K-Nearest-Neighbor en Python

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March 31, 2025

1 Introducción

K-Nearest-Neighbor es un algoritmo supervisado de Machine Learning que clasifica o predice datos según la similitud con ejemplos previos. Es fácil de implementar y se aplica en reconocimiento de patrones y sistemas de recomendación.

2 Metodología

Se siguieron los siguientes pasos para realizar K-Nearest-Neighbor

1. Primero hacemos imports de librerías que utilizaremos

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from matplotlib.colors import ListedColormap
import matplotlib.patches as mpatches
import seaborn as sb
plt.show
plt.rcParams['figure.figsize'] = (16, 9)
plt.style.use('ggplot')
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import MinMaxScaler
from sklearn.metrics import classification_report
from sklearn.metrics import confusion_matrix
```

2. Cargamos el archivo entrada csv con pandas y aprovechamos a ver un resumen estadístico de los datos

```
dataframe = pd.read_csv(r"reviews_sentiment.csv",sep=';')
print(dataframe.head(10))
print(dataframe.describe())
```

3. Veamos unas gráficas simples y qué información nos aportan

```
dataframe.hist()
plt.show()
```

4. Veamos realmente cuantas Valoraciones de Estrellas tenemos

```
print(dataframe.groupby('Star Rating').size())
```

5. Hacemos otra grafica y tambien graficamos mejor la cantidad de palabras

```
sb.catplot(x='Star Rating',data=dataframe,kind="count", aspect=3)
sb.catplot(x='wordcount',data=dataframe,kind="count", aspect=3)
plt.show()
```

6. Creamos nuestro X e y de entrada y los sets de entrenamiento y test.

```
X = dataframe[['wordcount','sentimentValue']].values
y = dataframe['Star Rating'].values

X_train, X_test, y_train, y_test = train_test_split(X, y, random_state=0)
scaler = MinMaxScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
```

7. Definimos el valor de k en 7 y creamos nuestro clasificador.

```
n_neighbors = 7

knn = KNeighborsClassifier(n_neighbors)
knn.fit(X_train, y_train)
print('Accuracy of K-NN classifier on training set: {:.2f}'
.format(knn.score(X_train, y_train)))
print('Accuracy of K-NN classifier on test set: {:.2f}'
.format(knn.score(X_test, y_test)))
```

8. Precisión del modelo

```
pred = knn.predict(X_test)
print(confusion_matrix(y_test, pred))
print(classification_report(y_test, pred))
```

9. Y graficamos.

```
h = .02 # step size in the mesh

# Create color maps
cmap_light = ListedColormap(['#FFAAAA', '#ffcc99', '#ffffb3','#b3ffff',
'#c2f0c2'])
cmap_bold = ListedColormap(['#FF0000', '#ff9933','#FFFF00','#00ffff',
'#00FF00'])

# we create an instance of Neighbours Classifier and fit the data.
clf = KNeighborsClassifier(n_neighbors, weights='distance')
clf.fit(X, y)

# Plot the decision boundary. For that, we will assign a color to each
# point in the mesh [x_min, x_max]x[y_min, y_max].

x_min, x_max = X[:, 0].min() - 1, X[:, 0].max() + 1
y_min, y_max = X[:, 1].min() - 1, X[:, 1].max() + 1
xx, yy = np.meshgrid(np.arange(x_min, x_max, h),
np.arange(y_min, y_max, h))
Z = clf.predict(np.c_[xx.ravel(), yy.ravel()])

