TEXT REPRESENTATION LEARNING

TEXT MINING AND NATURAL LANGUAGE PROCESSING FOR COMPUTATIONAL SOCIAL SCIENCES

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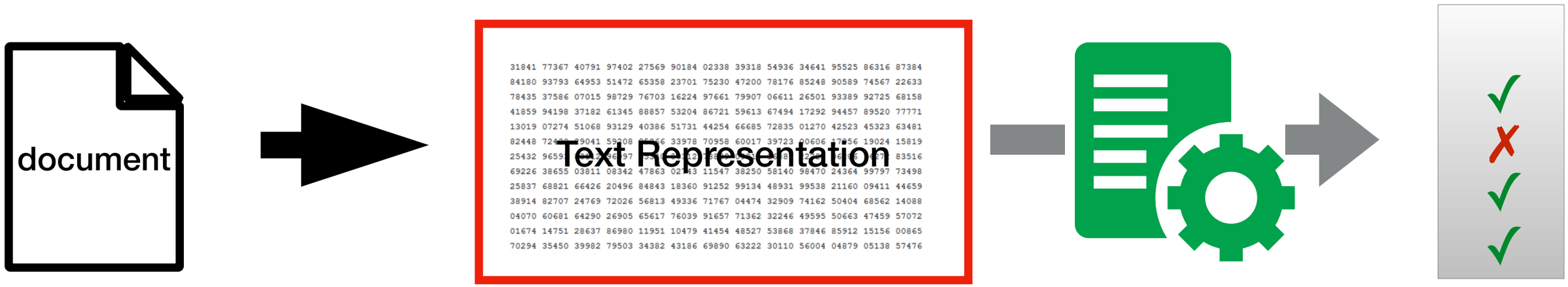
Text Representation



Feature extraction

Text classification task

Text Representation

- Three main approaches:
    - Bag of Words
    - Word embeddings
    - Contextual word embeddings

Bag of Words

- Each word is represented as a binary vector with D positions, where D is the size of the vocabulary (typically millions of tokens)
- The document is represented as the sum of the word vectors (counts of words)

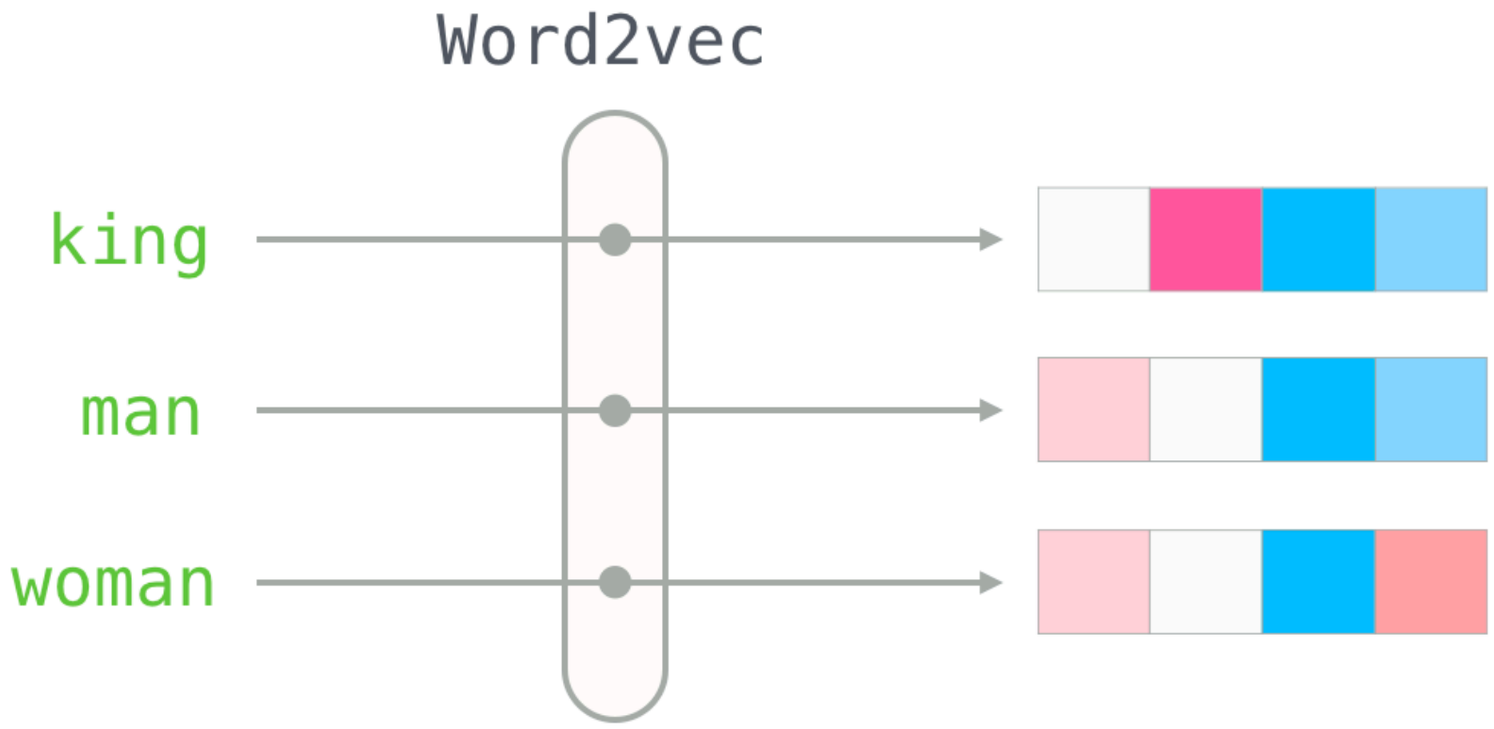
Document	the	cat	sat	in	hat	with
the cat sat	1	1	1	0	0	0
the cat sat in the hat	2	1	1	1	1	0
the cat with the hat	2	1	0	0	1	1

Bag of Words

- The dimensionality of the dictionary is huge, so a machine learnin model needs to learn millions of parameters
- Each word is completely independed, there's no way to represent semantic relationships between words
  (e.g. *amazing* and *awesome* are as similar as *amazing* and *terrible*)

Word embeddings

- Each word is represented as a vector with D real numbers
- D is much smaller than the dictionary size (typically hundreds)



Word embeddings

- Most popular implementation: Word2Vec
  The vectors are obtained by training a neural network on the task of predicting a word from their neighbors.

- Very popular for translation tasks
  (words in one language might have the same vector representation in another language)

- Word representations are independendent of their context
  E.g. *apple* (fruit) has exactly the same vector representation as *Apple* (company)

Contextual word embeddings

- Word representations are dependendent of their context.
- Most popular example: **Transformers**

Exercises