String Manipulation in Python

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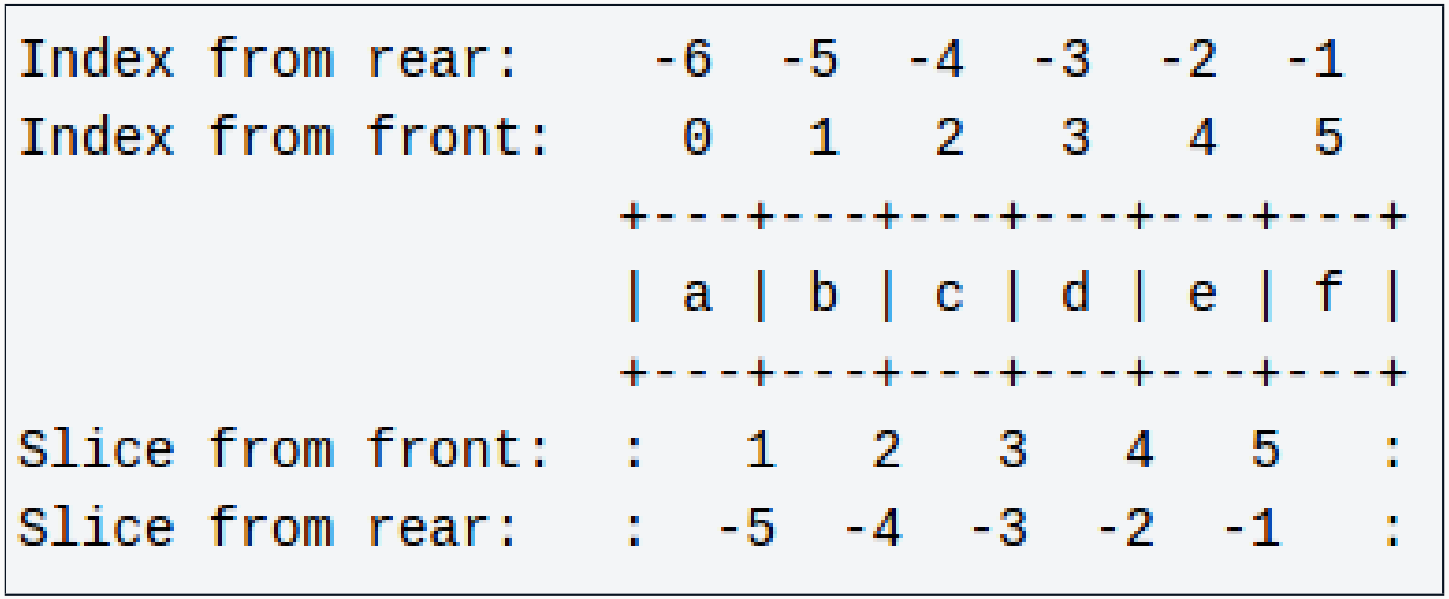
Strings



- immutable sequence data type
- sequence of Unicode characters wrapped inside single, double, or triple quotes
- an ordered collection of characters

WORDS FREQUENCIES

I am Daniel
I am Sam
Sam I am
That Sam-I-am
That Sam-I-am!
I do not like

that Sam-I-am

...

‘I’ ‘am’ ‘Daniel’
‘I’ ‘am’ ‘Sam’
‘Sam’ ‘I’ ‘am’
‘That’ ‘Sam’ ‘I’
‘am’ ‘That’ ‘Sam’
‘I’ ‘am’ ‘I’ ‘do’
‘not’ ‘like’ ‘that’
‘Sam’ ‘I’ ‘am’ ...

a	1	59	0.073
am	1	16	0.02
and	1	24	0.03
anyhwhere	1	1	0.001
anywhere	1	7	0.009
...			
you	1	34	0.042
total	55	804	1.0

Word importance

raw term frequency:

$$f_{t,d} = N(t, d)$$

normalized term frequency (prevents bias towards longer documents)

$$f_{t,d} = \frac{N(t, d)}{N(d)}$$

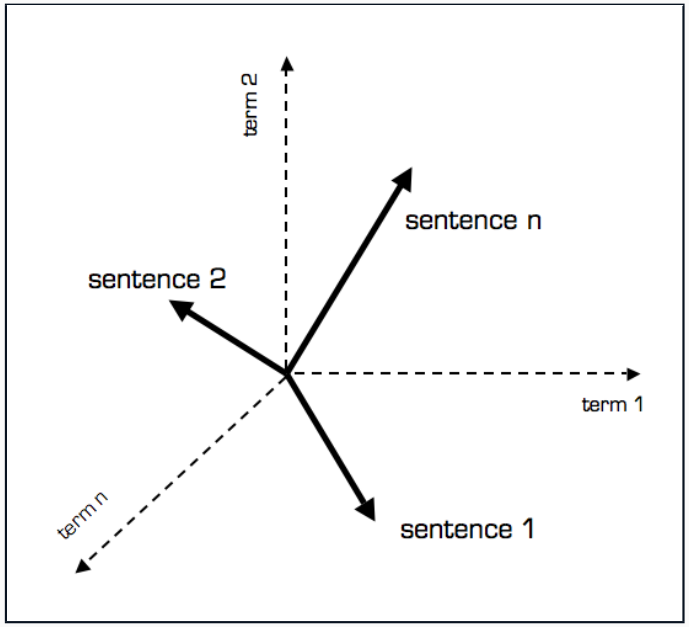
IDF weighted term frequency (removes non-informative words):

$$tfidf(t, d, D) = f_{t,d} \cdot log \frac{\mid D \mid}{\{d \in D : t \in d\}}$$

Vector space model (VSM)

Any collection of m documents can be represented in the vector space model by a document-term matrix of m documents and n terms

- a document vector with only one word is collinear to the vocabulary word axis
- a document vector that does not contain a specific word is orthogonal/perpendicular to the word axis
- two documents are identical if they contain the same words in a different order (BOW assumption)



Document space	t_1	t_2	t_3	...	t_n ← Term vector space
D_1	a_{11}	a_{12}	a_{13}	...	a_{1n}
D_2	a_{21}	a_{22}	a_{23}	...	a_{2n}
D_3	a_{31}	a_{32}	a_{33}	...	a_{3n}
...					
D_m	a_{m1}	a_{m2}	a_{m3}	...	a_{mn}
Q	b_1	b_2	b_3	...	b_n

Document comparison

```
1 texts = ['hello world', 'hello foobar']
2 lexicon = ['foobar', 'hello', 'world']
3 dtm = [[0, 1, 1], [1, 1, 0]]
```

$$\text{document similarity} = \frac{\mathbf{D_1} \cdot \mathbf{D_2}}{\|\mathbf{D_1}\|\|\mathbf{D_2}}$$

```
1 from scipy import spatial
2 print('[INFO] Cosine similarity for pairwise document comparison')
3 print('[INFO] Document 1 and 2:')
4 print(1 - spatial.distance.cosine(dtm[0],dtm[1]))
```

On this implementation, similarity ranges from 1 meaning exactly the same, with 0 indicating orthogonality or decorrelation.

```
1 [INFO] Cosine similarity for pairwise document comparison
2 [INFO] Document 1 and 2:
3 0.5
```

```
if questions:
   try:
      answer()
   except RunTimeError:
      pass
   else:
      print('break')
```