

Python : Manipulation de fichiers

Fichiers CSV et TXT

(1)

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1 Fichiers CSV

1.1 Enregistrement des données dans un fichier CSV

L'exemple ci-dessous montre comment tracer des signaux sinusoïdaux sur une période et sauvegarder les résultats dans un même fichier CSV.

Exemple :

Python

```
1 import numpy as np
2 import matplotlib.pyplot as plt
3 %matplotlib inline
4 '''
5 * sin et cos sur une période
6 * Sauvegarde dans un même fichier CSV
7 '''
8
9 a = 2.      # Amplitude des signaux
10 f = 5.      # Fréquence des signaux
11 fe = 500.   # Fréquence d'échantillonnage
12
13 t = np.arange(start=0, stop=1/f, step=1/fe)
14 S1 = a*np.sin(2.0*np.pi*f*t)
15 S2 = a*np.cos(2.0*np.pi*f*t)
16
17 # Courbes
18 plt.figure(figsize=(8,4))
19 plt.plot(t, S1, label='sin')
20 plt.plot(t, S2, label='cos')
21 plt.xlabel('t [s]')
22 plt.ylabel('S(t)')
23 plt.legend()
24 plt.title('Signaux sinusoïdaux')
25 plt.grid()
26 plt.show()
27
28 # Données
29 data = np.zeros((len(t), 3))
30 data[:, 0] = t
31 data[:, 1] = S1
32 data[:, 2] = S2
33
34 # Sauvegarde
35 name="csv/SinCos.csv"
36 np.savetxt(name, data, delimiter=",", header="t, sinus, cosinus", comments="")
```

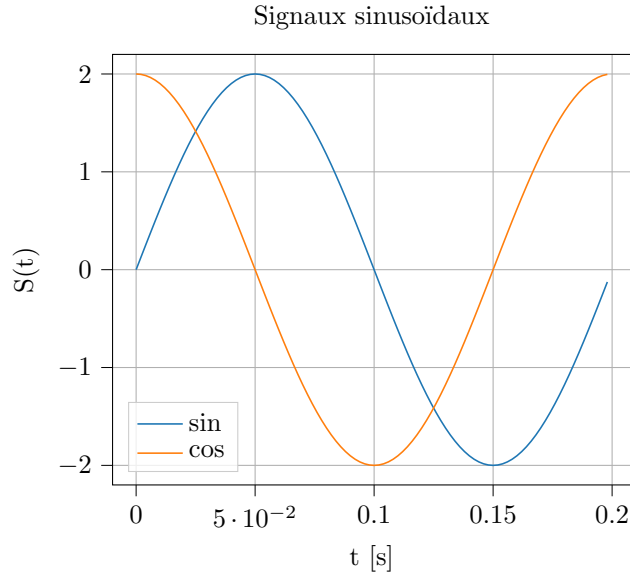


FIGURE 1 – Résultats : Courbes

t	sinus	cosinus
0.0000000000000000e+00	0.0000000000000000e+00	2.0000000000000000e+00
2.0000000000000000e-03	1.255810390586267478e-01	1.996053456856543118e+00
4.0000000000000000e-03	2.506664671286085166e-01	1.984229402628955752e+00
6.0000000000000000e-03	3.747626291714492575e-01	1.964574501457377442e+00
8.0000000000000000e-03	4.973797743297095897e-01	1.937166322257262152e+00
1.0000000000000000e-02	6.180339887498947915e-01	1.902113032590307062e+00
1.2000000000000000e-02	7.362491053693559495e-01	1.859552971776502694e+00
1.4000000000000000e-02	8.515585831301453190e-01	1.809654104932039154e+00
1.6000000000000000e-02	9.635073482034306469e-01	1.752613360087727168e+00
1.8000000000000000e-02	1.071653589957993313e+00	1.688655851004030151e+00
2.0000000000000000e-02	1.175570504584946274e+00	1.618033988749894903e+00
2.1999999999999987e-02	1.274847979497379269e+00	1.541026485551578507e+00
2.4000000000000000e-02	1.369094211857377452e+00	1.457937254842823105e+00
2.6000000000000000e-02	1.457937254842823105e+00	1.369094211857377452e+00
2.8000000000000000e-02	1.541026485551578284e+00	1.274847979497379491e+00
2.9999999999999989e-02	1.618033988749894680e+00	1.175570504584946496e+00
3.2000000000000000e-02	1.688655851004030151e+00	1.071653589957993313e+00
3.4000000000000000e-02	1.752613360087727390e+00	9.635073482034304249e-01
3.6000000000000000e-02	1.809654104932039154e+00	8.515585831301453190e-01
3.7999999999999990e-02	1.859552971776502694e+00	7.362491053693561716e-01
4.0000000000000000e-02	1.902113032590307062e+00	6.180339887498949025e-01
4.2000000000000000e-02	1.937166322257262152e+00	4.973797743297094787e-01
4.3999999999999974e-02	1.964574501457377220e+00	3.747626291714494240e-01
4.5999999999999922e-02	1.984229402628955752e+00	2.506664671286085166e-01
4.8000000000000000e-02	1.996053456856543118e+00	1.255810390586265812e-01
5.0000000000000000e-02	2.0000000000000000e+00	1.224646799147353207e-16
5.2000000000000000e-02	1.996053456856543118e+00	-1.255810390586268033e-01
5.3999999999999939e-02	1.984229402628955752e+00	-2.506664671286082946e-01
5.6000000000000000e-02	1.964574501457377442e+00	-3.747626291714492019e-01
5.8000000000000000e-02	1.937166322257262152e+00	-4.973797743297097007e-01

