ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
CAMPUS DI FORLÌ

91258 / B0385
Natural Language Processing

Lesson 3. Vector Space Model

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Table of Contents

1. Current Status

2. Representations Revisited

3. More Basic Algebra

Current Status

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You know...

- what is natural language processing

On your own, you have...

On your own, you (could) have...

You can...

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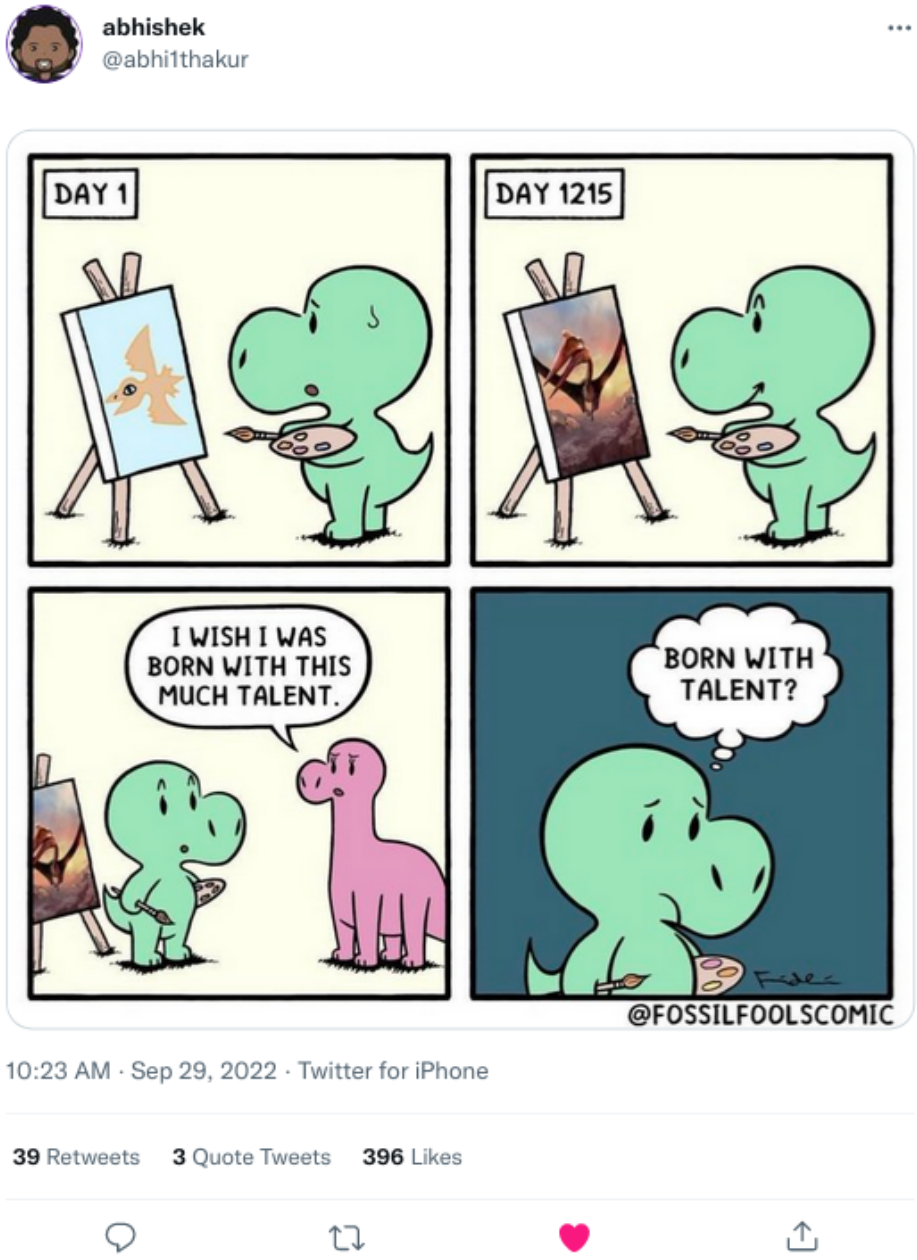
You can...

- open a text file (Python intro)
- tokenise and normalise text
- build some text representations



https://twitter.com/abhi1thakur/status/1575400771541155842

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   or use a lemmatiser to find the *actual* root of words

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4. Discard stopwords from the text*
5. Build a vectorial representation*

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Stopwords

Common words in a language that occur with a high frequency, but carry much less substantive information about the meaning of a phrase (Lane et al., 2019, p. 51–54)

[3] For instance, from NLTK, sklearn, or `https://github.com/stopwords-iso`

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Alternative 1 Consider the most frequent tokens in a reference corpus as stopwords (remember Genesis from P4P?)

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Alternative 1 Consider the most frequent tokens in a reference corpus as stopwords (remember Genesis from P4P?)

Alternative 2 Take an existing list of stopwords[3]

en	es	it
i	a	altri
me	ahora	certa
my	alli	della
it	cerca	nessuna
is	el	prima
do	es	quello
the	unas	solito
will	vez	va
other	yo	via

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Stopwords have to be considered with a grain of salt
(as everything in NLP)

Vector representation

BoW

- A text is represented as the bag (set) of its words
- It disregards grammar
- It disregards word order
- It (can) consider frequency

From (Lane et al., 2019, p. 41)

More Basic Algebra

x and y

https://twitter.com/miniapeur/status/1710074831079690394

Dot product

Algebraically, it is the sum of the products of the corresponding entries of the two sequences of numbers $a \cdot b$

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a = [1,2,3]
b = [3,4,6]
my_sum = 0
for i in range(len(a)):
    my_sum += a[i] * b[i]
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There are better —more efficient— ways to compute the dot product!

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Now, we can use the dot product to compare two documents ($\sim$ similarity)

Vector space model

"[. . .] an algebraic model for representing text documents (or more generally, items) as vectors [. . .]" [4]

[4] https://en.wikipedia.org/wiki/Vector_space_model

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Some applications

- Relevance rankings in keyword-based search
- Document clustering to "discover" structure and relations in a text collection

(not the SOTA for most tasks, but it's a *minimum viable product*)

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</> Let us see it working

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Tomorrow. . .

VADER

References

Lane, H., C. Howard, and H. Hapkem
2019. *Natural Language Processing in Action*. Shelter Island, NY: Manning Publication Co.