Haz doble clic (o pulsa Intro) para editar

```
#Instalar numpy con referencia np
import numpy as np
```

```
#Instalar el paquete del toolbox de redes neuronales tensorflow, versión 2.7.0. Versión vieja, instalo 2.13.0
#import tensorflow as tf
#print("TensorFlow version:", tf.__version__)

!pip install tensorflow==2.13.0
```

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Requirement already satisfied: tensorflow==2.13.0 in /usr/local/lib/python3.10/dist-packages (2.13.0)
Requirement already satisfied: absl-py>=1.0.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (1.4.0)
Requirement already satisfied: astunparse>=1.6.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (1.6.3)
Requirement already satisfied: flatbuffers>=23.1.21 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (23.5.26)
Requirement already satisfied: gast<=0.4.0,>=0.2.1 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (0.4.0)
Requirement already satisfied: google-pasta>=0.1.1 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (0.2.0)
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Requirement already satisfied: h5py>=2.9.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (3.9.0)
Requirement already satisfied: keras<2.14,>=2.13.1 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (2.13.1)
Requirement already satisfied: libclang>=13.0.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (16.0.6)
Requirement already satisfied: numpy<=1.24.3,>=1.22 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (1.23.5)
Requirement already satisfied: opt-einsum>=2.3.2 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (3.3.0)
Requirement already satisfied: packaging in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (23.1)
Requirement already satisfied: protobuf!=4.21.0,!=4.21.1,!=4.21.2,!=4.21.3,!=4.21.4,!=4.21.5,<5.0.0dev,>=3.20.3 in /usr/local/lib/pythor
Requirement already satisfied: setuptools in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (67.7.2)
Requirement already satisfied: six>=1.12.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (1.16.0)
Requirement already satisfied: tensorboard<2.14,>=2.13 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (2.13.0)
Requirement already satisfied: tensorflow-estimator<2.14,>=2.13.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (
Requirement already satisfied: termcolor>=1.1.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (2.3.0)
Requirement already satisfied: typing-extensions<4.6.0,>=3.6.6 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (4.5
Requirement already satisfied: wrapt>=1.11.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0) (1.15.0)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in /usr/local/lib/python3.10/dist-packages (from tensorflow==2.13.0)
Requirement already satisfied: wheel<1.0,>=0.23.0 in /usr/local/lib/python3.10/dist-packages (from astunparse>=1.6.0->tensorflow==2.13.6
Requirement already satisfied: google-auth<3,>=1.6.3 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2.14,>=2.13->tensorflo
Requirement already satisfied: google-auth-oauthlib<1.1,>=0.5 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2.14,>=2.13->
Requirement already satisfied: markdown>=2.6.8 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2.14,>=2.13->tensorflow==2.1
Requirement already satisfied: requests<3,>=2.21.0 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2.14,>=2.13->tensorflow=
Requirement already satisfied: tensorboard-data-server<0.8.0,>=0.7.0 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2.14,>
Requirement already satisfied: werkzeug>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2.14,>=2.13->tensorflow==2.1
Requirement already satisfied: cachetools<6.0,>=2.0.0 in /usr/local/lib/python3.10/dist-packages (from google-auth<3,>=1.6.3->tensorboar
Requirement already satisfied: pyasn1-modules>=0.2.1 in /usr/local/lib/python3.10/dist-packages (from google-auth<3,>=1.6.3->tensorboarc
Requirement already satisfied: rsa<5,>=3.1.4 in /usr/local/lib/python3.10/dist-packages (from google-auth<3,>=1.6.3->tensorboard<2.14,>=
Requirement already satisfied: requests-oauthlib>=0.7.0 in /usr/local/lib/python3.10/dist-packages (from google-auth-oauthlib<1.1,>=0.5-
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.10/dist-packages (from requests<3,>=2.21.0->tensorboar
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.10/dist-packages (from requests<3,>=2.21.0->tensorboard<2.14,>=2.1
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.10/dist-packages (from requests<3,>=2.21.0->tensorboard<2.14
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.10/dist-packages (from requests<3,>=2.21.0->tensorboard<2.14
Requirement already satisfied: MarkupSafe>=2.1.1 in /usr/local/lib/python3.10/dist-packages (from werkzeug>=1.0.1->tensorboard<2.14,>=2.
Requirement already satisfied: pyasn1<0.6.0,>=0.4.6 in /usr/local/lib/python3.10/dist-packages (from pyasn1-modules>=0.2.1->google-auth<
Requirement already satisfied: oauthlib>=3.0.0 in /usr/local/lib/python3.10/dist-packages (from requests-oauthlib>=0.7.0->google-auth-oa
```

```
#Actualizar la librería matplotlib en su última versión.
import matplotlib as mpl
import matplotlib.pyplot as plt
# Estilo clásico para gráficos, puede a
plt.style.use('classic')

# Este notebook fue realizado con la versión 3.1.3 de Matplotlib
print(mpl.__version__)
```
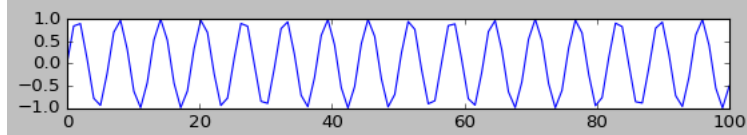
```
3.7.1
```

```
#Seleccionar en la librería matplotlib el método figure.
plt.figure()

x = np.linspace(0, 100, 100)

# Gráfico
plt.subplot(5, 1, 1) # (filas, columnas, número de panel)
plt.plot(x, np.sin(x))
```

```
[<matplotlib.lines.Line2D at 0x783eaf400550>]
```



```
#Mostrar todo el stack de librerías del entorno de ejecución utilizado.

!pip list
```

```
jaxlib                          0.4.14+cuda11.cudnn86
jeepney                         0.7.1
jieba                           0.42.1
Jinja2                          3.1.2
joblib                          1.3.2
jsonpickle                      3.0.2
jsonschema                      4.19.1
jsonschema-specifications       2023.7.1
jupyter-client                  6.1.12
jupyter-console                 6.1.0
jupyter_core                    5.3.2
jupyter-server                  1.24.0
jupyterlab-pygments             0.2.2
jupyterlab-widgets              3.0.9
kaggle                          1.5.16
keras                           2.13.1
keyring                         23.5.0
kiwisolver                      1.4.5
langcodes                       3.3.0
launchpadlib                    1.10.16
lazr.restfulclient              0.14.4
lazr.uri                        1.0.6
lazy_loader                     0.3
libclang                        16.0.6
librosa                         0.10.1
lightgbm                        4.0.0
linkify-it-py                   2.0.2
lit                             17.0.1
llvmlite                        0.39.1
locket                          1.0.0
logical-unification             0.4.6
LunarCalendar                   0.0.9
lxml                            4.9.3
Markdown                        3.4.4
markdown-it-py                  3.0.0
MarkupSafe                      2.1.3
matplotlib                      3.7.1
matplotlib-inline               0.1.6
matplotlib-venn                 0.11.9
mdit-py-plugins                 0.4.0
mdurl                           0.1.2
miniKanren                      1.0.3
missingno                       0.5.2
mistune                         0.8.4
mizani                          0.9.3
mkl                             2023.2.0
ml-dtypes                       0.3.1
mlxtend                         0.22.0
more-itertools                  10.1.0
moviepy                         1.0.3
mpmath                          1.3.0
msgpack                         1.0.7
multidict                       6.0.4
multipledispatch                1.0.0
multitasking                    0.0.11
murmurhash                      1.0.10
music21                         9.1.0
natsort                         8.4.0
nbclassic                       1.0.0
```

```
#Instalación de Geopandas, una de las más completas librerías de Python para GIS

!apt install gdal-bin python-gdal python3-gdal
!apt install python3-rtree
!pip install descartes
!pip install geopandas
import geopandas as gpd
```

```
Selecting previously unselected package libspatialindex6:amd64.
(Reading database ... 120895 files and directories currently installed.)
Preparing to unpack .../libspatialindex6_1.9.3-2_amd64.deb ...
Unpacking libspatialindex6:amd64 (1.9.3-2) ...
Selecting previously unselected package libspatialindex-c6:amd64.
Preparing to unpack .../libspatialindex-c6_1.9.3-2_amd64.deb ...
Unpacking libspatialindex-c6:amd64 (1.9.3-2) ...
Selecting previously unselected package libspatialindex-dev:amd64.
Preparing to unpack .../libspatialindex-dev_1.9.3-2_amd64.deb ...
Unpacking libspatialindex-dev:amd64 (1.9.3-2) ...
Selecting previously unselected package python3-rtree.
Preparing to unpack .../python3-rtree_0.9.7-1_all.deb ...
Unpacking python3-rtree (0.9.7-1) ...
Setting up libspatialindex6:amd64 (1.9.3-2) ...
Setting up libspatialindex-c6:amd64 (1.9.3-2) ...
Setting up libspatialindex-dev:amd64 (1.9.3-2) ...
Setting up python3-rtree (0.9.7-1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.1) ...
/sbin/ldconfig.real: /usr/local/lib/libtbb.so.12 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtbbbind_2_0.so.3 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtbbbind.so.3 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtbbmalloc_proxy.so.2 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtbbbind_2_5.so.3 is not a symbolic link