t	sinus	cosinus
5.99999999999999778e-02	1.902113032590307284e+00	-6.180339887498946805e-01
6.1999999999999956e-02	1.859552971776502694e+00	-7.362491053693559495e-01
6.40000000000000133e-02	1.809654104932038932e+00	-8.515585831301455411e-01
6.600000000000000311e-02	1.752613360087726946e+00	-9.635073482034307579e-01
6.800000000000000488e-02	1.688655851004029929e+00	-1.071653589957993535e+00
7.000000000000000666e-02	1.618033988749894903e+00	-1.175570504584946052e+00
7.200000000000000844e-02	1.541026485551578507e+00	-1.274847979497379269e+00
7.39999999999999634e-02	1.457937254842823549e+00	-1.369094211857376786e+00
7.59999999999999811e-02	1.369094211857377674e+00	-1.457937254842822661e+00
7.7999999999999989e-02	1.274847979497379713e+00	-1.541026485551578284e+00
8.000000000000000167e-02	1.175570504584946496e+00	-1.618033988749894680e+00
8.200000000000000344e-02	1.071653589957993313e+00	-1.688655851004030151e+00
8.400000000000000522e-02	9.635073482034304249e-01	-1.752613360087727390e+00
8.600000000000000699e-02	8.515585831301449860e-01	-1.809654104932039154e+00
8.79999999999999489e-02	7.362491053693562826e-01	-1.859552971776502694e+00
8.99999999999999667e-02	6.180339887498950135e-01	-1.902113032590307062e+00
9.19999999999999845e-02	4.973797743297095897e-01	-1.937166322257262152e+00
9.40000000000000022e-02	3.747626291714490909e-01	-1.964574501457377442e+00
9.600000000000000200e-02	2.506664671286081836e-01	-1.984229402628955752e+00
9.800000000000000377e-02	1.255810390586271641e-01	-1.996053456856543118e+00
1.00000000000000056e-01	2.449293598294706414e-16	-2.000000000000000000e+00
1.02000000000000073e-01	-1.255810390586266645e-01	-1.996053456856543118e+00
1.04000000000000091e-01	-2.506664671286086277e-01	-1.984229402628955752e+00
1.0599999999999970e-01	-3.747626291714487023e-01	-1.964574501457377442e+00
1.0799999999999988e-01	-4.973797743297091456e-01	-1.937166322257262374e+00
1.10000000000000006e-01	-6.180339887498945695e-01	-1.902113032590307284e+00
1.12000000000000023e-01	-7.362491053693558385e-01	-1.859552971776502917e+00
1.14000000000000041e-01	-8.515585831301454300e-01	-1.809654104932038932e+00
1.16000000000000059e-01	-9.635073482034307579e-01	-1.752613360087726946e+00
1.18000000000000077e-01	-1.071653589957993535e+00	-1.688655851004029929e+00
1.1999999999999956e-01	-1.175570504584946052e+00	-1.618033988749894903e+00
1.2199999999999973e-01	-1.274847979497379269e+00	-1.541026485551578507e+00
1.2399999999999991e-01	-1.369094211857377452e+00	-1.457937254842823105e+00
1.26000000000000009e-01	-1.457937254842822661e+00	-1.369094211857377896e+00
1.28000000000000027e-01	-1.541026485551578729e+00	-1.274847979497379269e+00
1.30000000000000044e-01	-1.618033988749894680e+00	-1.175570504584946496e+00
1.32000000000000062e-01	-1.688655851004030595e+00	-1.071653589957992647e+00
1.34000000000000080e-01	-1.752613360087727168e+00	-9.635073482034306469e-01
1.36000000000000098e-01	-1.809654104932039598e+00	-8.515585831301443198e-01
1.38000000000000115e-01	-1.859552971776502917e+00	-7.362491053693555054e-01
1.40000000000000133e-01	-1.902113032590307062e+00	-6.180339887498951246e-01
1.42000000000000151e-01	-1.937166322257262374e+00	-4.973797743297088680e-01
1.44000000000000169e-01	-1.964574501457377442e+00	-3.747626291714492575e-01
1.4599999999999909e-01	-1.984229402628955530e+00	-2.506664671286092383e-01
1.4799999999999927e-01	-1.996053456856543118e+00	-1.255810390586281633e-01
1.4999999999999944e-01	-2.000000000000000000e+00	-3.673940397442059375e-16
1.5199999999999962e-01	-1.996053456856543118e+00	1.255810390586256653e-01
1.5399999999999980e-01	-1.984229402628955752e+00	2.506664671286084611e-01
1.5599999999999998e-01	-1.964574501457377442e+00	3.747626291714485358e-01
1.58000000000000016e-01	-1.937166322257262152e+00	4.973797743297099228e-01
1.60000000000000033e-01	-1.902113032590307284e+00	6.180339887498944584e-01
1.62000000000000051e-01	-1.859552971776502472e+00	7.362491053693566156e-01
1.64000000000000069e-01	-1.809654104932039154e+00	8.515585831301453190e-01

