INTRODUCTION TO DIGITAL HUMANITIES

APPLICATIONS OF DH: LANGUAGE AND LITERATURE TOPIC MODELLING

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WHAT IS TOPIC-MODELLING

- Collective knowledge continues to grow; it becomes more difficult to find what one is looking for
- Topic Models more than search&link-approach
- Zooming in and out is possible with TMs
- Topic Model algorithms do not require prior annotation or labelling of the texts
- Topic Models discover the hidden thematic structure in large archives of documents

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WHAT IS TOPIC-MODELLING

- A method to find clusters of words in large bodies of text
- Those clusters are called topics
- A topic is recurring pattern co-occurring words
- Topic models are probabilistic models that are often based on the number of topics in the corpus being assumed and fixed

WHAT IS TOPIC-MODELLING

http://thomask81.github.io/INNZ_tm_vis/index.html#topic=0&lambda=1&term=

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MORE (BETTER) DATA AND SIMPLE ALGORITHMS OFTEN BEAT **COMPLEX ANALYTICS MODELS**

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"We don't have better algorithms. We just have more data " - Peter Norvig (Google)

[Banko and Brill, 2001]

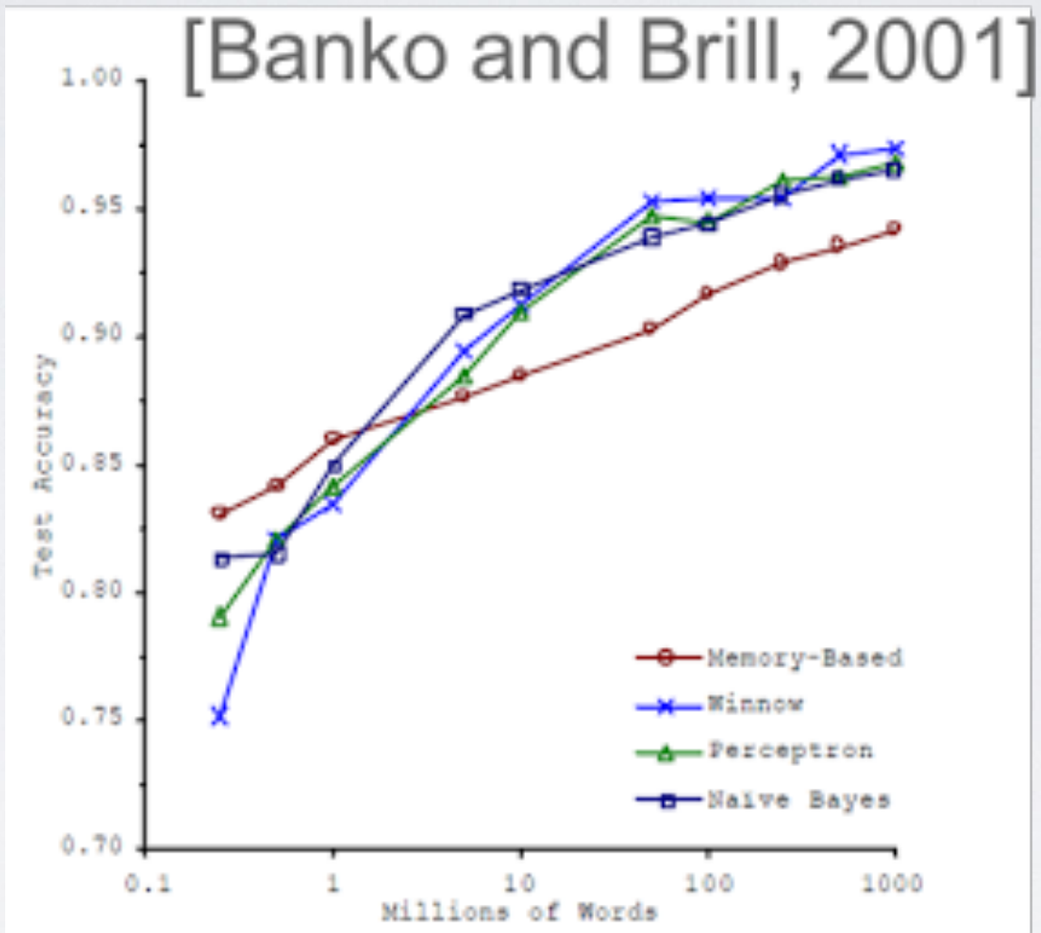

Figure 1. Learning Curves for Confusion Set Disambiguation

SO LET'S START WITH A SIMPLE ALGORITHM

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LATENT DIRICHLET ALLOCATION

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STATISTICAL INFERENCE

Deducing properties of an underlying distribution by analysis of data.

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LATENT DIRICHLET ALLOCATION (LDA)

Assumes that one can find a Dirichlet Distribution by analysing the words in a corpus.

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DIRICHLET DISTRIBUTION

Distribution on a probability distribution

Dirichlet dist.

