In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
from sklearn.decomposition import PCA
from sklearn.cluster import KMeans
from mpl_toolkits.mplot3d import Axes3D
from sklearn.cluster import AgglomerativeClustering
```

In [3]:
```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", for
ce_remount=True).
```

In [4]:
```
df = pd.read_csv('/content/drive/MyDrive/2022F ㅂ□ㄱㅋ□ㄴㅌ□ㅅ□ㅌ□/Data/countbylog.csv')
```

In [5]:
```
df
```

Out[5]:

	event_CompleteIDCertification	event_EndLoanApply	event_GetCreditInfo	event_Login	event_OpenApp	event_SignUp	event_StartLoar
0	0.0	0.0	3.0	1.0	0.0	0.0	
1	0.0	0.0	1.0	0.0	0.0	0.0	
2	0.0	0.0	3.0	0.0	0.0	0.0	
3	4.0	7.0	8.0	0.0	5.0	0.0	
4	15.0	39.0	5.0	15.0	15.0	0.0	
...	...	...	...	...	...	...	
584631	6.0	12.0	2.0	0.0	9.0	0.0	
584632	1.0	3.0	0.0	0.0	0.0	0.0	
584633	1.0	1.0	0.0	0.0	0.0	0.0	
584634	1.0	1.0	3.0	2.0	1.0	0.0	
584635	0.0	0.0	0.0	0.0	1.0	0.0	

584636 rows × 11 columns

1. PCA(to 3D) -> Kmeans Clustering

- 전체 유저 행동(11개)을 3차원으로 축소한 후 kmeans clustering 진행
- 로그 데이터가 모두 0에 몰려 있는 사람 / 활동을 일정 수준 이상 활발하게 한 사람으로 클러스터링됨
- 유저 행동 단위로 설명 불가능
- 해당 유저행동의 0의 비율이 각각 99.4%, 99.2%이기 때문에 고객 군집 특성에 반영되지 않음
- 유저 행동별로 clustering을 하기 위해 Feature Selection Approach 채택

In [6]:
```
pca = PCA(n_components = 3)
pca_fitted = pca.fit_transform(df)
pca_df = pd.DataFrame(data= pca_fitted, columns = ['principal component1', 'principal component2', 'principal c
```

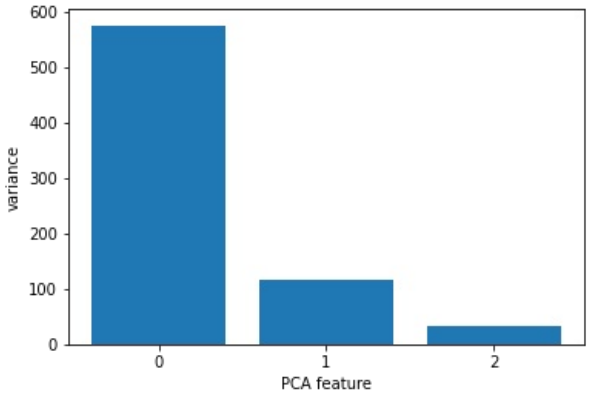
In [7]:
```
pca.explained_variance_ratio_
# 세 번째 주성분의 분산 설명력은 0.04밖에 되지 않음. 추가적인 주성분을 투입하더라도 설명 가능한 분산량이 얼마 증가하지 않기 때문
# 클러스터링 시 두 개의 그룹으로 클러스터링하기
```

Out[7]:
```
array([0.75312356, 0.15230085, 0.04283379])
```

In [8]:
```
sum(pca.explained_variance_ratio_)
```

Out[8]:
```
0.9482582004616323
```

In [9]:
```
# variation visualization
features = range(pca.n_components_)
plt.bar(features, pca.explained_variance_)
plt.xlabel('PCA feature')
plt.ylabel('variance')
plt.xticks(features)
plt.show()
```



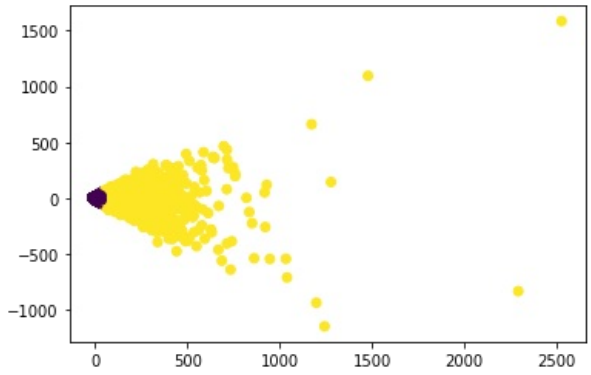
In [10]:
```
# 그룹 수, randomstate 설정
Kmeans1 = KMeans(n_clusters = 2, random_state = 10)

# 클러스터링 결과가 각 데이터가 몇 번째 그룹에 속하는지 저장
pca_df['cluster'] = Kmeans1.fit_predict(pca_df)
```

In [11]:
```
pca_df['cluster'].value_counts()
```

Out[11]:
```
0    560422
1     24214
Name: cluster, dtype: int64
```

In [12]:
```
plt.scatter(pca_df['principal component1'], pca_df['principal component2'], c=pca_df['cluster'])
plt.show()
```



2. 어플 사용 목적별 Kmeans clustering

- 어플의 사용목적 - 마이데이터(event_UseDSRCalc), 대출신청(event_StartLoanApply), 신용조회(event_GetCreditInfo)로 나누어 클러스터링 진행
- 해당 컬럼들을 가지고 3개의 그룹으로 Kmeans clustering 진행

In [14]:
```
df.sum()
```

Out[14]:
```
event_CompleteIDCertification    1237777.0
event_EndLoanApply               2715253.0
event_GetCreditInfo              2661997.0
event_Login                      2463755.0
event_OpenApp                    3460762.0
event_SignUp                       34892.0
event_StartLoanApply             1893914.0
event_UseDSRCalc                    4665.0
event_UseLoanManage              1558906.0
event_UsePrepayCalc                 7360.0
event_ViewLoanApplyIntro         1804712.0
dtype: float64
```

In [40]:
```
df2 = df[['event_StartLoanApply', 'event_UseDSRCalc', 'event_GetCreditInfo']]
```

In [41]:
```
# 그룹 수, randomstate 설정
Kmeans2 = KMeans(n_clusters = 3, random_state = 10, n_init = 20, init = 'random')

# 클러스터링 결과 각 데이터가 몇 번째 그룹에 속하는지 저장
df2['cluster'] = Kmeans2.fit_predict(df2)
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:5: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#ret
urning-a-view-versus-a-copy
  """
```

In [42]:
```
# 3차원 시각화
fig = plt.figure(figsize=(6, 6))
ax = fig.add_subplot(111, projection='3d')
ax.scatter(df2.event_UseDSRCalc, df2.event_StartLoanApply, df2.event_GetCreditInfo, c=df2.cluster, marker='o',
ax.set_xlabel('UseDSRCalc',rotation=150)
ax.set_ylabel('StartLoanApply')
ax.set_zlabel('GetCreditInfo', rotation=60)
plt.show()
```