Folktale similarity based on ontological abstraction

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Research task

- Compute pair-wise similarity of folktale texts using WordNet

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- Capture common elements in actors and events at an abstract level

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- Capture common elements in actors and events at an abstract level
- Complement existing folktale classification standards

Data

- Data taken from Dutch Folktale Database
  - `http://www.verhalenbank.nl/`, in Dutch

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- Subcorpus for proof of concept

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- Subcorpus for proof of concept
- 16 folktales, 33,022 words
- Grammatically correct, modern Dutch
- "Er was eens een klein meisje, dat Roodkapje heette. Wat een gekke naam, hè? Ze heette ook niet echt Roodkapje."
- *Once upon a time there lived a little girl, called Little Red Riding Hood. What a strange name, isn't it? She was not actually called Little Red Riding Hood.*

Preprocessing

- Preprocessing using Frog

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- Tokenization, lemmatization, POS-tagging
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- "Er was eens een klein meisje, dat Roodkapje heette. Wat een gekke naam, hè? Ze heette ook niet echt Roodkapje."
- *Once upon a time there lived a little girl, called Little Red Riding Hood. What a strange name, isn't it? She was not actually called Little Red Riding Hood.*
- klein meisje Roodkapje heten. gek naam hè. heten echt Roodkapje
- *little girl Little_Red call. strange name eh. call really Little_Red.*

Similarity computation

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- Sentence level comparison

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Similarity computation

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- Sentence level comparison
- Check for exact match or abstract match using WordNet
  - Dutch WordNet: Cornetto
- Match similarity score based on level of abstraction
- Sentence similarity score based on match similarity relative to size of lemma sets
- Directed similarity score for each sentence
- First synset used

Similarity computation example

Good day madam, said the princess, what are you doing?

Good afternoon basket maker, said the gnome.

---

source	Good day	madam	said	the	princess	what	does	you	there

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

---

source	Good day	madam	said	the	princess	what	does	you	there
lemma	day	madam	speak	princess	do				

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

---

source	Good day	madam	said	the	princess	what	does	you	there
lemma	day	madam	speak	princess	do				
synset	day	lady	speak	royal daughter	do				

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

---

day | lady | speak | royal daughter | do

Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

Good afternoon | basket maker | said | the | gnome

day | lady | speak | royal daughter | do

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

Good afternoon | basket maker | said | the | gnome

good afternoon | basket maker | speak | gnome

day | lady | speak | royal daughter | do

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

day | lady | speak | royal daughter | do

Good afternoon | basket maker | said | the | gnome

good afternoon | basket maker | speak | gnome

good afternoon | basket maker | speak | gnome

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

day | lady | speak | royal daughter | do | time unit

good afternoon | basket maker | speak | gnome

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

day | lady | speak | royal daughter | do

time unit

unit

good afternoon | basket maker | speak | gnome

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

day | lady | speak | royal daughter | do

time unit

unit

something

good afternoon | basket maker | speak | gnome

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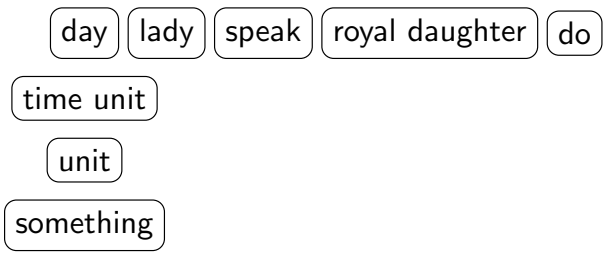
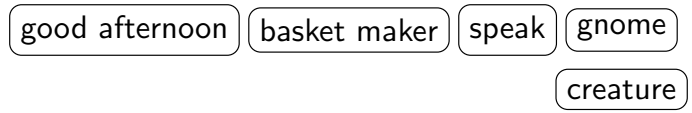
Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.





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Similarity computation example

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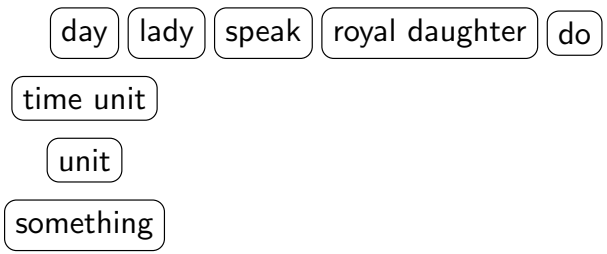
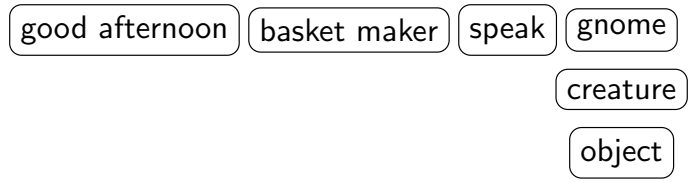
Good afternoon basket maker, said the gnome.





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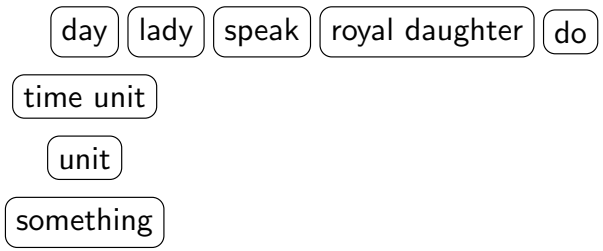
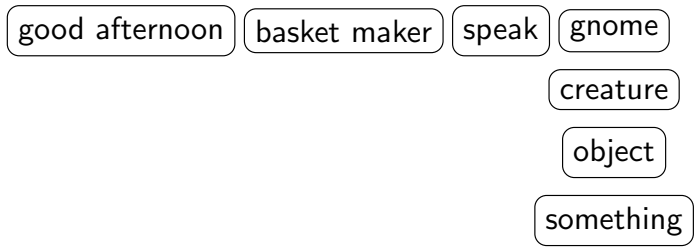
Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.





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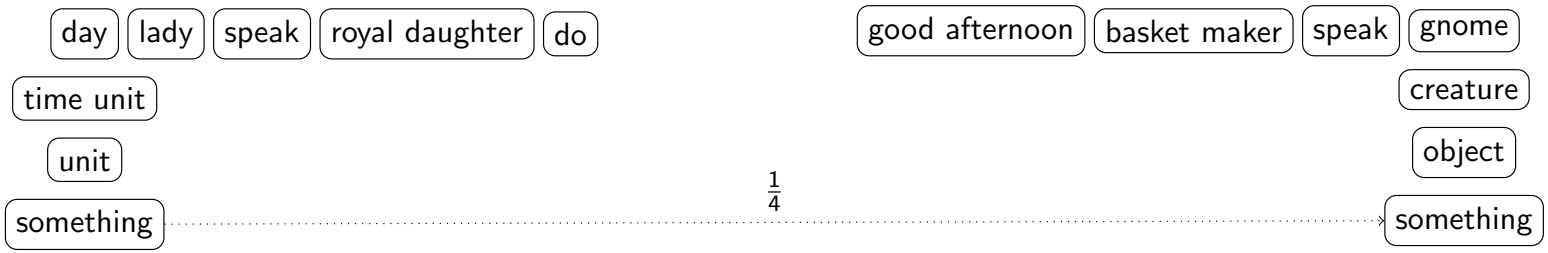

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

((1/4

day | lady | speak | royal daughter | do

good afternoon | basket maker | speak | gnome

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4}$

day | lady | speak | royal daughter | do | figure

good afternoon | basket maker | speak | gnome

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

((1/4

day | lady | speak | royal daughter | do | figure

good afternoon | basket maker | speak | gnome | maker

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4}$

day | lady | speak | royal daughter | do | figure

good afternoon | basket maker | speak | gnome | maker | figure

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Good day madam, said the princess, what are you doing?
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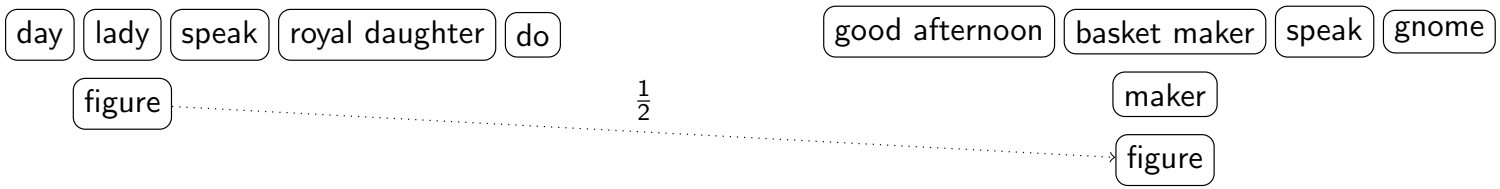

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4} + \frac{1}{2}$

day | lady | speak | royal daughter | do

good afternoon | basket maker | speak | gnome

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Similarity computation example

Good day madam, said the princess, what are you doing?
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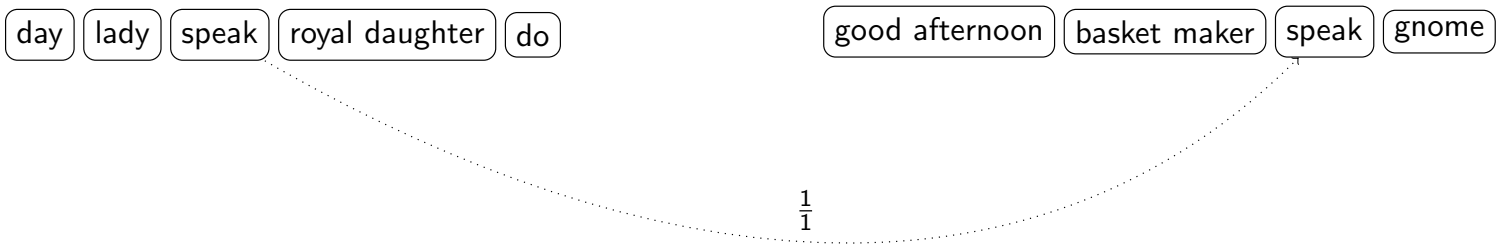

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4} + \frac{1}{2} + 1$

day | lady | speak | royal daughter | do

good afternoon | basket maker | speak | gnome

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4} + \frac{1}{2} + 1$

day | lady | speak | royal daughter | do | daughter

good afternoon | basket maker | speak | gnome

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4} + \frac{1}{2} + 1$

day | lady | speak | royal daughter | do

daughter

child

good afternoon | basket maker | speak | gnome

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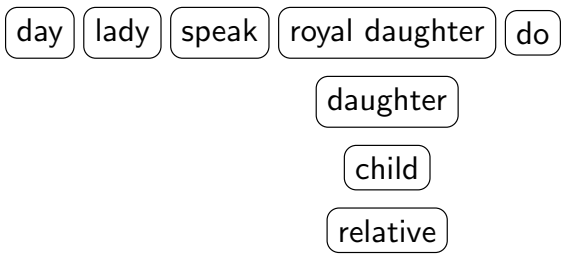
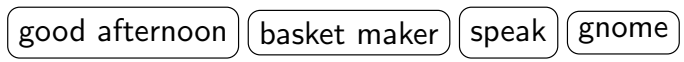
Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4} + \frac{1}{2} + 1$