$\theta = (\theta_1, \dots, \theta_n)$ $\quad \alpha = (\alpha_1, \dots, \alpha_n), \alpha_i > 0$

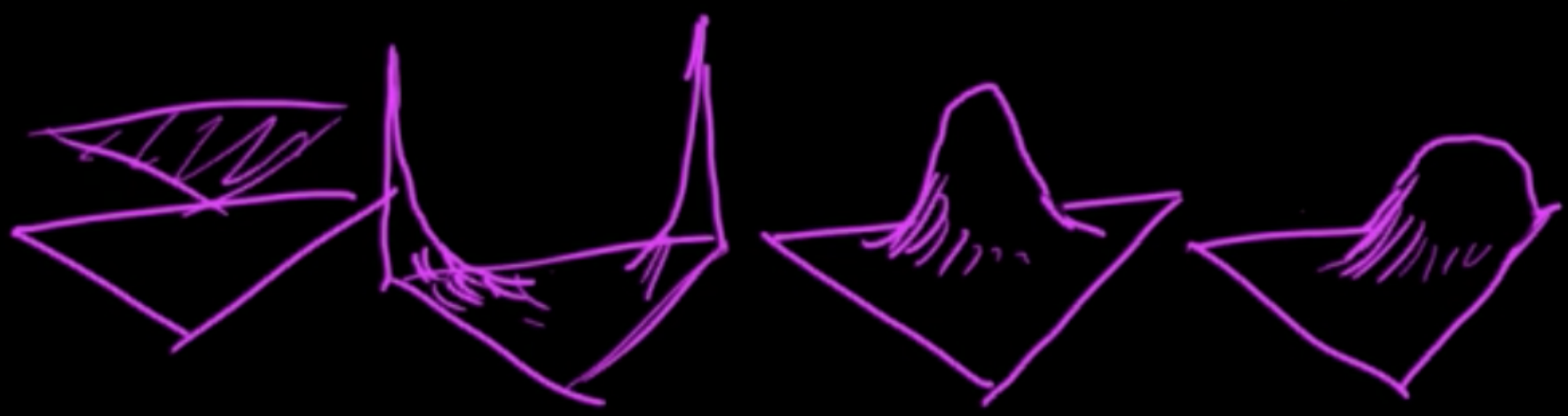
$\alpha_0 = \sum_{i=1}^{n} \alpha_i$.

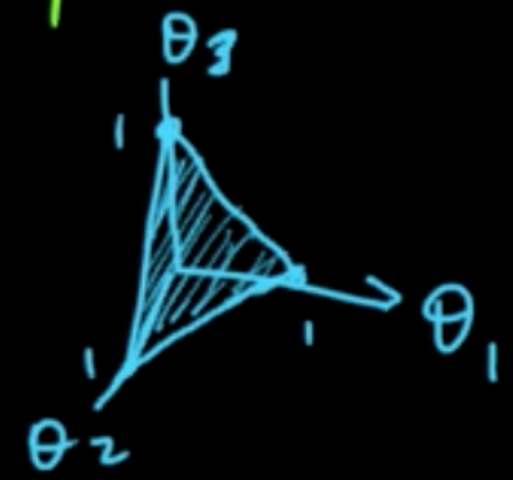
$$\theta \sim \mathrm{Dir}(\alpha) \qquad p(\theta) = \frac{1}{B(\alpha)} \prod_{i=1}^{n} \theta_i^{\alpha_i - 1} I(\theta \in S)$$

$$\frac{1}{B(\alpha)} = \frac{\Gamma(\alpha_0)}{\Gamma(\alpha_1) \cdots \Gamma(\alpha_n)}.$$

$$S = \{x \in \mathbb{R}^n : x_i \geq 0, \sum_{i=1}^{n} x_i = 1\}.$$

↳ prob. simplex.





DIRICHLET DISTRIBUTION OF WORDS IN CORPUS

1. For each document draw a topic distribution

2. For each word in the document.
   a. Draw a specific topic
   b. Draw a word

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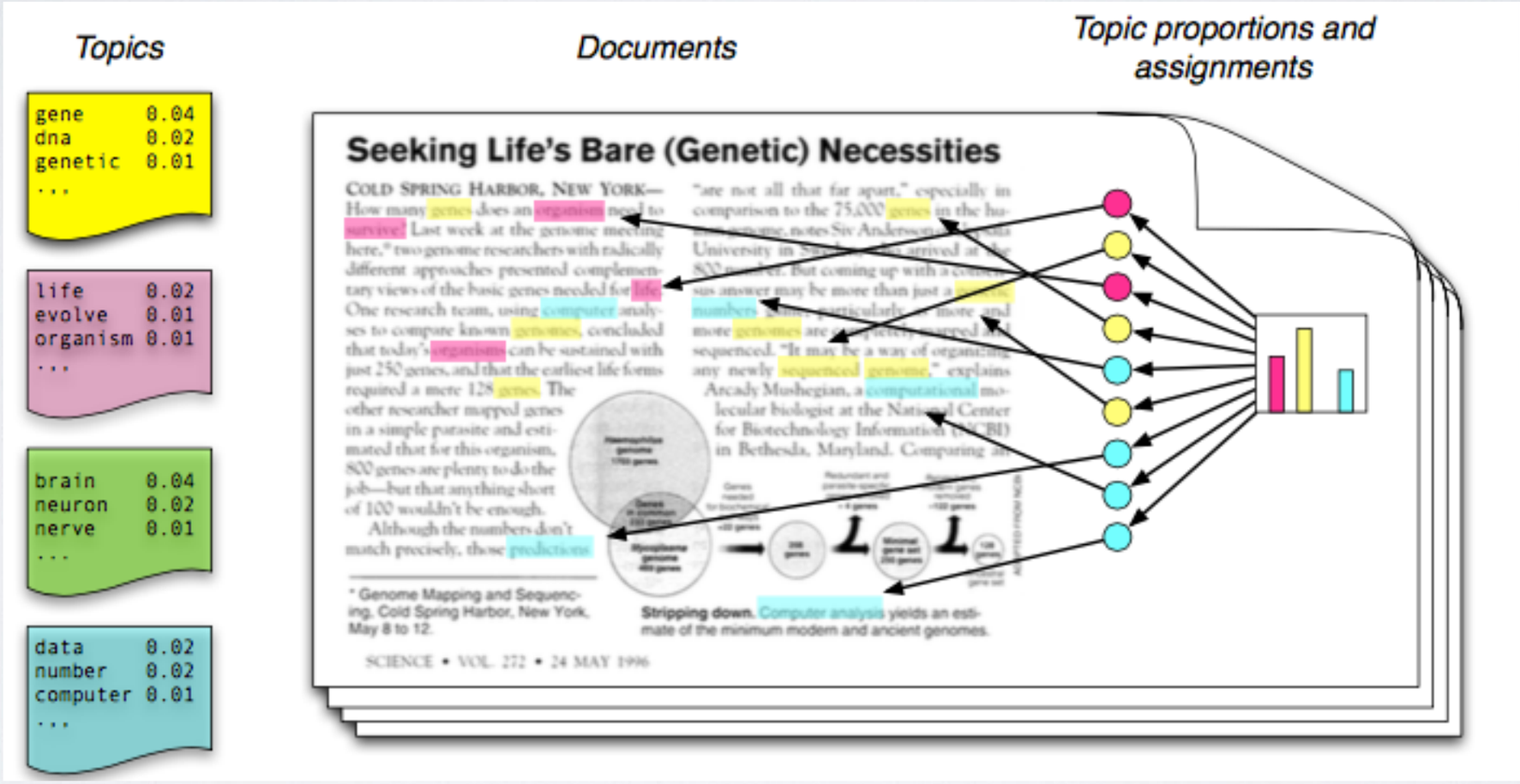
DIRICHLET DISTRIBUTION OF WORDS IN CORPUS



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LATENT DIRICHLET ALLOCATION

- Simplification of how the documents in a dataset were created using Dirichlet Distribution
- Documents are Bag-of-words (order of the words in each document is irrelevant)
- Each corpus has words from a number of known topics
- We do not know which words belong to which topic
- “panel” in document A and “panel” in document B are not the same “word”

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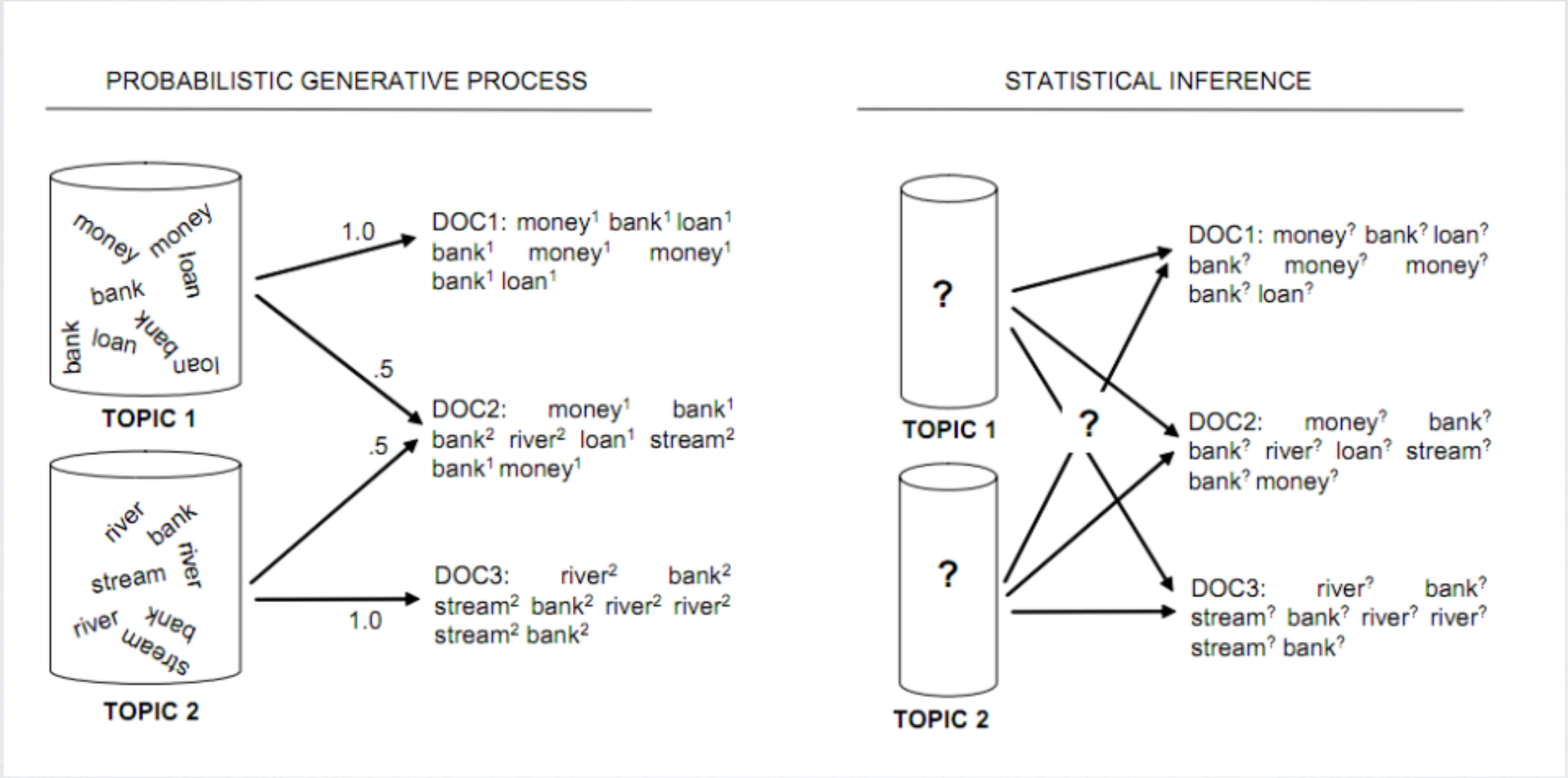
LATENT DIRICHLET ALLOCATION



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LATENT DIRICHLET ALLOCATION

- The central goal of topic modelling is to automatically discover the topics from a collection of documents.
- The central inferential problem for LDA is determining the posterior distribution of the latent variables given the document

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SUCCESS AND RESULTS OF LDA RELY ON APRIORI-SET VARIABLES

- Number of topics
- Number of iterations
- Normalisation of the data
- Stopwords

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A PRACTICAL EXAMPLE

- https://github.com/ThomasK81/TopicModellingR

WHAT DOES EACH VARIABLE DO?

