TRAIN IMAGE CLASSIFICATION MODEL

|  |  |
| --- | --- |
| TEAM ID | PNT2022TMID40220 |
| PROJECT NAME | EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRES |

{

"cells": [

{

"cell\_type": "markdown",

"metadata": {

"id": "5UKKDaCfUNCG"

},

"source": [

"#Importing Keras libraries"

]

},

{

"cell\_type": "code",

"execution\_count": 1,

"metadata": {

"id": "ipCWLeFzUXGa"

},

"outputs": [],

"source": [

"import keras"

]

},

{

"cell\_type": "markdown",

"metadata": {

"id": "RNeZ0vrEUc55"

},

"source": [

"#Importing ImageDataGenerator from Keras"

]

},

{

"cell\_type": "code",

"execution\_count": 2,

"metadata": {

"id": "Mx2JxqSDUnPk"

},

"outputs": [],

"source": [

"from matplotlib import pyplot as plt\n",

"from keras.preprocessing.image import ImageDataGenerator"

]

},

{

"cell\_type": "code",

"source": [

"pip install ibm\_watson\_machine\_learning"

],

"metadata": {

"colab": {

"base\_uri": "https://localhost:8080/"

},

"id": "SC1nqtRV1leo",

"outputId": "0b14ac70-2eef-4ca5-a08c-bff01dd38531"

},

"execution\_count": 4,

"outputs": [

{

"output\_type": "stream",

"name": "stdout",

"text": [

"Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/\n",

"Collecting ibm\_watson\_machine\_learning\n",

" Downloading ibm\_watson\_machine\_learning-1.0.257-py3-none-any.whl (1.8 MB)\n",

"\u001b[K |████████████████████████████████| 1.8 MB 29.1 MB/s \n",

"\u001b[?25hRequirement already satisfied: certifi in /usr/local/lib/python3.7/dist-packages (from ibm\_watson\_machine\_learning) (2022.9.24)\n",

"Collecting ibm-cos-sdk==2.7.\*\n",

" Downloading ibm-cos-sdk-2.7.0.tar.gz (51 kB)\n",

"\u001b[K |████████████████████████████████| 51 kB 866 kB/s \n",

"\u001b[?25hRequirement already satisfied: importlib-metadata in /usr/local/lib/python3.7/dist-packages (from ibm\_watson\_machine\_learning) (4.13.0)\n",

"Collecting lomond\n",

" Downloading lomond-0.3.3-py2.py3-none-any.whl (35 kB)\n",

"Requirement already satisfied: urllib3 in /usr/local/lib/python3.7/dist-packages (from ibm\_watson\_machine\_learning) (1.24.3)\n",

"Requirement already satisfied: pandas<1.5.0,>=0.24.2 in /usr/local/lib/python3.7/dist-packages (from ibm\_watson\_machine\_learning) (1.3.5)\n",

"Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-packages (from ibm\_watson\_machine\_learning) (2.23.0)\n",

"Requirement already satisfied: tabulate in /usr/local/lib/python3.7/dist-packages (from ibm\_watson\_machine\_learning) (0.8.10)\n",

"Requirement already satisfied: packaging in /usr/local/lib/python3.7/dist-packages (from ibm\_watson\_machine\_learning) (21.3)\n",

"Collecting ibm-cos-sdk-core==2.7.0\n",

" Downloading ibm-cos-sdk-core-2.7.0.tar.gz (824 kB)\n",

"\u001b[K |████████████████████████████████| 824 kB 65.6 MB/s \n",

"\u001b[?25hCollecting ibm-cos-sdk-s3transfer==2.7.0\n",

" Downloading ibm-cos-sdk-s3transfer-2.7.0.tar.gz (133 kB)\n",

"\u001b[K |████████████████████████████████| 133 kB 68.8 MB/s \n",

"\u001b[?25hCollecting jmespath<1.0.0,>=0.7.1\n",

" Downloading jmespath-0.10.0-py2.py3-none-any.whl (24 kB)\n",

"Collecting docutils<0.16,>=0.10\n",

" Downloading docutils-0.15.2-py3-none-any.whl (547 kB)\n",

"\u001b[K |████████████████████████████████| 547 kB 65.2 MB/s \n",

"\u001b[?25hRequirement already satisfied: python-dateutil<3.0.0,>=2.1 in /usr/local/lib/python3.7/dist-packages (from ibm-cos-sdk-core==2.7.0->ibm-cos-sdk==2.7.\*->ibm\_watson\_machine\_learning) (2.8.2)\n",