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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4} + \frac{1}{2} + 1$

day | lady | speak | royal daughter | do

daughter

child

relative

member

good afternoon | basket maker | speak | gnome

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4} + \frac{1}{2} + 1$

day | lady | speak | royal daughter | do

daughter

child

relative

member

figure

good afternoon | basket maker | speak | gnome

Universiteit Utrecht

Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4} + \frac{1}{2} + 1$

day | lady | speak | royal daughter | do

daughter

child

relative

member

figure

good afternoon | basket maker | speak | gnome

maker

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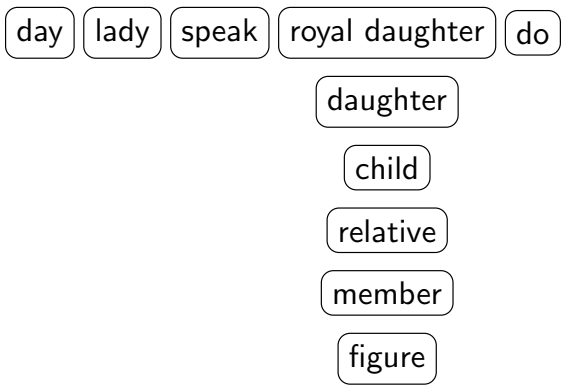

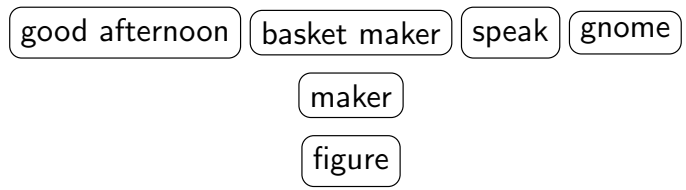

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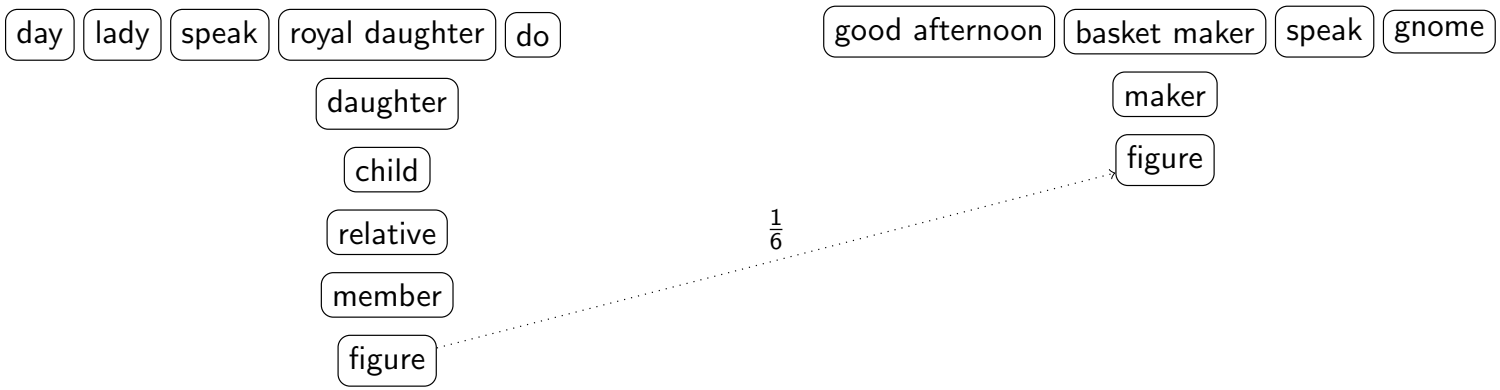

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4} + \frac{1}{2} + 1 + \frac{1}{6}$

day | lady | speak | royal daughter | do

good afternoon | basket maker | speak | gnome

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4} + \frac{1}{2} + 1 + \frac{1}{6}$

day | lady | speak | royal daughter | do | act

good afternoon | basket maker | speak | gnome

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4} + \frac{1}{2} + 1 + \frac{1}{6}$

day | lady | speak | royal daughter | do | act

good afternoon | basket maker | speak | gnome | notify

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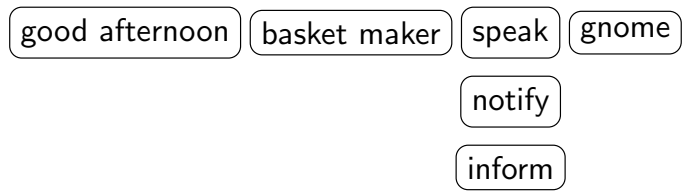
Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4} + \frac{1}{2} + 1 + \frac{1}{6}$



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Similarity computation example

