PD 7

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In [38]:

```
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
import seaborn as sns
from sklearn.metrics import f1_score, precision_score, recall_score
from sklearn.mixture import GaussianMixture
```

In [2]:

```
train_df = pd.read_csv("train.csv")
val_df = pd.read_csv("val.csv")
test_df = pd.read_csv("test.csv")
```

In [4]:

```
print(train_df.shape)
print(val_df.shape)
print(test_df.shape)
```

```
(95, 13)
(17, 13)
(17, 14)
```

In [5]:

```
X_test_df = test_df.iloc[:, 1:]
y_test = test_df.iloc[:, 0]
```

In [6]:

```
train_df
```

Out[6]:

	Alcohol	Malic acid	Ash	Alcalinity of ash	Magnesium	Total phenols	Flavanoids	Nonflavanoid phenols	Proanthocy
0	12.72	1.75	2.28	22.5	84	1.38	1.76	0.48	
1	13.23	3.30	2.28	18.5	98	1.80	0.83	0.61	
2	12.58	1.29	2.10	20.0	103	1.48	0.58	0.53	
3	12.37	1.17	1.92	19.6	78	2.11	2.00	0.27	
4	13.84	4.12	2.38	19.5	89	1.80	0.83	0.48	
...	...	...	...	...	...	...	...	...	
90	12.84	2.96	2.61	24.0	101	2.32	0.60	0.53	
91	12.70	3.87	2.40	23.0	101	2.83	2.55	0.43	
92	12.77	2.39	2.28	19.5	86	1.39	0.51	0.48	
93	12.88	2.99	2.40	20.0	104	1.30	1.22	0.24	
94	12.25	4.72	2.54	21.0	89	1.38	0.47	0.53	

95 rows × 13 columns

In [11]:

```
df_all = pd.concat([train_df, val_df, X_test_df])
```

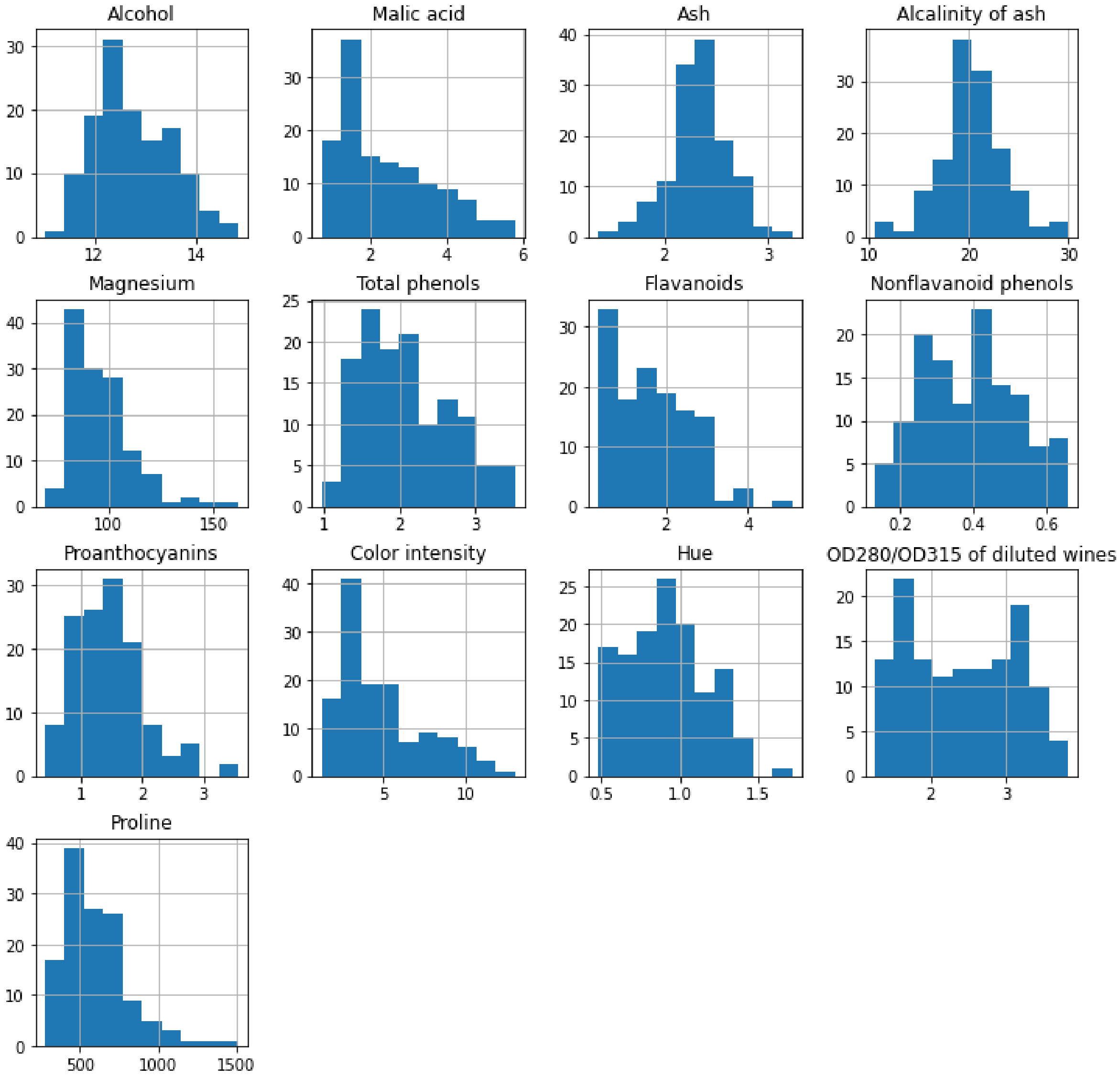
In [12]:

```
df_all.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 129 entries, 0 to 16
Data columns (total 13 columns):
 #   Column                        Non-Null Count  Dtype  
---  ------                        --------------  -----  
 0   Alcohol                       129 non-null    float64
 1   Malic acid                    129 non-null    float64
 2   Ash                           129 non-null    float64
 3   Alcalinity of ash             129 non-null    float64
 4   Magnesium                     129 non-null    int64  
 5   Total phenols                 129 non-null    float64
 6   Flavanoids                    129 non-null    float64
 7   Nonflavanoid phenols          129 non-null    float64
 8   Proanthocyanins               129 non-null    float64
 9   Color intensity               129 non-null    float64
 10  Hue                           129 non-null    float64
 11  OD280/OD315 of diluted wines  129 non-null    float64
 12  Proline                       129 non-null    int64  
dtypes: float64(11), int64(2)
memory usage: 14.1 KB
```

In [14]:

```
df_all.hist(figsize=(12,12))
plt.show()
```



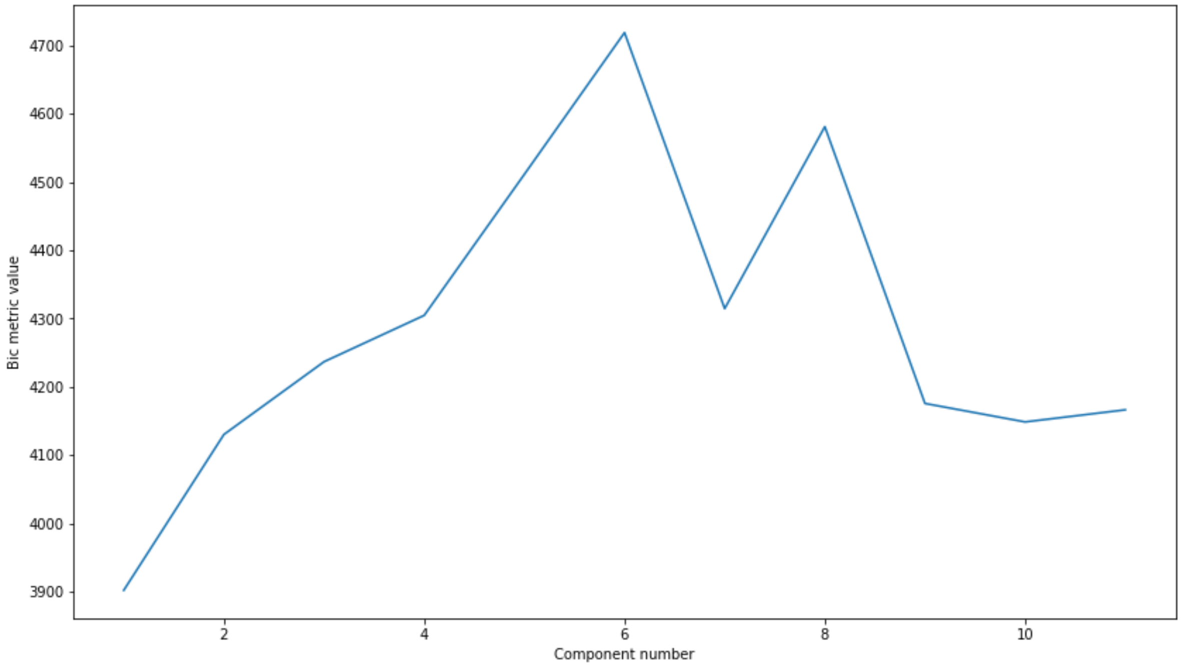
Wykorzystanie GMM do wykrywania próbek odstających