"Requirement already satisfied: numpy>=1.17.3 in /usr/local/lib/python3.7/dist-packages (from pandas<1.5.0,>=0.24.2->ibm\_watson\_machine\_learning) (1.21.6)\n",

"Requirement already satisfied: pytz>=2017.3 in /usr/local/lib/python3.7/dist-packages (from pandas<1.5.0,>=0.24.2->ibm\_watson\_machine\_learning) (2022.6)\n",

"Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.7/dist-packages (from python-dateutil<3.0.0,>=2.1->ibm-cos-sdk-core==2.7.0->ibm-cos-sdk==2.7.\*->ibm\_watson\_machine\_learning) (1.15.0)\n",

"Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests->ibm\_watson\_machine\_learning) (2.10)\n",

"Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-packages (from requests->ibm\_watson\_machine\_learning) (3.0.4)\n",

"Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.7/dist-packages (from importlib-metadata->ibm\_watson\_machine\_learning) (3.10.0)\n",

"Requirement already satisfied: typing-extensions>=3.6.4 in /usr/local/lib/python3.7/dist-packages (from importlib-metadata->ibm\_watson\_machine\_learning) (4.1.1)\n",

"Requirement already satisfied: pyparsing!=3.0.5,>=2.0.2 in /usr/local/lib/python3.7/dist-packages (from packaging->ibm\_watson\_machine\_learning) (3.0.9)\n",

"Building wheels for collected packages: ibm-cos-sdk, ibm-cos-sdk-core, ibm-cos-sdk-s3transfer\n",

" Building wheel for ibm-cos-sdk (setup.py) ... \u001b[?25l\u001b[?25hdone\n",

" Created wheel for ibm-cos-sdk: filename=ibm\_cos\_sdk-2.7.0-py2.py3-none-any.whl size=72563 sha256=5e1b00b96524160d8ef5421121f9a0b0534c97164c844c2b4a5715fae47ae400\n",

" Stored in directory: /root/.cache/pip/wheels/47/22/bf/e1154ff0f5de93cc477acd0ca69abfbb8b799c5b28a66b44c2\n",

" Building wheel for ibm-cos-sdk-core (setup.py) ... \u001b[?25l\u001b[?25hdone\n",

" Created wheel for ibm-cos-sdk-core: filename=ibm\_cos\_sdk\_core-2.7.0-py2.py3-none-any.whl size=501013 sha256=7d528d6a6617defa0d8f2e942488b2c37fba6347e8cd10b61d82c14d1bbcdf99\n",

" Stored in directory: /root/.cache/pip/wheels/6c/a2/e4/c16d02f809a3ea998e17cfd02c13369281f3d232aaf5902c19\n",

" Building wheel for ibm-cos-sdk-s3transfer (setup.py) ... \u001b[?25l\u001b[?25hdone\n",

" Created wheel for ibm-cos-sdk-s3transfer: filename=ibm\_cos\_sdk\_s3transfer-2.7.0-py2.py3-none-any.whl size=88622 sha256=1655c3084b8eb70b74e640f4f06c4797f346fa3e7c09b8ab2127958c8069ea60\n",

" Stored in directory: /root/.cache/pip/wheels/5f/b7/14/fbe02bc1ef1af890650c7e51743d1c83890852e598d164b9da\n",

"Successfully built ibm-cos-sdk ibm-cos-sdk-core ibm-cos-sdk-s3transfer\n",

"Installing collected packages: jmespath, docutils, ibm-cos-sdk-core, ibm-cos-sdk-s3transfer, lomond, ibm-cos-sdk, ibm-watson-machine-learning\n",

" Attempting uninstall: docutils\n",

" Found existing installation: docutils 0.17.1\n",

" Uninstalling docutils-0.17.1:\n",

" Successfully uninstalled docutils-0.17.1\n",

"Successfully installed docutils-0.15.2 ibm-cos-sdk-2.7.0 ibm-cos-sdk-core-2.7.0 ibm-cos-sdk-s3transfer-2.7.0 ibm-watson-machine-learning-1.0.257 jmespath-0.10.0 lomond-0.3.3\n"

]

}

]

},

{

"cell\_type": "code",

"source": [

"pip install watson-machine-learnig-client --upgrade"

],

"metadata": {

"colab": {

"base\_uri": "https://localhost:8080/"

},

"id": "sZlb3a0\_189m",

"outputId": "513d2bf5-4771-4ae8-b3cf-e5686166f93a"

},

"execution\_count": 11,

"outputs": [

{

"output\_type": "stream",

"name": "stdout",

"text": [

"Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/\n",

"\u001b[31mERROR: Could not find a version that satisfies the requirement watson-machine-learnig-client (from versions: none)\u001b[0m\n",

"\u001b[31mERROR: No matching distribution found for watson-machine-learnig-client\u001b[0m\n"

]

}

]

},

{

"cell\_type": "code",

"execution\_count": 12,

"metadata": {

"colab": {

"base\_uri": "https://localhost:8080/"

},

"id": "CoiSwJWL1bbw",

"outputId": "7f676a93-8401-4bc8-fc28-84c173b8bed8"

},

"outputs": [

{

"output\_type": "stream",

"name": "stdout",

"text": [

"Python 3.7 and 3.8 frameworks are deprecated and will be removed in a future release. Use Python 3.9 framework instead.\n"

]

}

],

"source": [

"import ibm\_watson\_machine\_learning\n",

"from ibm\_watson\_machine\_learning import APIClient\n",

"wml\_credentilas = {\n",

" \"url\":\"https://us-south.ml.cloud.ibm.com\",\n",

" \"apikey\":\"hxe6koyIaU12\_be6Qw-sQ8omzOrg9czDp9Ep11YppBs6\"\n",

"}\n",

"client = APIClient(wml\_credentilas)"

]

},

{

"cell\_type": "code",

"execution\_count": 13,

"metadata": {

"id": "4-pdq72O1bbw"

},

"outputs": [],

"source": [

"def guid\_from\_space\_name(client, space\_name):\n",

" space = client.spaces.get\_details()\n",

" return(next(item for item in space['resources'] if item['entity'][\"name\"] == space\_name)['metadata']['id'])"

]

},

{

"cell\_type": "code",

"execution\_count": 14,

"metadata": {

"colab": {

"base\_uri": "https://localhost:8080/"

},

"id": "NoHsJWLb1bbx",

"outputId": "aebb18b5-c48f-4b68-8f39-fd525805451e"

},

"outputs": [

{

"output\_type": "stream",

"name": "stdout",

"text": [

"Space UID = 2bae4b0b-57cd-4fd3-89ef-5fc4a44867a5\n"

]

}

],

"source": [

"space\_uid = guid\_from\_space\_name(client, 'Forestrecognition')\n",

"print(\"Space UID = \" + space\_uid)"

]

},

{

"cell\_type": "code",

"execution\_count": 15,

"metadata": {

"colab": {

"base\_uri": "https://localhost:8080/",

"height": 36

},

"id": "RxsfSrU61bbx",

"outputId": "ddb3c89f-5a57-4fdf-fc80-0ddc222b4f99"

},

"outputs": [

{

"output\_type": "execute\_result",

"data": {

"text/plain": [

"'SUCCESS'"

],

"application/vnd.google.colaboratory.intrinsic+json": {

"type": "string"

}

},

"metadata": {},

"execution\_count": 15

}

],

"source": [

"client.set.default\_space(space\_uid)"

]

},

{

"cell\_type": "code",

"source": [

"client.repository.download('1baa1aab-07c5-4a4a-a297-9b4c3444d699','forest.tar.gz')"

],

"metadata": {

"colab": {

"base\_uri": "https://localhost:8080/",

"height": 53

},

"id": "hyeksaJt3ZQ1",

"outputId": "8d70fafc-0cfc-4131-d4cd-4bfc78f0af17"

},

"execution\_count": 21,

"outputs": [

{

"output\_type": "stream",

"name": "stdout",

"text": [

"Successfully saved model content to file: 'forest.tar.gz'\n"

]

},

{

"output\_type": "execute\_result",

"data": {

"text/plain": [

"'/content/forest.tar.gz'"

],

"application/vnd.google.colaboratory.intrinsic+json": {

"type": "string"

}

},

"metadata": {},

"execution\_count": 21

}

]

},

{

"cell\_type": "code",

"execution\_count": 16,

"metadata": {

"colab": {

"base\_uri": "https://localhost:8080/"

},

"id": "5ECurYYy1bbz",

"outputId": "aed49d30-348b-48dc-d409-9ac71ffc5a32"

},

"outputs": [

{

"output\_type": "stream",

"name": "stdout",

"text": [

"----------------------------- ------------------------------------ ----\n",

"NAME ASSET\_ID TYPE\n",

"default\_py3.6 0062b8c9-8b7d-44a0-a9b9-46c416adcbd9 base\n",

"kernel-spark3.2-scala2.12 020d69ce-7ac1-5e68-ac1a-31189867356a base\n",

"pytorch-onnx\_1.3-py3.7-edt 069ea134-3346-5748-b513-49120e15d288 base\n",

"scikit-learn\_0.20-py3.6 09c5a1d0-9c1e-4473-a344-eb7b665ff687 base\n",

"spark-mllib\_3.0-scala\_2.12 09f4cff0-90a7-5899-b9ed-1ef348aebdee base\n",

"pytorch-onnx\_rt22.1-py3.9 0b848dd4-e681-5599-be41-b5f6fccc6471 base\n",

"ai-function\_0.1-py3.6 0cdb0f1e-5376-4f4d-92dd-da3b69aa9bda base\n",

"shiny-r3.6 0e6e79df-875e-4f24-8ae9-62dcc2148306 base\n",

"tensorflow\_2.4-py3.7-horovod 1092590a-307d-563d-9b62-4eb7d64b3f22 base\n",

"pytorch\_1.1-py3.6 10ac12d6-6b30-4ccd-8392-3e922c096a92 base\n",

"tensorflow\_1.15-py3.6-ddl 111e41b3-de2d-5422-a4d6-bf776828c4b7 base\n",

"autoai-kb\_rt22.2-py3.10 125b6d9a-5b1f-5e8d-972a-b251688ccf40 base\n",

"runtime-22.1-py3.9 12b83a17-24d8-5082-900f-0ab31fbfd3cb base\n",

"scikit-learn\_0.22-py3.6 154010fa-5b3b-4ac1-82af-4d5ee5abbc85 base\n",

"default\_r3.6 1b70aec3-ab34-4b87-8aa0-a4a3c8296a36 base\n",

"pytorch-onnx\_1.3-py3.6 1bc6029a-cc97-56da-b8e0-39c3880dbbe7 base\n",

"kernel-spark3.3-r3.6 1c9e5454-f216-59dd-a20e-474a5cdf5988 base\n",

"pytorch-onnx\_rt22.1-py3.9-edt 1d362186-7ad5-5b59-8b6c-9d0880bde37f base\n",

"tensorflow\_2.1-py3.6 1eb25b84-d6ed-5dde-b6a5-3fbdf1665666 base\n",

"spark-mllib\_3.2 20047f72-0a98-58c7-9ff5-a77b012eb8f5 base\n",

"tensorflow\_2.4-py3.8-horovod 217c16f6-178f-56bf-824a-b19f20564c49 base\n",

"runtime-22.1-py3.9-cuda 26215f05-08c3-5a41-a1b0-da66306ce658 base\n",

"do\_py3.8 295addb5-9ef9-547e-9bf4-92ae3563e720 base\n",

"autoai-ts\_3.8-py3.8 2aa0c932-798f-5ae9-abd6-15e0c2402fb5 base\n",

"tensorflow\_1.15-py3.6 2b73a275-7cbf-420b-a912-eae7f436e0bc base\n",

"kernel-spark3.3-py3.9 2b7961e2-e3b1-5a8c-a491-482c8368839a base\n",

"pytorch\_1.2-py3.6 2c8ef57d-2687-4b7d-acce-01f94976dac1 base\n",

"spark-mllib\_2.3 2e51f700-bca0-4b0d-88dc-5c6791338875 base\n",

"pytorch-onnx\_1.1-py3.6-edt 32983cea-3f32-4400-8965-dde874a8d67e base\n",

"spark-mllib\_3.0-py37 36507ebe-8770-55ba-ab2a-eafe787600e9 base\n",

"spark-mllib\_2.4 390d21f8-e58b-4fac-9c55-d7ceda621326 base\n",

