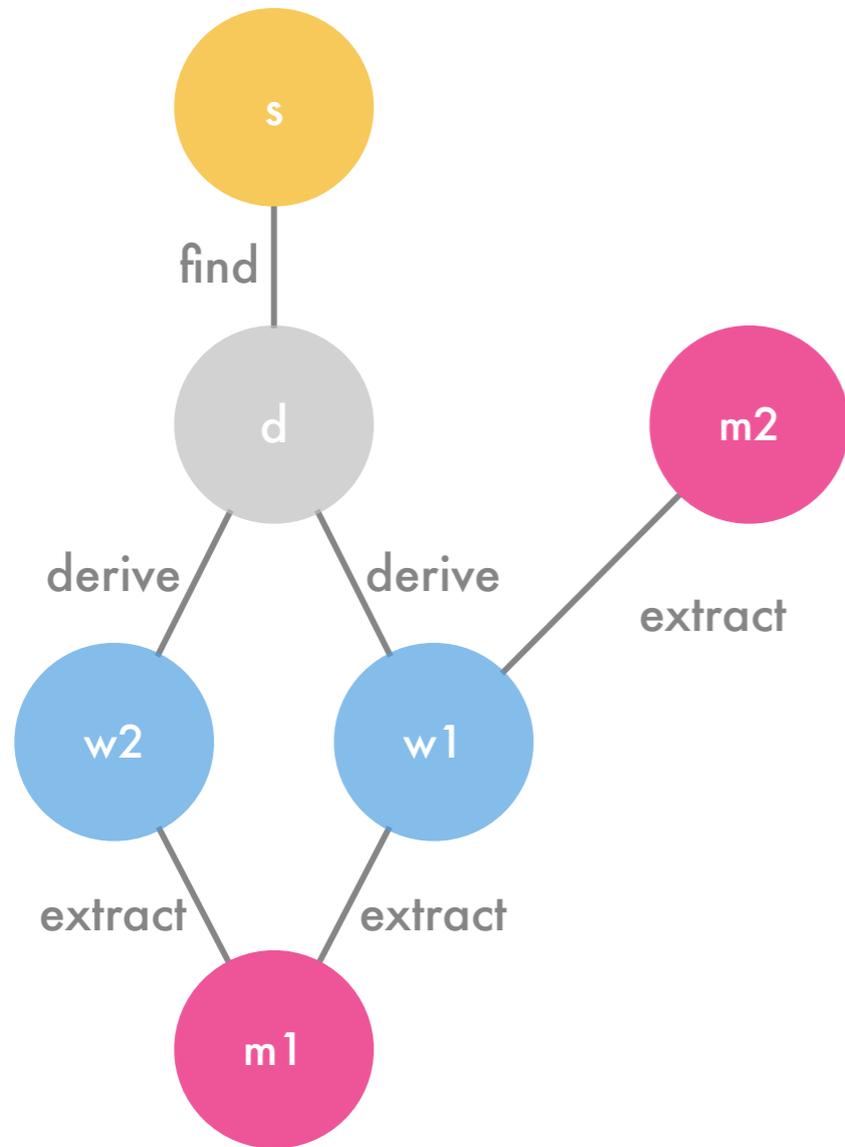
Graph-walk (Page rank)



Transitions
in both ways

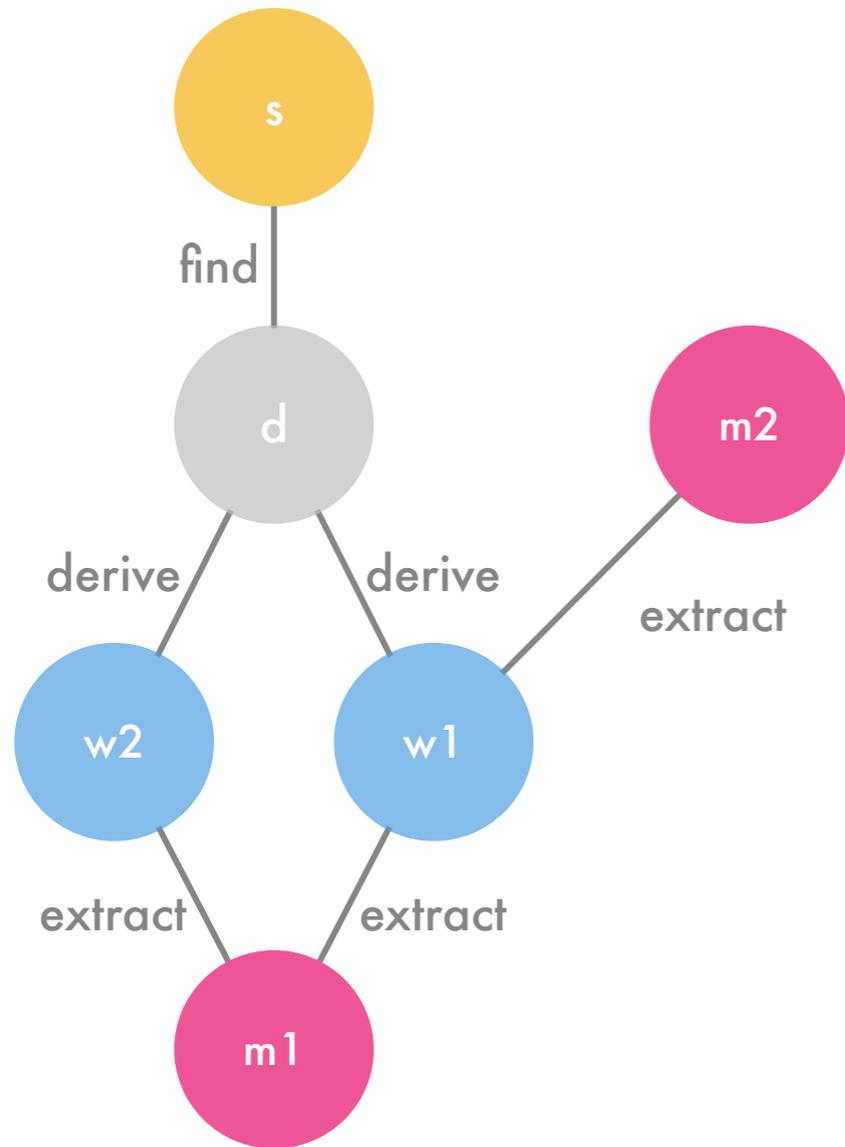


Transition Matrix



	s	d	w1	w2	m1	m2
s						
d						
w1						
w2						
m1						
m2						

Transition Matrix



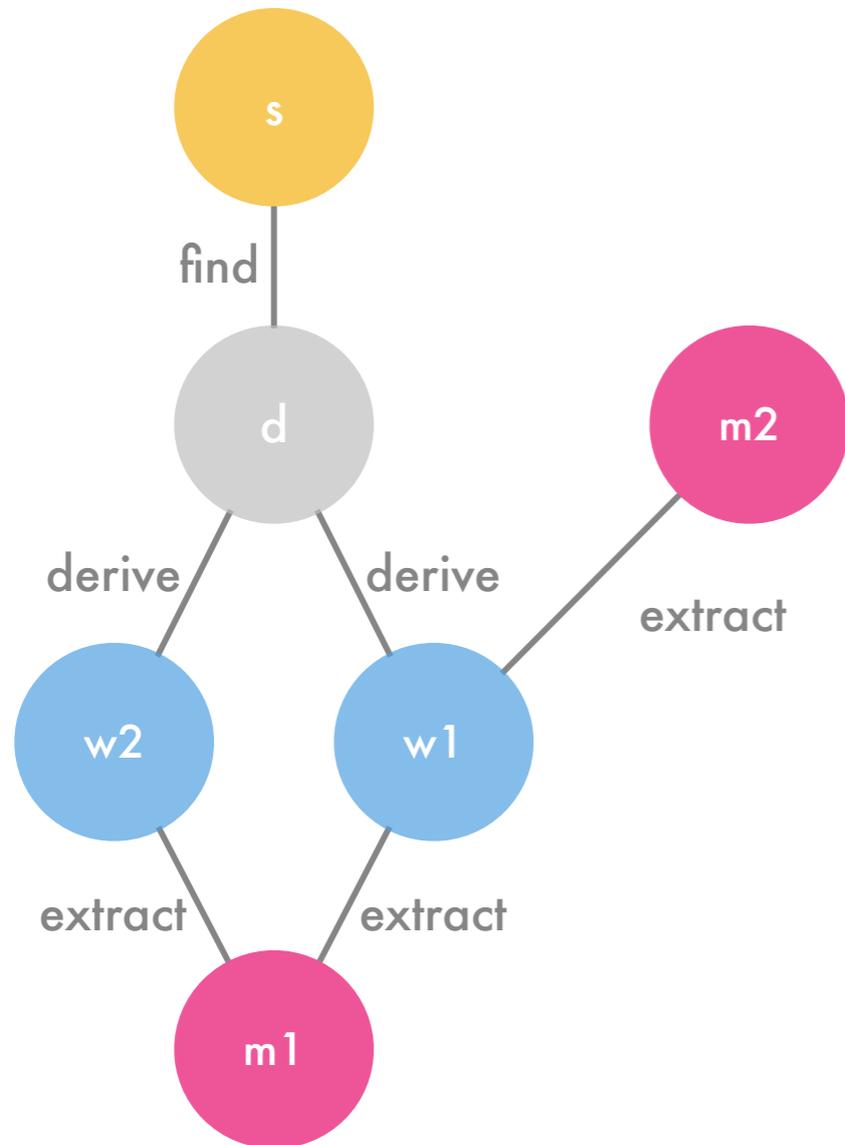
x

	s	d	w1	w2	m1	m2
s						
d						
w1						
w2						
m1						
m2						

y



Transition Matrix



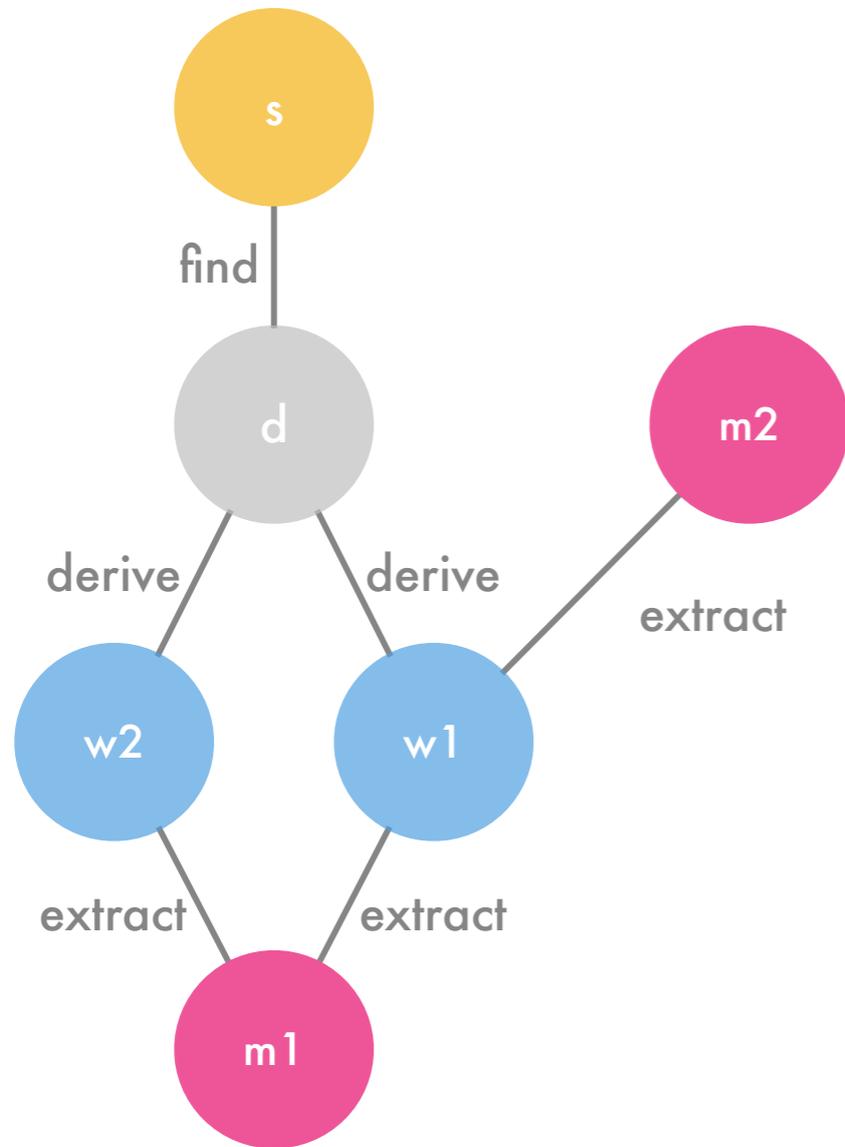
x

	s	d	w1	w2	m1	m2
s						
d						
w1						
w2						
m1						
m2						

y

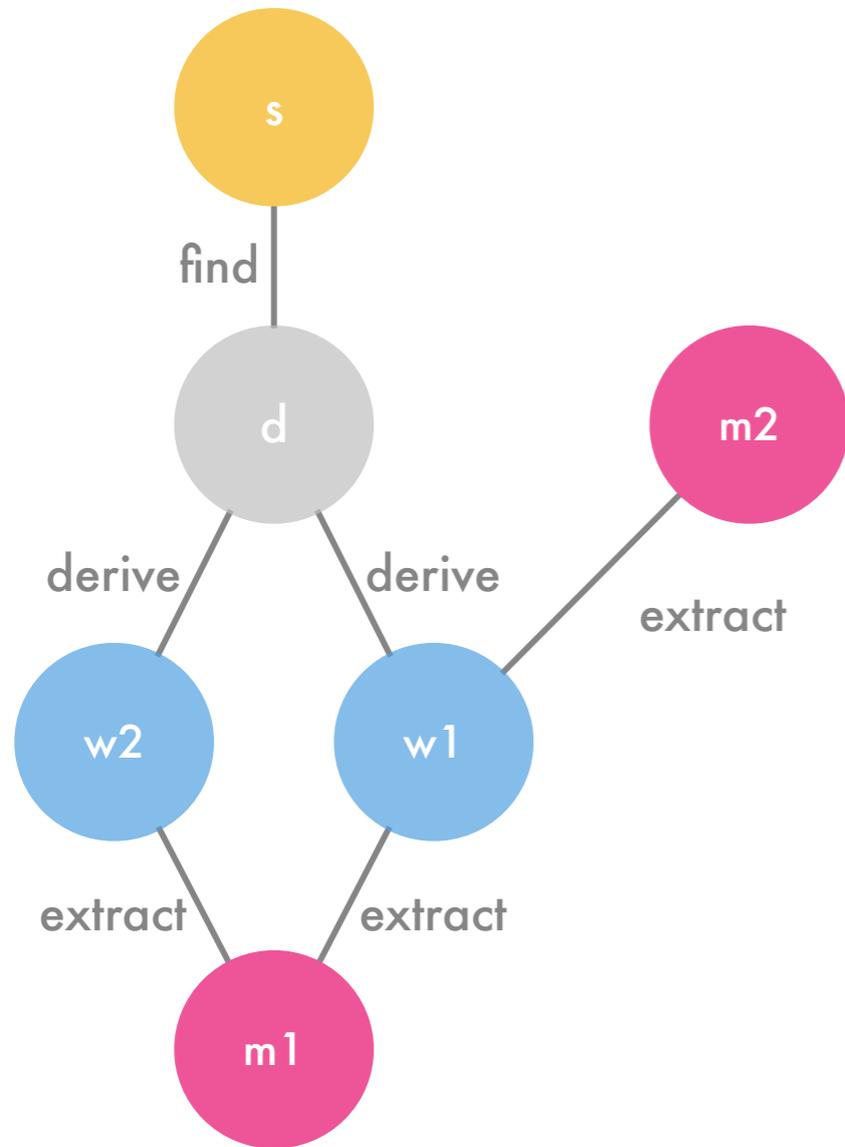
$$(x,y) = P(x \rightarrow y)$$

Transition Matrix



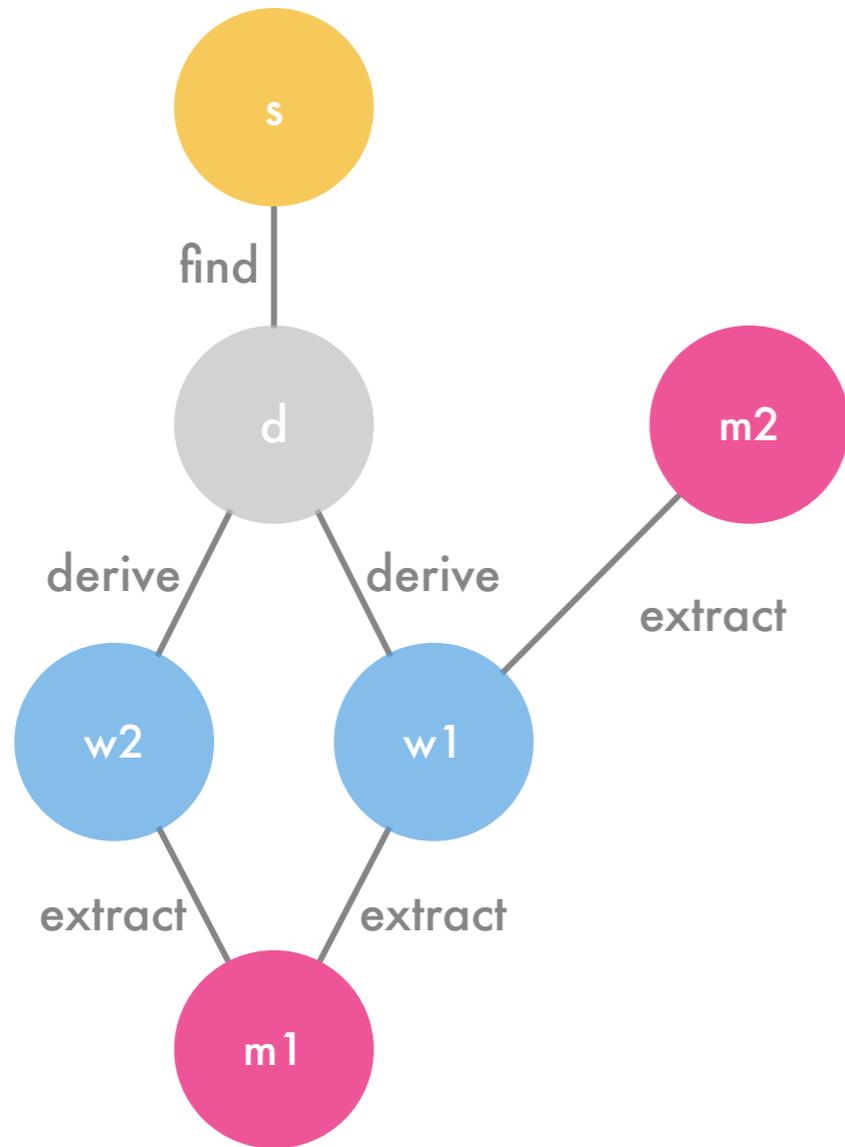
	s	d	w1	w2	m1	m2
s	0					
d						
w1						
w2						
m1						
m2						

Transition Matrix



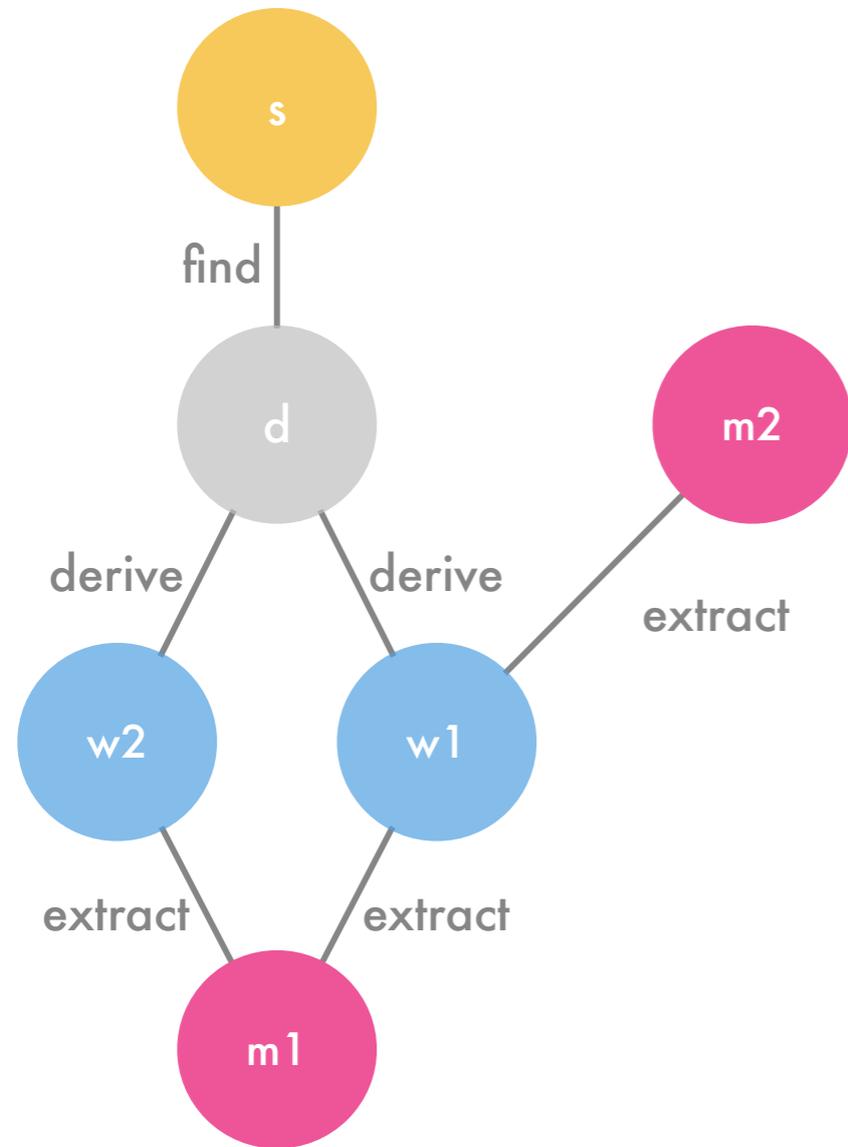
	s	d	w1	w2	m1	m2
s	0					
d	1					
w1						
w2						
m1						
m2						

Transition Matrix



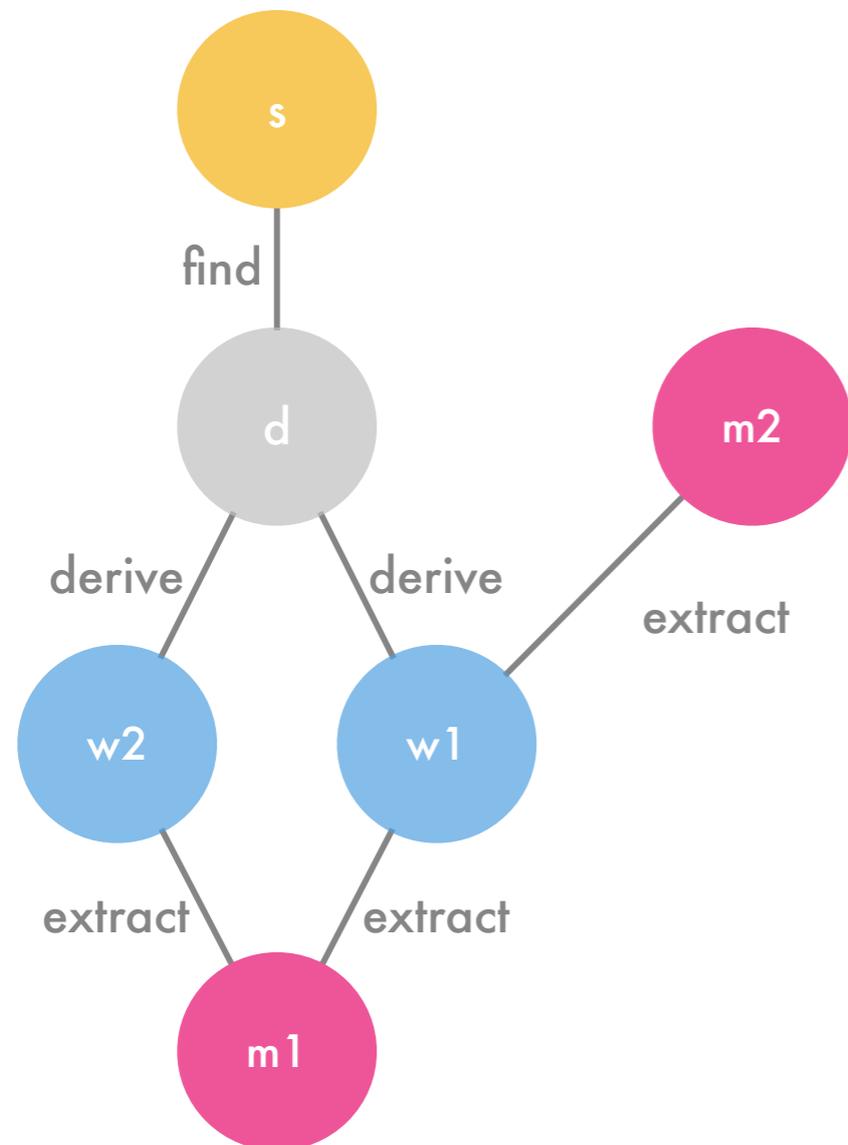
	s	d	w1	w2	m1	m2
s	0					
d	1					
w1	0					
w2	0					
m1	0					
m2	0					