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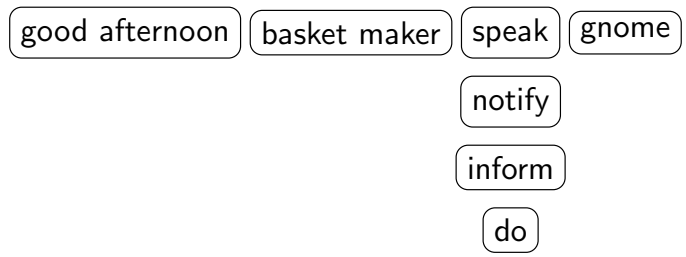

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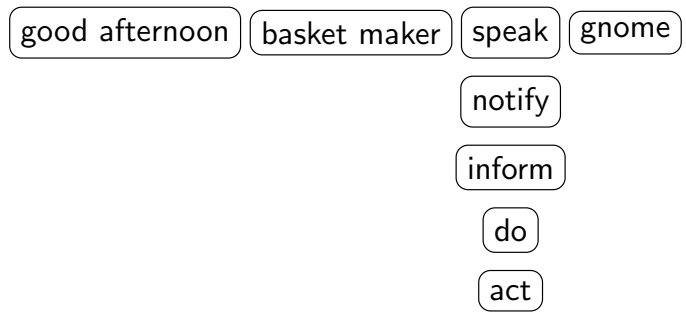
Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4} + \frac{1}{2} + 1 + \frac{1}{6}$



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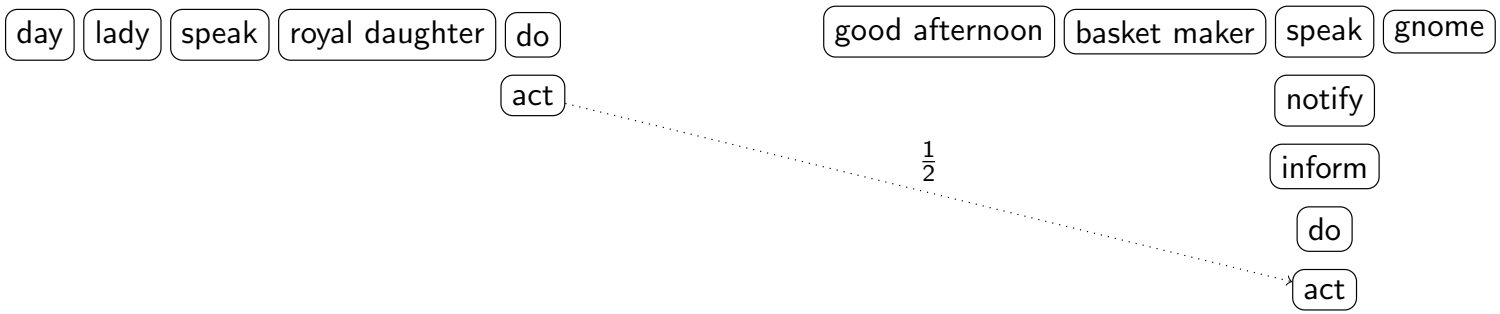
Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4} + \frac{1}{2} + 1 + \frac{1}{6}$



Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4}+\frac{1}{2}+1+\frac{1}{6}+\frac{1}{2})$

day | lady | speak | royal daughter | do

good afternoon | basket maker | speak | gnome

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4}+\frac{1}{2}+1+\frac{1}{6}+\frac{1}{2})$

day | lady | speak | royal daughter | do

good afternoon | basket maker | speak | gnome

no match

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4}+\frac{1}{2}+1+\frac{1}{6}+\frac{1}{2})+(0$

day | lady | speak | royal daughter | do

good afternoon | basket maker | speak | gnome

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4}+\frac{1}{2}+1+\frac{1}{6}+\frac{1}{2})+(0$

day | lady | speak | royal daughter | do

good afternoon | basket maker | speak | gnome | maker

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4}+\frac{1}{2}+1+\frac{1}{6}+\frac{1}{2})+(0$

day | lady | speak | royal daughter | do

good afternoon | basket maker | speak | gnome

maker

figure

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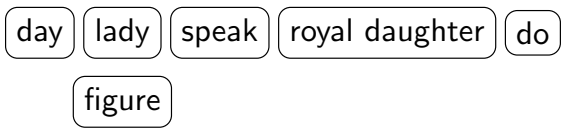
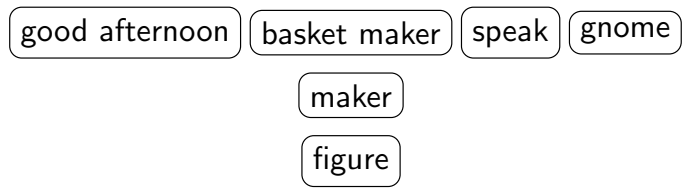
Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4}+\frac{1}{2}+1+\frac{1}{6}+\frac{1}{2})+(0$





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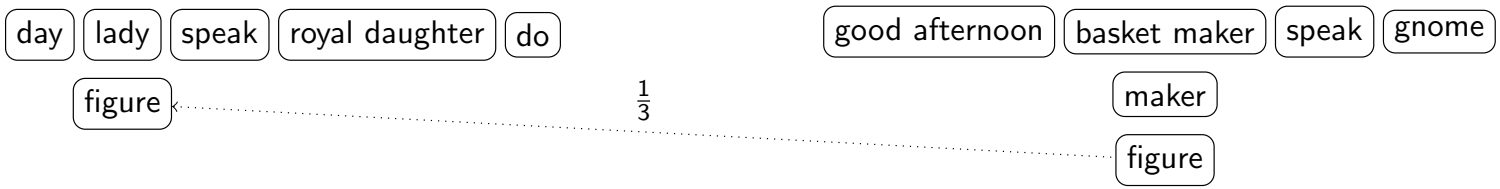
Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4}+\frac{1}{2}+1+\frac{1}{6}+\frac{1}{2})+(0$



Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4}+\frac{1}{2}+1+\frac{1}{6}+\frac{1}{2})+(0+\frac{1}{3}$

day | lady | speak | royal daughter | do

good afternoon | basket maker | speak | gnome

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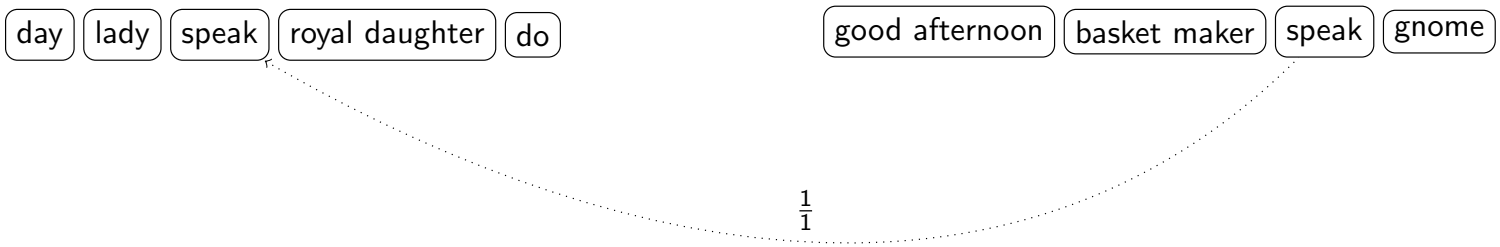
Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4}+\frac{1}{2}+1+\frac{1}{6}+\frac{1}{2})+(0+\frac{1}{3}$



Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4}+\frac{1}{2}+1+\frac{1}{6}+\frac{1}{2})+(0+\frac{1}{3}+1$

day | lady | speak | royal daughter | do

good afternoon | basket maker | speak | gnome

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$$((\tfrac{1}{4}+\tfrac{1}{2}+1+\tfrac{1}{6}+\tfrac{1}{2})+(0+\tfrac{1}{3}+1$$

day | lady | speak | royal daughter | do

good afternoon | basket maker | speak | gnome | creature

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$$((\tfrac{1}{4}+\tfrac{1}{2}+1+\tfrac{1}{6}+\tfrac{1}{2})+(0+\tfrac{1}{3}+1$$

day | lady | speak | royal daughter | do | daughter

good afternoon | basket maker | speak | gnome | creature

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$((\frac{1}{4}+\frac{1}{2}+1+\frac{1}{6}+\frac{1}{2})+(0+\frac{1}{3}+1$

day | lady | speak | royal daughter | do

daughter

child

good afternoon | basket maker | speak | gnome

creature

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Similarity computation example

Good day madam, said the princess, what are you doing?
Good afternoon basket maker, said the gnome.

$$((\tfrac{1}{4}+\tfrac{1}{2}+1+\tfrac{1}{6}+\tfrac{1}{2})+(0+\tfrac{1}{3}+1$$

day | lady | speak | royal daughter | do

daughter

child

relative

good afternoon | basket maker | speak | gnome

creature

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Similarity computation example

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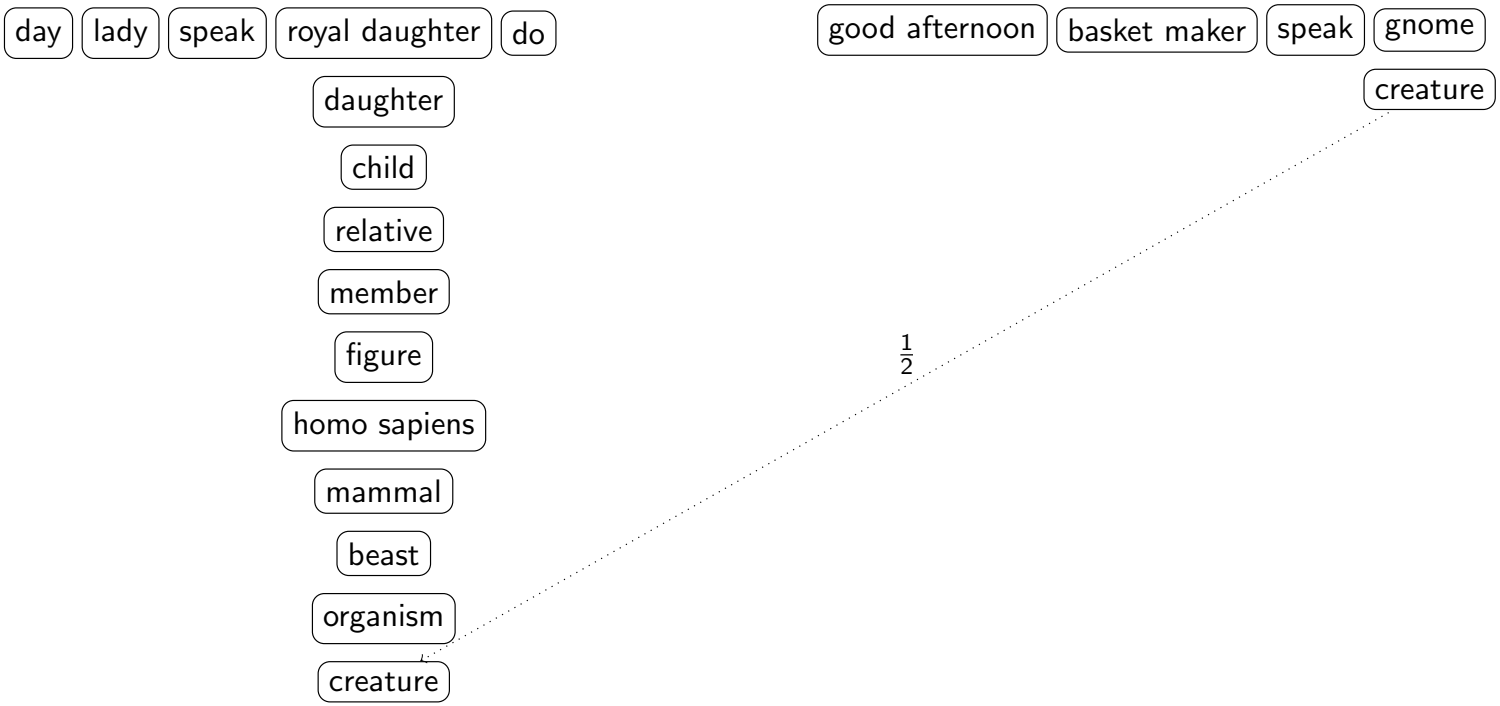

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$$((\tfrac{1}{4}+\tfrac{1}{2}+1+\tfrac{1}{6}+\tfrac{1}{2})+(0+\tfrac{1}{3}+1+\tfrac{1}{2}))\,/(5+4)=0.47$$

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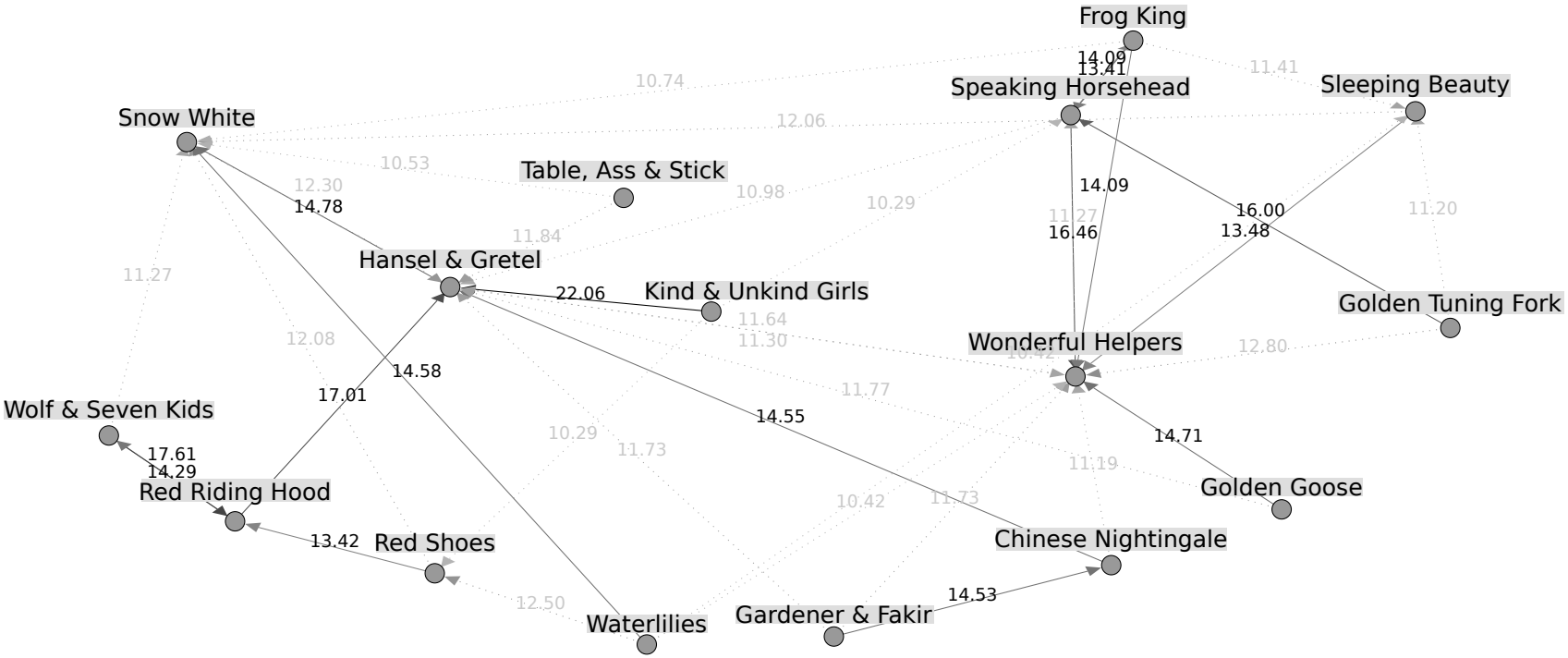
- Clusters based on similarity thresholds

Similarity computation results



- Central nodes and clusters visible
- Royal protagonists, moral values vs. civilian protagonists, dangerous circumstances

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Differences with other approaches

- Approaches for pairs of concepts
  - Evaluation using human concept similarity ratings

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  - Evaluation less straightforward

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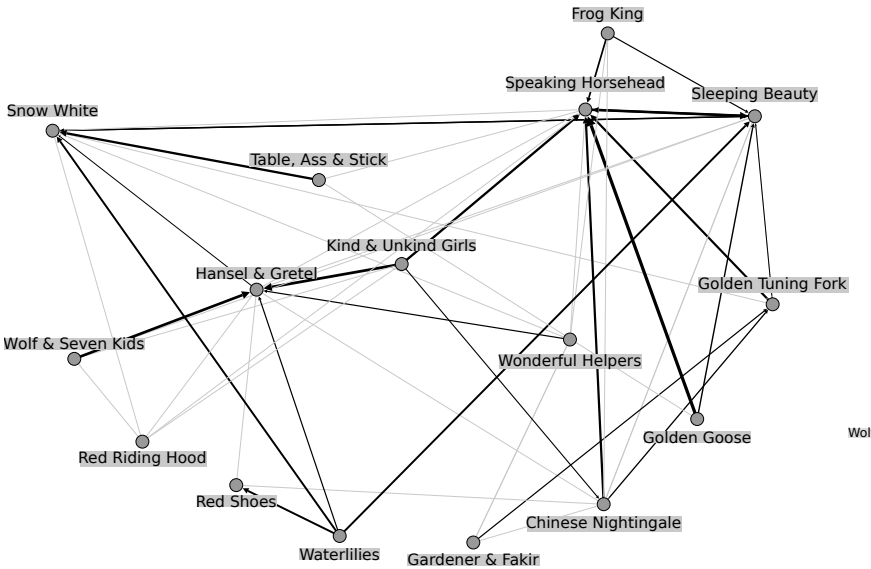
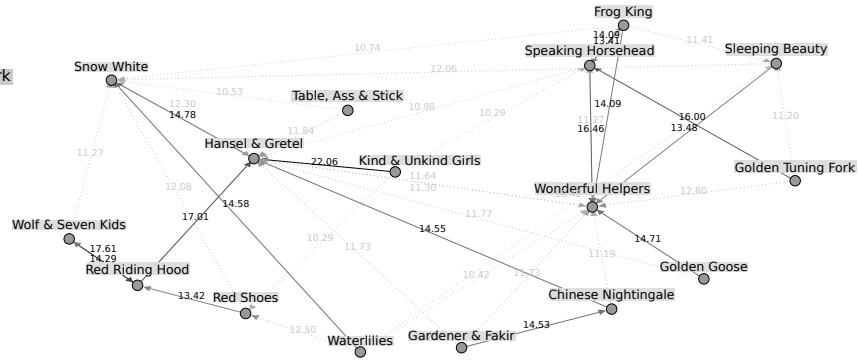
- Current measure: length from current node to first shared node
- Intended as measure of actor/event relatedness at some level of abstraction, instead of similarity

Evaluation

- Same method, no WordNet, lemma's only





- Clustering and central nodes less apparent

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Evaluation

- Similarity measure vs. human ratings

scored term	McNo	McRel	McSim	RgNo	RgRel	RgSim
source	**0.64**	**0.60**	0.64	0.54	0.48	0.55
target	0.44	0.39	0.49	0.53	0.53	0.54
lowest	0.59	0.54	0.63	0.53	0.52	0.55
average	0.62	0.56	**0.65**	**0.58**	**0.55**	**0.59**
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- Miller & Charles, Rubenstein & Goodenough word pairs
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- Different type of similarity measure

