```
# -*- coding: utf-8 -*-
"""
Created on Tue Jun  7 21:41:58 2022

@author: Jeevi
"""
from sympy import Matrix # whole matrix nullity package
import numpy as np # this can also used to find rank and nullity package
import matplotlib.pyplot as plt

A = [[1, 2, 2], [2, 4, 4], [0, 1, 0]]
A = Matrix(A)
NullSpace = A.nullspace()

NullSpace = Matrix(NullSpace)
print("Null Space : ", NullSpace)
print(A * NullSpace)
#The size of the null space of the matrix provides us with the number of linear relations among attributes.


#Nullity of a matrix A is defined as the size of the null space of the matrix A and so are the linear relations.

B = np.matrix([[1, 2, 2], [2, 4, 4], [0, 1, 0]])   # NUMPY PACKAGE
B= np.linalg.matrix_rank(B)  # linear Algebra NUMPY PACKAGE TO FIND RANK OF MATRIX
n = A.shape[1]  # No of columns of MATRIX
#rank = A.rank()  # BY USING SYMPY PACKAGE OPTIONAL
#nullity = n - rank # BY USING SYMPY PACKAGE OPTIONAL
nullity = n - B
print("Nullity : ", nullity)
```

```
# using heatplot to map the matrix

# Define Data

x = np.array([[1, 2, 2], [2, 4, 4], [0, 1, 0]] )


# Image

plt.imshow(x)

# Display


plt.show()
```

Console output with graph

Spyder (Python 3.9)

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C:\Users\Jeevi\.spyder-py3

C:\Users\Jeevi\.spyder-py3\untitled0.py

assignmentnew1.py X | assignment2.py X | untitled0.py* X

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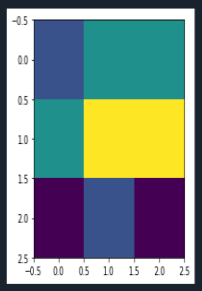

Help | Variable Explorer | Plots | Files

Console 1/A X

Figures now render in the Plots pane by default. To make them also appear inline in the Console, uncheck "Mute Inline Plotting" under the Plots pane options menu.

```
In [13]: runfile('C:/Users/Jeevi/.spyder-py3/untitled0.py', wdir='C:/Users/Jeevi/.spyder-py3')
Null Space :  Matrix([[-2], [0], [1]])
Matrix([[0], [0], [0]])
Nullity :  1

In [14]: runfile('C:/Users/Jeevi/.spyder-py3/untitled0.py', wdir='C:/Users/Jeevi/.spyder-py3')
Null Space :  Matrix([[-2], [0], [1]])
Matrix([[0], [0], [0]])
Nullity :  1

In [15]:
```

IPython console | History

LSP Python: ready | conda: base (Python 3.9.12) | Line 32, Col 1 | UTF-8 | CRLF | RW | Mem 92%

32°C Partly cloudy

ENG IN 22:19 07-06-2022