t	sinus	cosinus
1.660000000000000087e-01	-1.752613360087726724e+00	9.635073482034314241e-01
1.6800000000000000104e-01	-1.688655851004030151e+00	1.071653589957993313e+00
1.7000000000000000122e-01	-1.618033988749895125e+00	1.175570504584945830e+00
1.7200000000000000140e-01	-1.541026485551578062e+00	1.274847979497379935e+00
1.7400000000000000158e-01	-1.457937254842823105e+00	1.369094211857377230e+00
1.759999999999999898e-01	-1.369094211857377896e+00	1.457937254842822661e+00
1.779999999999999916e-01	-1.274847979497380601e+00	1.541026485551577618e+00
1.799999999999999933e-01	-1.175570504584946496e+00	1.618033988749894680e+00
1.819999999999999951e-01	-1.071653589957994201e+00	1.688655851004029484e+00
1.839999999999999969e-01	-9.635073482034306469e-01	1.752613360087727168e+00
1.859999999999999987e-01	-8.515585831301459852e-01	1.809654104932038710e+00
1.880000000000000004e-01	-7.362491053693556164e-01	1.859552971776502917e+00
1.9000000000000000022e-01	-6.180339887498952356e-01	1.902113032590307062e+00
1.9200000000000000040e-01	-4.973797743297089791e-01	1.937166322257262374e+00
1.9400000000000000058e-01	-3.747626291714493685e-01	1.964574501457377442e+00
1.9600000000000000075e-01	-2.506664671286093493e-01	1.984229402628955530e+00
1.9800000000000000093e-01	-1.255810390586265257e-01	1.996053456856543118e+00 ;

TABLE 1: Résultats : Fichier **CSV**

1.1.1 Exercice 1

Écrire un programme pour enregistrer les données suivantes dans un fichier [CSV](#).

	<hr/>		
	x	$2x$	x^2
	<hr/>		
0.0000000000000000e+00	0.0000000000000000e+00	0.0000000000000000e+00	0.0000000000000000e+00
1.0000000000000000e+00	2.0000000000000000e+00	1.0000000000000000e+00	1.0000000000000000e+00
2.0000000000000000e+00	4.0000000000000000e+00	4.0000000000000000e+00	4.0000000000000000e+00
3.0000000000000000e+00	6.0000000000000000e+00	9.0000000000000000e+00	9.0000000000000000e+00
4.0000000000000000e+00	8.0000000000000000e+00	1.6000000000000000e+01	1.6000000000000000e+01
5.0000000000000000e+00	1.0000000000000000e+01	2.5000000000000000e+01	2.5000000000000000e+01

TABLE 2: Exercice 1

1.1.2 Exercice 2

Écrire un programme pour enregistrer les données suivantes dans un fichier [CSV](#).

x	e^x
0.0000000000000000e+00	1.0000000000000000e+00
1.0000000000000000e-01	1.1051709180756477e+00
2.0000000000000000e-01	1.2214027581601698e+00
3.0000000000000000e-01	1.3498588075760031e+00
4.0000000000000000e-01	1.4918246976412703e+00
5.0000000000000000e-01	1.6487212707001281e+00
6.0000000000000000e-01	1.8221188003905091e+00
7.0000000000000000e-01	2.0137527074704766e+00
8.0000000000000000e-01	2.2255409284924678e+00
9.0000000000000000e-01	2.4596031111569498e+00
1.0000000000000000e+00	2.7182818284590450e+00
1.1000000000000000e+00	3.0041660239464333e+00
1.2000000000000000e+00	3.3201169227365481e+00
1.3000000000000000e+00	3.6692966676192444e+00
1.4000000000000000e+00	4.0551999668446754e+00
1.5000000000000000e+00	4.4816890703380645e+00
1.6000000000000000e+00	4.9530324243951149e+00
1.7000000000000000e+00	5.4739473917272007e+00
1.8000000000000000e+00	6.0496474644129465e+00
2.0000000000000000e+00	7.3890560989306504e+00

TABLE 3: Exercice 2

1.2 Enregistrement des données dans plusieurs fichiers CSV

Le programme exporte les données vers trois fichiers CSV (AM_0.csv, AM_1.csv et Am_2.csv).

Exemple :

Python

```

1 import numpy as np
2 import matplotlib.pyplot as plt
3 %matplotlib inline
4
5 '''
6 Modulation d'amplitude pour différentes valeur de
7 l'indice de modulation m
8 '''
9
10 m = [0.5, 1, 2] # Indice de modulation
11 fm = 10         # Fréquence du message (signal modulant)
12 fp = 200        # Fréquence de la porteuse
13 Te = 0.0002     # Période d'échantillonnage
14
15 t = np.arange(start=-.1,stop=.1,step=Te)
16
17 for i in range(len(m)):
18     S = 2*(1+m[i]*np.cos(2.0*np.pi*fm*t))*np.cos(2.0*np.pi*fp*t)
19
20     # Courbes
21     plt.figure(figsize=(8,4))
22     plt.plot(t,S)
23     plt.xlabel('t [s]')
24     plt.ylabel('S(t)')
25     plt.title('Signal AM pour m = {}'.format(m[i]))
26     plt.grid()
27
28     # Données
29     data = np.zeros((len(t),2))
30     data[:,0] = t
31     data[:,1] = S
32
33     # Sauvegarde
34     name="csv/AM_{}.csv".format(i)
35     np.savetxt(name,data,delimiter=",",header="t,S",comments="")
36
37 plt.show()

```

1.2.1 Exercice 3

Écrire un programme pour créer les fichiers CSV suivants :

x	$2x$
0.0000000000000000e+00	0.0000000000000000e+00
1.0000000000000000e+00	2.0000000000000000e+00
2.0000000000000000e+00	4.0000000000000000e+00
3.0000000000000000e+00	6.0000000000000000e+00
4.0000000000000000e+00	8.0000000000000000e+00
5.0000000000000000e+00	1.0000000000000000e+01;

TABLE 4: Exercice 3 : Table_1.csv

x	x^2
0.0000000000000000e+00	0.0000000000000000e+00
1.0000000000000000e+00	1.0000000000000000e+00
2.0000000000000000e+00	4.0000000000000000e+00
3.0000000000000000e+00	9.0000000000000000e+00
4.0000000000000000e+00	1.6000000000000000e+01
5.0000000000000000e+00	2.5000000000000000e+01

TABLE 5: Exercice 3 : Table_2.csv

1.3 Importation des données à partir d'un fichier CSV

Exemple :

Python

```

1 import csv
2
3 def lectureColCSV(fichier, sep, n) :
4     """
5     fichier <str> : Le nom du fichier -> "SinCos.csv"
6     sep         <str> : Le séparateur de colonnes -> ","
7     n           <int> : Le numéro de la colonne à lire
8     """
9     file = open(fichier, "r")
10    reader = csv.reader(file, delimiter = sep)
11    col = []
12    for row in reader:
13        try:
14            sep_decimal = row[n].replace(",", ".")
15            col.append(float(sep_decimal))
16        except:
17            pass
18    file.close()
19    return col
20
21 temps = lectureColCSV("csv/SinCos.csv", ",", 0)
22 x = lectureColCSV("csv/SinCos.csv", ",", 1)
23 y = lectureColCSV("csv/SinCos.csv", ",", 2)
24
25 # Courbes
26 plt.figure(figsize=(8,4))
27 plt.plot(temps,x,label='sin')
28 plt.plot(temps,y,label='cos')
29 plt.xlabel('t [s]')
30 plt.ylabel('S(t)')
31 plt.legend()
32 plt.title('Signaux sinusoïdaux')
33 plt.grid()
34 plt.show()

