Demo : No pattern found

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In [11]:
```
# -*- coding: utf-8 -*-
import sys,os
import numpy as np
import random
from matplotlib import pyplot as plt
%matplotlib inline
import pandas as pd
import seaborn as sns
from sklearn import preprocessing
import math
from sklearn.svm import LinearSVC
from sklearn.svm import SVC
from sklearn.naive_bayes import GaussianNB
from numpy.random import RandomState
np.set_printoptions(suppress=True)
from sklearn.linear_model import LogisticRegression
from sklearn.neural_network import MLPClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.svm import SVC
from sklearn.gaussian_process import GaussianProcessClassifier
from sklearn.gaussian_process.kernels import RBF
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier, AdaBoostClassifier, GradientBoostingClassifier,ExtraTreesClassifier, BaggingClassifier
from sklearn.naive_bayes import GaussianNB
from sklearn.discriminant_analysis import QuadraticDiscriminantAnalysis, LinearDiscriminantAnalysis
from xgboost import XGBClassifier
sns.set(font_scale=2)
from warnings import filterwarnings
filterwarnings('ignore')
```

In [12]:
```
g_classifiers = [
    ('Logistic Regression', LogisticRegression()),
    ('Nearest Neighbors', KNeighborsClassifier()),
    ('Linear SVM', SVC(kernel='linear', C=0.025)),
    ('RBF SVM', SVC(gamma=2, C=1)),
    ('Gaussian Process', GaussianProcessClassifier(1.0 * RBF(1.0))),
    ('Decision Tree', DecisionTreeClassifier(max_depth=5)),
    ('Random Forest', RandomForestClassifier(max_depth=5, n_estimators=10, max_features=1)),
    ('AdaBoost', AdaBoostClassifier()),
    ('Extra Trees', ExtraTreesClassifier()),
    ('GradientBoosting', GradientBoostingClassifier()),
    ('Bagging', BaggingClassifier()),
    ('Naive Bayes', GaussianNB()),
    ('QDA', QuadraticDiscriminantAnalysis()),
    ('LDA', LinearDiscriminantAnalysis()),
    ('MLP', MLPClassifier(alpha=1)),
    ('XGB', XGBClassifier()),
]
```

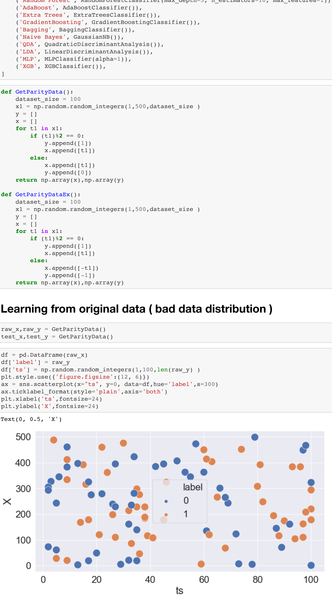
In [13]:
```
def GetParityData():
    dataset_size = 100
    x1 = np.random.random_integers(1,500,dataset_size )
    y = []
    x = []
    for t1 in x1:
        if (t1)%2 == 0:
            y.append([1])
            x.append([t1])
        else:
            x.append([t1])
            y.append([0])
    return np.array(x),np.array(y)

def GetParityDataEx():
    dataset_size = 100
    x1 = np.random.random_integers(1,500,dataset_size )
    y = []
    x = []
    for t1 in x1:
        if (t1)%2 == 0:
            y.append([1])
            x.append([t1])
        else:
            x.append([-t1])
            y.append([-1])
    return np.array(x),np.array(y)
```

Learning from original data (bad data distribution)

In [14]:
```
raw_x,raw_y = GetParityData()
test_x,test_y = GetParityData()
```

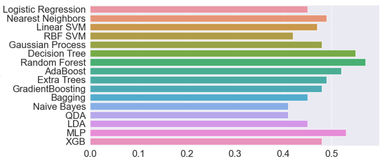
In [15]:
```
df = pd.DataFrame(raw_x)
df['label'] = raw_y
df['ts'] = np.random.random_integers(1,100,len(raw_y) )
plt.style.use({'figure.figsize':(12, 6)})
ax = sns.scatterplot(x="ts", y=0, data=df,hue='label',s=300)
ax.ticklabel_format(style='plain',axis='both')
plt.xlabel('ts',fontsize=24)
plt.ylabel('X',fontsize=24)
```

