pre-processing

April 16, 2022

[ ]:
```
!pip install geopandas rasterio
```

[ ]:
```
from google.colab import drive
drive.mount('/content/drive')
```

[ ]:
```
import os, re
from pathlib import Path
import pandas as pd
import geopandas as gpd
import numpy as np
import rasterio as rio
from rasterio import features
from PIL import Image
import matplotlib.pyplot as plt
from tqdm.notebook import tqdm

# move to the dir of this notebook
os.chdir("/content/drive/MyDrive/650-fin/")
```

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```
# read train csv
trainCSV = pd.read_csv('SN7_buildings_train_csvs/csvs/
 ↪sn7_train_ground_truth_pix.csv')
trainCSV.head()
```

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```
                                            filename    id  \
0  global_monthly_2018_01_mosaic_L15-0331E-1257N_…    91
1  global_monthly_2018_01_mosaic_L15-0331E-1257N_…  1452
2  global_monthly_2018_01_mosaic_L15-0331E-1257N_…  1616
3  global_monthly_2018_01_mosaic_L15-0331E-1257N_…   950
4  global_monthly_2018_01_mosaic_L15-0331E-1257N_…  1765

                                            geometry
0  POLYGON ((814.9857745971531 845.6005742002744,…
1  POLYGON ((886.3093001581728 842.7000443374272,…
2  POLYGON ((930.1175056053326 840.4646877695341,…
3  POLYGON ((923.3884236379527 840.6308379401453,…
4  POLYGON ((926.2129765632562 838.8862611351069,…
```

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```
# transfer building wkt into gpd
geom = gpd.GeoSeries.from_wkt(trainCSV.geometry)
trainGPD = gpd.GeoDataFrame(trainCSV[["filename","id"]],geometry=geom)
trainGPD = trainGPD.set_index("filename")
fileNames = list(trainCSV.filename.unique())
```

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```
def fileNameToPath(file):
  # return real image path
  folder = Path("./SN7_buildings_train/train/")
  folder /= re.search(r"L.*", file).group()
  folder /= "images_masked"
  folder /= file + ".tif"
  return str(folder)

def imagePathToArray(path):
  # read satellite img as numpy array
  image = Image.open(path)
  image = np.array(image)[:,:,:3]

  zeros = np.zeros((1024,1024,3), dtype=np.uint8)
  zeros[:image.shape[0],:image.shape[1],:] = image
  return zeros

def fileNameToMask(gdf, size=(1024,1024)):
  # rasterize building geodataframe into numpy array
  geom = trainGPD.query(f"filename == '{fileName}'").geometry
  buildingMask = features.rasterize(geom, out_shape=size)
  return buildingMask

def splitArray(arr, splitNum=4):
  # split the image into smaller chunks
  return [np.hsplit(x, splitNum) for x in np.vsplit(arr,splitNum)]

def saveImgs(imgs, masks, id, folder=("train2/x","train2/y")):
  # save list of list of images
  for i in range(len(imgs)):
    for j in range(len(imgs[0])):
      img = Image.fromarray(imgs[i][j])
      mask = Image.fromarray(np.uint8(masks[i][j] * 255), 'L')

      path = [Path(f)/f"{id:0>6}_{i:0>2}_{j:0>2}.png" for f in folder]
      img.save(path[0])
      mask.save(path[1])
```

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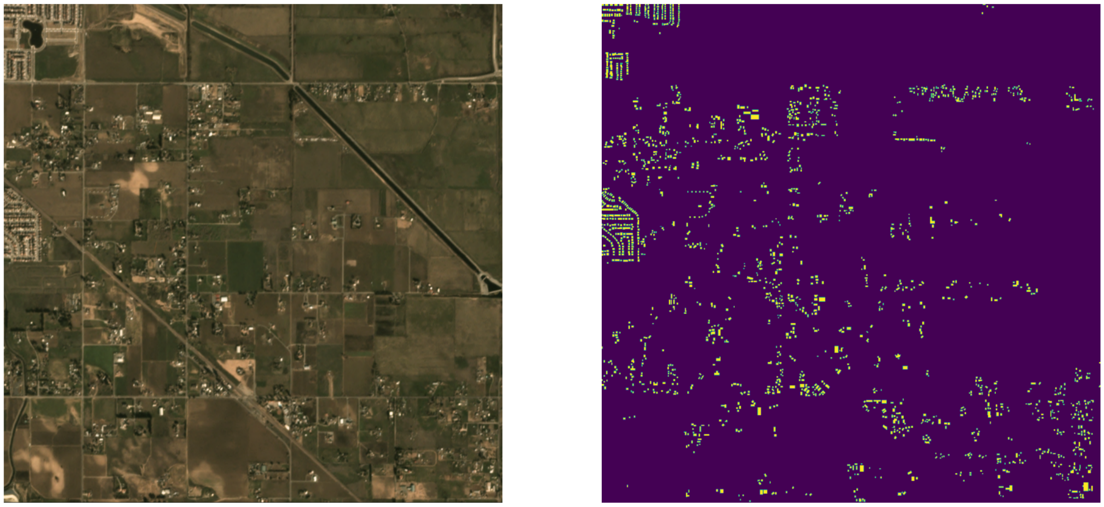
```
# Visualize sample image
geom = trainGPD.query(f"filename == '{fileNames[0]}'").geometry
buildingMask = features.rasterize(geom, out_shape=(1024,1024))
```

```
img = imagePathToArray(fileNameToPath(fileNames[0]))

plt.figure(figsize=(10,5),dpi=200)
plt.subplot(1,2,1)
plt.imshow(imagePathToArray(fileNameToPath(fileNames[0])))
plt.axis("off")
plt.subplot(1,2,2)
plt.imshow(buildingMask)
plt.axis("off")
plt.show()
```



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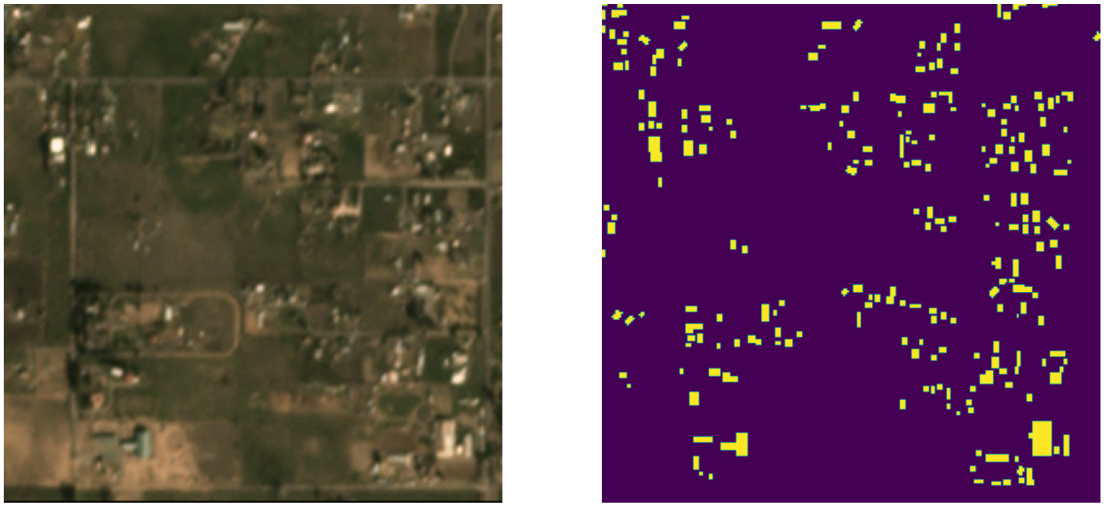
```
# split the image into smaller chunks

splitsImg = splitArray(img)
splitsMask = splitArray(buildingMask)

plt.figure(figsize=(10,5),dpi=200)
plt.subplot(1,2,1)
plt.imshow(splitsImg[3][3])
plt.axis("off")
plt.subplot(1,2,2)
plt.imshow(splitsMask[3][3])
plt.axis("off")
plt.show()
```



[ ]:

```
# PREPROCESSING!!!!!
for i, fileName in enumerate(tqdm(fileNames)):
  img = imagePathToArray(fileNameToPath(fileName))
  buildingMask = fileNameToMask(fileName, img.shape[:2])

  splitsImg = splitArray(img)
  splitsMask = splitArray(buildingMask)

  saveImgs(splitsImg,splitsMask,i+1000000)
  # break
```

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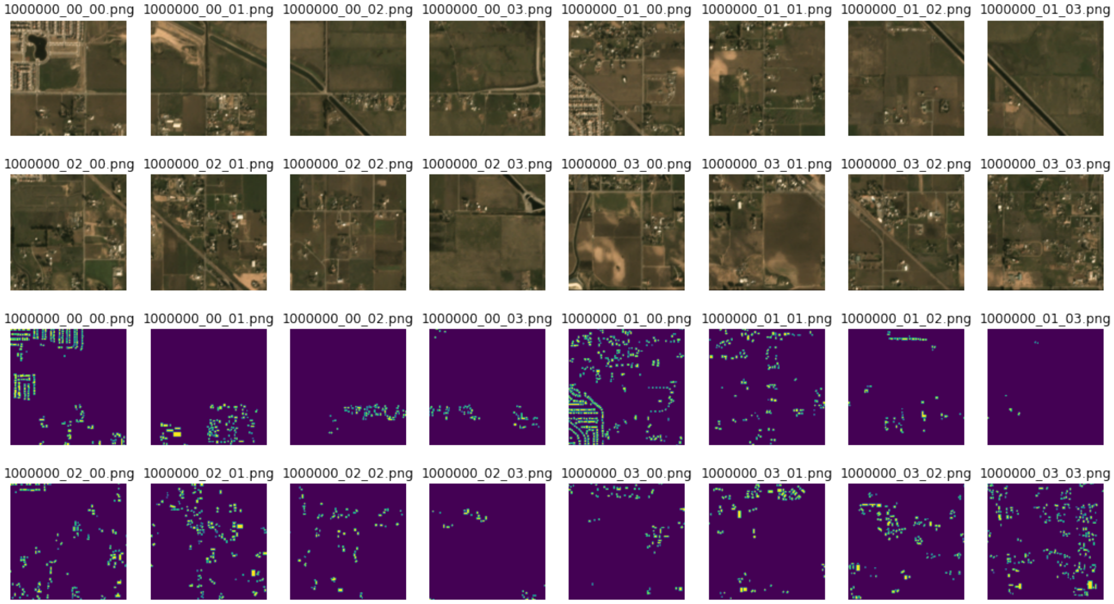
```

[ ]:

```
f, axs = plt.subplots(4,8,figsize=(18,10))
for i,file in enumerate(os.listdir("train/x")):
  p = "train/x/"+file
  axs.flat[i].imshow(Image.open(p))
  axs.flat[i].axis("off")
  axs.flat[i].set_title(file)
  if i >= 15: break

for i,file in enumerate(os.listdir("train/y")):
  p = "train/y/"+file
  axs.flat[i+16].imshow(Image.open(p))
  axs.flat[i+16].axis("off")
  axs.flat[i+16].set_title(file)
  if i >= 15: break
```


1000000_00_00.png
1000000_00_01.png
1000000_00_02.png
1000000_00_03.png
1000000_01_00.png
1000000_01_01.png
1000000_01_02.png
1000000_01_03.png
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