# Put the result into a color plot
Z = Z.reshape(xx.shape)
plt.figure()
plt.pcolormesh(xx, yy, Z, cmap=cmap_light)

# Plot also the training points
plt.scatter(X[:, 0], X[:, 1], c=y, cmap=cmap_bold,edgecolor='k', s=20)
plt.xlim(xx.min(), xx.max())
plt.ylim(yy.min(), yy.max())
patch0 = mpatches.Patch(color='#FF0000', label='1')
patch1 = mpatches.Patch(color='#ff9933', label='2')
patch2 = mpatches.Patch(color='#FFFF00', label='3')
patch3 = mpatches.Patch(color='#00ffff', label='4')
patch4 = mpatches.Patch(color='#00FF00', label='5')
plt.legend(handles=[patch0, patch1, patch2, patch3,patch4])

plt.title("5-Class classification (k = %i, weights = '%s')"
% (n_neighbors, 'distance'))

plt.show()
```

10. Elegimos el mejor valor de k

```
plt.show()
k_range = range(1, 20)
scores = []
for k in k_range:
    knn = KNeighborsClassifier(n_neighbors = k)
knn.fit(X_train, y_train)
scores.append(knn.score(X_test, y_test))
plt.figure()
plt.xlabel('k')
plt.ylabel('accuracy')
plt.scatter(k_range, scores)
plt.xticks([0,5,10,15,20])
```

11. Predecir nuevas muestras

```
print(clf.predict([[5, 1.0]]))
print(clf.predict_proba([[20, 0.0]]))
```

2.1 Código en Python

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from matplotlib.colors import ListedColormap
import matplotlib.patches as mpatches
import seaborn as sb
plt.show
plt.rcParams['figure.figsize'] = (16, 9)
plt.style.use('ggplot')
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import MinMaxScaler
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import classification_report
from sklearn.metrics import confusion_matrix
dataframe = pd.read_csv(r"reviews_sentiment.csv",sep=';')
print(dataframe.head(10))
print(dataframe.describe())
dataframe.hist()
plt.show()
print(dataframe.groupby('Star Rating').size())
sb.catplot(x='Star Rating',data=dataframe,kind="count", aspect=3)
sb.catplot(x='wordcount',data=dataframe,kind="count", aspect=3)
plt.show()
X = dataframe[['wordcount','sentimentValue']].values
```

```
y = dataframe['Star Rating'].values

X_train, X_test, y_train, y_test = train_test_split(X, y, random_state=0)
scaler = MinMaxScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
n_neighbors = 7

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knn.fit(X_train, y_train)
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.format(knn.score(X_train, y_train)))
print('Accuracy of K-NN classifier on test set: {:.2f}'
.format(knn.score(X_test, y_test)))
pred = knn.predict(X_test)
print(confusion_matrix(y_test, pred))
print(classification_report(y_test, pred))
h = .02 # step size in the mesh

# Create color maps
cmap_light = ListedColormap(['#FFAAAA', '#ffcc99', '#ffffb3','#b3ffff','#c2f0c2'])
cmap_bold = ListedColormap(['#FF0000', '#ff9933','#FFFF00','#00ffff','#00FF00'])

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x_min, x_max = X[:, 0].min() - 1, X[:, 0].max() + 1
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xx, yy = np.meshgrid(np.arange(x_min, x_max, h),
np.arange(y_min, y_max, h))
Z = clf.predict(np.c_[xx.ravel(), yy.ravel()])

# Put the result into a color plot
Z = Z.reshape(xx.shape)
plt.figure()
plt.pcolormesh(xx, yy, Z, cmap=cmap_light)

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plt.ylim(yy.min(), yy.max())
patch0 = mpatches.Patch(color='#FF0000', label='1')
```
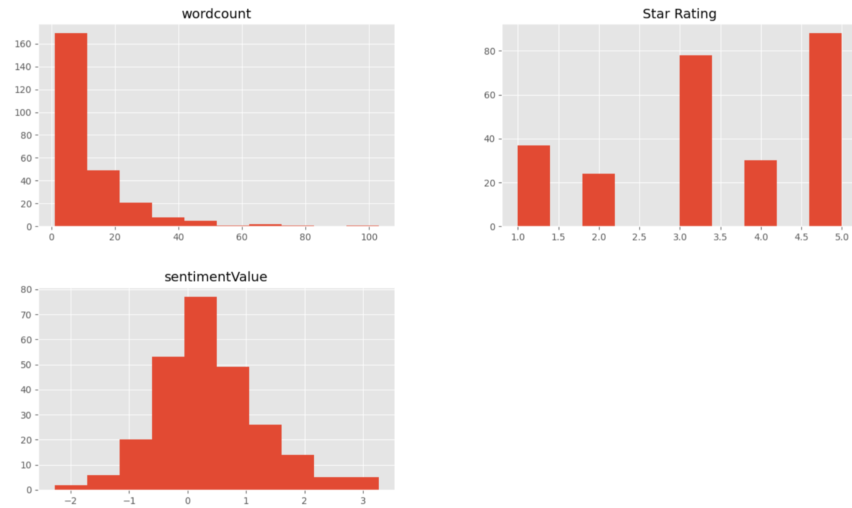

```
patch1 = mpatches.Patch(color='#ff9933', label='2')
patch2 = mpatches.Patch(color='#FFFF00', label='3')
patch3 = mpatches.Patch(color='#00ffff', label='4')
patch4 = mpatches.Patch(color='#00FF00', label='5')
plt.legend(handles=[patch0, patch1, patch2, patch3,patch4])

plt.title("5-Class classification (k = %i, weights = '%s')"
% (n_neighbors, 'distance'))

plt.show()
k_range = range(1, 20)
scores = []
for k in k_range:
    knn = KNeighborsClassifier(n_neighbors = k)
knn.fit(X_train, y_train)
scores.append(knn.score(X_test, y_test))
plt.figure()
plt.xlabel('k')
plt.ylabel('accuracy')
plt.scatter(k_range, scores)
plt.xticks([0,5,10,15,20])
print(clf.predict([[5, 1.0]]))
print(clf.predict_proba([[20, 0.0]]))
```

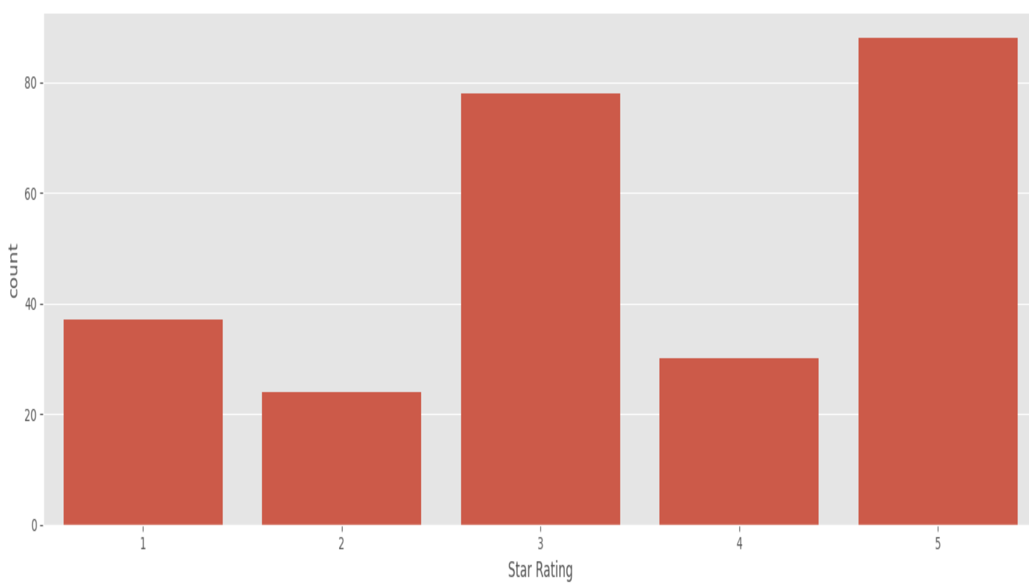
3 Resultados

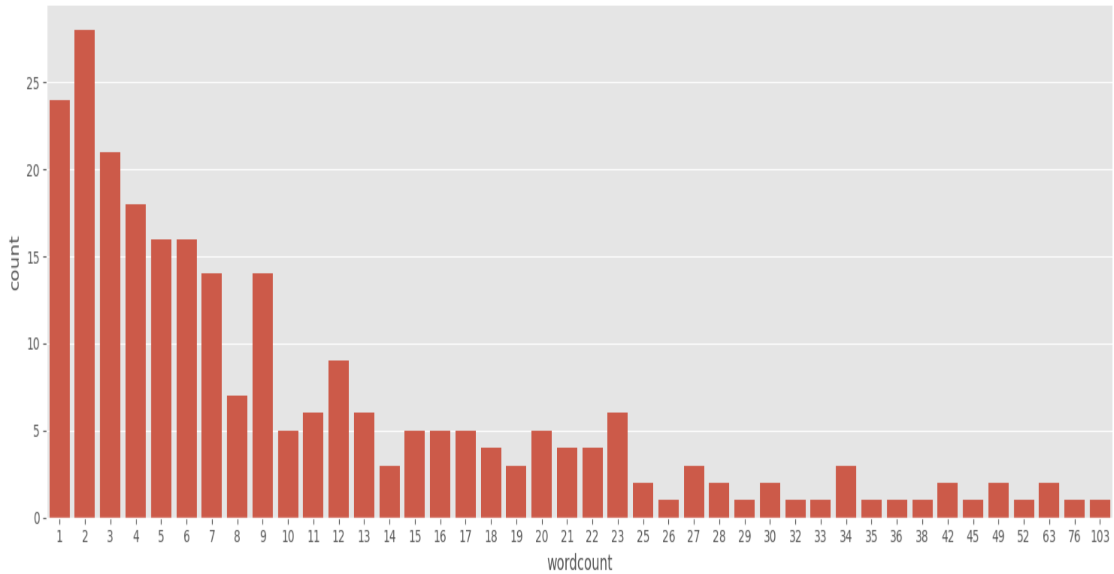
```
                 Review Title  ...  sentimentValue
0                Sin conexión  ...       -0.486389
1                faltan cosas  ...       -0.586187
2  Es muy buena lo recomiendo  ...       -0.602240
3             Version antigua  ...       -0.616271
4                  Esta bien  ...       -0.651784
5                      Buena  ...       -0.720443
6              De gran ayuda  ...       -0.726825
7                  Muy buena  ...       -0.736769
8               Ta to guapa.  ...       -0.765284
9            Se han corregido  ...       -0.797961
```

```
[10 rows x 7 columns]
        wordcount  Star Rating  sentimentValue
count  257.000000   257.000000      257.000000
mean    11.501946     3.420233        0.383849
std     13.159812     1.409531        0.897987
min      1.000000     1.000000       -2.276469
25%      3.000000     3.000000       -0.108144
50%      7.000000     3.000000        0.264091
75%     16.000000     5.000000        0.808384
max    103.000000     5.000000        3.264579
```

