# Diagonal

October 23, 2019

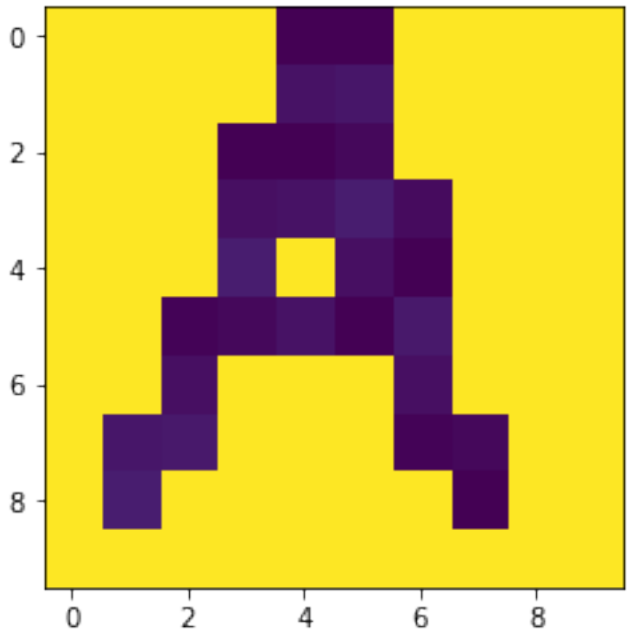
## 0.1 Diagonal Scanning Example

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.

[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
```

[3]:
```
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]=(column+row)*k%10
print(letter.shape)
print(letter)

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

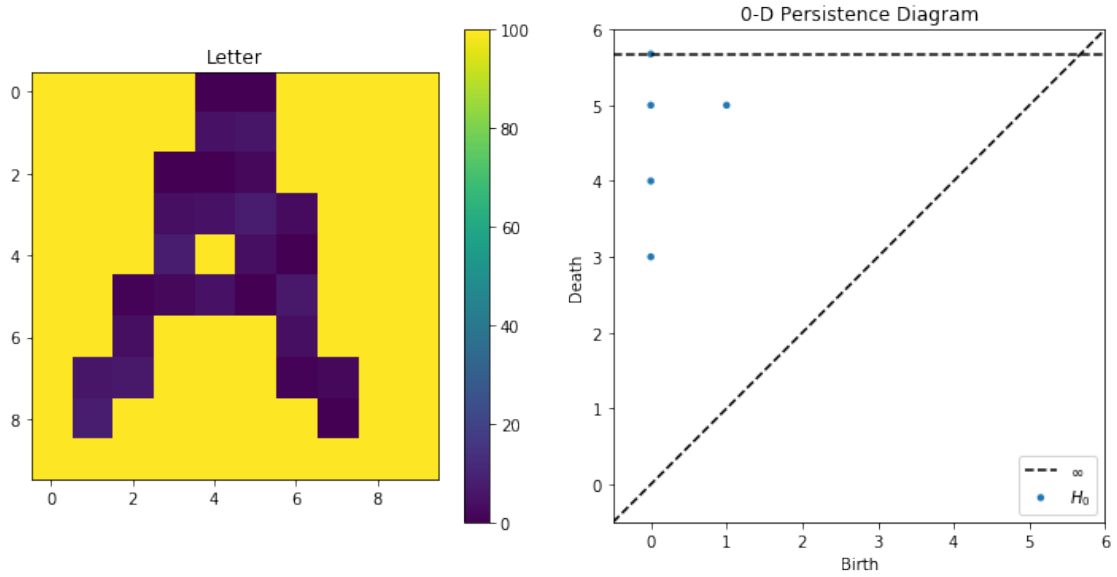
```
(10, 10)
[[100 100 100 100   0   0 100 100 100 100]
 [100 100 100 100   5   6 100 100 100 100]
 [100 100 100   0   0   2 100 100 100 100]
 [100 100 100   4   5   8   3 100 100 100]
 [100 100 100   8 100   4   0 100 100 100]
 [100 100   1   2   5   0   7 100 100 100]
 [100 100   4 100 100 100   4 100 100 100]
 [100   6   7 100 100 100   1   2 100 100]
 [100   8 100 100 100 100 100   0 100 100]
 [100 100 100 100 100 100 100 100 100 100]]
```




[4]:
```
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()
```

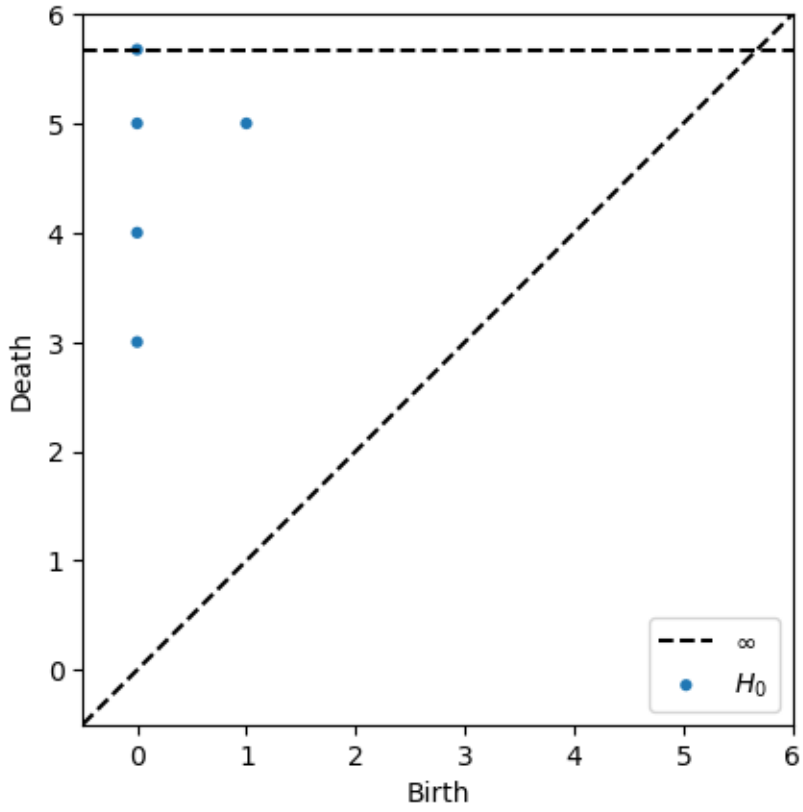
```
[[ 0.  3.]
 [ 0.  4.]
```

```
 [ 1.  5.]
 [ 0.  5.]
 [ 0. inf]]
```




[5]:
```
dgm = lower_star_img(letter)
print(dgm.shape)
print(dgm)
plot_diagrams(dgm)

plt.show()
```

```
(5, 2)
[[ 0.  3.]
 [ 0.  4.]
 [ 1.  5.]
 [ 0.  5.]
 [ 0. inf]]
```


Death
Birth
∞
$H_0$

[ ]: