# TP1-Demo-Prog-RandScatter

March 26, 2024

[417]:

```
#DEMO PROGRAM
#TO DISPLAY READING INPUTS FROM A CSV FILE TO VARIABLES
#TO DISPLAY PROCESSING AND WRITING OUTPUT TO A CSV FILE

import random as rand
import math

class RANDSCATTER:
    def __init__(self,alpha,beta):
        self.alpha = alpha
        self.beta = beta


    ##THIS PART IS OPTIONAL
    ##USED THIS TO GENERATE X-Y GRID FOR THIS EXAMPLE ONLY
    def INPUTGRID(self):
        dx=0.10
        dy=0.10
        ngrid=200
        xmin=-10.00
        ymin=-10.00

        file = open("XYINPUT.csv","w")  # OPENING CSV-FILE FOR WRITING
        file.write("XVAL,YVAL\n")       # HEADER-LINE OF CSV-FILE

        ##LOOP OVER X,Y TO CREATE GRIDS
        for ix in range(0,ngrid+1):
            for iy in range(0,ngrid+1):
                xval=xmin+dx*ix
                yval=ymin+dy*iy
                file.write("{0:.6f},{1:.6f}\n".format(xval,yval)) #WRITING IN␣
 ↪CSV FILE
        file.close() #FILE CLOSE


    ##FOLLOW THIS PART FOR THE TP1 PROJECT
    def TESTOUTPUT(self):
        #OUTPUT CSV-FILE
        file2 = open("XYOUTPUT.csv","w")   # "w" MEANS OPEN-FILE FOR WRITING
        file2.write("XVAL,YVAL,DENSITY\n")  #HEADER LINE OF OUTPUT CSV-FILE

        #INPUT CSV-FILE
        file1 = open("XYINPUT.csv","r")    # "r" MEANS OPEN-FILE FOR READING␣
↪ONLY
        linefile1 = csv.reader(file1)      # FUNCTION FOR PROCESSING LINE IN A␣
↪CSV-FILE

        next(linefile1)                    # ESCAPE THE FIRST LINE OF CSV-FILE :
↪ HEADER LINE
        for row in linefile1:              # LOOP TO READ ELEMENTS OF CSV-FILE
            xval = float(row[0])           # 1ST ELEMENT OF ROW, USE "float()"␣
↪FOR PROPER CONVERSION
            yval = float(row[1])           # 2ND ELEMENT OF ROW, USE "float()"␣
↪FOR PROPER CONVERSION

            if ((xval*yval) > 0.00 ):
                f1 = self.alpha*rand.uniform(0.0,1.0)
                f2 = self.beta*rand.uniform(-1.0,0.0)
                ff=f1+f2                       # 3RD ELEMENT, FILLING WITH␣
↪RANDOM NUMBER
            else:
                f1 = self.beta*rand.uniform(0.0,1.0)
                f2 = self.alpha*rand.uniform(-1.0,0.0)
                ff=f1+f2                       # 3RD ELEMENT, FILLING WITH␣
↪RANDOM NUMBER

            ##PRINTING OUTPUT WITH FORMAT
            file2.write("{0:.4f},{1:.4f},{2:.6f}\n".format(xval,yval,ff))
            #print("{0:.4f},{1:.4f},{2:.6f}".format(xval,yval,ff))
        file1.close() #FILE CLOSE
        file2.close() #FILE CLOSE
```

[418]:

```
#SETTING OBJECT
OBJ1 = RANDSCATTER(0.8,0.2)
```

[419]:

```
#CREATING X-Y GRID
#INPUT FILE => "XYINPUT.csv"
OBJ1.INPUTGRID()
```

[420]:

```
#OUTPUT FILE: X,Y and Random Number values
#FILE => "XYOUTPUT.csv"
OBJ1.TESTOUTPUT()
```

[421]:

```
#PLOTTING OUTPUT CSV DATA FILE
#importing pandas and matplotlib

import pandas as pd
import matplotlib.pyplot as plt

df = pd.read_csv("XYOUTPUT.csv")
for col in df.columns:
    print(col)
```

```
XVAL
YVAL
DENSITY
```

[422]:

```
#PRINTING HEAD
df.head()
```

[422]:

```
   XVAL  YVAL   DENSITY
0 -10.0 -10.0  0.132370
1 -10.0  -9.9  0.025430
2 -10.0  -9.8  0.141567
3 -10.0  -9.7  0.450581
4 -10.0  -9.6  0.389029
```

[423]:

```
#PRINTING TAIL
df.tail()
```

[423]:

```
       XVAL  YVAL   DENSITY
40396  10.0   9.6  0.490221
40397  10.0   9.7  0.360224
40398  10.0   9.8  0.067055
40399  10.0   9.9  0.504543
40400  10.0  10.0  0.669134
```

[424]:

```
#PRINTING MAXIMUM IN EACH COLUMN
df.max()
```

[424]:

```
XVAL       10.000000
YVAL       10.000000
DENSITY     0.797987
dtype: float64
```

[425]:

```
#PRINTING MINIMUM IN EACH COLUMN
df.min()
```

[425]:

```
XVAL      -10.000000
YVAL      -10.000000
```

```
DENSITY    -0.796778
dtype: float64
```

[426]:
```
#PRINTING ROW ELEMENTS OF FOR MAXIMUM VALUE OF "DENSITY"
df.loc[df['DENSITY'].idxmax()]
```

[426]:
```
XVAL        2.200000
YVAL        8.700000
DENSITY     0.797987
Name: 24709, dtype: float64
```

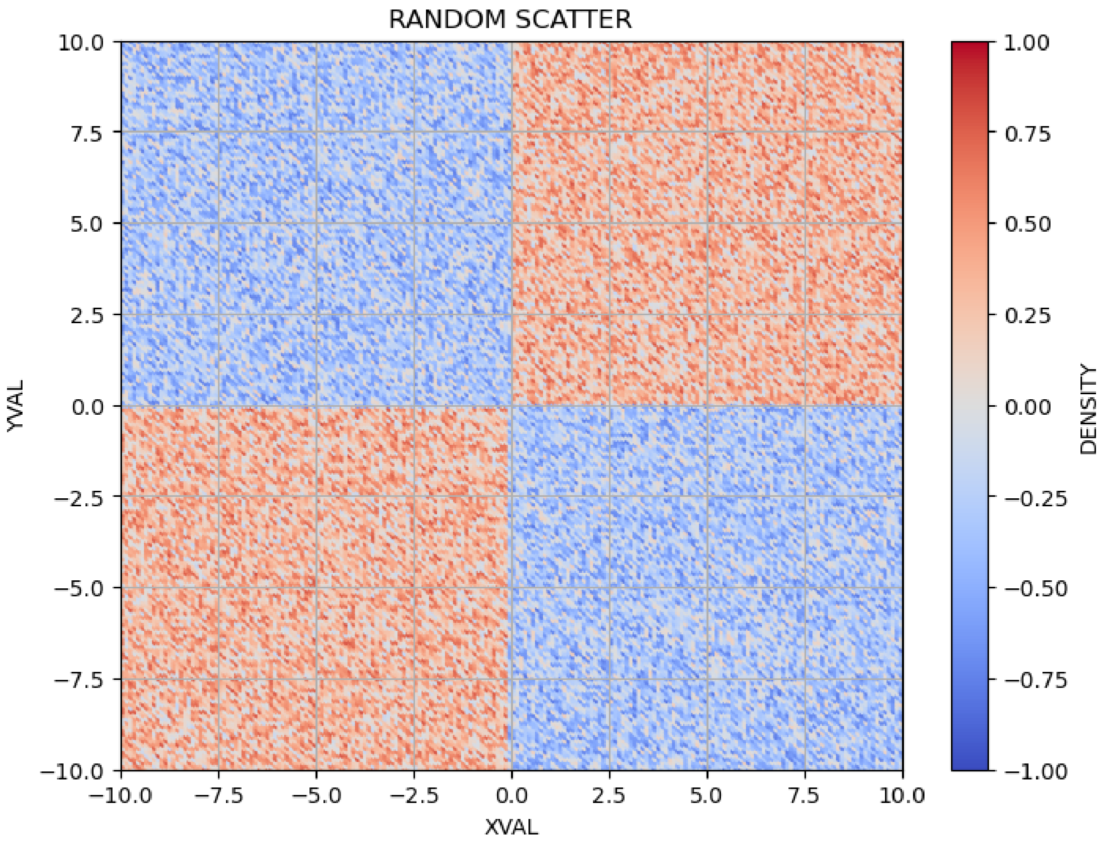
[427]:
```
#PRINTING ROW ELEMENTS OF FOR MINIMUM VALUE OF "DENSITY"
df.loc[df['DENSITY'].idxmin()]
```

[427]:
```
XVAL       -0.100000
YVAL        7.000000
DENSITY    -0.796778
Name: 20069, dtype: float64
```

[428]:
```
#x,y,c => x-axis, y-axis, z-axis
#colormap       => Colour Scheme for contour plot
#xlim, ylim     => Set minimum,maximum values in x-axis and y-axis
#vmin,vmax      => Set minimum and maximum values in z-axis
#xticks, yticks => Set the position of markers in x-axis and yaxis
#s => Size of the shape
#grid => Set grid on plot
#figsize => Set size of the figure

df.plot( x="XVAL", y="YVAL", kind="scatter", c="DENSITY",colormap="coolwarm",␣
 ↪xlim=(-10,10), ylim=(-10,10),
        vmin=(-1), vmax=(1), xticks=(-10,-7.5,-5.0,-2.5,0,2.5,5.0,7.5,10.0),
        yticks=(-10,-7.5,-5.0,-2.5,0,2.5,5.0,7.5,10.0),
        s=(5.5), grid=("on"), figsize=(8,6))


plt.title("RANDOM SCATTER",fontsize='12')
plt.show()
```


RANDOM SCATTER
10.0
7.5
5.0
2.5
0.0
−2.5
−5.0
−7.5
−10.0
YVAL
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0
XVAL
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
DENSITY