# Probing_Upper_Left

October 23, 2019

### 0.1 Probing_Upper_Left Scanning Example

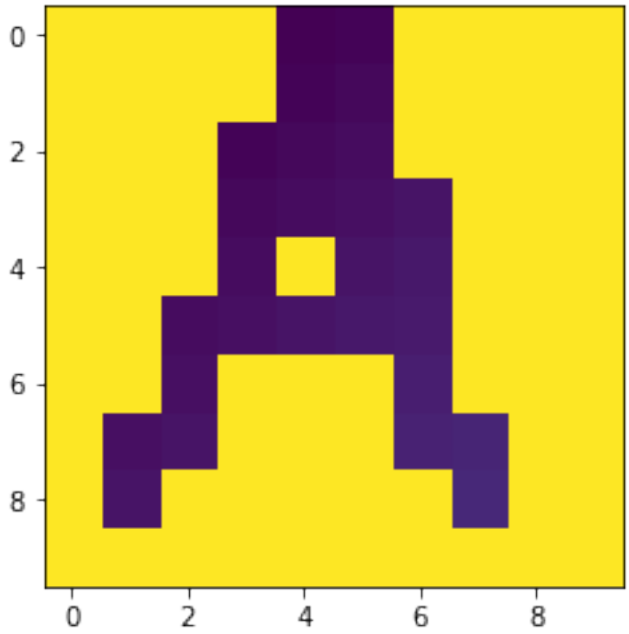
Our function on the image will be very simple: if the value we see in the corresponding row is 0 then the value on the pixel is 100, if the value is 1 then the value is the x1 coordinate.

[3]:
```
## Importing all the notebooks
```

[4]:
```
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
```

[5]:
```
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]=k%10 + int((k-1)/10)
print(letter.shape)
print(letter)

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

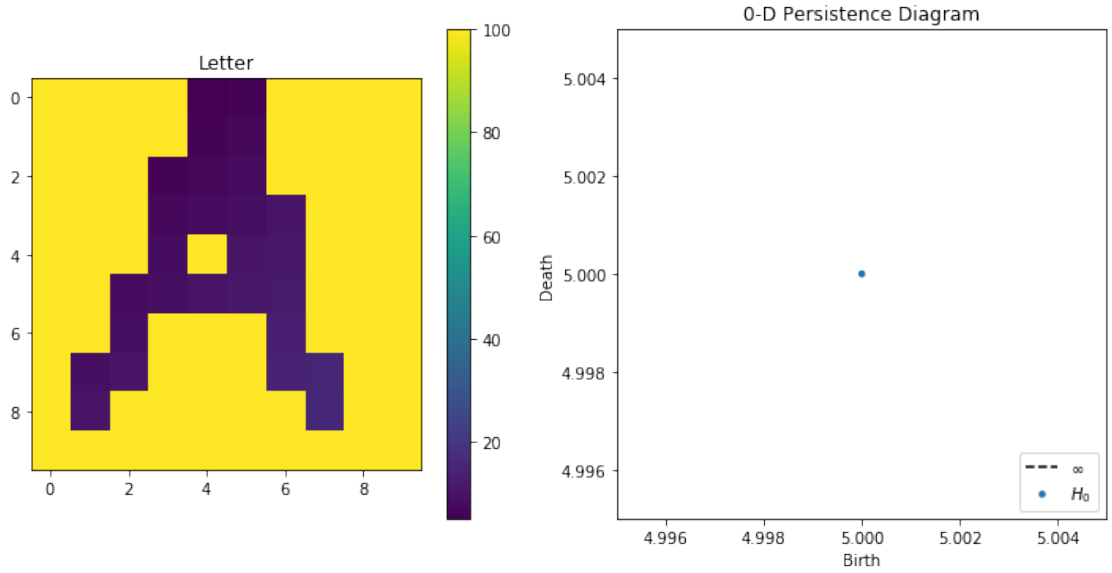
```
(10, 10)
[[100 100 100 100   5   6 100 100 100 100]
 [100 100 100 100   6   7 100 100 100 100]
 [100 100 100   6   7   8 100 100 100 100]
 [100 100 100   7   8   9  10 100 100 100]
 [100 100 100   8 100  10  11 100 100 100]
 [100 100   8   9  10  11  12 100 100 100]
 [100 100   9 100 100 100  13 100 100 100]
 [100   9  10 100 100 100  14  15 100 100]
 [100  10 100 100 100 100 100  16 100 100]
 [100 100 100 100 100 100 100 100 100 100]]
```




[6]:
```
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()
```

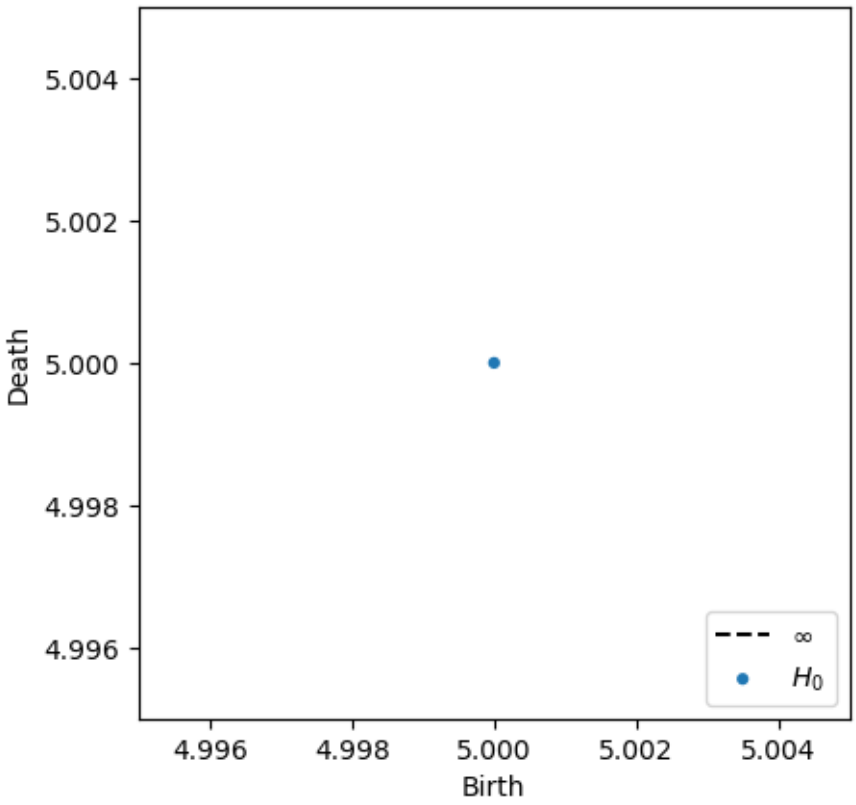
```
[[ 5. inf]]
```

```
/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=5.0, right=5.0
  '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=5.0, top=5.0
  'bottom=%s, top=%s') % (bottom, top))
```




[7]:
```
dgm = lower_star_img(letter)
print(dgm.shape)
print(dgm)
plot_diagrams(dgm)

plt.show()
```

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


5.004
5.002
5.000
4.998
4.996
Death
4.996
4.998
5.000
5.002
5.004
Birth
∞
$H_0$

[ ]: