## Scientific domains of mistrust

Query expansion for *mistrust* using matrix decomposition & neural embeddings in the JSTOR digital library

Lasse Hansen & Kristoffer L Nielbo chcaa.au.dk chcaa.io

> Center for Humanities Computing Aarhus University, Denmark





## Outline

1 Dataset JSTOR digital library

2 Model 1 Non-negative Matrix Factorization Keyword sets

3 Model 2 Neural embeddings Sparse graph Dense graph

### Scientific domains of mistrust

Lasse Hansen & Kristoffer L Nielbo chcaa.au.dk chcaa.io

#### Dataset

JSTOR digital library

#### Model 1

Non-negative Matrix Factorization Keyword sets

#### Model 2

Neural embeddings





Figure 1: JSTOR Data For Research,  $n = 43,802, \sim 400 \text{m}$  words, Eng\*, Fr, Ger.



Scientific domains of mistrust

Lasse Hansen & Kristoffer L Nielbo chcaa.au.dk chcaa.io

Dataset

JSTOR digital library

Andal 1

Non-negative Matrix Factorization Keyword sets

Model 2 Neural embeddings

Sparse graph
Dense graph



### Scientific domains of mistrust

Lasse Hansen & Kristoffer L Nielbo chcaa.au.dk chcaa.io

#### Dataset

JSTOR digital library

#### lodel 1

Non-negative Matrix Factorization Keyword sets

### Model 2 Neural embeddings

Sparse graph

CENTER FOR HUMANITIES COMPUTING AARHUS

# Matrix decomposition of TD matrix

For bag-of-words representation X w. documents in columns and words in rows, such that each entry  $X_{ij}$  is the ith word in the jth column, we solve

$$\underset{W.H}{\operatorname{argmin}} \parallel X - WH \parallel_F^2 \quad s.t. \ W, H \le 0$$

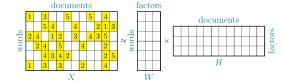


Figure 2: Non-negative matrix factorization of TD matrix X

 $W\!H$  is a low-rank approximation of the data (++fewer factors than documents and words) and each document is the weighted sum of columns in W, "document factors"  $\sim$  themes or topics

[NOTE] because the data set was seeded with *MISTRUST*, the model is de facto seeded

Scientific domains of

Lasse Hansen & Kristoffer L Nielbo chcaa.au.dk chcaa.io

Dataset

JSTOR digital library

Model 1

Non-negative Matrix Factorization

Reyword Sets

viouei 2 Neural embeddin

### Keyword sets for MISTRUST

```
* social research science trust amp theory group model data individual
    man say life think love thing world god word human
    * health patient medical care service treatment public mental report dr
    woman female gender male sexual man sex marriage mother wife
    court law supra id legal justice lawver federal note criminal
    la le les et des que en du french paris
    student school teacher education educational college teach program university class
    war military peace united british american international states foreign army
    soviet russian russia union communist europe policy western foreign west
    china chinese japan japanese asia asian relation east foreign communist
    book history pp chapter century author reader text university review
    black african white africa racial american race south americans ethnic
13
    church religious catholic god religion christian faith muslim century england
    india indian pakistan muslim asia south country asian native region
15
    community local land city area environmental water village people forest
16
    german und der germany die vo des europe french european
17
    israel jewish arab jew muslim peace east al middle conflict
    political party government democracy election politics democratic social power public
18
    child family parent mother father school social amp marriage young
19
20
    film image art narrative director story character media american production
21
    poem love literary language line reader write word text read
    economic market country policy price economy trade bank industry investment
    music art performance play style voice hear culture movement popular
23
    worker union labor employee management labour industrial social company industry
24
```

nuclear weapon security arm energy pakistan military strategic international treaty

## \*) factors used to subset the jstor data



# Scientific domains of

Lasse Hansen & Kristoffer L Nielbo chcaa.au.dk

#### Dataset

JSTOR digital library

#### Nodel 1

Non-negative Matrix

#### Keyword sets

#### Model 2

Veural embeddings

Dones gran

# Distributed word representation

For a discrete input  $w_0, w_1, ..., w_n$ , we train a simple feedforward network such that

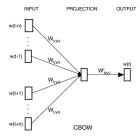


Figure 3: CBOW architecture for learning neural embeddings at the word level

$$\frac{1}{T}\sum_{t=1}^{T}\sum_{-n\leq j\leq n}\log p(w_t|w_{t+j}), \quad j\neq 0$$

Semantic similarity between any two word embeddings, A and B, can then be measured as their angular similarity

$$1 - \frac{\cos^{-1}(\frac{A \cdot B}{\|A\| \|B\|})}{\pi},$$



Scientific domains of

Lasse Hansen & Kristoffer L Nielbo chcaa.au.dk chcaa.io

#### Dataset

JSTOR digital library

#### Model 1

Non-negative Matrix Factorization Keyword sets

# Neural embeddings

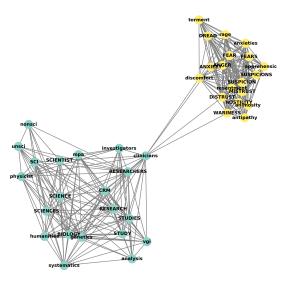


Figure 4: Sparse query graph for MISTRUST and SCIENCE

CENTER FOR HUMANITIES
COMPUTING AARHUS

#### Scientific domains of mistrust

Lasse Hansen & Kristoffer L Nielbo chcaa.au.dk chcaa.io

#### Datase

JSTOR digital librar

#### Model 1

Non-negative Matrix Factorization

### Model 2

Neural embeddin

## Sparse graph

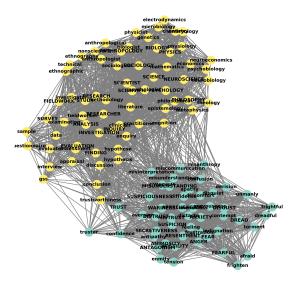


Figure 5: Dense query graph for MISTRUST and SCIENCE



Scientific domains of

Lasse Hansen & Kristoffer L Nielbo chcaa.au.dk chcaa.io

Dataset

JSTOR digital library

Model 1

Non-negative Matrix Factorization

Neyword sets

viouei 2

Sparse graph

## Thank you for your attention

chcaa@cas.au.dk chcaa.io

slides: http://knielbo.github.io/files/kln\_mistrust\_query.pdf

Scientific domains of mistrust

Lasse Hansen & Kristoffer L Nielbo chcaa.au.dk chcaa.io

Dataset

JSTOR digital library

Vlodel I

Non-negative Matrix Factorization Keyword sets

Model 2

Neural embeddings

