In [20]:
```
import numpy as np
import pandas as pd
import seaborn as sns
from sklearn.cluster import DBSCAN
from sklearn.datasets import make_blobs
from sklearn.preprocessing import StandardScaler
from sklearn.decomposition import PCA
from IPython.display import display
```

In [13]:
```
X, _ = make_blobs(
    n_samples=750, n_features=10, cluster_std=0.4, random_state=0
)
X = StandardScaler().fit_transform(X)
```

In [14]:
```
df = pd.DataFrame(X)
display(df)
```

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|---|---|
| **0** | -1.412178 | 0.138881 | 1.030354 | -1.374328 | 1.277320 | 0.716573 | 1.352784 | -0.072073 | 1.1181 |
| **1** | 1.120948 | 1.053943 | -1.291701 | 0.250096 | -0.622285 | 0.671510 | -0.185737 | 0.496576 | -1.3574 |
| **2** | -1.473422 | 0.555454 | 0.518343 | -1.198269 | 1.419566 | 0.741096 | 1.278301 | 0.156885 | 0.9755 |
| **3** | 1.148823 | 1.054616 | -1.359783 | 0.234991 | -0.427253 | 0.757168 | -0.342457 | 1.161739 | -1.3782 |
| **4** | -0.233203 | -1.327316 | 0.666572 | 1.119386 | -0.706356 | -1.231405 | -1.040749 | -0.681332 | -0.0407 |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | |
| **745** | 1.532491 | 0.955039 | -0.995627 | 0.251636 | -0.703416 | 0.668838 | -0.438386 | 1.397128 | -1.5740 |
| **746** | -1.313371 | 0.409123 | 1.169887 | -1.131298 | 1.336661 | 0.653766 | 1.441933 | -0.313999 | 1.2563 |
| **747** | -1.460007 | 0.411918 | 1.076572 | -1.169049 | 1.268149 | 0.726909 | 1.590668 | 0.275679 | 1.1709 |
| **748** | -1.454470 | 0.153634 | 1.031319 | -1.409967 | 1.515520 | 0.826626 | 1.075929 | 0.356608 | 0.9122 |
| **749** | -1.174188 | -0.013734 | 1.146523 | -1.503986 | 1.126015 | 0.579320 | 1.567498 | -0.068226 | 1.1694 |

750 rows × 10 columns

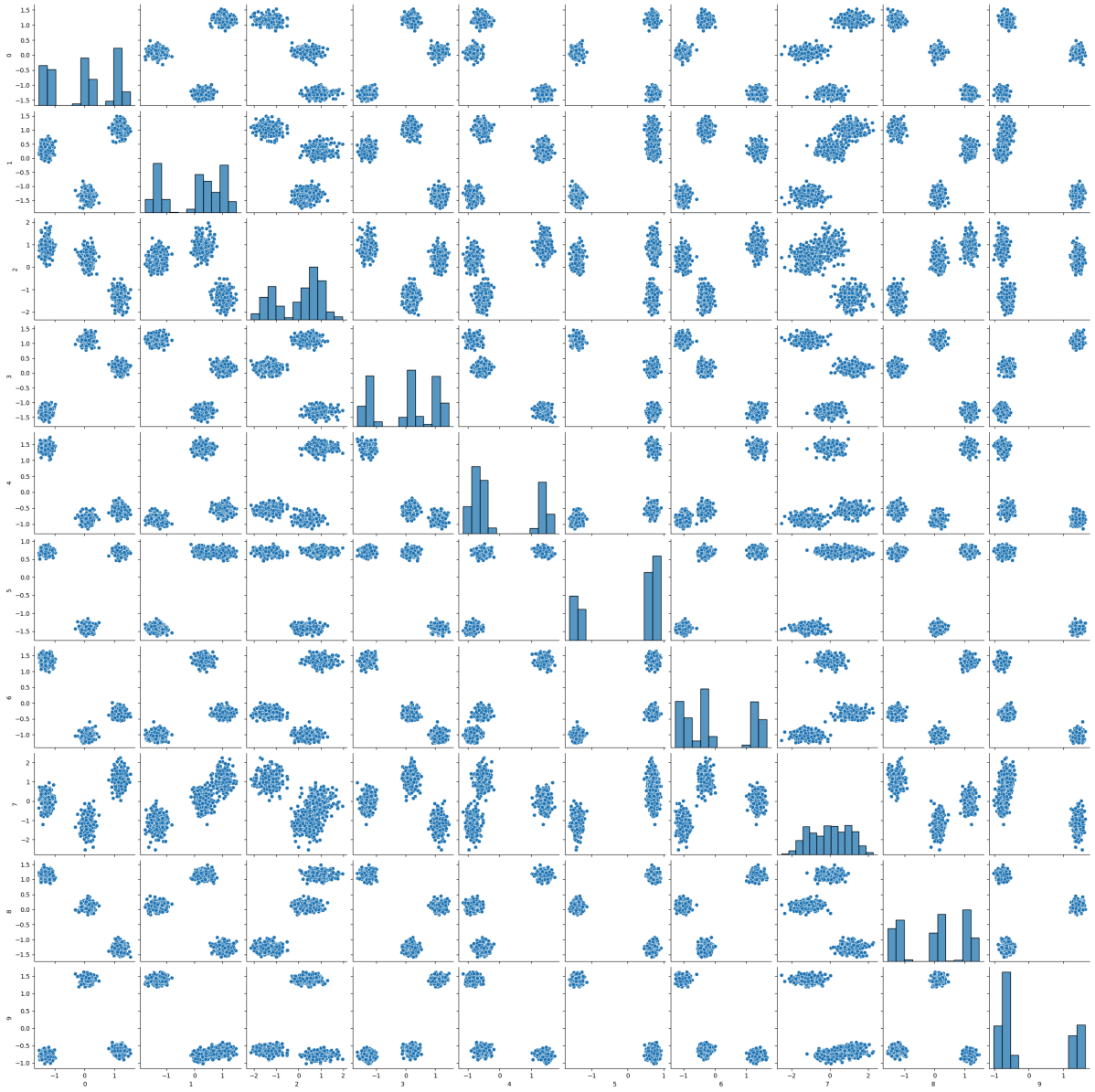
In [15]:
```
dbscan = DBSCAN()
clustering = dbscan.fit_predict(X)
```

In [24]:
```
np.unique(clustering)
```

Out[24]:
```
array([-1,  0,  1,  2])
```

In [16]:
```
sns.pairplot(df)
```

Out[16]:
```
<seaborn.axisgrid.PairGrid at 0x7fafa7ff1d50>
```



In [23]:
```
df_pca = pd.DataFrame(PCA(n_components=0.9).fit_transform(df))
display(df_pca)
df_with_labels = df_pca.copy()
df_with_labels["clusters"] = clustering
display(df_with_labels)
sns.scatterplot(df_with_labels, x=0, y=1, hue="clusters")

# # %%
# clustering.labels_
```

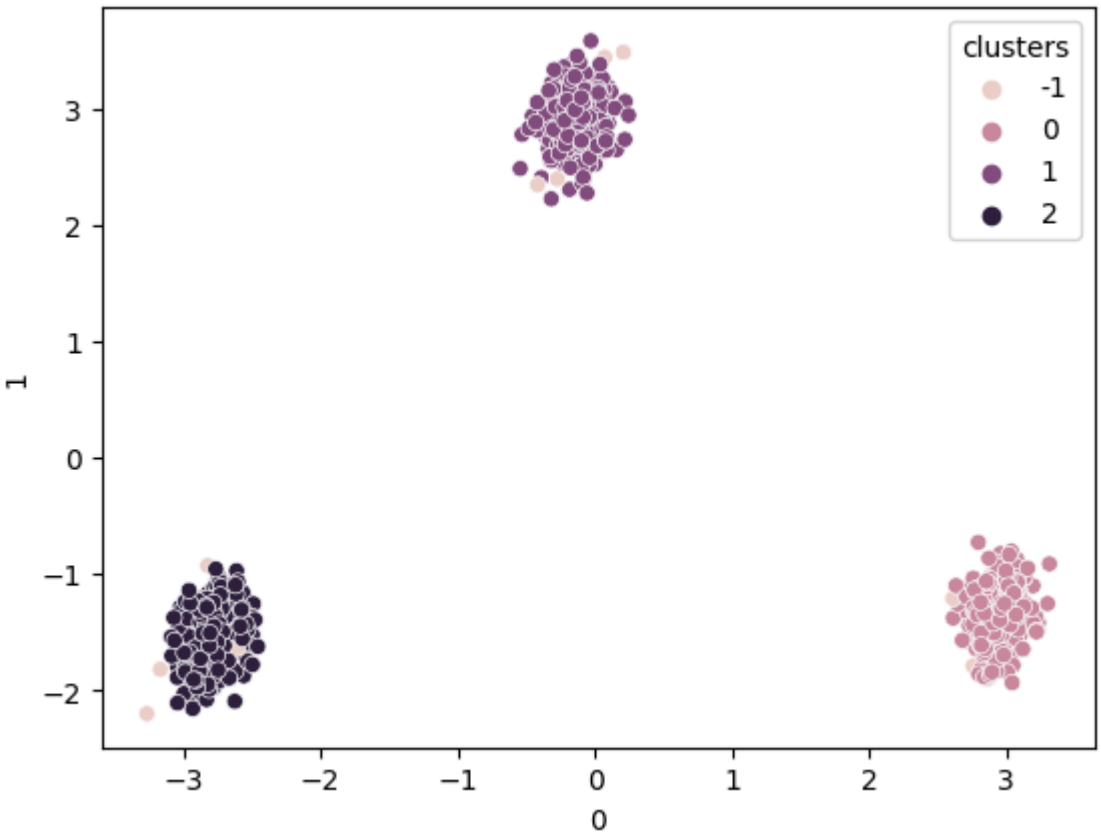
| | 0 | 1 |
|---|---|---|
| **0** | 2.879354 | -1.528204 |
| **1** | -0.237821 | 2.665336 |
| **2** | 2.934311 | -1.010308 |
| **3** | -0.149849 | 2.941895 |
| **4** | -2.541960 | -1.539241 |
| **...** | ... | ... |
| **745** | -0.335449 | 3.151280 |
| **746** | 2.846703 | -1.641857 |
| **747** | 3.071572 | -1.350743 |
| **748** | 2.986945 | -1.256748 |
| **749** | 2.817957 | -1.611575 |

750 rows × 2 columns

| | 0 | 1 | clusters |
|---|---|---|---|
| **0** | 2.879354 | -1.528204 | 0 |
| **1** | -0.237821 | 2.665336 | 1 |
| **2** | 2.934311 | -1.010308 | 0 |
| **3** | -0.149849 | 2.941895 | 1 |
| **4** | -2.541960 | -1.539241 | 2 |
| **...** | ... | ... | ... |
| **745** | -0.335449 | 3.151280 | 1 |
| **746** | 2.846703 | -1.641857 | 0 |
| **747** | 3.071572 | -1.350743 | 0 |
| **748** | 2.986945 | -1.256748 | 0 |
| **749** | 2.817957 | -1.611575 | 0 |

750 rows × 3 columns

Out[23]: <AxesSubplot: xlabel='0', ylabel='1'>


clusters
-1
0
1
2
3
2
1
0
−1
−2
1
−3
−2
−1
0
1
2
3
0