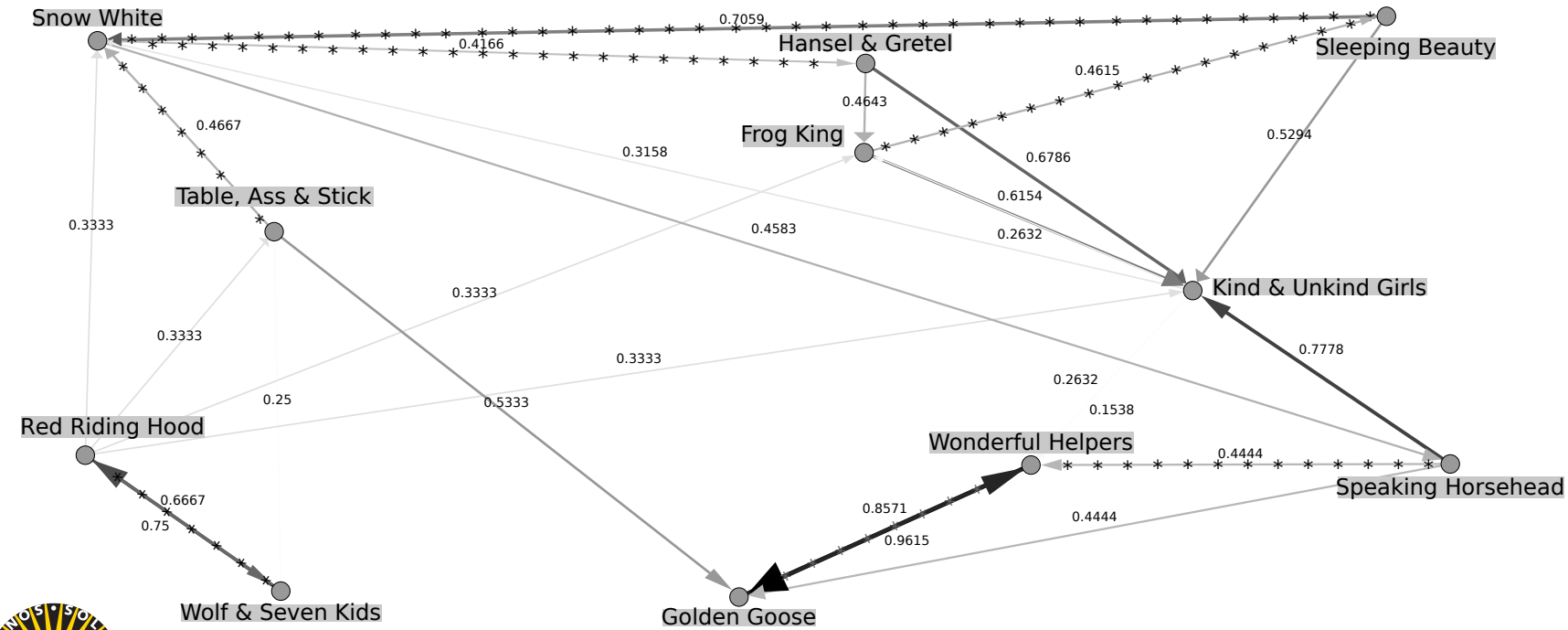
Evaluation

- Comparison with Thompson Motif Index
- Limited number of (semi-)abstract story elements for many (but not all) folktales

ATU	*Title*	*Motif description*	*Motif code*	*match level*
123	The Wolf & the Seven Kids	Disguise by changing voice	K1832	
333	Little Red Riding Hood	Wolf puts flour on his paw to disguise himself	K1839.1	4
533	The Speaking Horsehead	Disguise as goose-girl (turkey-girl)	K1816.5	3
533	The Speaking Horsehead	Imposter forces oath of secrecy	K1933	2
709	Snow White	Compassionate executioner: substituted heart	K0512.2	1

Evaluation

- Directed motif overlap, 2 most similar documents per node
- Asterisk (*) indicates relation also found by WordNet method



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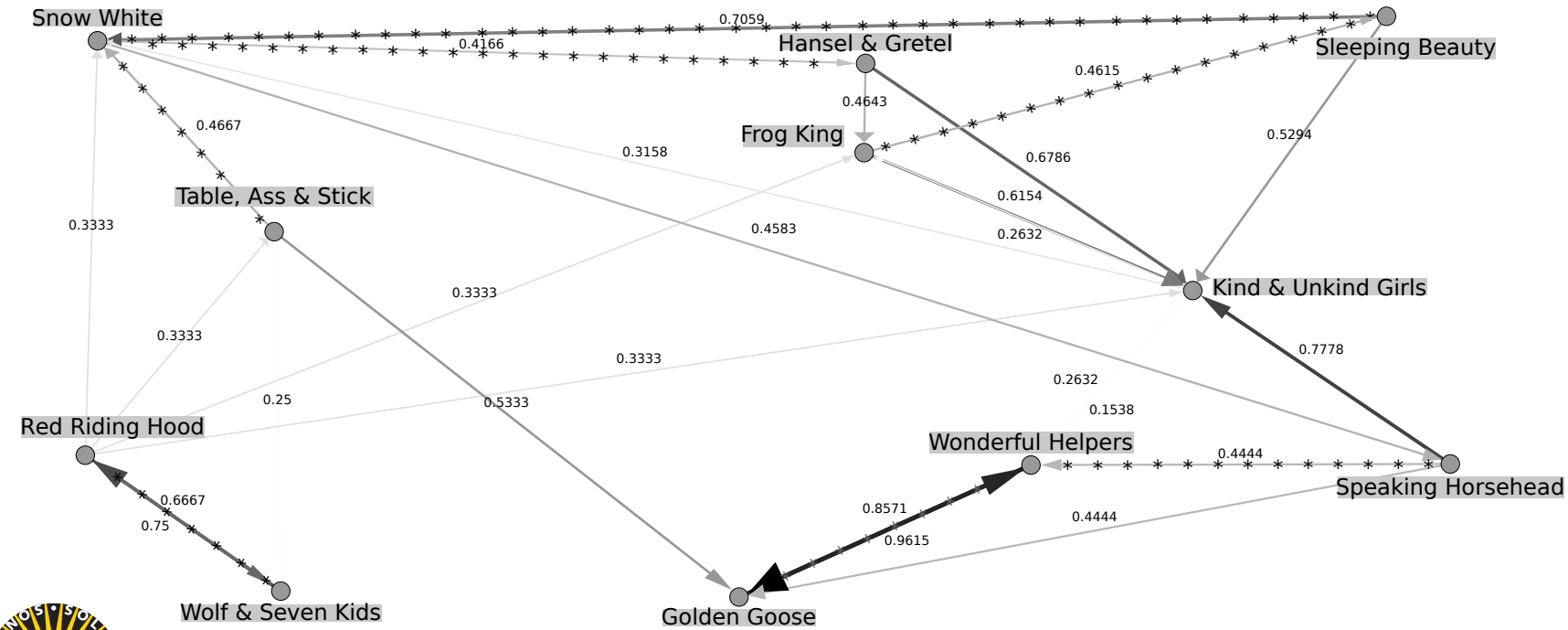
- TMI contains different type of relation



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- Sensible clusters and central nodes found

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- Use larger and/or more heterogeneous corpus
- Address computational efficiency and scalability

Discussion

Questions?

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