/sbin/ldconfig.real: /usr/local/lib/libtbbmalloc.so.2 is not a symbolic link

Collecting descartes
  Downloading descartes-1.1.0-py3-none-any.whl (5.8 kB)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.10/dist-packages (from descartes) (3.7.1)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib->descartes) (1.1.1)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.10/dist-packages (from matplotlib->descartes) (0.12.0)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib->descartes) (4.43.0)
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib->descartes) (1.4.5)
Requirement already satisfied: numpy>=1.20 in /usr/local/lib/python3.10/dist-packages (from matplotlib->descartes) (1.23.5)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib->descartes) (23.1)
Requirement already satisfied: pillow>=6.2.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib->descartes) (9.4.0)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib->descartes) (3.1.1)
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.10/dist-packages (from matplotlib->descartes) (2.8.2)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.10/dist-packages (from python-dateutil>=2.7->matplotlib->descartes)
Installing collected packages: descartes
Successfully installed descartes-1.1.0
Requirement already satisfied: geopandas in /usr/local/lib/python3.10/dist-packages (0.13.2)
Requirement already satisfied: fiona>=1.8.19 in /usr/local/lib/python3.10/dist-packages (from geopandas) (1.9.4.post1)
Requirement already satisfied: packaging in /usr/local/lib/python3.10/dist-packages (from geopandas) (23.1)
Requirement already satisfied: pandas>=1.1.0 in /usr/local/lib/python3.10/dist-packages (from geopandas) (1.5.3)
Requirement already satisfied: pyproj>=3.0.1 in /usr/local/lib/python3.10/dist-packages (from geopandas) (3.6.1)
Requirement already satisfied: shapely>=1.7.1 in /usr/local/lib/python3.10/dist-packages (from geopandas) (2.0.1)
Requirement already satisfied: attrs>=19.2.0 in /usr/local/lib/python3.10/dist-packages (from fiona>=1.8.19->geopandas) (23.1.0)
Requirement already satisfied: certifi in /usr/local/lib/python3.10/dist-packages (from fiona>=1.8.19->geopandas) (2023.7.22)
Requirement already satisfied: click~=8.0 in /usr/local/lib/python3.10/dist-packages (from fiona>=1.8.19->geopandas) (8.1.7)
```

#Instalación de geoplot, una de las librerías de python para acceder a servicios de geocodificación

!pip install geoplot