- Search Text
- Collection
- Year
- Additional Stopwords
- Number of Topics
- Numbers of Terms Shown
- Iterations

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ZOOMING IN AND OUT?

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THE RISK OF NORMALISATION

- http://thomask81.github.io/Greek_vis/#topic=4&lambda=1&term=
- ArabicMorph
- ArabicTranslated
- ArabicTM

TOPIC MODELLING IS NOT AN END, BUT A MEANS TO AN END

- https://www.google.com/fusiontables/DataSource?docid=1HuEta4_g-S01X9LEow8F6llidt8s5u5_GKkur_so&pli=1#card:id=2

- https://www.google.com/fusiontables/DataSource?docid=1fppC5YlmhtxbtDWiEwbgq_N2FCQQKQKTtN8rPJV9#card:id=2

USE CASE: CARTOONS VERSUS ARTICLES

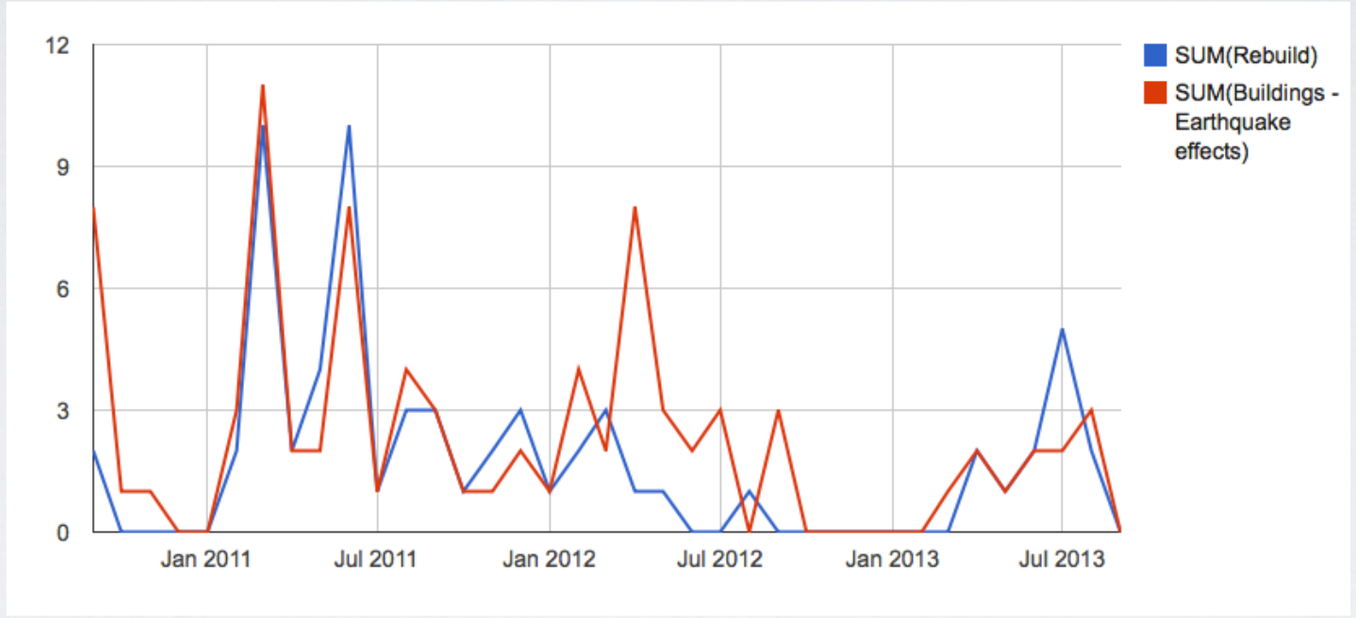
- Looking at the perception of the Canterbury EQ in published articles and published editorial cartoons