```

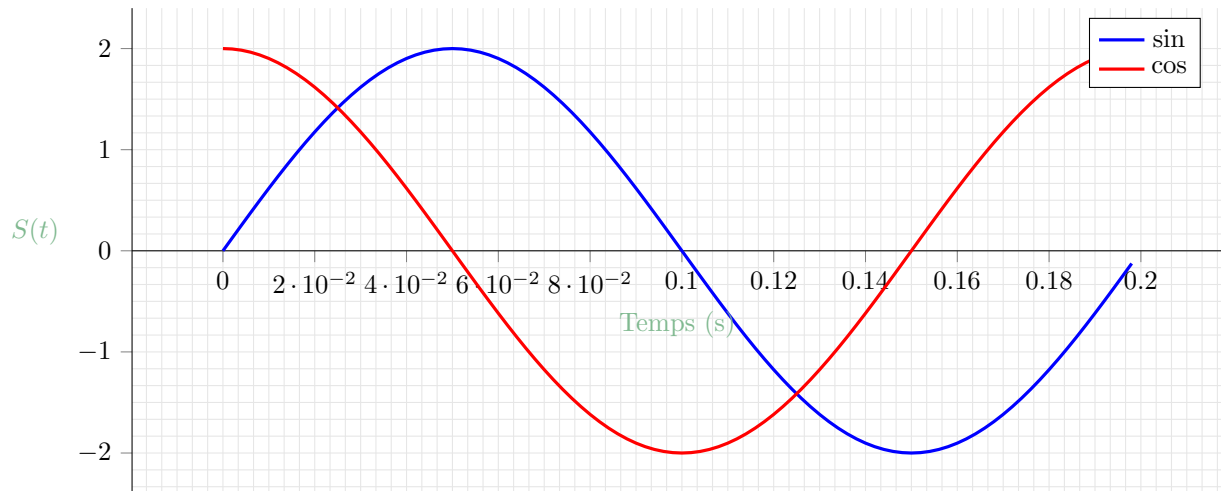


FIGURE 2 – Résultats : Courbes

1.3.1 Exercice 4

- Écrire un programme pour importer et tracer les données du fichier `Table_1.csv`
- Écrire un programme pour importer et tracer les données du fichier `Table_2.csv`

1.3.2 Exercice 5

- Écrire un programme pour importer les données du fichier `Exercice5.csv`
- Dans des graphes différents, tracer les données de chaque colonne en fonction de la première colonne.

2 Lecture d'un fichier TXT

Exemple :

Python

```
1 import matplotlib.pyplot as plt
2 import numpy as np
3 %matplotlib inline
4
5 f = open("txt/Donnees.txt" , 'r')
6 f.readline()
7 data = np.loadtxt(f)
8 f.close()
9
10 plt.figure()
11 plt.plot(data[:,0], data[:,1], "r-")
12 plt.plot(data[:,0], data[:,2], "b-")
13 plt.grid()
14 plt.show()
```

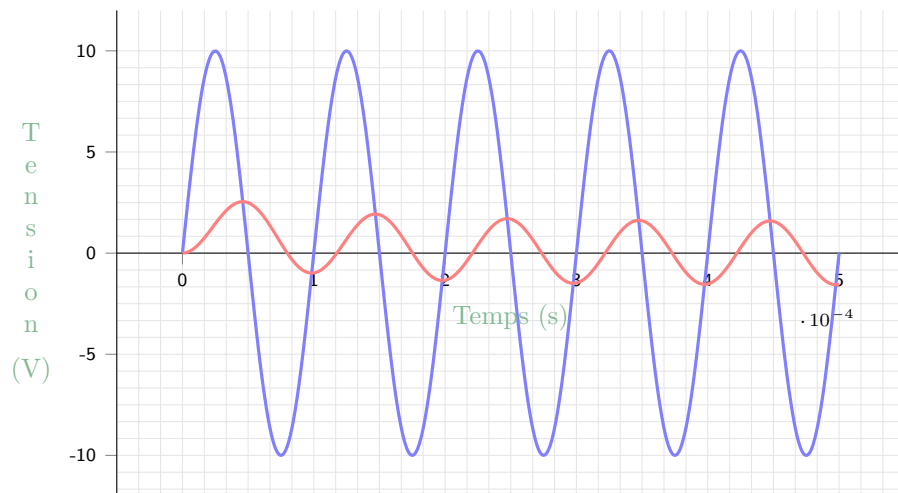


FIGURE 3 – Courbes des données