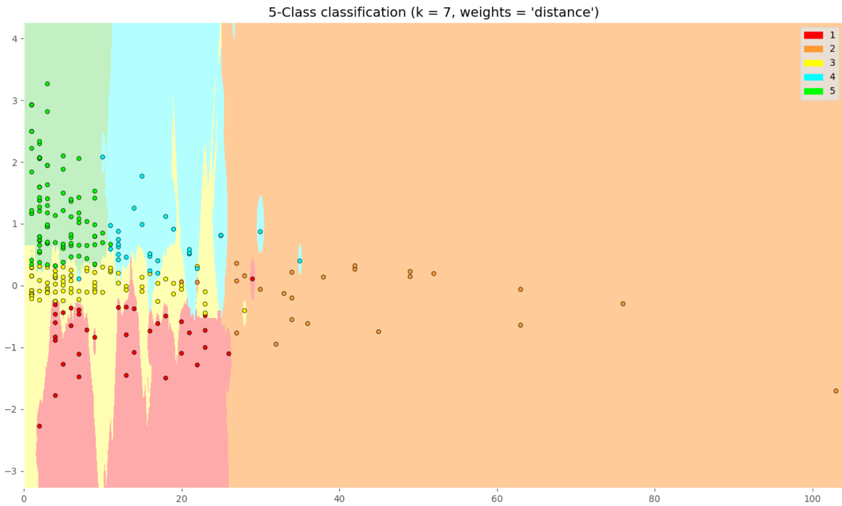


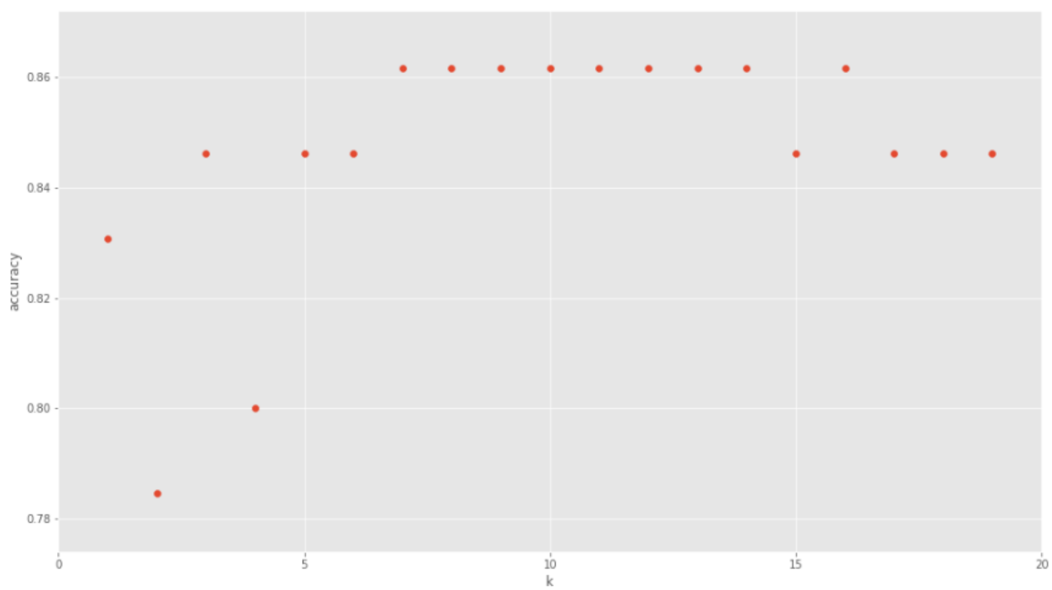

```
Star Rating
1      37
2      24
3      78
4      30
5      88
dtype: int64
```






```
[[ 9  0  1  0  0]
 [ 0  1  0  0  0]
 [ 0  1 17  0  1]
 [ 0  0  2  8  0]
 [ 0  0  4  0 21]]
              precision    recall  f1-score   support

           1       1.00      0.90      0.95        10
           2       0.50      1.00      0.67         1
           3       0.71      0.89      0.79        19
           4       1.00      0.80      0.89        10
           5       0.95      0.84      0.89        25

    accuracy                           0.86        65
   macro avg       0.83      0.89      0.84        65
weighted avg       0.89      0.86      0.87        65
```






```
ccuracy of K-NN classifier on training set: 0.90
Accuracy of K-NN classifier on test set: 0.86
[5]
[[0.00381998 0.02520212 0.97097789 0. 0. ]]
```

4 Conclusión

En este ejercicio creamos un modelo en Python con K-Nearest Neighbor para clasificar puntos según sus "k vecinos más cercanos". Como es un algoritmo supervisado, requiere suficientes datos etiquetados para entrenarse. Aunque es simple, consume mucha memoria y CPU, por lo que no es ideal para grandes datasets. Usamos solo dos dimensiones para visualizar los grupos y realizar predicciones, lo que ayudó a comprender mejor el problema.