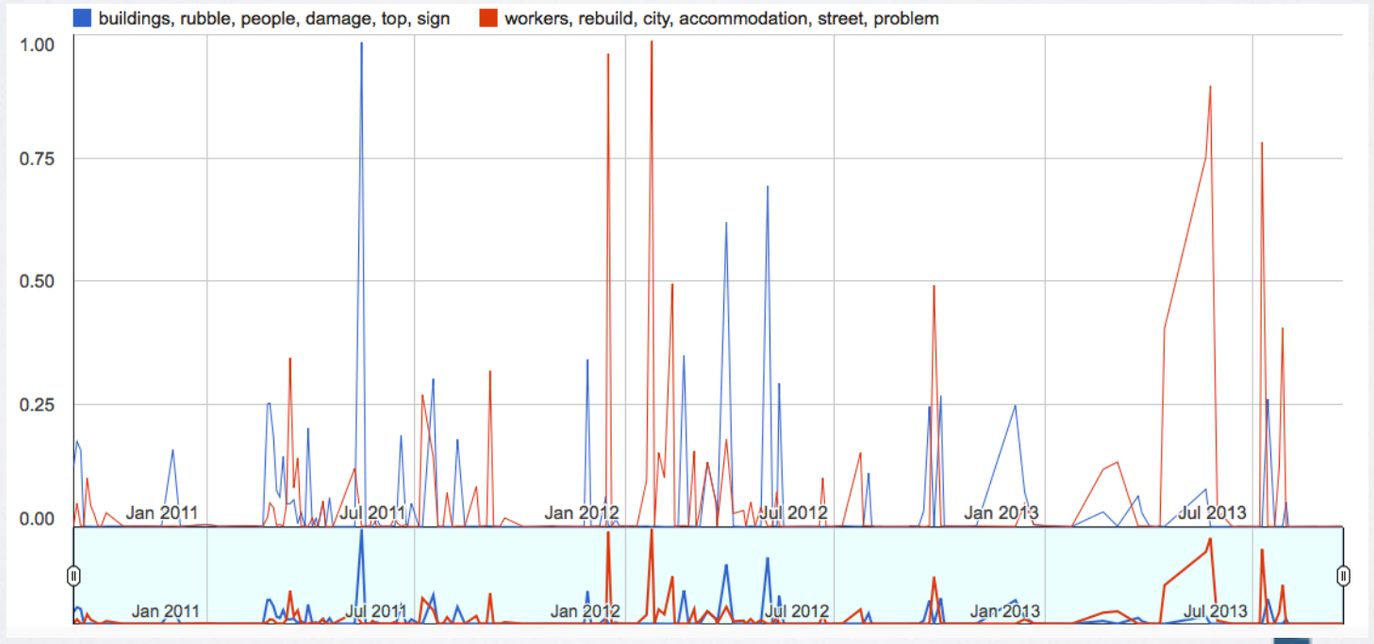
- Topic-Modelling is just one part of the overall research and is part of the quantitative analysis of the research data

- Quantitative analysis made it possible to reduce the sample from over 100,000 articles to around 2000 and reduce the number of cartoons from over 30,000 to under 1000.

- Combined with qualitative analysis (on the smaller sample)

SUBJECT HEADINGS VS TM





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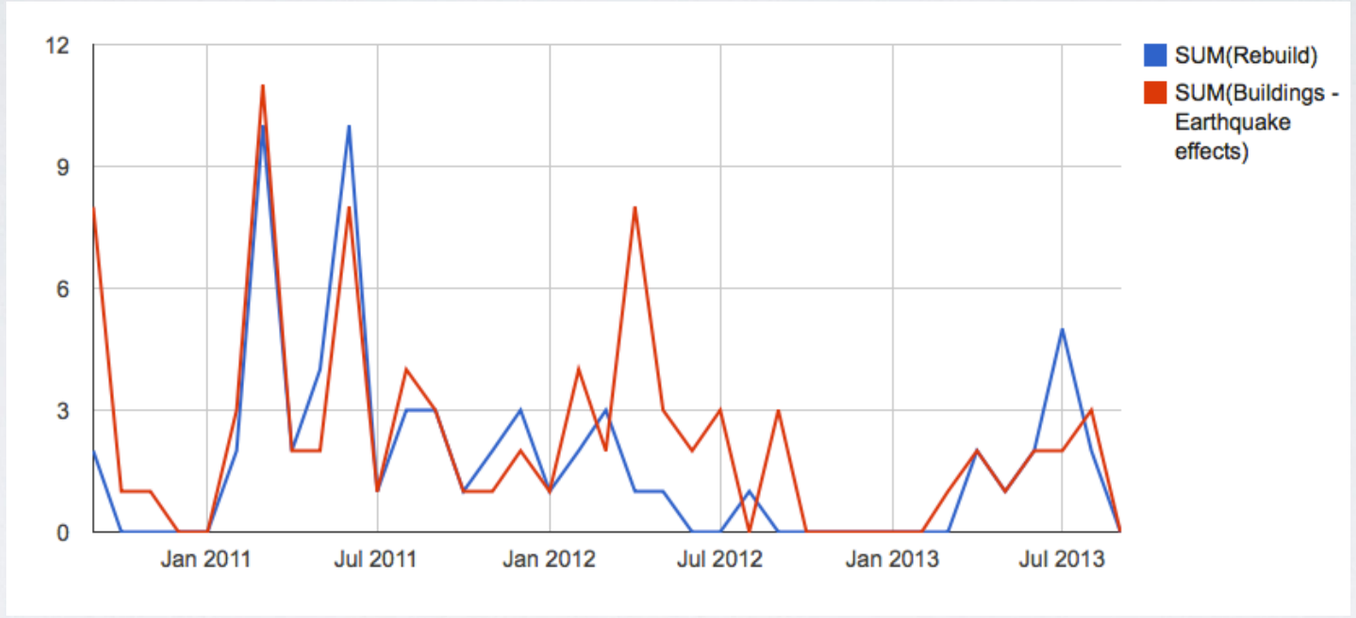

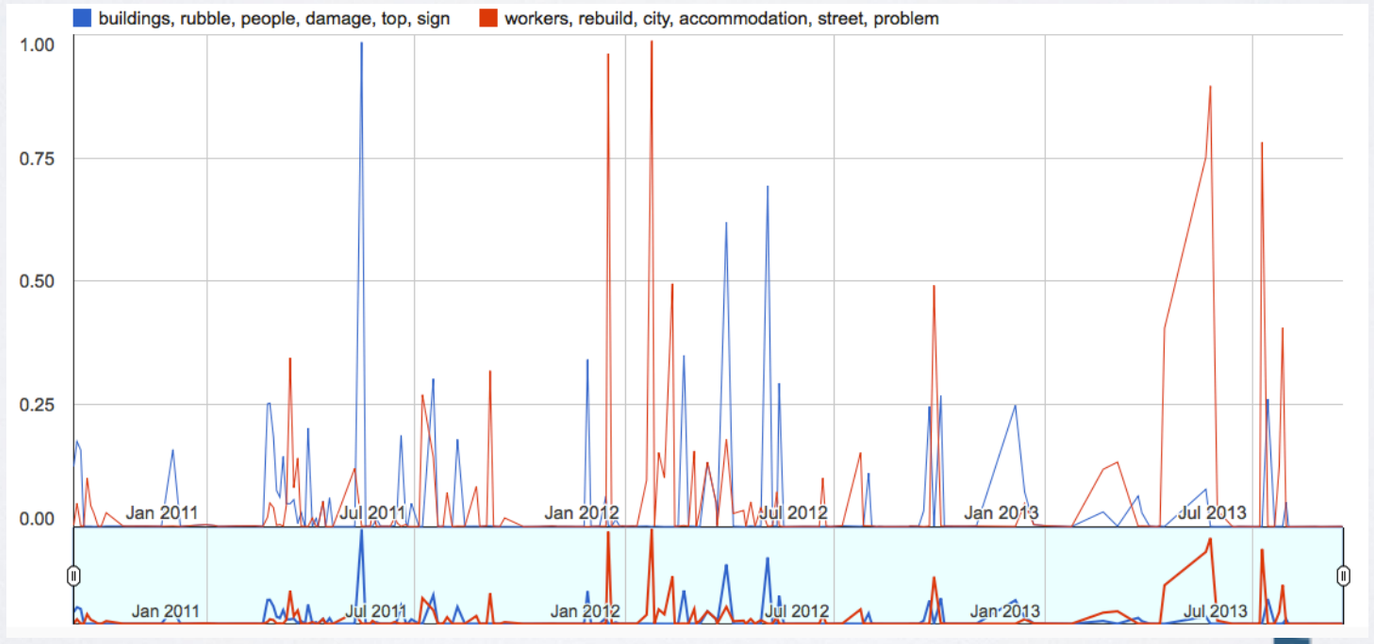

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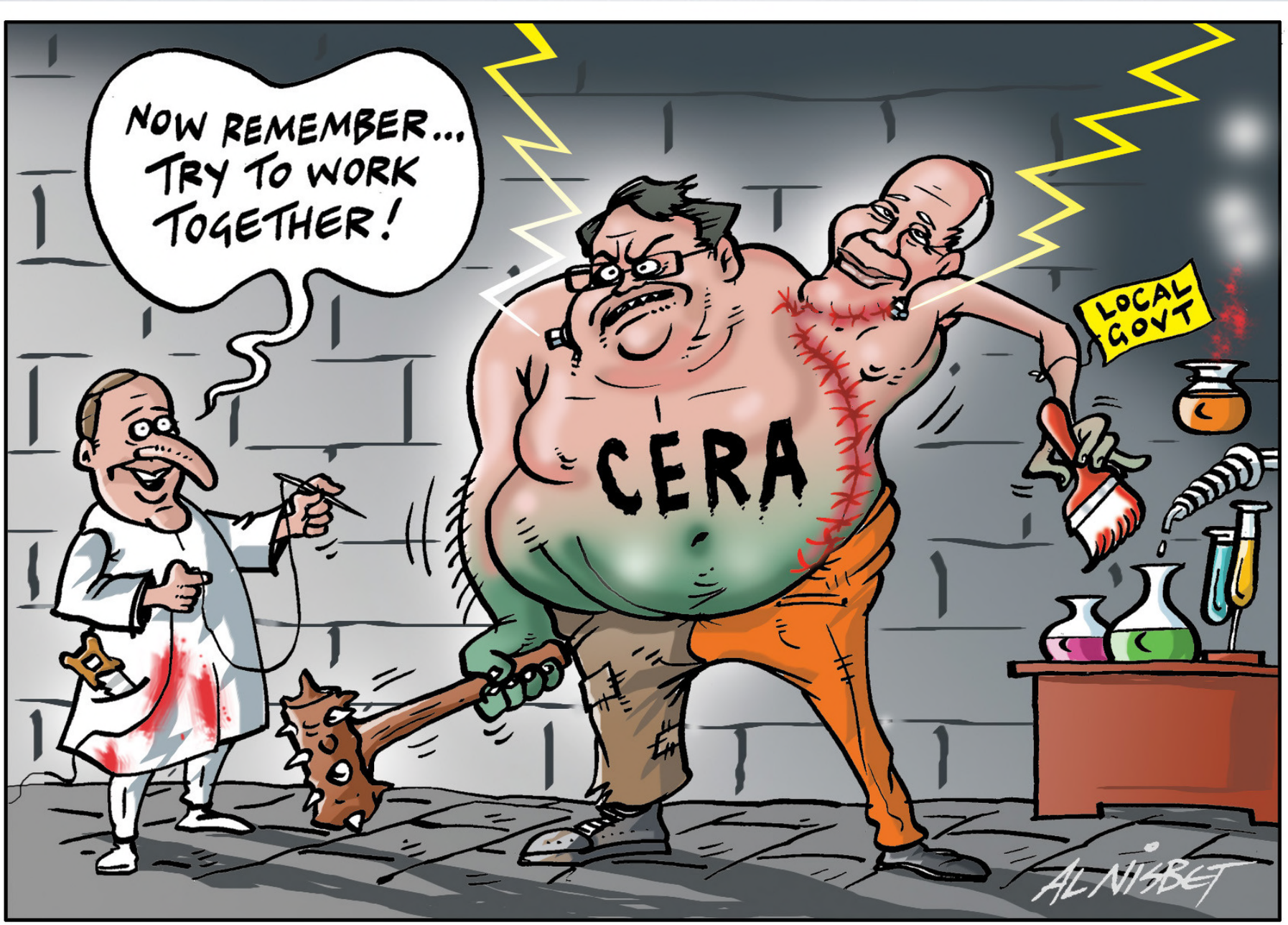
COMBINING DATA-SETS