```
Collecting geoplot
  Downloading geoplot-0.5.1-py3-none-any.whl (28 kB)
Requirement already satisfied: matplotlib>=3.1.2 in /usr/local/lib/python3.10/dist-packages (from geoplot) (3.7.1)
Requirement already satisfied: seaborn in /usr/local/lib/python3.10/dist-packages (from geoplot) (0.12.2)
Requirement already satisfied: pandas in /usr/local/lib/python3.10/dist-packages (from geoplot) (1.5.3)
Requirement already satisfied: geopandas>=0.9.0 in /usr/local/lib/python3.10/dist-packages (from geoplot) (0.13.2)
Collecting cartopy (from geoplot)
  Downloading Cartopy-0.22.0-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (11.8 MB)
                                         ━━━━━━━━ 11.8/11.8 MB 48.8 MB/s eta 0:00:00
Collecting mapclassify>=2.1 (from geoplot)
  Downloading mapclassify-2.6.0-py3-none-any.whl (40 kB)
                                         ━━━━━━━━ 40.8/40.8 kB 3.8 MB/s eta 0:00:00
Collecting contextily>=1.0.0 (from geoplot)
  Downloading contextily-1.3.0-py3-none-any.whl (16 kB)
Requirement already satisfied: geopy in /usr/local/lib/python3.10/dist-packages (from contextily>=1.0.0->geoplot) (2.3.0)
Collecting mercantile (from contextily>=1.0.0->geoplot)
  Downloading mercantile-1.2.1-py3-none-any.whl (14 kB)
Requirement already satisfied: pillow in /usr/local/lib/python3.10/dist-packages (from contextily>=1.0.0->geoplot) (9.4.0)
Collecting rasterio (from contextily>=1.0.0->geoplot)
  Downloading rasterio-1.3.8-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (21.3 MB)
                                         ━━━━━━━━ 21.3/21.3 MB 51.8 MB/s eta 0:00:00
Requirement already satisfied: requests in /usr/local/lib/python3.10/dist-packages (from contextily>=1.0.0->geoplot) (2.31.0)
Requirement already satisfied: joblib in /usr/local/lib/python3.10/dist-packages (from contextily>=1.0.0->geoplot) (1.3.2)
Requirement already satisfied: xyzservices in /usr/local/lib/python3.10/dist-packages (from contextily>=1.0.0->geoplot) (2023.7.0)
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Requirement already satisfied: fiona>=1.8.19 in /usr/local/lib/python3.10/dist-packages (from geopandas>=0.9.0->geoplot) (1.9.4.post1)
Requirement already satisfied: packaging in /usr/local/lib/python3.10/dist-packages (from geopandas>=0.9.0->geoplot) (23.1)
Requirement already satisfied: pyproj>=3.0.1 in /usr/local/lib/python3.10/dist-packages (from geopandas>=0.9.0->geoplot) (3.6.1)
Requirement already satisfied: shapely>=1.7.1 in /usr/local/lib/python3.10/dist-packages (from geopandas>=0.9.0->geoplot) (2.0.1)
Requirement already satisfied: scipy>=1.0 in /usr/local/lib/python3.10/dist-packages (from mapclassify>=2.1->geoplot) (1.11.3)
Requirement already satisfied: numpy>=1.3 in /usr/local/lib/python3.10/dist-packages (from mapclassify>=2.1->geoplot) (1.23.5)
Requirement already satisfied: scikit-learn in /usr/local/lib/python3.10/dist-packages (from mapclassify>=2.1->geoplot) (1.2.2)
Requirement already satisfied: networkx in /usr/local/lib/python3.10/dist-packages (from mapclassify>=2.1->geoplot) (3.1)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.1.2->geoplot) (1.1.1)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.1.2->geoplot) (0.12.0)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.1.2->geoplot) (4.43.0)
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.1.2->geoplot) (1.4.5)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.1.2->geoplot) (3.1.1)
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.1.2->geoplot) (2.8.
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.10/dist-packages (from pandas->geoplot) (2023.3.post1)
Requirement already satisfied: pyshp>=2.1 in /usr/local/lib/python3.10/dist-packages (from cartopy->geoplot) (2.3.1)
Requirement already satisfied: attrs>=19.2.0 in /usr/local/lib/python3.10/dist-packages (from fiona>=1.8.19->geopandas>=0.9.0->geoplot
Requirement already satisfied: certifi in /usr/local/lib/python3.10/dist-packages (from fiona>=1.8.19->geopandas>=0.9.0->geoplot) (202
Requirement already satisfied: click~=8.0 in /usr/local/lib/python3.10/dist-packages (from fiona>=1.8.19->geopandas>=0.9.0->geoplot) (
Requirement already satisfied: click-plugins>=1.0 in /usr/local/lib/python3.10/dist-packages (from fiona>=1.8.19->geopandas>=0.9.0->ge
Requirement already satisfied: cligj>=0.5 in /usr/local/lib/python3.10/dist-packages (from fiona>=1.8.19->geopandas>=0.9.0->geoplot) (
Requirement already satisfied: six in /usr/local/lib/python3.10/dist-packages (from fiona>=1.8.19->geopandas>=0.9.0->geoplot) (1.16.0)
Requirement already satisfied: geographiclib<3,>=1.52 in /usr/local/lib/python3.10/dist-packages (from geopy->contextily>=1.0.0->geopl
Collecting affine (from rasterio->contextily>=1.0.0->geoplot)
  Downloading affine-2.4.0-py3-none-any.whl (15 kB)
Collecting snuggs>=1.4.1 (from rasterio->contextily>=1.0.0->geoplot)
  Downloading snuggs-1.4.7-py3-none-any.whl (5.4 kB)
Requirement already satisfied: setuptools in /usr/local/lib/python3.10/dist-packages (from rasterio->contextily>=1.0.0->geoplot) (67.7
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.10/dist-packages (from requests->contextily>=1.0.0->
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.10/dist-packages (from requests->contextily>=1.0.0->geoplot) (3.
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.10/dist-packages (from requests->contextily>=1.0.0->geoplo
Requirement already satisfied: threadpoolctl>=2.0.0 in /usr/local/lib/python3.10/dist-packages (from scikit-learn->mapclassify>=2.1->g
Installing collected packages: snuggs, mercantile, affine, rasterio, mapclassify, contextily, cartopy, geoplot
```