In [1]:

```python
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
import os

import tsfresh
from scipy import interpolate
from tsfresh import extract_features
from tsfresh.utilities.dataframe_functions import impute

import warnings
```

In [2]:

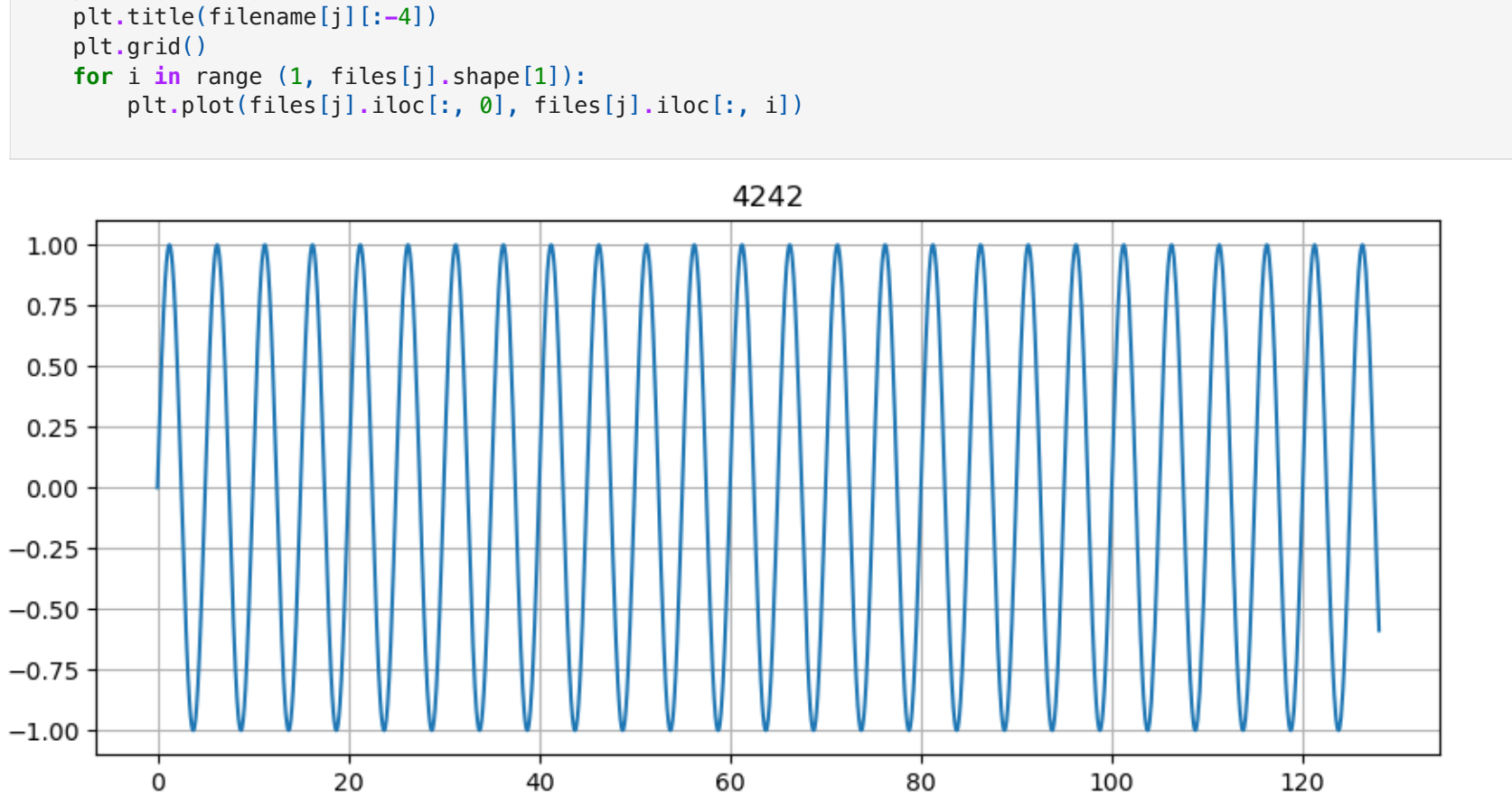
```python
path='./test_sinus/'

filename=os.listdir(path)

files=[pd.read_csv(path + file, sep=',', header=None) for file in filename]
```

In [3]:

```python
for j in range(len(filename)):
    plt.figure(figsize=(10, 4))
    plt.title(filename[j][:-4])
    plt.grid()
    for i in range (1, files[j].shape[1]):
        plt.plot(files[j].iloc[:, 0], files[j].iloc[:, i])
```



In [4]:

```python
#questa è una cella di prova, non dovrebbe servire

df = pd.read_csv(path + filename[0], sep=',', header=None)

features = pd.DataFrame()
```

In [5]:

```python
df
```

Out[5]:

	0	1
0	0.000000	0.000000
1	0.012801	0.016086
2	0.025603	0.032168
3	0.038404	0.048241
4	0.051205	0.064302
...	...	...
9995	127.950000	-0.534550
9996	127.960000	-0.548070
9997	127.970000	-0.561460
9998	127.990000	-0.574700
9999	128.000000	-0.587790