In [15]:

```
bic = []
for i in range(1, 12):
    gmm_tmp = GaussianMixture(n_components = i, random_state = 42, covariance_type = "full"
    gmm_tmp.fit(train_df)
    bic.append(gmm_tmp.bic(train_df))
```

In [18]:

```
plt.figure(figsize=(14, 8))
plt.plot(range(1, 12), bic)
plt.xlabel("Component number")
plt.ylabel("Bic metric value")
plt.show()
```



In [19]:

```
gmm = GaussianMixture(covariance_type='full', n_components=1, random_state=42)
gmm.fit(train_df)
```

Out[19]:

```
GaussianMixture(random_state=42)
```

Wybór próbek odstających

In [23]:

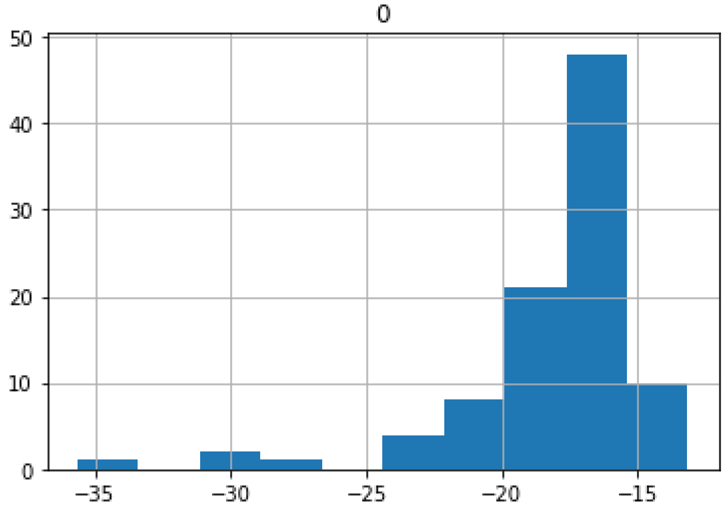
```
probs_train = gmm.score_samples(train_df)
probs_val = gmm.score_samples(val_df)
```

In [24]:

```
pd.DataFrame(probs_train).hist()
```

Out[24]:

```
array([[<AxesSubplot:title={'center':'0'}>]], dtype=object)
```

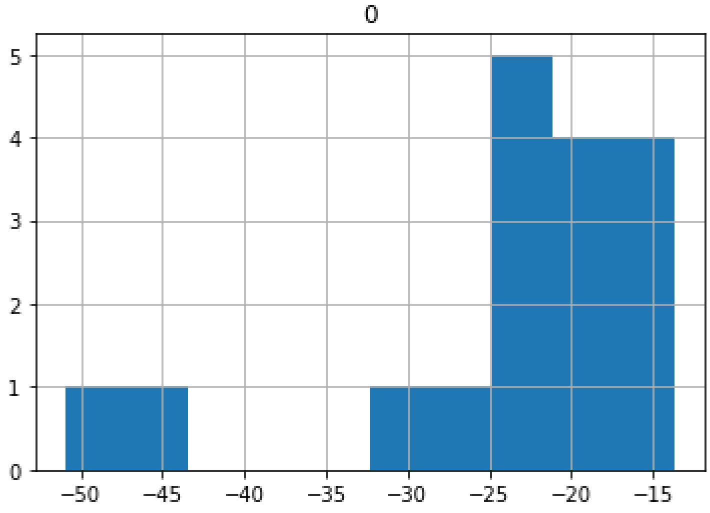


In [25]:

```
pd.DataFrame(probs_val).hist()
```

Out[25]:

```
array([[<AxesSubplot:title={'center':'0'}>]], dtype=object)
```



In [28]:

```
probs = pd.concat([pd.DataFrame(zip(probs_val, ["val"]*len(probs_val))), pd.DataFrame(zip(p
probs.reset_index(inplace=True, drop=True)
probs.columns = ["prob", "set"]
```

In [29]:

```
probs
```

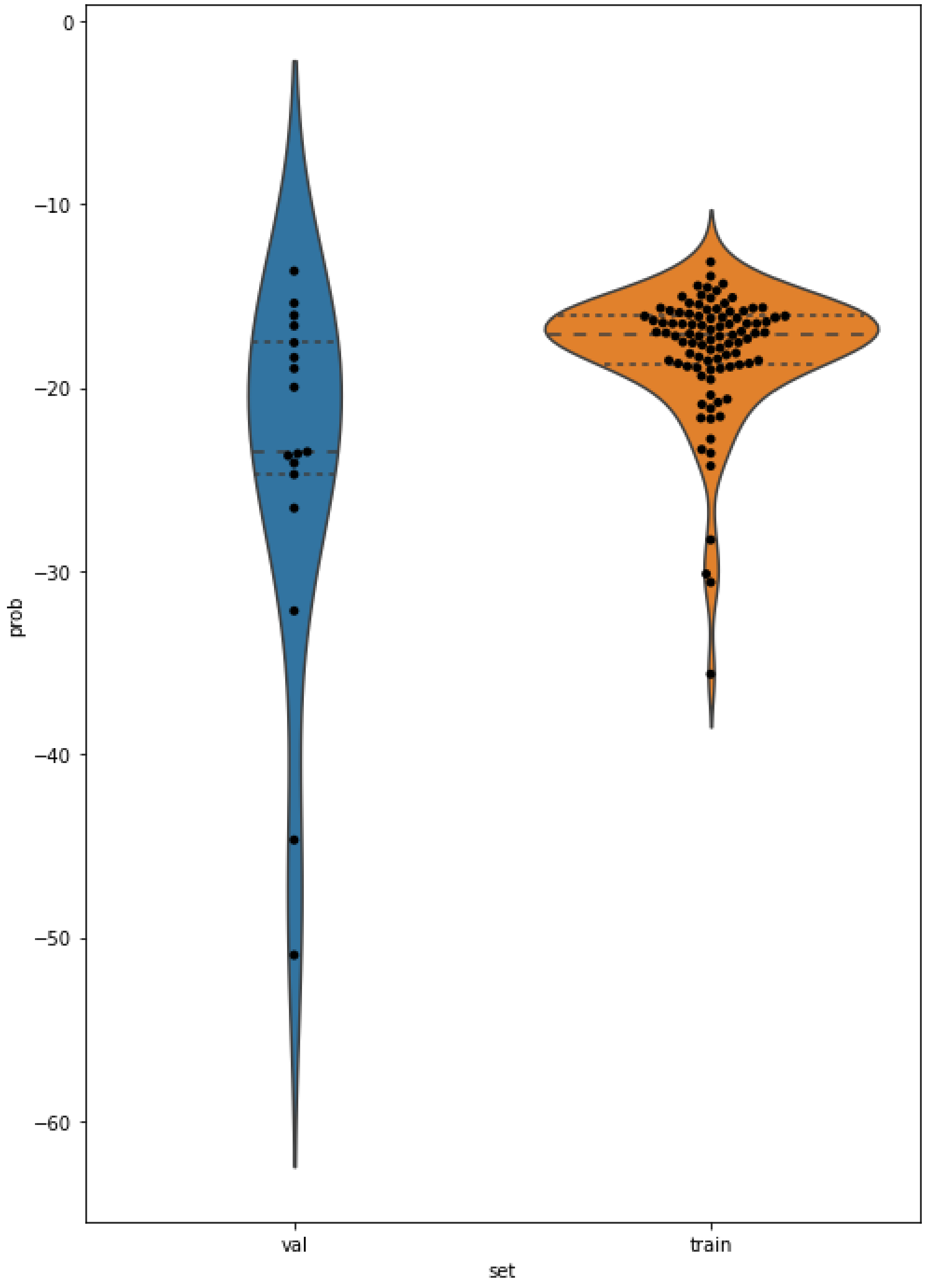
Out[29]:

	prob	set
0	-24.109594	val
1	-13.656306	val
2	-18.348802	val
3	-24.731812	val
4	-26.572217	val
...	...	...
107	-17.185796	train
108	-16.504880	train
109	-17.588148	train
110	-15.767297	train
111	-18.207360	train

112 rows × 2 columns

In [35]:

```
plt.figure(figsize=(8, 12))
sns.violinplot(data = probs, y = "prob", x = "set", inner = "quartiles")
sns.swarmplot(data = probs, y = "prob", x = "set", color = "black")
plt.show()
```



Bazując na wykresach wybieramy threshold na poziomie -31.

Sprawdzenie wyników

In [36]:

```
test_probs = gmm.score_samples(X_test_df)
y_testh = test_probs < -31
y_testh = y_testh.astype(int)
```

In [39]:

```
results = pd.DataFrame(
    [("precision", precision_score(y_test, y_testh)),
    ("recall", recall_score(y_test, y_testh)),
    ("F1-score", f1_score(y_test, y_testh))],
    columns=["metric", "value"]
)
results
```

Out[39]:

	metric	value
0	precision	0.833333
1	recall	1.000000
2	F1-score	0.909091