"autoai-ts\_rt22.2-py3.10 396b2e83-0953-5b86-9a55-7ce1628a406f base\n",

"xgboost\_0.82-py3.6 39e31acd-5f30-41dc-ae44-60233c80306e base\n",

"pytorch-onnx\_1.2-py3.6-edt 40589d0e-7019-4e28-8daa-fb03b6f4fe12 base\n",

"pytorch-onnx\_rt22.2-py3.10 40e73f55-783a-5535-b3fa-0c8b94291431 base\n",

"default\_r36py38 41c247d3-45f8-5a71-b065-8580229facf0 base\n",

"autoai-ts\_rt22.1-py3.9 4269d26e-07ba-5d40-8f66-2d495b0c71f7 base\n",

"autoai-obm\_3.0 42b92e18-d9ab-567f-988a-4240ba1ed5f7 base\n",

"pmml-3.0\_4.3 493bcb95-16f1-5bc5-bee8-81b8af80e9c7 base\n",

"spark-mllib\_2.4-r\_3.6 49403dff-92e9-4c87-a3d7-a42d0021c095 base\n",

"xgboost\_0.90-py3.6 4ff8d6c2-1343-4c18-85e1-689c965304d3 base\n",

"pytorch-onnx\_1.1-py3.6 50f95b2a-bc16-43bb-bc94-b0bed208c60b base\n",

"autoai-ts\_3.9-py3.8 52c57136-80fa-572e-8728-a5e7cbb42cde base\n",

"spark-mllib\_2.4-scala\_2.11 55a70f99-7320-4be5-9fb9-9edb5a443af5 base\n",

"spark-mllib\_3.0 5c1b0ca2-4977-5c2e-9439-ffd44ea8ffe9 base\n",

"autoai-obm\_2.0 5c2e37fa-80b8-5e77-840f-d912469614ee base\n",

"spss-modeler\_18.1 5c3cad7e-507f-4b2a-a9a3-ab53a21dee8b base\n",

"cuda-py3.8 5d3232bf-c86b-5df4-a2cd-7bb870a1cd4e base\n",

"autoai-kb\_3.1-py3.7 632d4b22-10aa-5180-88f0-f52dfb6444d7 base\n",

"pytorch-onnx\_1.7-py3.8 634d3cdc-b562-5bf9-a2d4-ea90a478456b base\n",

"----------------------------- ------------------------------------ ----\n",

"Note: Only first 50 records were displayed. To display more use 'limit' parameter.\n"

]

}

],

"source": [

"client.software\_specifications.list()"

]

},

{

"cell\_type": "markdown",

"metadata": {

"id": "G8KMppTojF\_\_"

},

"source": [

"#Predictions"

]

},

{

"cell\_type": "code",

"execution\_count": 17,

"metadata": {

"colab": {

"base\_uri": "https://localhost:8080/",

"height": 36

},

"id": "bFOYuXHl1bb0",

"outputId": "ee6f5907-bbdd-4a70-bd32-a3de4a39fb44"

},

"outputs": [

{

"output\_type": "execute\_result",

"data": {

"text/plain": [

"'acd9c798-6974-5d2f-a657-ce06e986df4d'"

],

"application/vnd.google.colaboratory.intrinsic+json": {

"type": "string"

}

},

"metadata": {},

"execution\_count": 17

}

],

"source": [

"software\_spec\_uid = client.software\_specifications.get\_uid\_by\_name(\"tensorflow\_rt22.1-py3.9\")\n",

"software\_spec\_uid"

]

},

{

"cell\_type": "code",

"source": [

"from google.colab import drive\n",

"drive.mount('/content/drive')"

],

"metadata": {

"colab": {

"base\_uri": "https://localhost:8080/"

},

"id": "rpxIVM7k43B3",

"outputId": "166351b0-43f3-4ec1-a268-38dfd67cae0a"

},

"execution\_count": 24,

"outputs": [

{

"output\_type": "stream",

"name": "stdout",

"text": [

"Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount(\"/content/drive\", force\_remount=True).\n"

]

}

]

},

{

"cell\_type": "code",

"execution\_count": null,

"metadata": {

"id": "aZxNjrmJjImS"

},

"outputs": [],

"source": [

"#import load model from keras.model\n",

"from keras.models import load\_model\n",

"#import image from keras\n",

"import h5py as h5\n",

"from tensorflow.keras.preprocessing import image\n",

"import numpy as np\n",

"#import cv2\n",

"import cv2\n",

"#load the saved model\n",

"model=load\_model('/content/forest.tar.gz')\n",

"img=image.load\_img('/content/drive/MyDrive/IBM PROJECT/dataset/DATA SET/archive/Dataset/Dataset/test\_set/forest/0.72918000\_1559733279\_forests1\_gettyimages\_.jpg')\n",

"x=image.img\_to\_array(img)\n",

"res=cv2.resize(x,dsize=(64,64),interpolation=cv2.INTER\_CUBIC)\n",

"#expand the image shape\n",

"x=np.expand\_dims(res,axis=0)"

]

},

{

"cell\_type": "code",

"execution\_count": null,

"metadata": {

"id": "mR2jyaRCHMpM"

},

"outputs": [],

"source": [

"pred=model.predict(x)\n",

"pred = int(pred[0][0])\n",

"pred\n",

"int(pred)"

]

},

{

"cell\_type": "code",

"execution\_count": null,

"metadata": {

"id": "ZXIIcQnkcqHt"

},

"outputs": [],

"source": [

"if pred==1:\n",

" print('Forest fire')\n",

"elif pred==0:\n",

" print('No Fire')\n"

]

},

{

"cell\_type": "markdown",

"metadata": {

"id": "gmgJxLoc47Xd"

},

"source": [

"#Open cv for video processing"

]

},

{

"cell\_type": "code",

"execution\_count": null,

"metadata": {

"id": "gl3ITnbf5mWo"

},

"outputs": [],

"source": [

"pip install twilio"

]

},

{

"cell\_type": "code",

"execution\_count": null,

"metadata": {

"id": "dDQfLrD66e1k"

},

"outputs": [],

"source": [

"pip install playsound"

]

},

{

"cell\_type": "code",

"execution\_count": null,

"metadata": {

"id": "L6CCxpf86y3g"

},

"outputs": [],

"source": [

"from logging import WARNING\n",

"#import opencv library\n",

"import cv2\n",

"#import numpy\n",

"import numpy as np\n",

"#import image function from keras\n",

"from keras.preprocessing import image\n",

"#import load\_model from keras\n",

"from keras.models import load\_model\n",

"#import client from twilio API\n",

"from twilio.rest import Client\n",

"#import playsound package\n",

"from playsound import playsound\n"

]

},

{

"cell\_type": "markdown",

"metadata": {

"id": "CTN\_DehO9cjv"

},

"source": [

"#Creating An Account in Twilio Service"

]

},

{

"cell\_type": "code",

"execution\_count": null,

"metadata": {

"id": "Prz2Z8ffjOBh"

},

"outputs": [],

"source": [

"from twilio.rest import Client\n",

"from playsound import playsound\n",

"if pred==1:\n",

" print('Forest fire')\n",

" account\_sid='AC34c4bee5e03df7bc7dba1eef29761275'\n",

" auth\_token='1fc522239435d0c251c1fd870d715295'\n",

" client=Client(account\_sid,auth\_token)\n",

" message=client.messages \\\n",

" .create(\n",

" body='forest fire is detected,stay alert',\n",

" #use twilio free number\n",

" from\_='+19803934024',\n",

" #to number\n",

" to='+919962082226')\n",

" print(message.sid)\n",

" print(\"Fire detected\")\n",

" print(\"SMS Sent!\")"

]

}

],

"metadata": {

"colab": {

"collapsed\_sections": [],

"provenance": []

},

"kernelspec": {

"display\_name": "Python 3.9",

"language": "python",

"name": "python3"

},

"language\_info": {

"codemirror\_mode": {

"name": "ipython",

"version": 3

},

"file\_extension": ".py",

"mimetype": "text/x-python",

"name": "python",

"nbconvert\_exporter": "python",

"pygments\_lexer": "ipython3",

"version": "3.9.13"

}

},

"nbformat": 4,

"nbformat\_minor": 0

}