Transition Matrix



	s	d	w1	w2	m1	m2
s	0	$\frac{1}{2}$				
d	1	0				
w1	0	$\frac{1}{4}$				
w2	0	$\frac{1}{4}$				
m1	0	0				
m2	0	0				

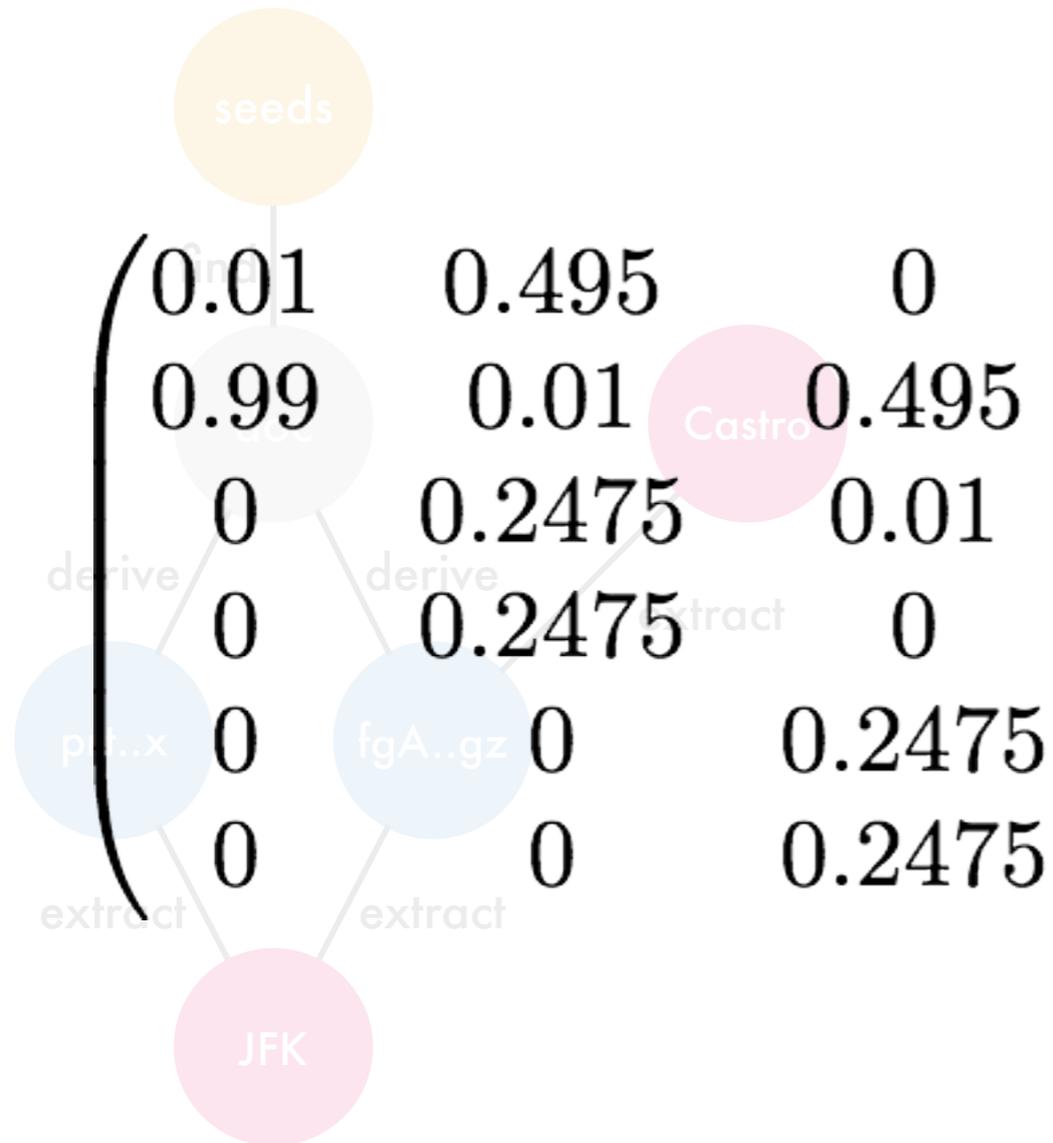
Transition Matrix



	s	d	w1	w2	m1	m2
s	0	$\frac{1}{2}$	0	0	0	0
d	1	0	$\frac{1}{2}$	$\frac{1}{2}$	0	0
w1	0	$\frac{1}{4}$	0	0	$\frac{1}{2}$	1
w2	0	$\frac{1}{4}$	0	0	$\frac{1}{2}$	0
m1	0	0	$\frac{1}{4}$	$\frac{1}{2}$	0	0
m2	0	0	$\frac{1}{4}$	0	0	0

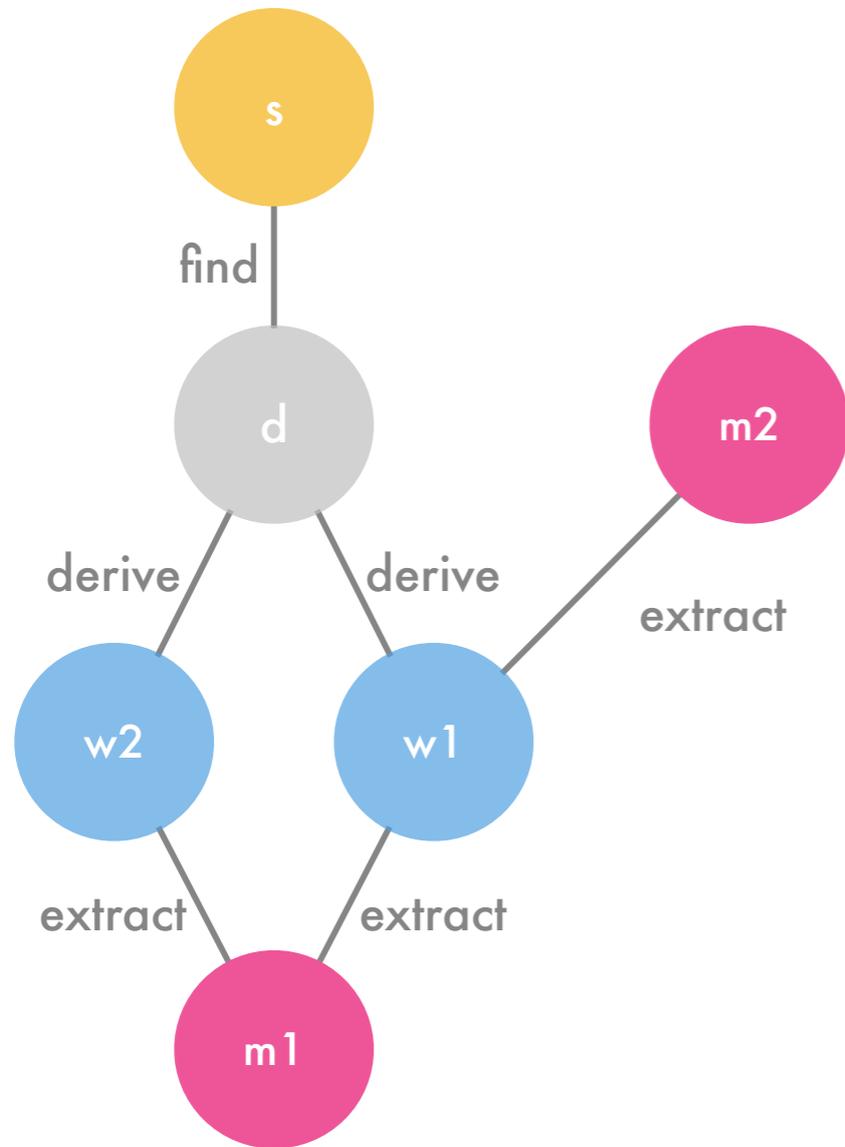
Transition Matrix

with lazyness factor $\lambda=0.01$



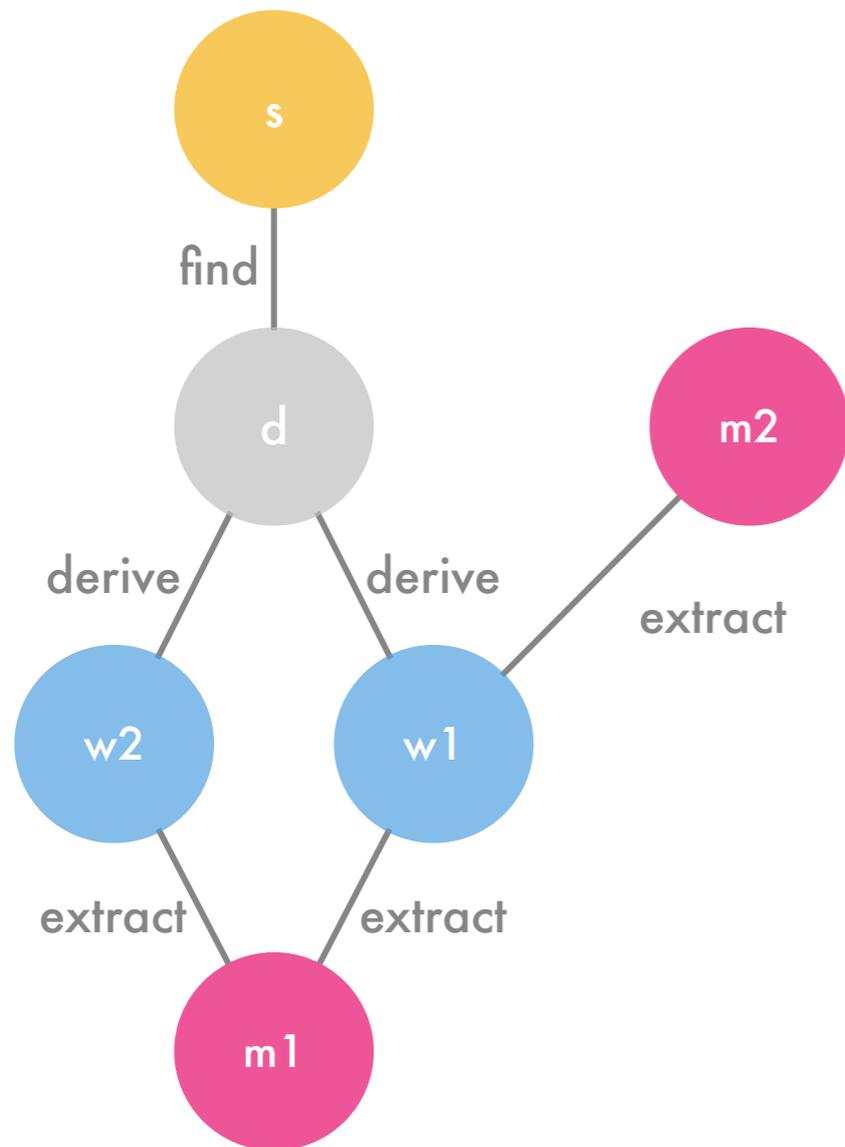
	s	d	w1	w2	m1	m2
s	0	0	0	0	0	0
d	0	1	0.495	0.495	0.99	0
w1	0	0.495	0	0	0.5	1
w2	0	0.495	0	0	0.5	0
m1	0	0	0.495	0.495	0	0
m2	0	0	0.495	0.495	0	0

State Vector



s	
d	
w1	
w2	
m1	
m2	

State Vector



s	1
d	0
w1	0
w2	0
m1	0
m2	0

Transition Matrix and State Vector

$$\begin{pmatrix} 0.01 & 0.495 & 0 & 0 & 0 & 0 \\ 0.99 & 0.01 & 0.495 & 0.495 & 0 & 0 \\ 0 & 0.2475 & 0.01 & 0 & 0.495 & 0.99 \\ 0 & 0.2475 & 0 & 0.01 & 0.495 & 0 \\ 0 & 0 & 0.2475 & 0.495 & 0.01 & 0 \\ 0 & 0 & 0.2475 & 0 & 0 & 0.01 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

Transition Matrix and State Vector

$$\begin{pmatrix} 0.01 & 0.495 & 0 & 0 & 0 & 0 \\ 0.99 & 0.01 & 0.495 & 0.495 & 0 & 0 \\ 0 & 0.2475 & 0.01 & 0 & 0.495 & 0.99 \\ 0 & 0.2475 & 0 & 0.01 & 0.495 & 0 \\ 0 & 0 & 0.2475 & 0.495 & 0.01 & 0 \\ 0 & 0 & 0.2475 & 0 & 0 & 0.01 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} =$$