10000 rows × 2 columns

In [6]:

```python
for i in range(1, df.shape[1]):

    # Downsampling
    rows = range(0, df.shape[0], 7000)
    df_for_extraction = df.iloc[rows, [0, i]].copy()

    # Creazione dataset per estrazione
    df_for_extraction['id'] = np.repeat(i+1, df_for_extraction.shape[0])
    df_for_extraction.columns = ['x', 'y', 'id']

    #features extraction
    extracted_features=extract_features(df_for_extraction, column_id="id", column_sort="x", show_warnings=None)

    #NaN values removal
    impute(extracted_features)

    features = pd.concat([features, extracted_features])


features
```

```
Feature Extraction: 100%|██████████| 1/1 [00:02<00:00,  2.43s/it]
/opt/anaconda3/envs/WGM_tsfresh/lib/python3.11/site-packages/tsfresh/utilities/dataframe_functions.py:198: RuntimeWarning: The columns ['y__mean_second_derivative_central' 'y__skewness' 'y__kurtosis'
 'y__sample_entropy' 'y__autocorrelation__lag_2'
 'y__autocorrelation__lag_3' 'y__autocorrelation__lag_4'
 'y__autocorrelation__lag_5' 'y__autocorrelation__lag_6'
 'y__autocorrelation__lag_7' 'y__autocorrelation__lag_8'
 'y__autocorrelation__lag_9' 'y__partial_autocorrelation__lag_0'
 'y__partial_autocorrelation__lag_1' 'y__partial_autocorrelation__lag_2'
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 'y__fft_coefficient__attr_"abs"__coeff_60'
 'y__fft_coefficient__attr_"abs"__coeff_61'
 'y__fft_coefficient__attr_"abs"__coeff_62'
 'y__fft_coefficient__attr_"abs"__coeff_63'
 'y__fft_coefficient__attr_"abs"__coeff_64'
 'y__fft_coefficient__attr_"abs"__coeff_65'
 'y__fft_coefficient__attr_"abs"__coeff_66'
 'y__fft_coefficient__attr_"abs"__coeff_67'
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 'y__permutation_entropy__dimension_4__tau_1'
 'y__permutation_entropy__dimension_5__tau_1'
 'y__permutation_entropy__dimension_6__tau_1'
 'y__permutation_entropy__dimension_7__tau_1'
 'y__query_similarity_count__query_None__threshold_0.0'
 'y__mean_n_absolute_max__number_of_maxima_7'] did not have any finite values. Filling with zeros.
  warnings.warn(
```

Out[6]:

	y__variance_larger_than_standard_deviation	y__has_duplicate_max	y__has_duplicate_min	y__has_duplicate	y__sum_values	y__abs_energy	y__mean_abs_change	y__mean_change	y__mean_second_derivative_central	y__median	…	y__f
2	0.0	0.0	0.0	0.0	-0.47186	0.222652	0.47186	-0.47186	0.0	-0.23593	…	

1 rows × 783 columns

In [7]:

```python
# Estrazione completa delle features di tutti i file dentro la cartella

warnings.filterwarnings('ignore')

features = pd.DataFrame()

for file in filename:

    df = pd.read_csv(path + file, sep=',', header=None)

    for i in range(1, df.shape[1]):

        # Downsampling (valutare se cambiare/eliminare)
        rows = range(0, df.shape[0], 7000)
        df_for_extraction = df.iloc[rows, [0, i]].copy()

        # Creazione dataset per estrazione
        df_for_extraction['id'] = np.repeat(i, df_for_extraction.shape[0])
        df_for_extraction.columns = ['x', 'y', 'id']

        #features extraction
        extracted_features=extract_features(df_for_extraction, column_id="id", column_sort="x", show_warnings=False)

        #NaN values removal
        impute(extracted_features)

        features = pd.concat([features, extracted_features], axis=0)



features
```

```
Feature Extraction: 100%|██████████| 1/1 [00:02<00:00,  2.45s/it]
```

Out[7]:

	y__variance_larger_than_standard_deviation	y__has_duplicate_max	y__has_duplicate_min	y__has_duplicate	y__sum_values	y__abs_energy	y__mean_abs_change	y__mean_change	y__mean_second_derivative_central	y__median	…	y__f
1	0.0	0.0	0.0	0.0	-0.47186	0.222652	0.47186	-0.47186	0.0	-0.23593	…	

1 rows × 783 columns

In [8]:

```python
warnings.filterwarnings('default')
```

In [9]:

```python
# Vettore labels

y_label = []

for df, f in zip(files, filename):

    y_label = np.concatenate((y_label, np.repeat(f[:4], df.shape[1]-1)))

y_label = y_label.astype(np.float64)

print(features.shape)
print(y_label.shape)
```

```
(1, 783)
(1,)
```

In [11]:

```python
#Salvataggio file

features.to_csv('./features_sinus.csv')
```

In [ ]: