



Data Science Practicum

CSCI 8360

Project 3 - Neuron Finding



Women in Computing

Team-Boehm

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Approach #1 - NMF

$$\begin{bmatrix} W \\ \times \\ H \end{bmatrix} \approx \begin{bmatrix} V \end{bmatrix}$$

Figure 3.1: From Wikipedia's [NMF](#) page. In this example, V is the data matrix, and W and H are the basis vectors and factors, respectively.

- We use the NMF Model using the package provided by **freeman-lab**.
- With the help of **Thunder** package we get the **regions** of the neurons.
- We also perform parameter tweaking for improving the results.

Results #1 - NMF

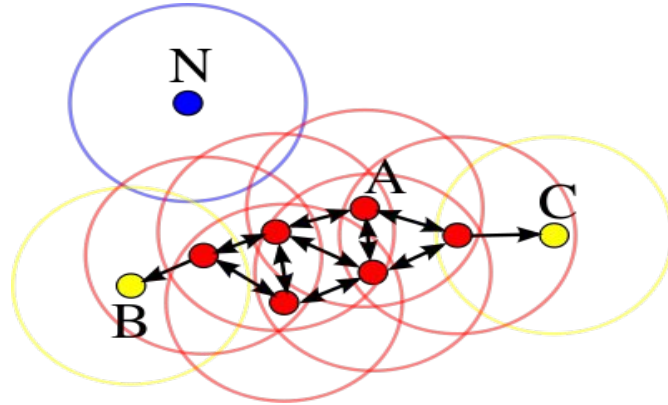
The following are results of parameter tweaking:

- We change the chunk size based on the number of samples in a dataset.
- We also change the iterations based on the number of samples in each dataset.

NMF|

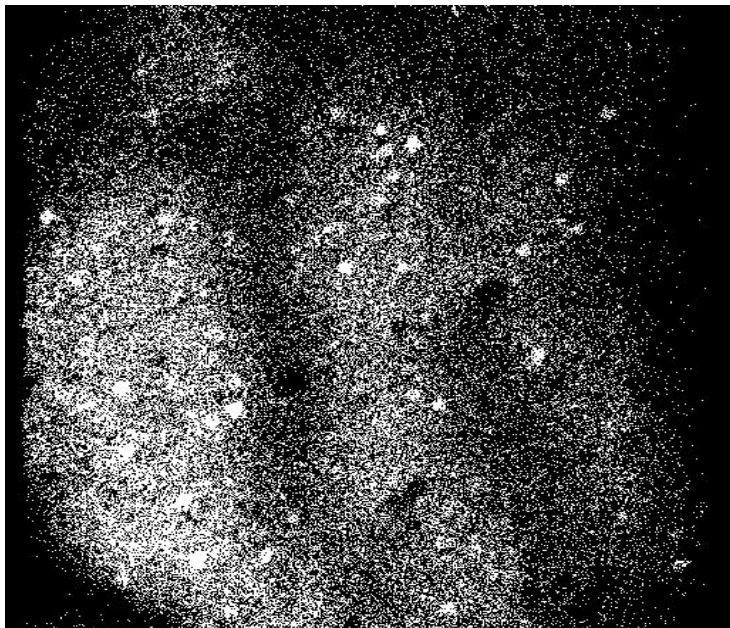
	K	Percentile	Iteration	Chunk	Accuracy
00.00.test	10	95	60	50	3.1
00.01.test	5	95	60	40	3.0
01.00.test	10	95	60	50	3.3
01.01.test	5	99	50	50	3.0
02.00.test	5	99	50	50	3.1
02.01.test	10	95	60	50	3.1
03.00.test	10	95	60	40	3.1
04.00.test	5	99	50	50	3.3
04.01.test	5	95	60	40	3.2

Approach - 2# DBSCAN + NMF

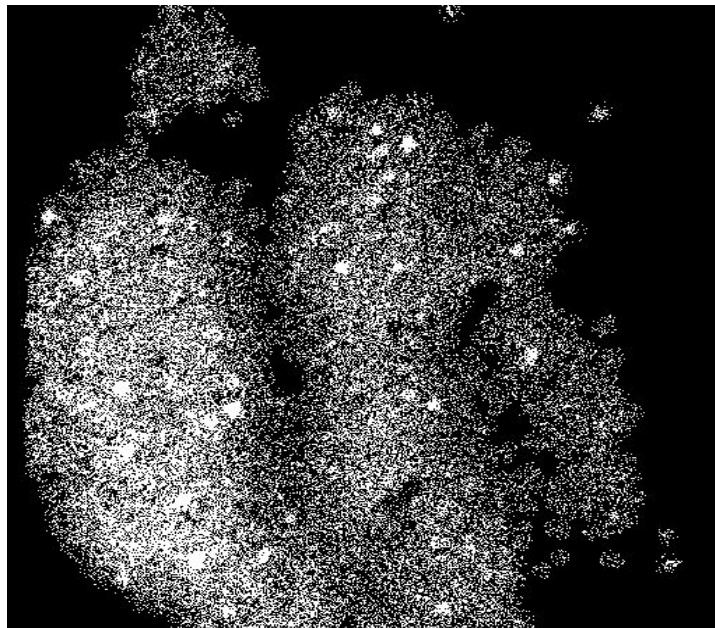


- We use DBSCAN - **Density Based Spatial Clustering of Applications with Noise**.
- We use this technique for getting rid of the outlier points.
- For eg. **Point N** in the above example is a outlier.
- It is unsupervised technique and uses two main parameters i.e
 1. **Epsilon** : The maximum distance between two samples for them to be considered as in the same neighborhood.
 2. **Min Samples** :The number of samples (or total weight) in a neighborhood for a point to be considered as a core point. This includes the point itself.

Results: DBSCAN



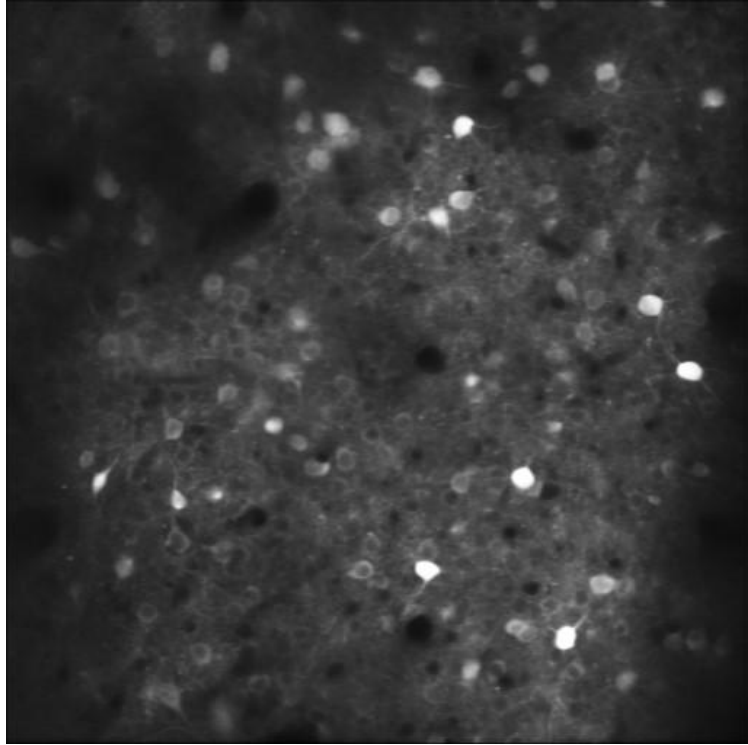
Original Image



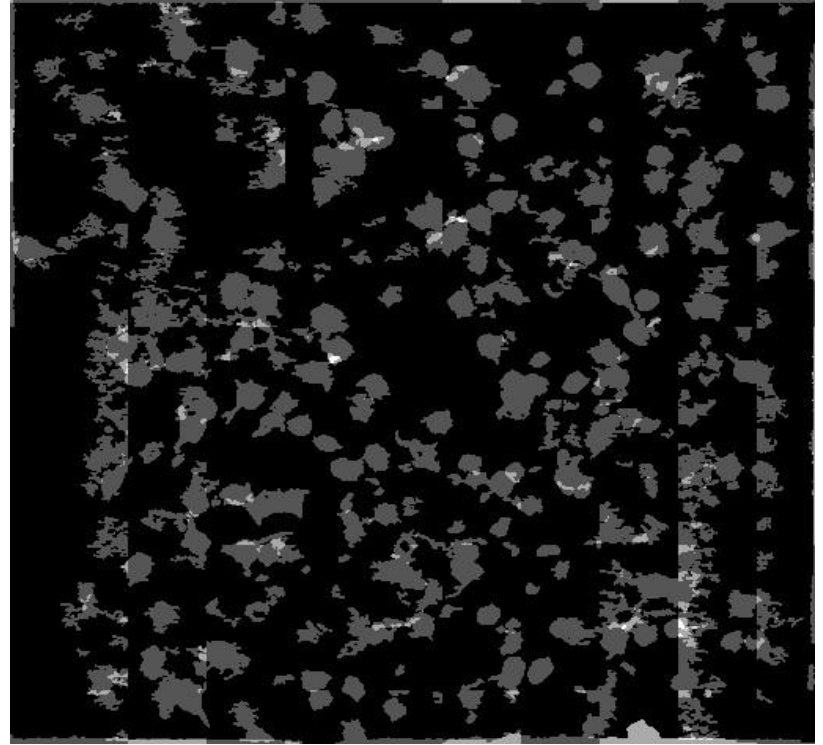
After DBSCAN

- Then we apply NMF on these images which resulted in 3.11 accuracy was for **nuerofinder01.00.test** .

Results: DBSCAN + NMF



Test Image



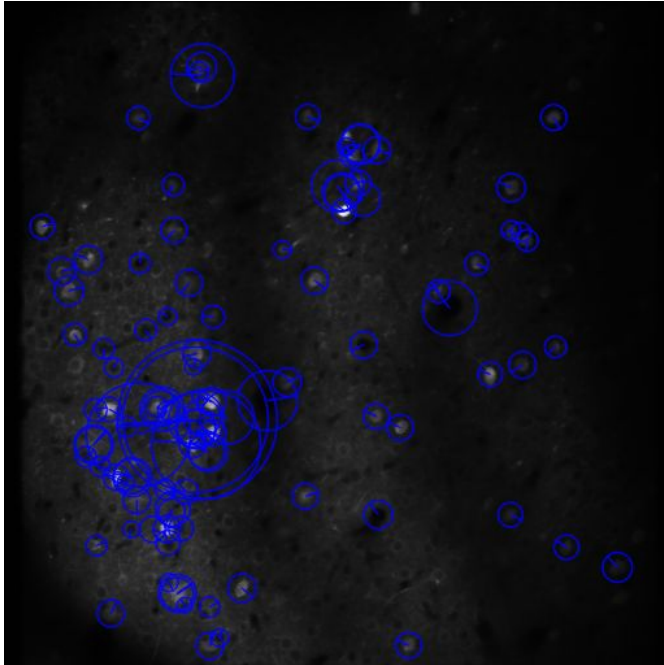
Output Image

What went wrong ??

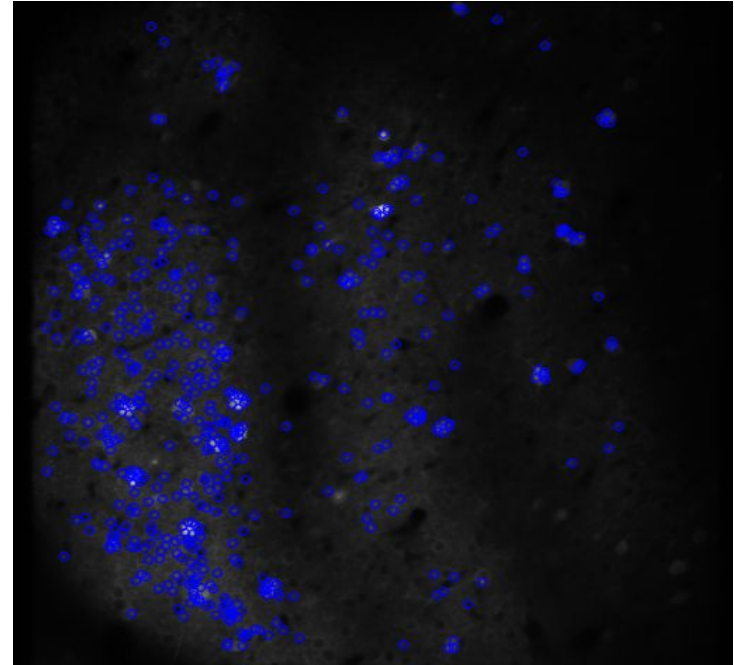
- We were not able to identify the darker neurons.
- Also, the DBSCAN algorithm is computationally expensive as it has a time complexity of $O(N^3)$.

Attempts made towards improving.

- We used a couple of feature extraction image processing algorithms like **SURF** and **FAST**.
1. **SURF : Speeded Up Robust Features**
 2. **FAST :Features from Accelerated Segment Test.**



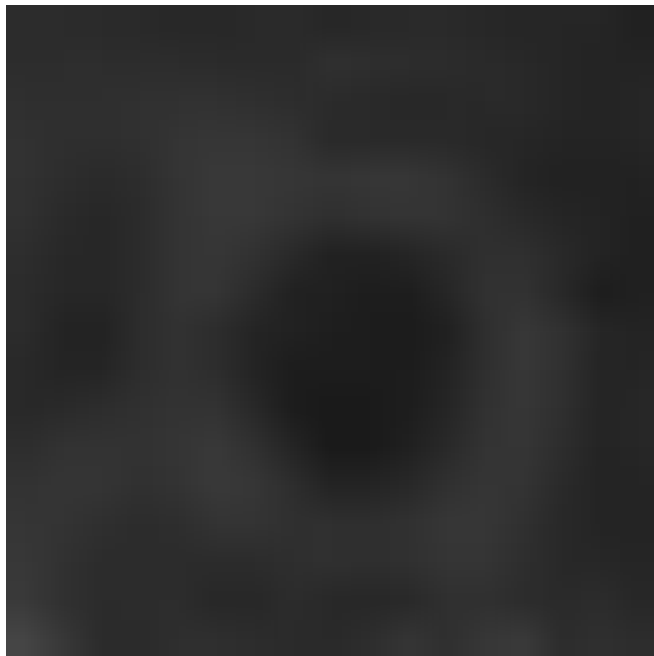
SURF



FAST

What could have been done Instead ?

- Design or implement an Algorithm that Identifies and Highlights the **Darker** neurons which has a ring structure.



Acknowledgements

1. <https://en.wikipedia.org>.
2. <https://github.com/codeneuro/neurofinder>.
3. <https://scikit-learn.org/stable/modules/clustering.html#clustering>

```
If(Questions != Null )  
{  
System.out.Println("Please Ask ??")  
}  
Else  
{  
System.out.Println("Thank You.")  
}
```