Transition Matrix and State Vector

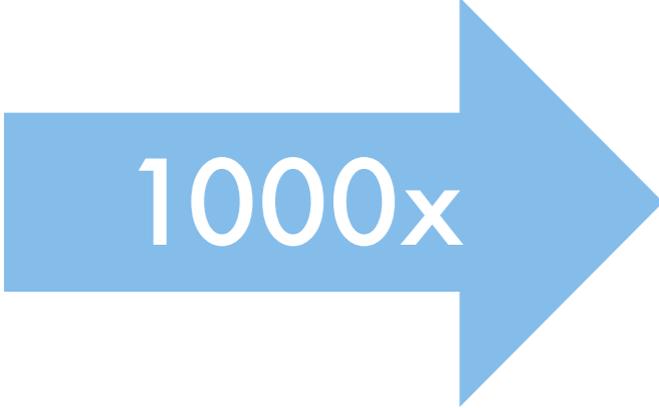
$$\begin{pmatrix} 0.01 & 0.495 & 0 & 0 & 0 & 0 \\ 0.99 & 0.01 & 0.495 & 0.495 & 0 & 0 \\ 0 & 0.2475 & 0.01 & 0 & 0.495 & 0.99 \\ 0 & 0.2475 & 0 & 0.01 & 0.495 & 0 \\ 0 & 0 & 0.2475 & 0.495 & 0.01 & 0 \\ 0 & 0 & 0.2475 & 0 & 0 & 0.01 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 0.01 \\ 0.99 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

Iterated Multiplication

$$\begin{pmatrix} 0.01 & 0.495 & 0 & 0 & 0 & 0 \\ 0.99 & 0.01 & 0.495 & 0.495 & 0 & 0 \\ 0 & 0.2475 & 0.01 & 0 & 0.495 & 0.99 \\ 0 & 0.2475 & 0 & 0.01 & 0.495 & 0 \\ 0 & 0 & 0.2475 & 0.495 & 0.01 & 0 \\ 0 & 0 & 0.2475 & 0 & 0 & 0.01 \end{pmatrix} \cdot \begin{pmatrix} 0.01 \\ 0.99 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 0.49015 \\ 0.0198 \\ 0.245025 \\ 0.245025 \\ 0 \\ 0 \end{pmatrix}$$

Iterated Multiplication

$$\begin{pmatrix} 0.01 & 0.495 & 0 & 0 & 0 & 0 \\ 0.99 & 0.01 & 0.495 & 0.495 & 0 & 0 \\ 0 & 0.2475 & 0.01 & 0 & 0.495 & 0.99 \\ 0 & 0.2475 & 0 & 0.01 & 0.495 & 0 \\ 0 & 0 & 0.2475 & 0.495 & 0.01 & 0 \\ 0 & 0 & 0.2475 & 0 & 0 & 0.01 \end{pmatrix} \cdot \begin{pmatrix} 0.01 \\ 0.99 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 0.49015 \\ 0.0198 \\ 0.245025 \\ 0.245025 \\ 0 \\ 0 \end{pmatrix}$$



1000x

Iterated Multiplication

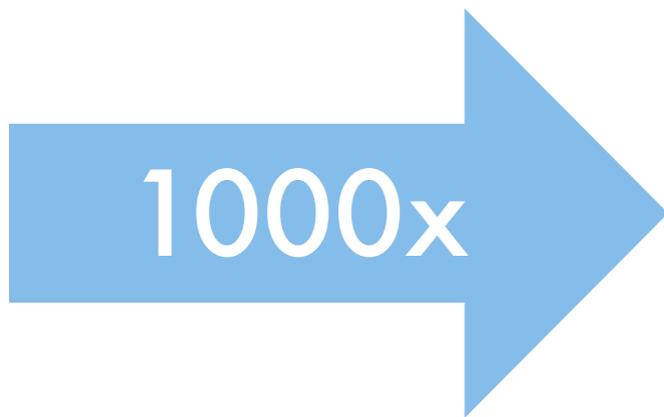
$$\begin{pmatrix} 0.01 & 0.495 & 0 & 0 & 0 & 0 \\ 0.99 & 0.01 & 0.495 & 0.495 & 0 & 0 \\ 0 & 0.2475 & 0.01 & 0 & 0.495 & 0.99 \\ 0 & 0.2475 & 0 & 0.01 & 0.495 & 0 \\ 0 & 0 & 0.2475 & 0.495 & 0.01 & 0 \\ 0 & 0 & 0.2475 & 0 & 0 & 0.01 \end{pmatrix} \cdot \begin{pmatrix} 0.01 \\ 0.99 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 0.49015 \\ 0.0198 \\ 0.245025 \\ 0.245025 \\ 0 \\ 0 \end{pmatrix}$$

1000x

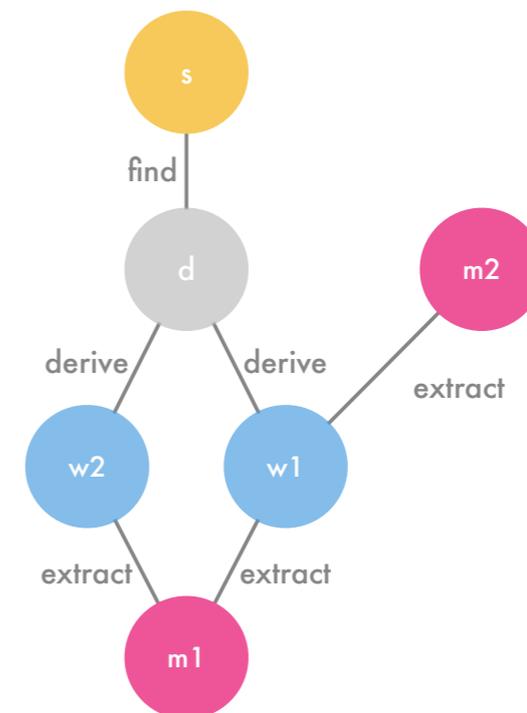
$$\begin{pmatrix} .1666666669360522 \\ .3333333327945566 \\ .1904761907840597 \\ .1428571430880448 \\ .1190476188551988 \\ .04761904754207952 \end{pmatrix}$$

Iterated Multiplication

$$\begin{pmatrix} 0.01 & 0.495 & 0 & 0 & 0 & 0 \\ 0.99 & 0.01 & 0.495 & 0.495 & 0 & 0 \\ 0 & 0.2475 & 0.01 & 0 & 0.495 & 0.99 \\ 0 & 0.2475 & 0 & 0.01 & 0.495 & 0 \\ 0 & 0 & 0.2475 & 0.495 & 0.01 & 0 \\ 0 & 0 & 0.2475 & 0 & 0 & 0.01 \end{pmatrix} \cdot \begin{pmatrix} 0.01 \\ 0.99 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 0.49015 \\ 0.0198 \\ 0.245025 \\ 0.245025 \\ 0 \\ 0 \end{pmatrix}$$



$$\begin{pmatrix} .1666666669360522 \\ .3333333327945566 \\ .1904761907840597 \\ .1428571430880448 \\ .1190476188551988 \\ .04761904754207952 \end{pmatrix}$$



Evaluation

Evaluation

- Tested English, Chinese, Japanese

Evaluation

- Tested English, Chinese, Japanese
- 36 datasets, 18 classes

Evaluation

- Tested English, Chinese, Japanese
- 36 datasets, 18 classes
- 9 classes for all 3 languages (e.g. US presidents)

Evaluation

- Tested English, Chinese, Japanese
- 36 datasets, 18 classes
- 9 classes for all 3 languages (e.g. US presidents)
- 9 language-specific classes (e.g. Chinese dynasties)

Evaluation

- Tested English, Chinese, Japanese
- 36 datasets, 18 classes
 - 9 classes for all 3 languages (e.g. US presidents)
 - 9 language-specific classes (e.g. Chinese dynasties)
- 5 runs / dataset, 3 random seeds

MAP > 90%

US Presidents cont.

US Presidents cont.

- rcwang.com/seal

US Presidents cont.

- rcwang.com/seal
- boowa.com

US Presidents cont.

- rcwang.com/seal
- boowa.com
- Still strange results

US Presidents cont.

- rcwang.com/seal
- boowa.com
- Still strange results
 - Google results

US Presidents cont.

- rcwang.com/seal
- boowa.com
- Still strange results
 - Google results
 - Latest news

US Presidents cont.

- rcwang.com / seal
- boowa.com
- Still strange results
 - Google results
 - Latest news

[George W. Bush, Bill Clinton issue statements on Osama bin Laden's ...](#) 
2 May 2011 ... President **Barack Obama** announced al Qaeda leader **Osama bin ...** George
W. Bush, **Bill Clinton** issue statements on **Osama bin Laden's** death ...
[blog.zap2it.com/.../george-w-bush-bill-clinton-issue-statements-on-osama-bin-ladens-
death.html](http://blog.zap2it.com/.../george-w-bush-bill-clinton-issue-statements-on-osama-bin-ladens-death.html) - [Cached](#)

US Presidents cont.

- rcwang.com / seal
- boowa.com
- Still strange results
 - Google results
 - Latest news

#	Found Items
1	Hillary Clinton
2	Sarah Palin
3	John McCain
4	Donald Trump
5	Ronald Reagan
6	Al Gore
7	Jimmy Carter
8	Pakistan
9	David Petraeus
10	Dick Cheney
11	Richard Nixon
12	Osama bin Laden
13	Robert Gates
14	President
15	Michael Bloomberg
16	Republican Party
17	Democrats
18	Israel
19	Karl Rove
20	Harry Reid

[George W. Bush, Bill Clinton issue statements on Osama bin Laden's ...](#) 
2 May 2011 ... President **Barack Obama** announced al Qaeda leader **Osama bin ...** George
W. Bush, **Bill Clinton** issue statements on **Osama bin Laden's** death ...
[blog.zap2it.com/.../george-w-bush-bill-clinton-issue-statements-on-osama-bin-ladens-
death.html - Cached](#)

Bootstrapping



```
stats = {}, used = input, rs1t = {}

for i = 1 to M do
  m = min(3, |used|)
  seeds = selectm(used) U top(rs1t)
  stats = expand(seeds)
  rs1t = rank(stats)
  used = used U seeds
rof
```

Binary Relations



More Wrappers

More Wrappers

- New: Middle context

More Wrappers

- New: Middle context
- Slight adjustments to the old algorithm

More Wrappers

- New: Middle context
- Slight adjustments to the old algorithm
- “Mayor of...”

More Wrappers

- New: Middle context
- Slight adjustments to the old algorithm
- “Mayor of...”
- “Duet with...”, etc.

sadhSAbcGsadutsobAMawrKu
SAjkLsdFautsmeRKelwrKgErmA
nyjkLsdfkuxeSAmcvDkBSs



sadhSAbcGsadutsobAMawrKu
SAjkLsdFautsmeRkelwrKgErmA
nyjkLsdfkuxeSAmcvDkBSs

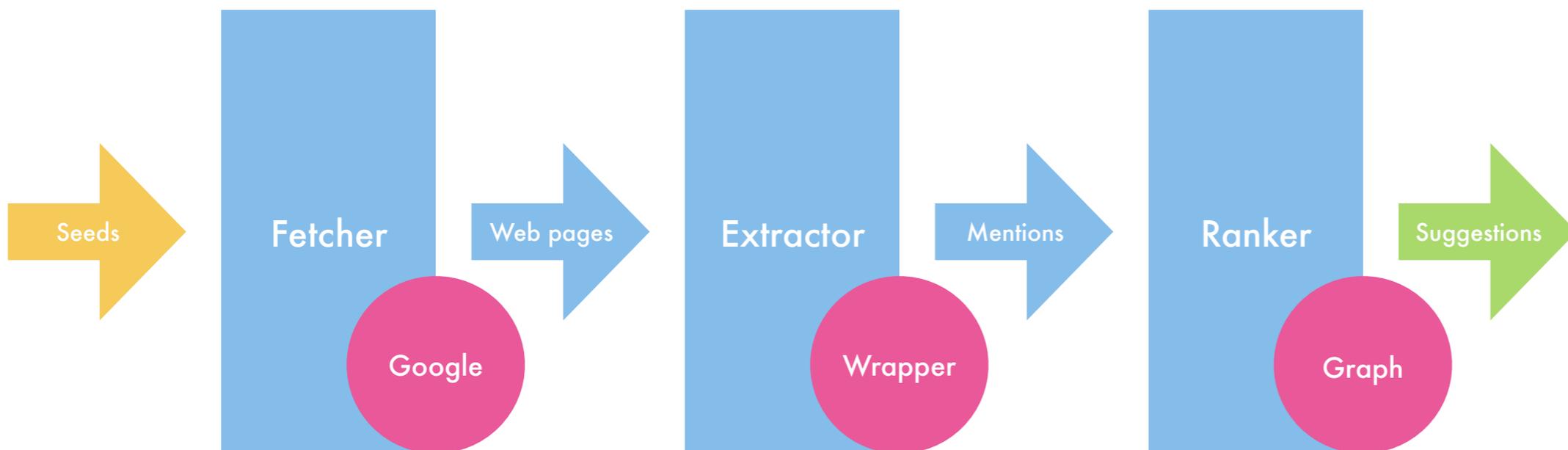


Much res

Not sure if that fits...

going on

Thank you



- Bootstrapping
- Binary relations