Out[15]:
```
Text(0, 0.5, 'X')
```



In [20]:
```
result = []
models = {}
for name, clf in g_classifiers:
    clf.fit(raw_x, raw_y)
    score = clf.score(test_x,test_y)
    result.append([name,score])
    models[name] = clf
df = pd.DataFrame(result)
plt.xlabel('Classifier',fontsize=2)
plt.ylabel('Accuracy',fontsize=2)
sns.barplot(y=0, x=1, data=df)
```

Out[20]:
```
<AxesSubplot:xlabel='1', ylabel='0'>
```



In [22]:
```
input_x = [[112],[244]]
input_x = np.random.random_integers(500,1000,20)
input_x=input_x[:,np.newaxis]
pred_x = np.array(input_x)
pred_y = models['LDA'].predict(pred_x)
for x,y in zip(input_x,pred_y):
    if y == 1:
        print(" %d --> Even" %x[0])
    else:
        print(" %d --> Odd" %x[0])
```

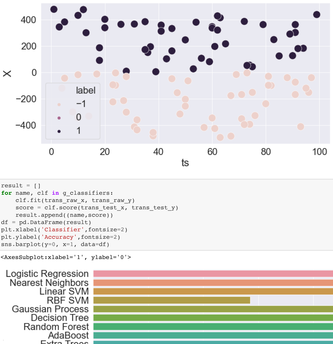
```
 893 --> Odd
 887 --> Odd
 530 --> Odd
 682 --> Odd
 948 --> Odd
 573 --> Odd
 793 --> Odd
 918 --> Odd
 738 --> Odd
 572 --> Odd
 716 --> Odd
 972 --> Odd
 712 --> Odd
 699 --> Odd
 500 --> Odd
 907 --> Odd
 581 --> Odd
 550 --> Odd
 953 --> Odd
 933 --> Odd
```

Leanring from good data distribution

In [16]:
```
trans_raw_x,trans_raw_y = GetParityDataEx()
trans_test_x,trans_test_y = GetParityDataEx()
```

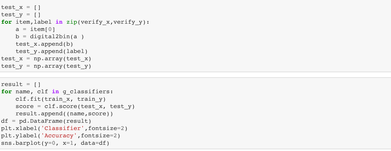
In [17]:
```
df = pd.DataFrame(trans_raw_x)
df['label'] = trans_raw_y
df['ts'] = np.random.random_integers(1,100,len(raw_y) )
plt.style.use({'figure.figsize':(12, 6)})
ax = sns.scatterplot(x='ts', y=0, data=df,hue='label',s=300)
ax.ticklabel_format(style='plain',axis='both')
plt.xlabel('ts',fontsize=24)
plt.ylabel('X',fontsize=24)
```

Out[17]:
```
Text(0, 0.5, 'X')
```



In [18]:
```
result = []
for name, clf in g_classifiers:
    clf.fit(trans_raw_x, trans_raw_y)
    score = clf.score(trans_test_x, trans_test_y)
    result.append([name,score])
df = pd.DataFrame(result)
plt.xlabel('Classifier',fontsize=2)
plt.ylabel('Accuracy',fontsize=2)
sns.barplot(y=0, x=1, data=df)
```

Out[18]:
```
<AxesSubplot:xlabel='1', ylabel='0'>
```

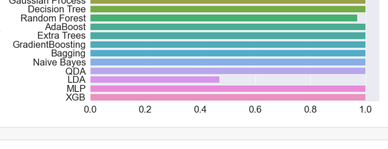


Method from internet

In [19]:
```
extern_raw_x,extern_raw_y = GetParityData()
verify_x,verify_y = GetParityData()
def digital2bin(x):
    a = format(x, '032b')
    l = list(str(a))
    l = np.array(list(map(int, l)))
    return l

train_x = []
train_y = []
for item,label in zip(extern_raw_x,extern_raw_y):
    a = item[0]
    b = digital2bin(a )
    train_x.append(b)
    train_y.append(label)

train_x = np.array(train_x)
train_y = np.array(train_y)

test_x = []
test_y = []
for item,label in zip(verify_x,verify_y):
    a = item[0]
    b = digital2bin(a )
    test_x.append(b)
    test_y.append(label)
test_x = np.array(test_x)
test_y = np.array(test_y)
```

In [20]:
```
result = []
for name, clf in g_classifiers:
    clf.fit(train_x, train_y)
    score = clf.score(test_x, test_y)
    result.append([name,score])
df = pd.DataFrame(result)
plt.xlabel('Classifier',fontsize=2)
plt.ylabel('Accuracy',fontsize=2)
sns.barplot(y=0, x=1, data=df)
```

Out[20]:
```
<AxesSubplot:xlabel='1', ylabel='0'>
```



In [ ]:
```

```