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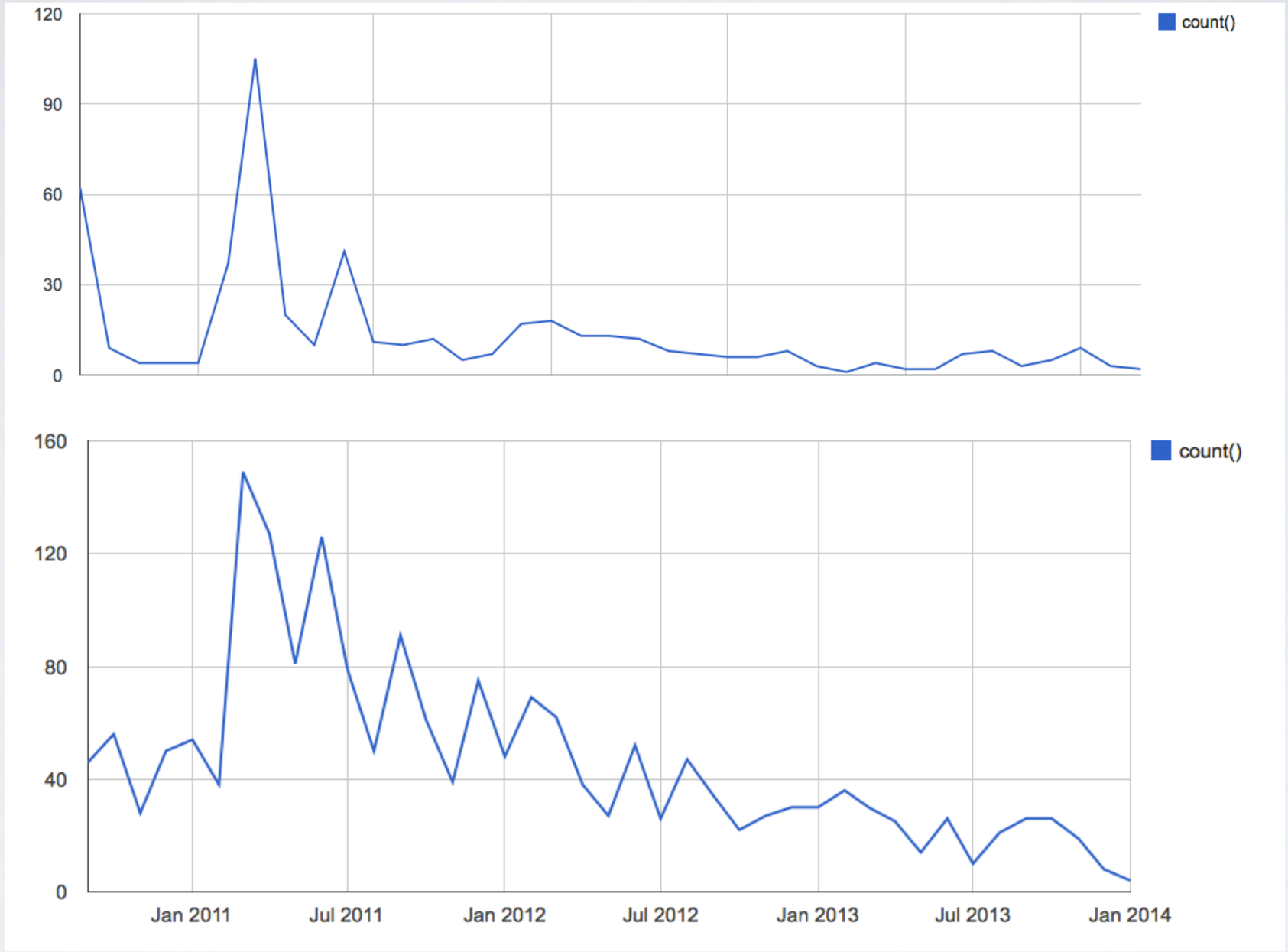

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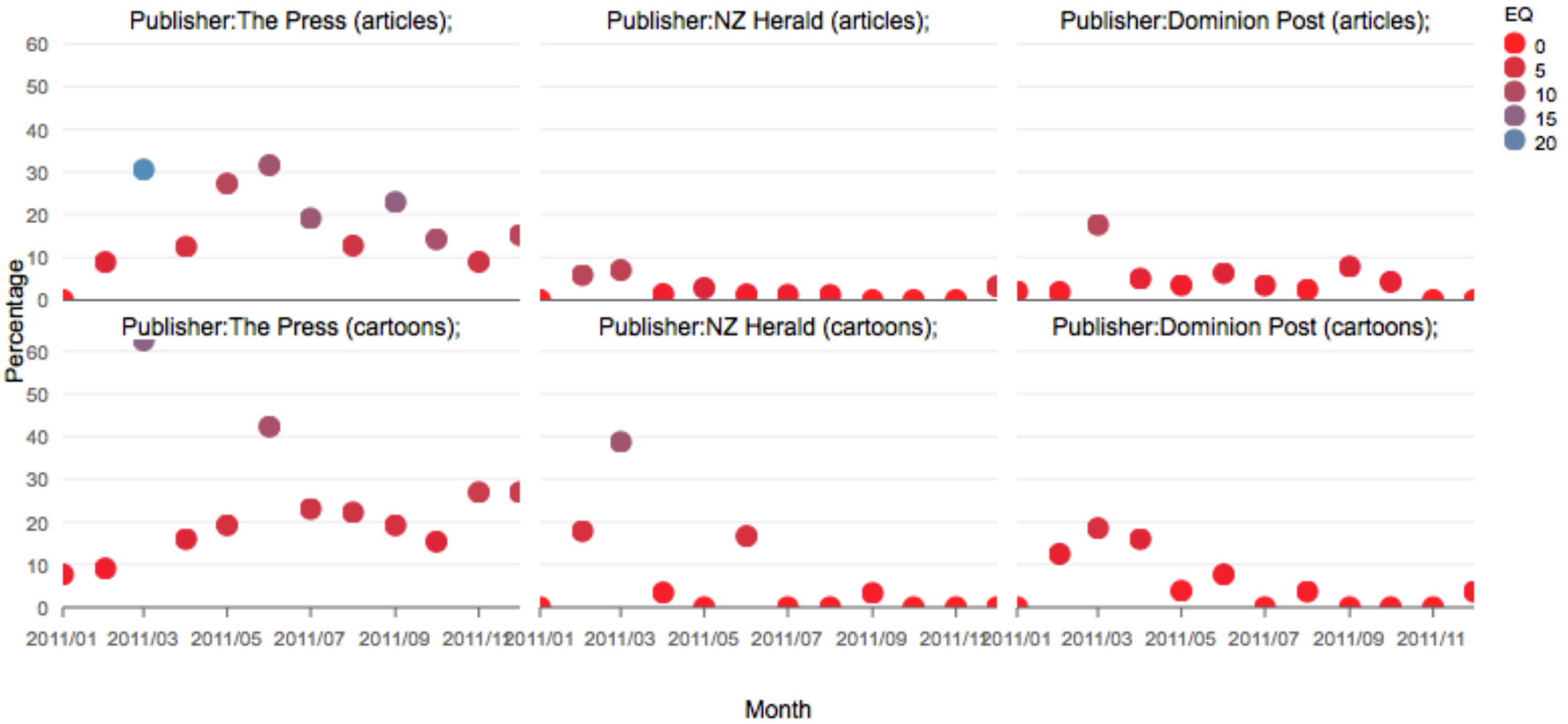

