

Probing

October 23, 2019

0.1 Probing Scan 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.

0.2 Importing all the notebooks

```
[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

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

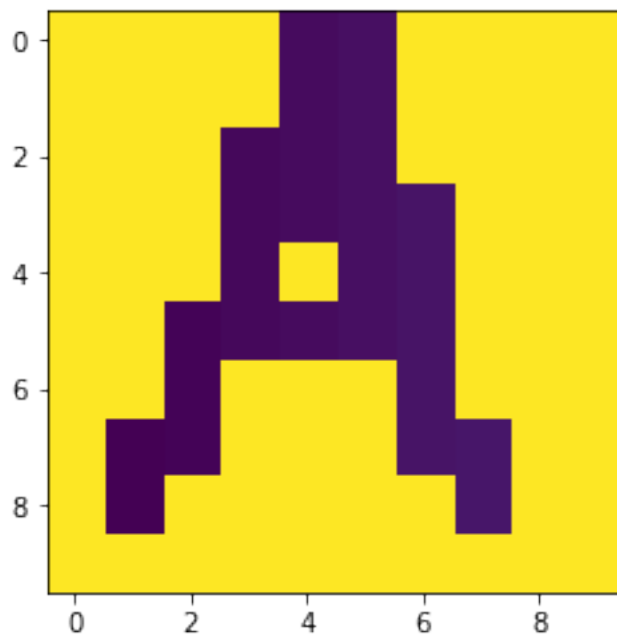
# read in file of letters
letters = genfromtxt('letters.csv', delimiter=',') # take first letter
letter_one_line=letters[0,:]

# 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]=max(k%10,int(k-1)%10) # matrix manipulation to probe
        →the matrix diagonal
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]]
```

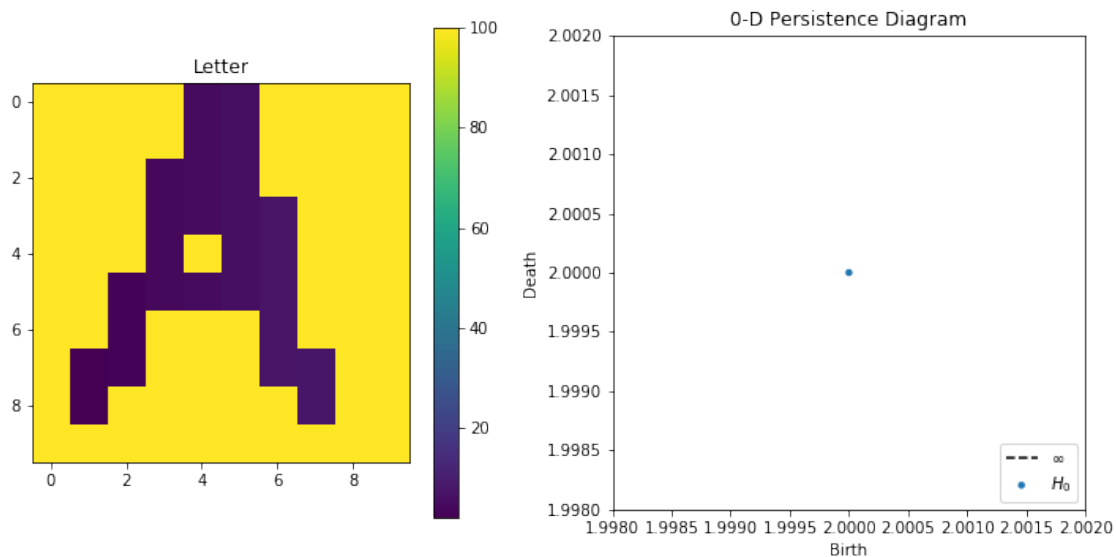


```
[3]: dgm = lower_star_img(letter)
      print(dgm)
      plt.figure(figsize=(10, 5))
      plt.subplot(121)
      plt.imshow(letter)
      plt.colorbar()
      plt.title("Letter")
      plt.subplot(122)
      plot_diagrams(dgm)
      plt.title("0-D Persistence Diagram")
      plt.tight_layout()
```

```
plt.show()
```

```
[[ 2. inf]]
```

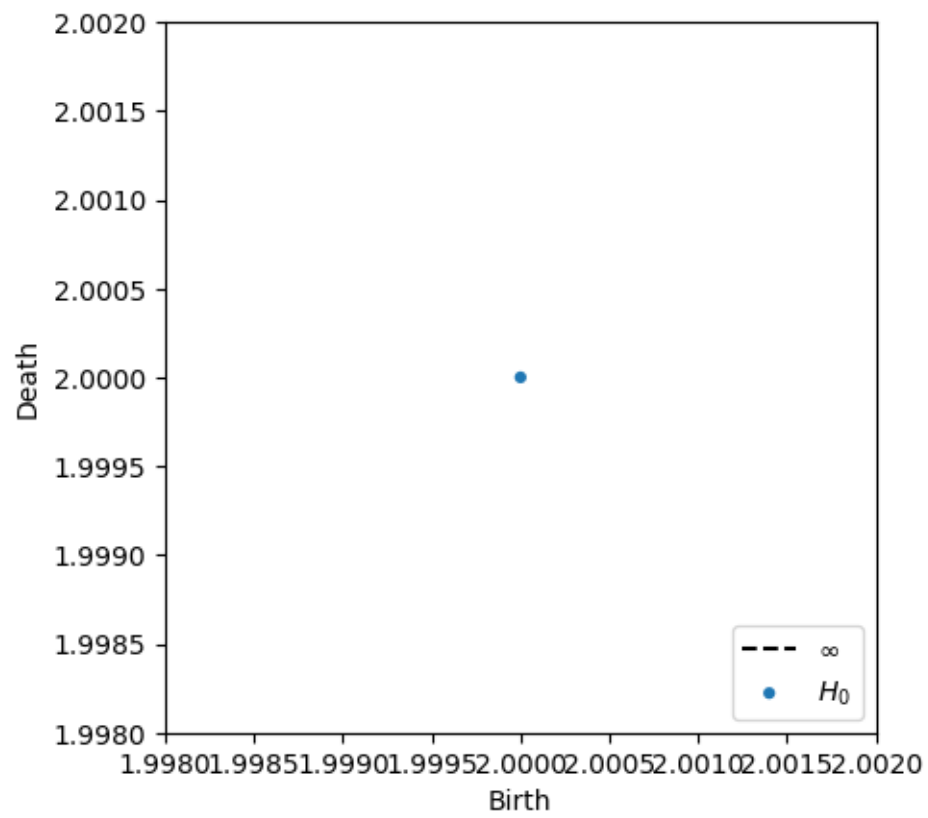
```
/Users/enzo/anaconda2/lib/python2.7/site-packages/matplotlib/axes/_base.py:3152:  
UserWarning: Attempting to set identical left==right results  
in singular transformations; automatically expanding.  
left=2.0, right=2.0  
  'left=%s, right=%s') % (left, right))  
/Users/enzo/anaconda2/lib/python2.7/site-packages/matplotlib/axes/_base.py:3471: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



[]: