```
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
import seaborn as sns

np.set_printoptions(precision=3, suppress=True)

import tensorflow as tf

from tensorflow import keras
from tensorflow.keras import layers

print(tf.__version__)

url = '/content/tmpsVoyage.csv'
column_names = ['tx', 'nbr', 'txVaccin', 'txQuar', 'txInfect',
                'tmpsInfect', 'tmpsQuar', 'tmpsVoyage']

raw_dataset = pd.read_csv(url, names=column_names,
                          na_values='?', comment='\t',
                          sep=',', skipinitialspace=True)

dataset = raw_dataset.copy()
dataset.tail()

unit = 'tmpsVoyage'
```

```
     2.7.0
```

```
train_dataset = dataset.sample(frac=0.8, random_state=0)
test_dataset = dataset.drop(train_dataset.index)

train_dataset.describe().transpose()
```

|  | count | mean | std | min | 25% | 50% | 75% | max |
|---|---|---|---|---|---|---|---|---|
| **tx** | 1711.0 | 134.900058 | 9.324888e+01 | 1.00 | 102.00 | 110.00 | 116.000 | 648.00 |
| **nbr** | 1711.0 | 150.000000 | 0.000000e+00 | 150.00 | 150.00 | 150.00 | 150.000 | 150.00 |
| **txVaccin** | 1711.0 | 0.200000 | 6.357885e-15 | 0.20 | 0.20 | 0.20 | 0.200 | 0.20 |
| **txQuar** | 1711.0 | 0.000000 | 0.000000e+00 | 0.00 | 0.00 | 0.00 | 0.000 | 0.00 |
| **txInfect** | 1711.0 | 0.500000 | 0.000000e+00 | 0.50 | 0.50 | 0.50 | 0.500 | 0.50 |
| **tmpsInfect** | 1711.0 | 4.000000 | 0.000000e+00 | 4.00 | 4.00 | 4.00 | 4.000 | 4.00 |
| **tmpsQuar** | 1711.0 | 1.000000 | 0.000000e+00 | 1.00 | 1.00 | 1.00 | 1.000 | 1.00 |
| **tmpsVoyage** | 1711.0 | 10.513314 | 5.536515e+00 | 1.01 | 5.53 | 10.61 | 15.305 | 19.98 |

```
sns.pairplot(train_dataset[['tx', unit]], diag_kind='kde')
```

```
<seaborn.axisgrid.PairGrid at 0x7f62c3859590>
```

```
#coder fct pour supprimer les valeurs trop absurdes
train_features = train_dataset.copy()
test = train_features.pop(unit)
toto = train_features.pop('tx')
l1 = test.values.tolist()
l2 = toto.values.tolist()

print(len(l1))

fin = []

for i in range (0,20):
  a = i
  b = a + 1

  l = []
  for j in range(len(l1)):
    p = l1[j]
    if (p >= a) and (p <= b):
      l.append(j)


  sumi = 0

  for u in l:
    sumi = sumi + l2[u]

  if len(l) == 0:
    print()
  else:
    sumi = sumi / len(l)
    #print(sumi)
    error = sumi / 3


    for k in l:
      if (l2[k] < sumi + error) and (l2[k] > sumi - error):
        fin.append(k)

print(fin)
```

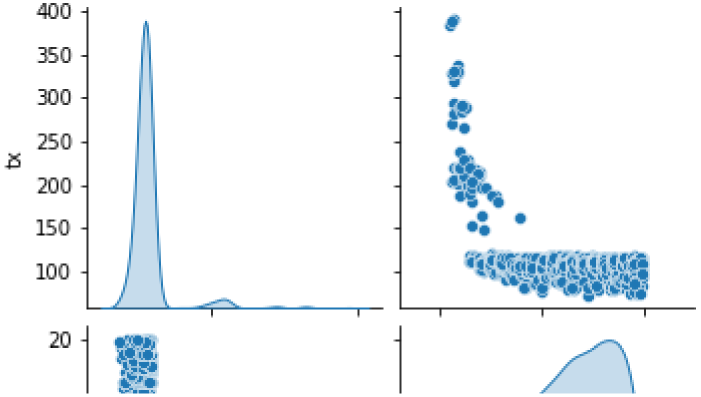
```
1711

[75, 244, 370, 403, 425, 546, 569, 727, 804, 825, 833, 876, 970, 1017, 1020, 1194, 1292, 1403, 1434, 1599, 28, 163, 254, 291, 3
```

```
data = []
for j in fin:
  data.append([l1[j],l2[j]])

df = pd.DataFrame(data, columns = [unit, 'tx'])


df.describe().transpose()
```

| | count | mean | std | min | 25% | 50% | 75% | max |
|---|---|---|---|---|---|---|---|---|
| **tmpsVoyage** | 1188.0 | 11.958350 | 5.085354 | 1.16 | 7.9125 | 12.46 | 16.395 | 19.98 |
| **tx** | 1188.0 | 114.699495 | 34.808681 | 73.00 | 103.0000 | 109.00 | 113.000 | 390.00 |

```
sns.pairplot(df[['tx', unit]], diag_kind='kde')
```

```
<seaborn.axisgrid.PairGrid at 0x7f62c367c7d0>
```



```
dataset = df.copy()
dataset.tail()

train_dataset = dataset.sample(frac=0.8, random_state=0)
test_dataset = dataset.drop(train_dataset.index)

train_dataset.describe().transpose()
```

| | count | mean | std | min | 25% | 50% | 75% | max |
|---|---|---|---|---|---|---|---|---|
| **tmpsVoyage** | 950.0 | 11.931642 | 5.061917 | 1.16 | 7.995 | 12.4 | 16.335 | 19.98 |
| **tx** | 950.0 | 115.134737 | 36.135513 | 74.00 | 103.000 | 109.0 | 113.000 | 390.00 |

```
train_features = train_dataset.copy()
test_features = test_dataset.copy()

train_labels = train_features.pop('tx')
test_labels = test_features.pop('tx')


normalizer = tf.keras.layers.Normalization(axis=-1)
normalizer.adapt(np.array(train_features))
```

```
horsepower = np.array(train_features[unit])

horsepower_normalizer = layers.Normalization(input_shape=[1,], axis=None)
horsepower_normalizer.adapt(horsepower)


def build_and_compile_model(norm):
  model = keras.Sequential([
      norm,
      layers.Dense(64, activation='relu'),
      layers.Dense(64, activation='relu'),
      layers.Dense(1)
  ])

  model.compile(loss='mean_absolute_error',
                optimizer=tf.keras.optimizers.Adam(0.001))
  return model


dnn_horsepower_model = build_and_compile_model(horsepower_normalizer)
dnn_horsepower_model.summary()
```

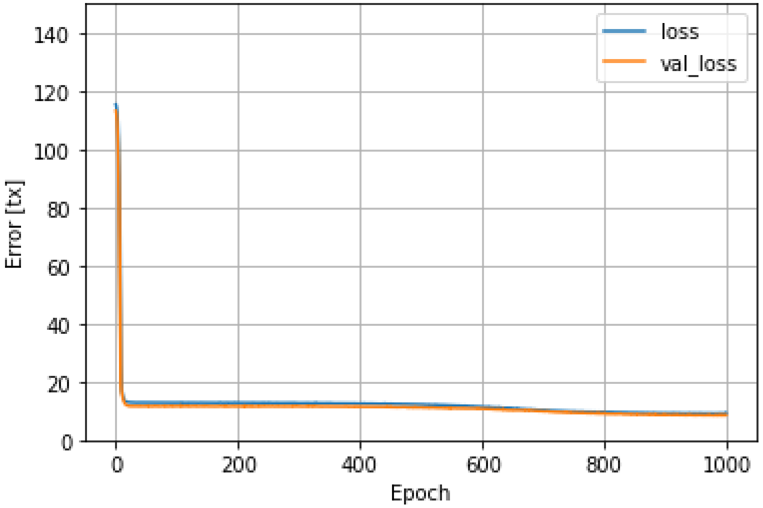
```
Model: "sequential_3"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 normalization_7 (Normalizat  (None, 1)                3
 ion)

 dense_9 (Dense)             (None, 64)                128

 dense_10 (Dense)            (None, 64)                4160

 dense_11 (Dense)            (None, 1)                 65

=================================================================
Total params: 4,356
Trainable params: 4,353
```

```
     Non-trainable params: 3
```

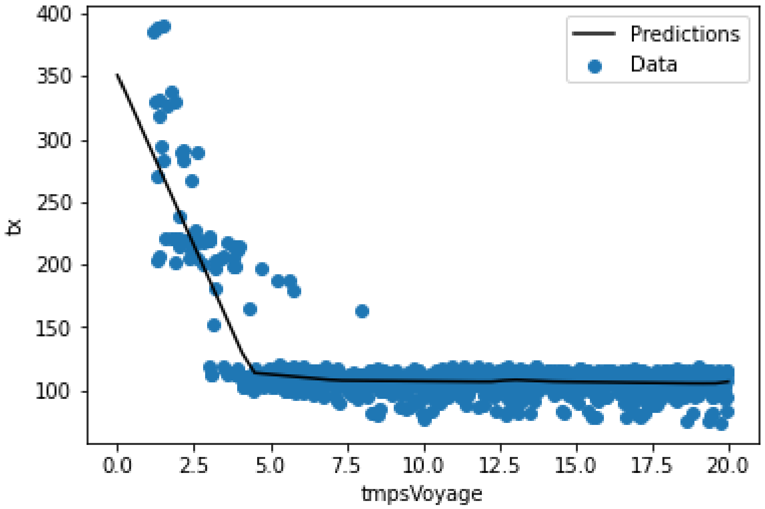
```
%%time
history = dnn_horsepower_model.fit(
    train_features[unit],
    train_labels,
    validation_split=0.2,
    verbose=0, epochs=1000)
```

```
     CPU times: user 58.2 s, sys: 3.64 s, total: 1min 1s
     Wall time: 1min 22s
```

```
def plot_loss(history):
  plt.plot(history.history['loss'], label='loss')
  plt.plot(history.history['val_loss'], label='val_loss')
  plt.ylim([0, 150])
  plt.xlabel('Epoch')
  plt.ylabel('Error [tx]')
  plt.legend()
  plt.grid(True)

plot_loss(history)
```



```
x = tf.linspace(0.0, 20, 50)
y = dnn_horsepower_model.predict(x)

def plot_horsepower(x, y):
  plt.scatter(train_features[unit], train_labels, label='Data')
  plt.plot(x, y, color='k', label='Predictions')
  plt.xlabel(unit)
  plt.ylabel('tx')

  plt.legend()

plot_horsepower(x, y)
```



```
dnn_horsepower_model.evaluate(
    test_features[unit], test_labels,
    verbose=0)
```

```
8.583414077758789
```

```
dnn_horsepower_model.predict([0.24])
```

```
     array([[337.597]], dtype=float32)
```

```
#lancer avec txInfect entre 0.2 et 0.4
```

✓ 0 s terminée à 10:16 ● ×