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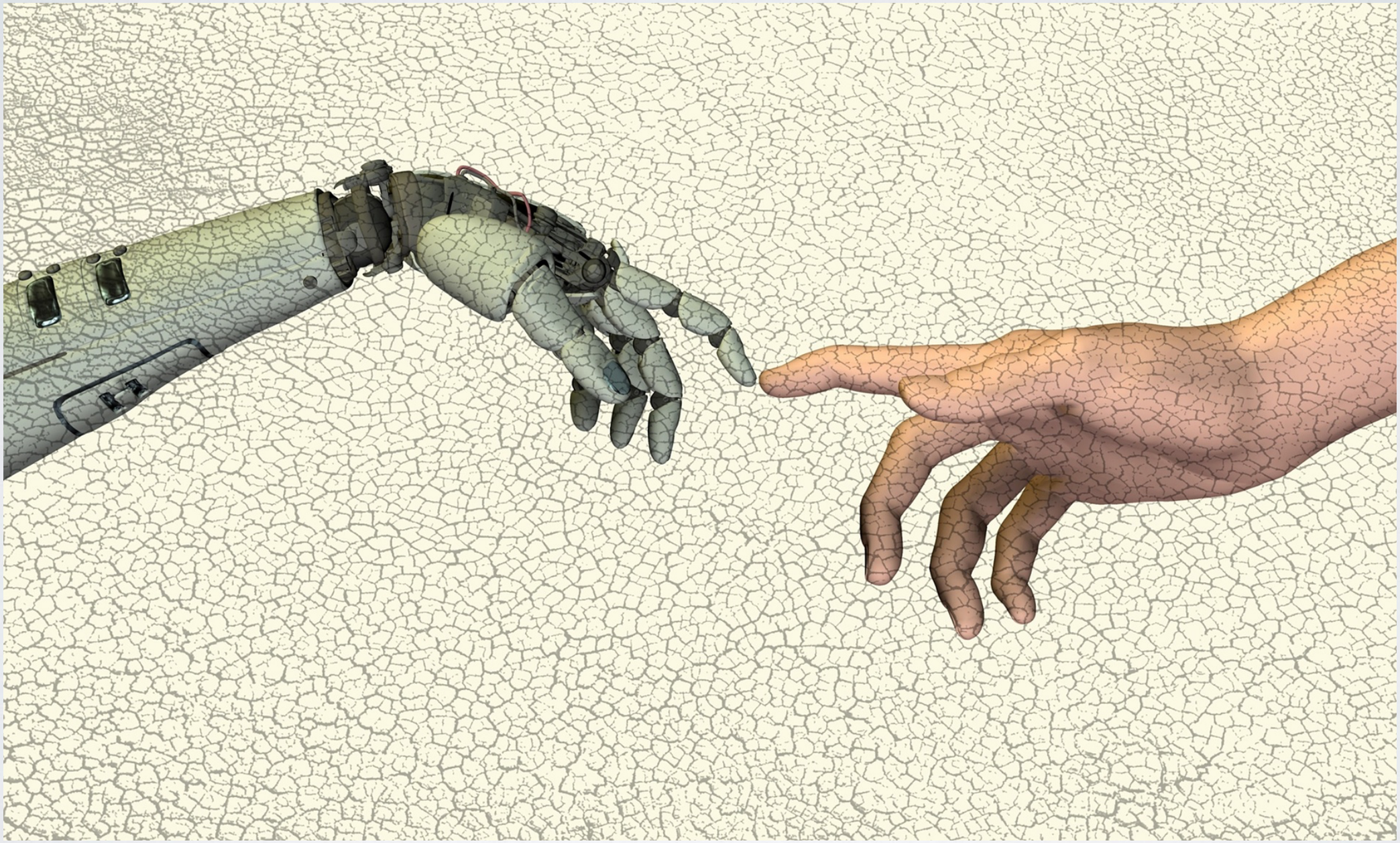
QUESTIONS?



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