

Feature selection

PREPROCESSING FOR MACHINE LEARNING IN PYTHON



Sarah Guido

Senior Data Scientist

What is feature selection?

- Selecting features to be used for modeling
- Doesn't create new features
- Improve model's performance

Feature selection feature

feature

가

가

가

. Scikit - learn

가

feature

가

가

가

가

가

When to select features

city	state	lat	long
hico	tx	31.982778	-98.033333
mackinaw city	mi	45.783889	-84.727778
winchester	ky	37.990000	-84.179722

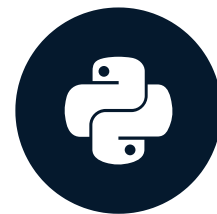
feature selection , tf - idf , model 가 feature가 model .

Let's practice!

PREPROCESSING FOR MACHINE LEARNING IN PYTHON

Removing redundant features

PREPROCESSING FOR MACHINE LEARNING IN PYTHON



Sarah Guido
Senior Data Scientist

Redundant features

- Remove noisy features
- Remove correlated features
- Remove duplicated features

가

가

가
가
가

Scenarios for manual removal

city	state	lat	long
hico	tx	31.982778	-98.033333
mackinaw city	mi	45.783889	-84.727778
winchester	ky	37.990000	-84.179722



Correlated features

- Statistically correlated: features move together directionally
- Linear models assume feature independence
- Pearson correlation coefficient

가 , 가 .

가 . Pearson

가 1 가

가 , 0 가 , - 1 가 .

가 .

Correlated features

```
print(df)
```

```
   A    B    C
0  3.06  3.92  1.04
1  2.76  3.40  1.05
2  3.24  3.17  1.03
...
```

```
print(df.corr())
```

```
   A          B          C
A  1.000000  0.787194  0.543479
B  0.787194  1.000000  0.565468
C  0.543479  0.565468  1.000000
```

가 .

"corr" .

. A B 가 1 (0.78)

가 .

Let's practice!

PREPROCESSING FOR MACHINE LEARNING IN PYTHON

Selecting features using text vectors

PREPROCESSING FOR MACHINE LEARNING IN PYTHON



Sarah Guido

Senior Data Scientist

Looking at word weights

```
print(tfidf_vec.vocabulary_)
```

```
{'200': 0,  
 '204th': 1,  
 '33rd': 2,  
 'ahead': 3,  
 'alley': 4,  
 ...}
```

```
print(text_tfidf[3].data)
```

```
[0.19392702 0.20261085 0.24915  
 0.31957651 0.18599931 ...]
```

```
print(text_tfidf[3].indices)
```

```
[ 31 102  20  70   5 ...]
```

. 가 가 . 가 , 가 , 가 . 가 가 . 가 , 가 .

Looking at word weights

```
vocab = {v:k for k,v in
          tfidf_vec.vocabulary_.items()}
```

```
print(vocab)
```

```
{0: '200',  
 1: '204th',  
 2: '33rd',  
 3: 'ahead',  
 4: 'alley',  
 ...}
```

```
zipped_row =  
dict(zip(text_tfidf[3].indices,  
text_tfidf[3].data))
```

```
print(zipped_row)
```

```
{5: 0.1597882543332701,  
 7: 0.26576432098763175,  
 8: 0.18599931331925676,  
 9: 0.26576432098763175,  
10: 0.13077355258450366,  
 ...}
```

가 , 가 . 가 , 가 .

가 . 가 , 가 , 가 .

Looking at word weights

```
def return_weights(vocab, vector, vector_index):
```

```
    zipped = dict(zip(vector[vector_index].indices,  
                      vector[vector_index].data))
```

```
    return {vocab[i]:zipped[i] for i in vector[vector_index].indices}
```

```
print(return_weights(vocab, text_tfidf, 3))
```

```
{ 'and': 0.1597882543332701,  
  'are': 0.26576432098763175,  
  'at': 0.18599931331925676,  
  ...
```

4

가
(3)

, text_tfidf

가

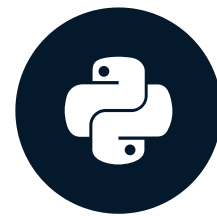
Let's practice!

PREPROCESSING FOR MACHINE LEARNING IN PYTHON

(dimensionality reduction)

Dimensionality reduction

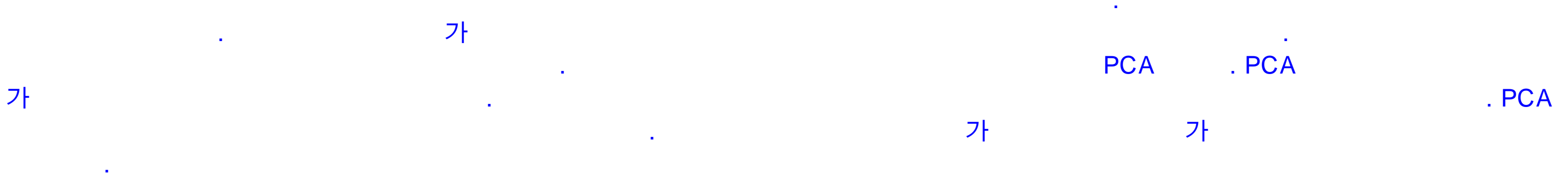
PREPROCESSING FOR MACHINE LEARNING IN PYTHON



Sarah Guido
Senior Data Scientist

Dimensionality reduction and PCA

- Unsupervised learning method
- Combines/decomposes a feature space
- Feature extraction - here we'll use to reduce our feature space
- Principal component analysis
- Linear transformation to uncorrelated space
- Captures as much variance as possible in each component



PCA in scikit-learn

```
from sklearn.decomposition import PCA  
pca = PCA()  
df_pca = pca.fit_transform(df)
```

PCA

```
print(df_pca)
```

pca

```
[88.4583, 18.7764, -2.2379, ..., 0.0954, 0.0361, -0.0034],  
[93.4564, 18.6709, -1.7887, ..., -0.0509, 0.1331, 0.0119],  
[-186.9433, -0.2133, -5.6307, ..., 0.0332, 0.0271, 0.0055]
```

PCA
PCA
가
skikit - learn PCA

```
print(pca.explained_variance_ratio_)
```

```
[0.9981, 0.0017, 0.0001, 0.0001, ...]
```

PCA caveats

- Difficult to interpret components
- End of preprocessing journey

PCA

가

가 . PCA

PCA

. PCA

PCA

Let's practice!

PREPROCESSING FOR MACHINE LEARNING IN PYTHON