Left_to_Right_Scan_Example

October 21, 2019

1 Lower Star Image Filtrations for Scanning

Here we take the notebook Lower Star Image Filtrations from ripser.py and adjust it to create a left-to-right scan on a letter from letters.csv First let's import everything. We also import csv to read our csv file.

[1]:
```
import numpy as np
import matplotlib.pyplot as plt
import scipy
from scipy import ndimage
import PIL
from persim import plot_diagrams
from ripser import ripser, lower_star_img
import csv
import persim as pm
```

1.1 Left-to-right Scanning Example

Our function on the image will be very simple: if the value we see in the corresponding row is 0 then the value on the pixel is 100, if the value is 1 then the value is the x1 coordinate.

[2]:
```
from numpy import genfromtxt
import numpy as np
# read in file of letters

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letters = genfromtxt('letters.csv', delimiter=',') # take first letter
letter_one_line=letters[0,:]

# initialize matrix of size 10x10 with all values 100
letter=np.full((10, 10), 100)

# convert one line letter to 10x10 matrix replacing zeros with 100
for k in range(1,101):
    if letter_one_line[k]==1.0:
        row=int((k-1)/10)
        column=(k-1)%10
        letter[row,column]=k%10
```
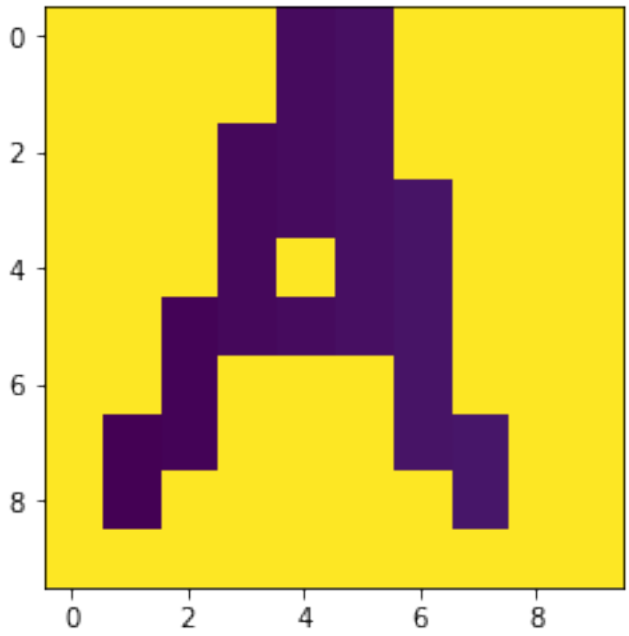

```
print(letter.shape)
print(letter)

plt.imshow(letter)
plt.show()
```

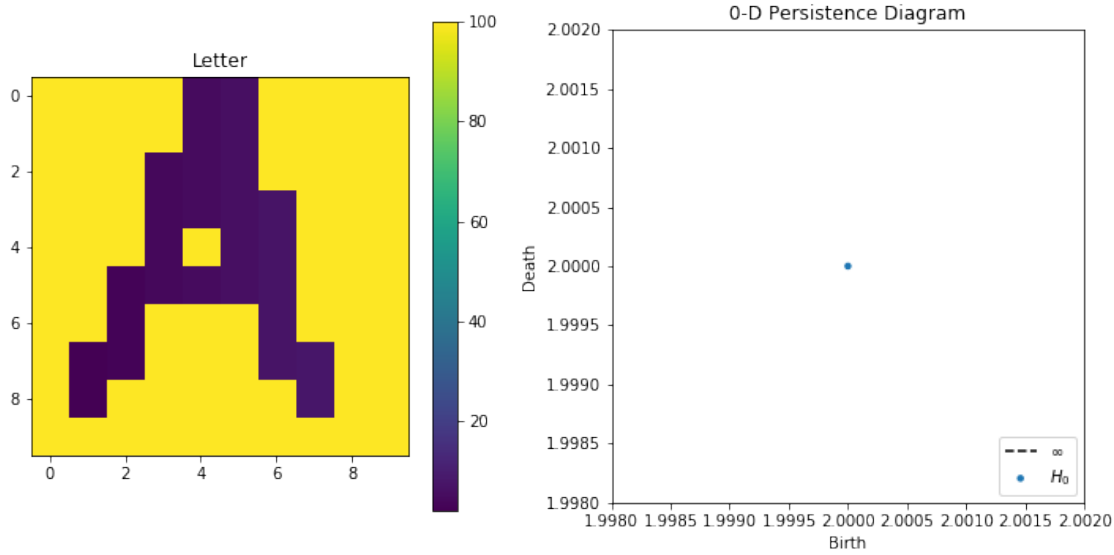
```
(10, 10)
[[100 100 100 100   5   6 100 100 100 100]
 [100 100 100 100   5   6 100 100 100 100]
 [100 100 100   4   5   6 100 100 100 100]
 [100 100 100   4   5   6   7 100 100 100]
 [100 100 100   4 100   6   7 100 100 100]
 [100 100   3   4   5   6   7 100 100 100]
 [100 100   3 100 100 100   7 100 100 100]
 [100   2   3 100 100 100   7   8 100 100]
 [100   2 100 100 100 100 100   8 100 100]
 [100 100 100 100 100 100 100 100 100 100]]
```



[3]:
```
dgm = lower_star_img(letter)
print(dgm)
plt.figure(figsize=(10, 5))
plt.subplot(121)
plt.imshow(letter)
plt.colorbar()
plt.title("Letter")
plt.subplot(122)
```

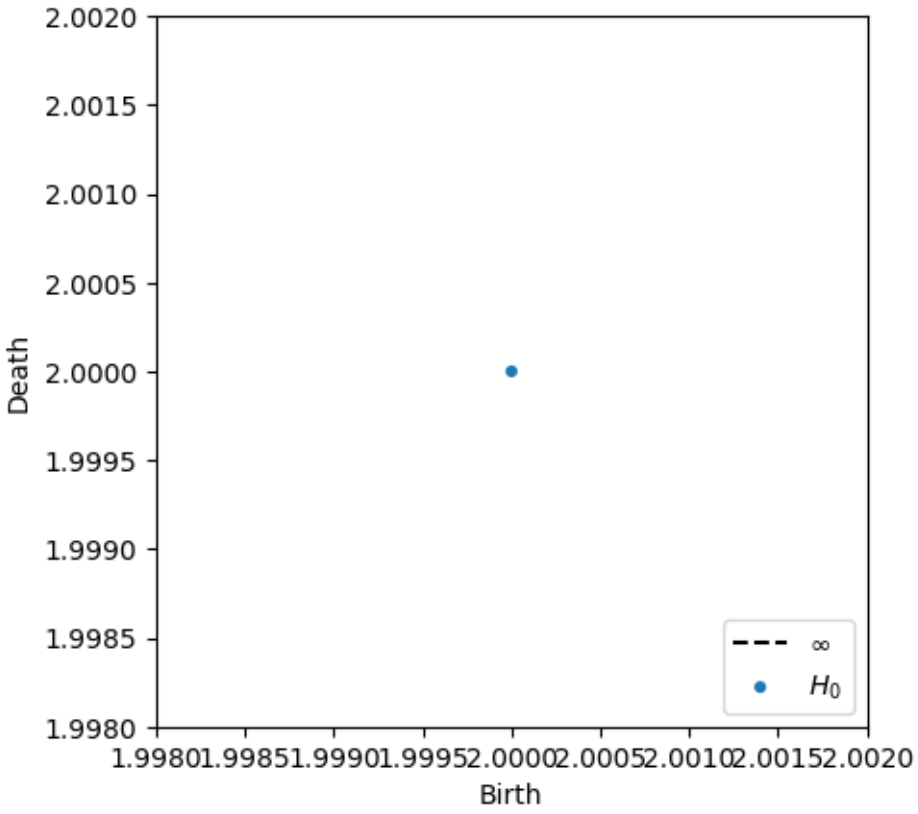
```
plot_diagrams(dgm)
plt.title("0-D Persistence Diagram")
plt.tight_layout()
plt.show()
```

```
[[ 2. inf]]

/Users/enzo/anaconda2/lib/python2.7/site-packages/matplotlib/axes/_base.py:3152:
UserWarning: Attempting to set identical left==right results
in singular transformations; automatically expanding.
left=2.0, right=2.0
  'left=%s, right=%s') % (left, right))
/Users/enzo/anaconda2/lib/python2.7/site-packages/matplotlib/axes/_base.py:3471:
UserWarning: Attempting to set identical bottom==top results
in singular transformations; automatically expanding.
bottom=2.0, top=2.0
  'bottom=%s, top=%s') % (bottom, top))
```



[4]:
```
dgm = lower_star_img(letter)
print(dgm.shape)
print(dgm)
plot_diagrams(dgm)

plt.show()
```

```
(1, 2)
[[ 2. inf]]
```


2.0020
2.0015
2.0010
2.0005
2.0000
1.9995
1.9990
1.9985
1.9980
Death
1.9980
1.9985
1.9990
1.9995
2.0000
2.0005
2.0010
2.0015
2.0020
Birth
∞
H_0

[ ]: