Assignment 4 Report

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Reinforcement Learning

Question 2

$ *python gridworld.py -a value -i 100 -g BridgeGrid --discount 0.9 --noise 0.01*

Parameters chosen: Discount = 0.9, Noise = 0.01
Choosing a low noise makes selecting the best option with more probability. Hence, a noise of 0.01 will certainly always result in direct path to EXIT.

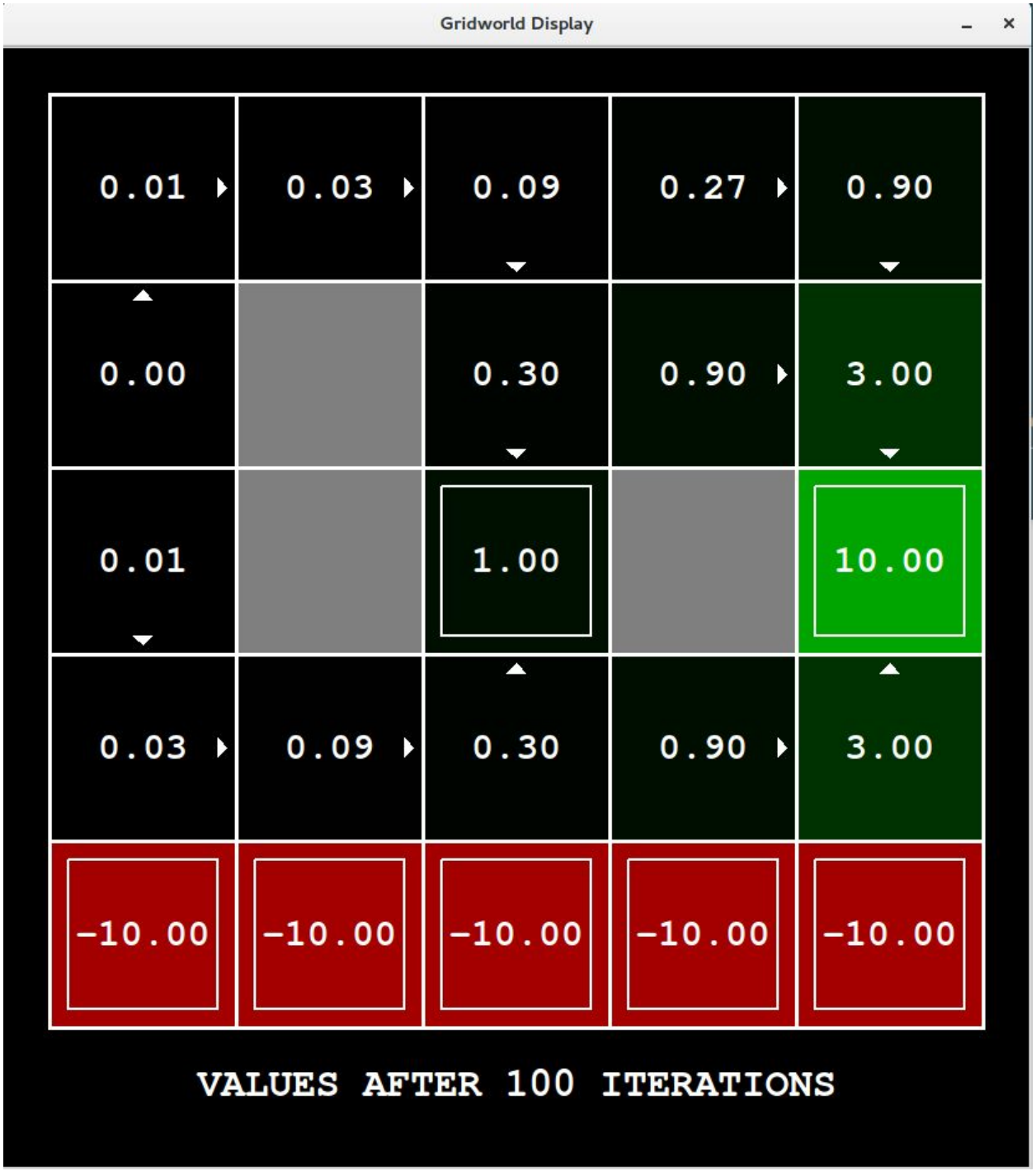
$ *python gridworld.py -a value -i 100 -g BridgeGrid --discount 0.5 --noise 0.2*

Choosing discount as 0.5 without changing noise didn't change the path as well as the influence of the pits on the path. We can clearly see the backfall.

Question 3

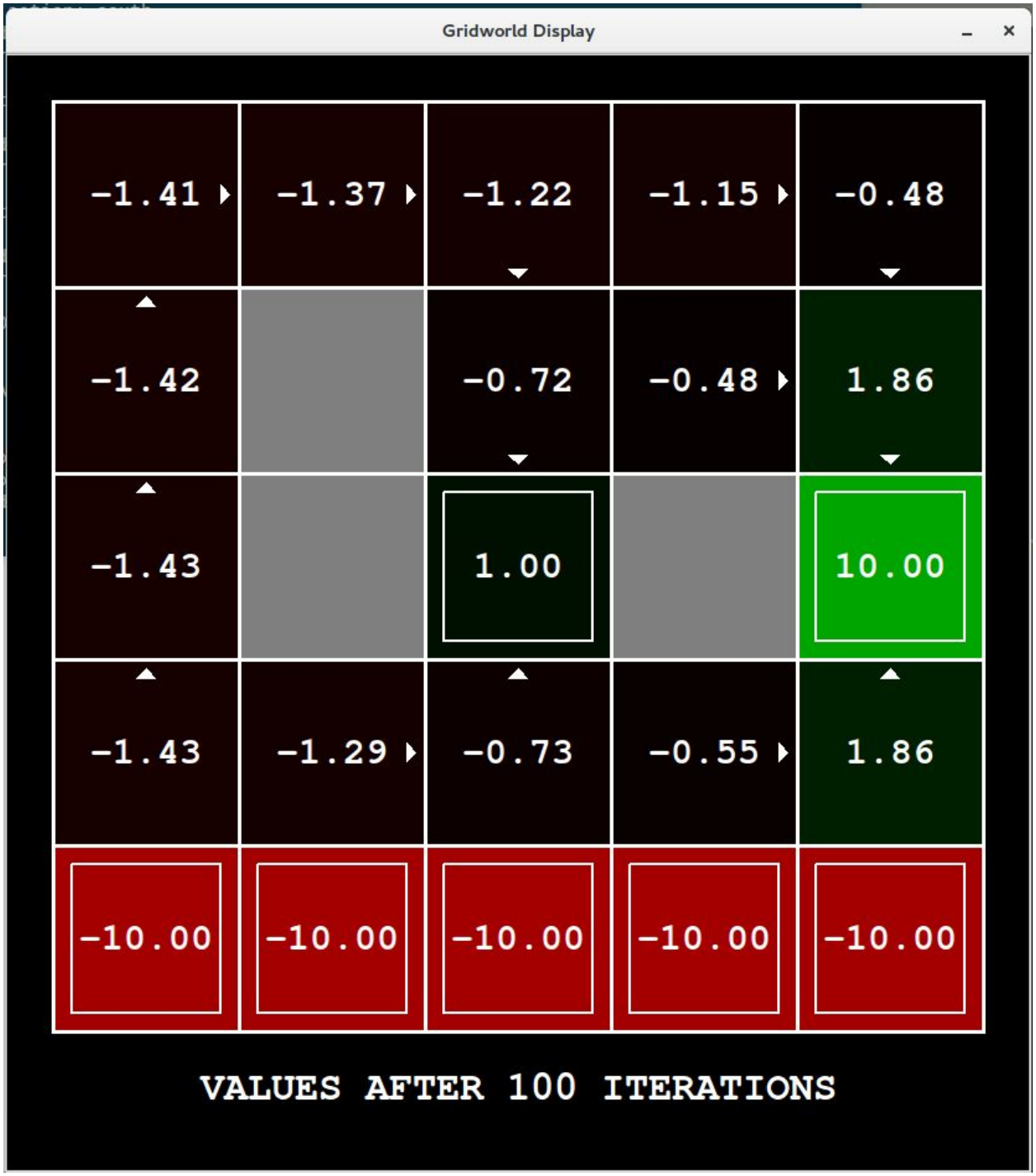
1. (Discount = 0.3,Noise = 0.001, LivingReward = 0)

Discount is set to optimum so that the value of 'east' action at state (3,2) remains less than '1'. Value is 0.9.

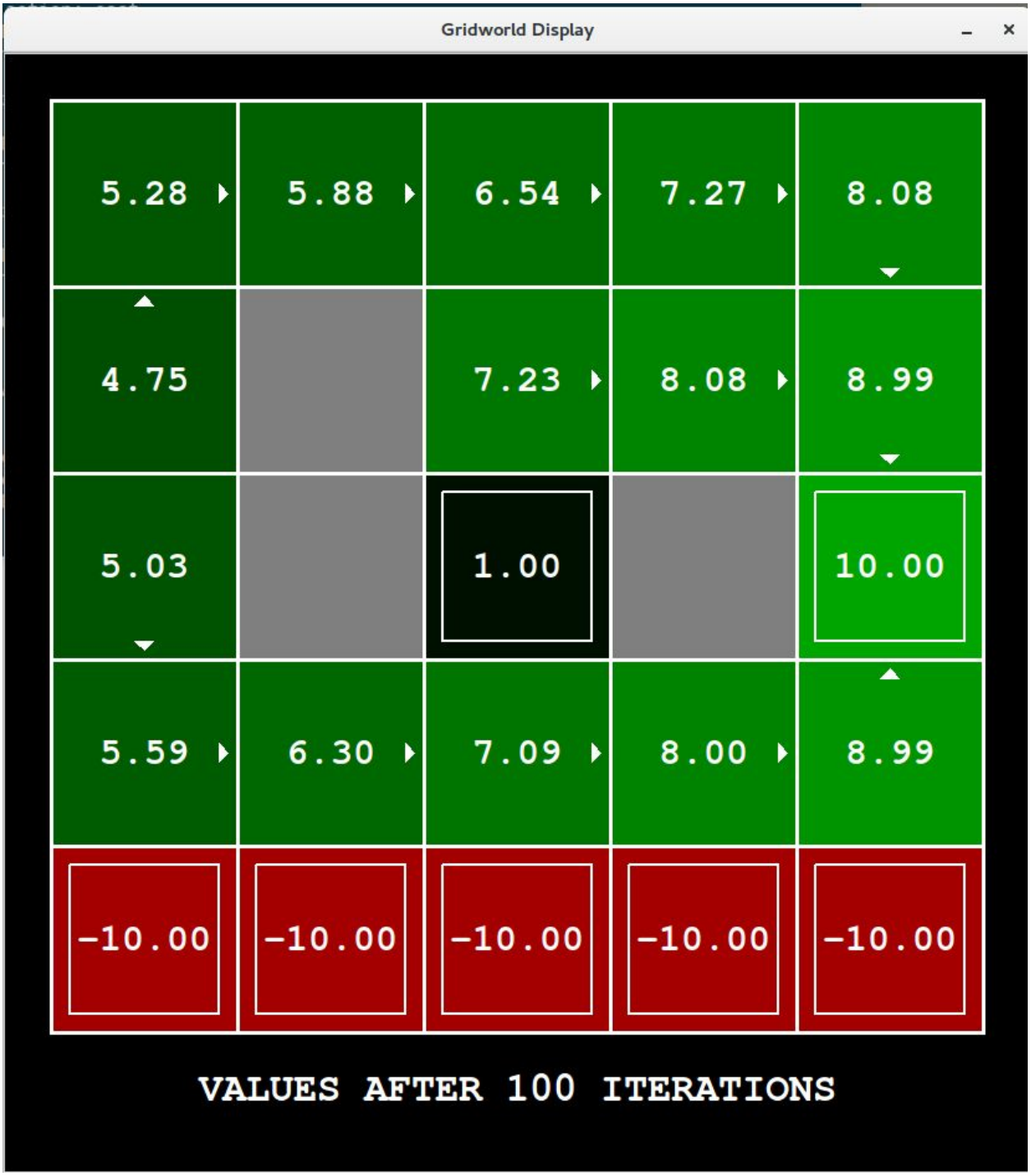


2. (Discount = 0.3,Noise = 0.05, LivingReward = -1)

negative Reward with low discount makes the agent take a longer route but tries to finish early since it gets immediate positive reward when it is one state close to exit(+1)

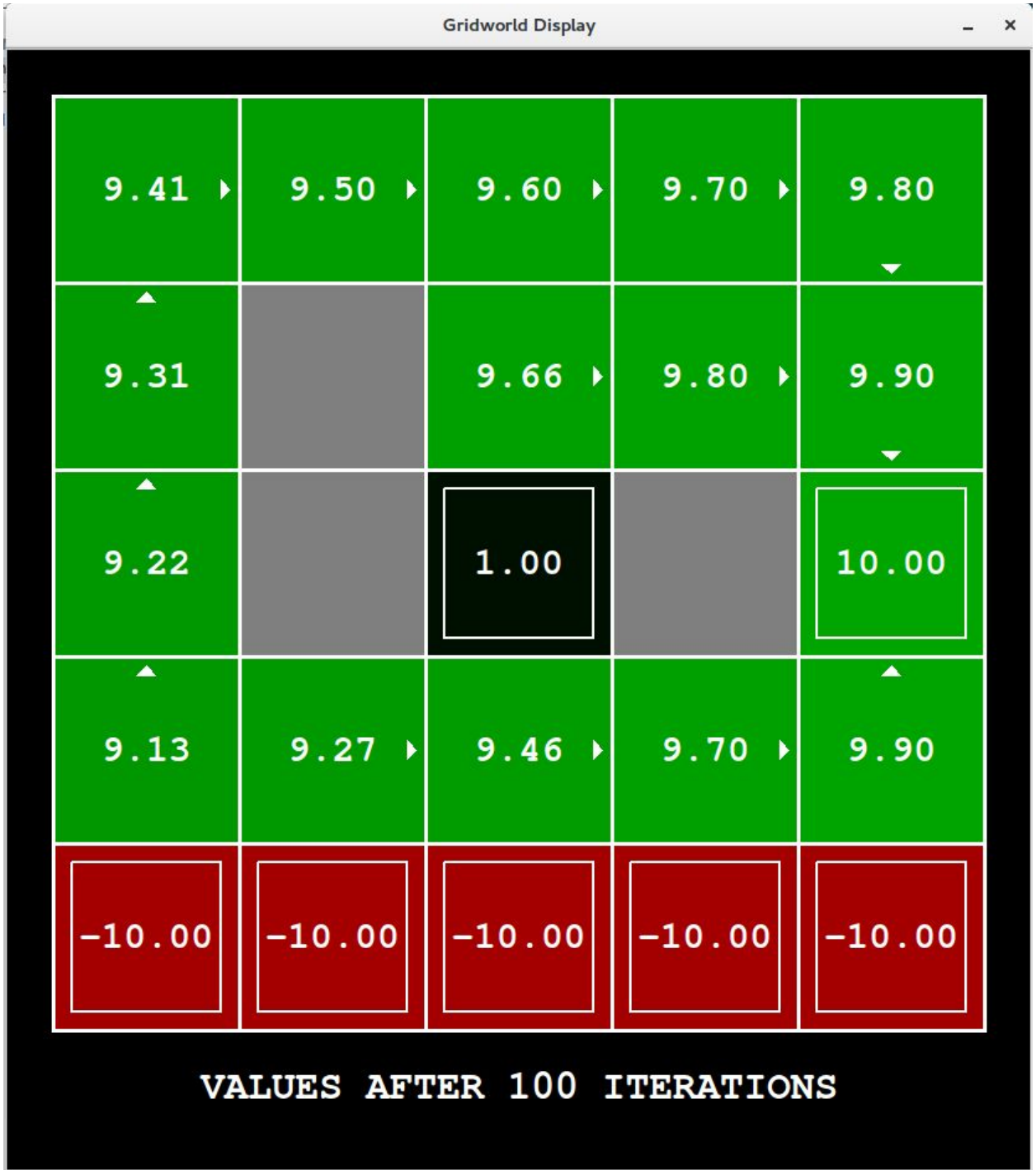


3. (Discount = 0.9,Noise = 0.01, LivingReward = 0)



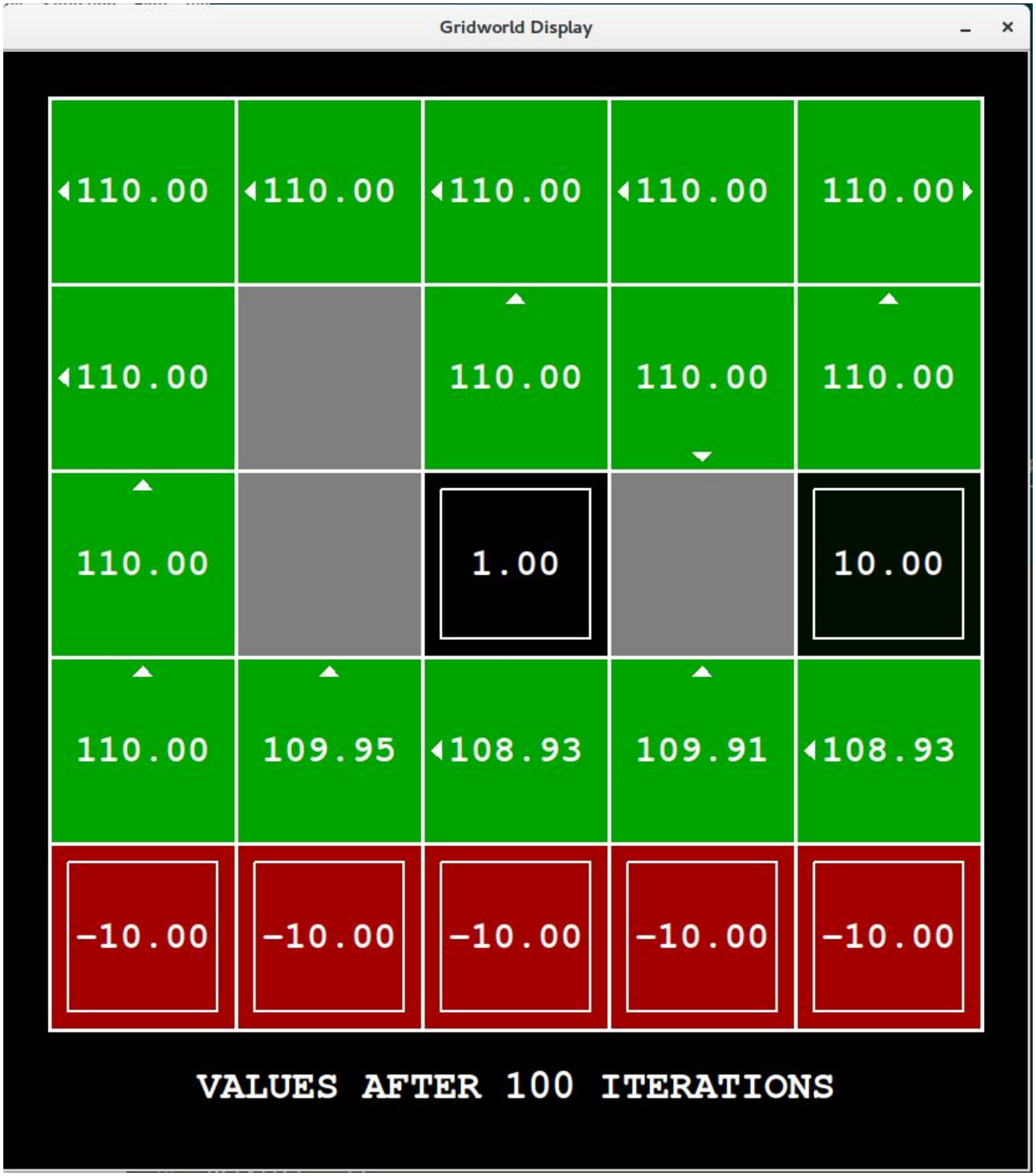
4. (Discount = 0.99,Noise = 0.01, LivingReward = 0)

A high discount meant the agent will choose a longer path and will wait for a longer reward. Hence it exits through (+10)



5. (Discount = 0.9,Noise = 0.01, **LivingReward** = 11)

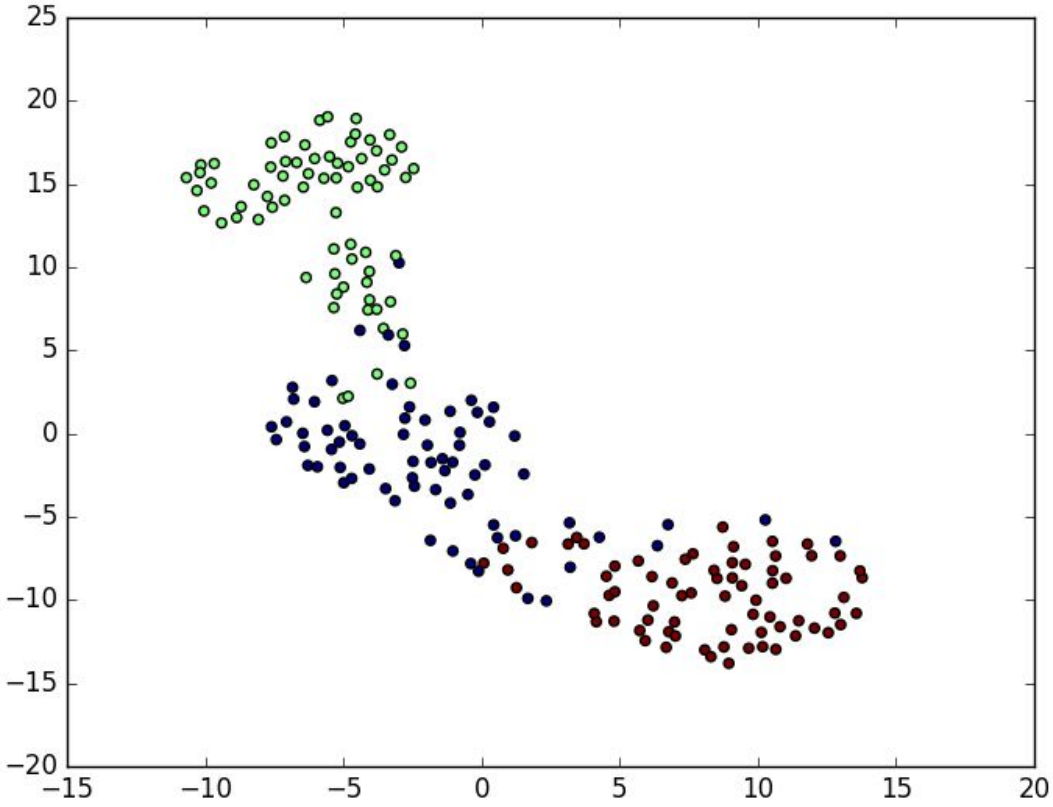
A reward higher than the maximum reward at exit will make the agent move infinitely Looking for higher rewards which it won't find. Hence it'll move infinitely



K means Clustering

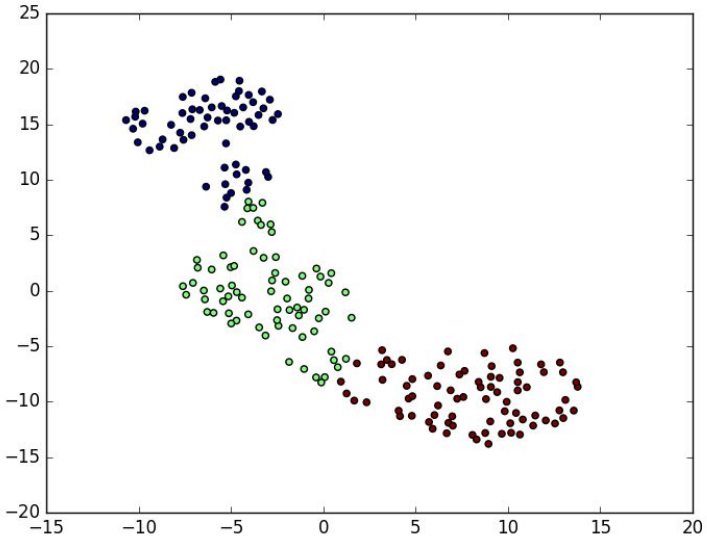
seedset.csv

1. t-SNE 2D scatter plot without k means

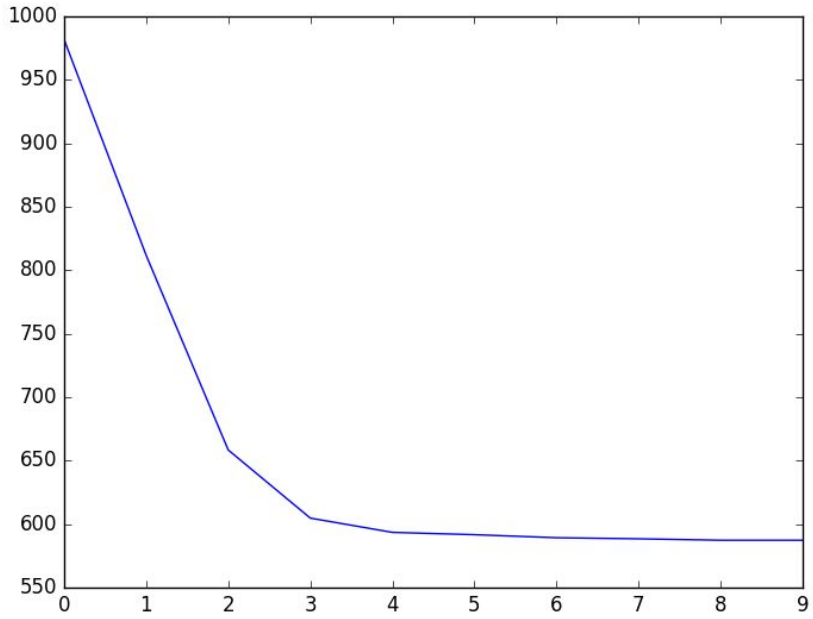


2. t-SNE 2D Scatter plot for predicted labels

A great dataset which makes k means clustering separate the dataset clearly which can be seen in the plots.

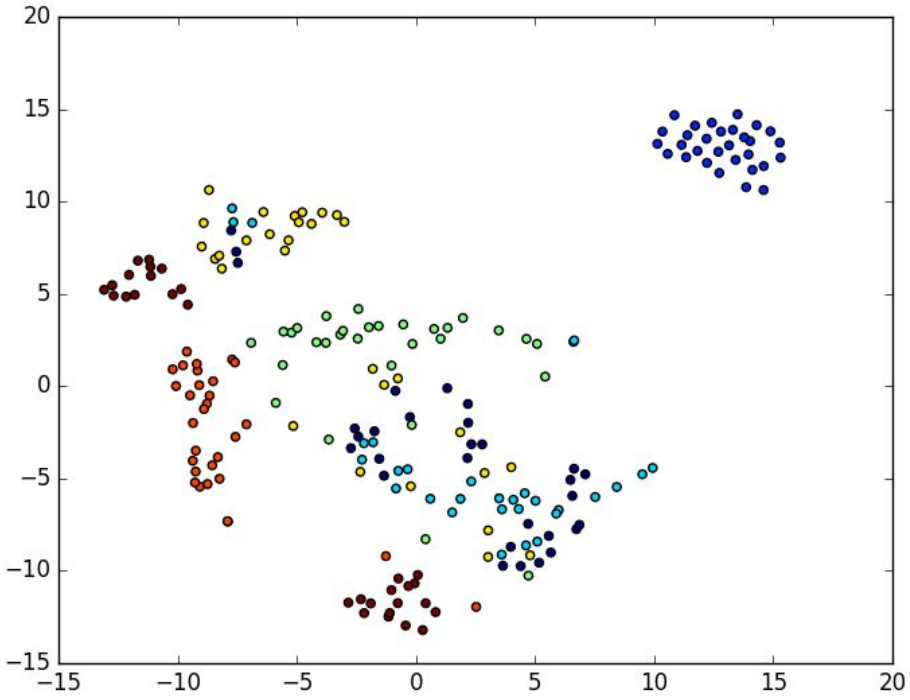


3. Objective function vs Iteration number



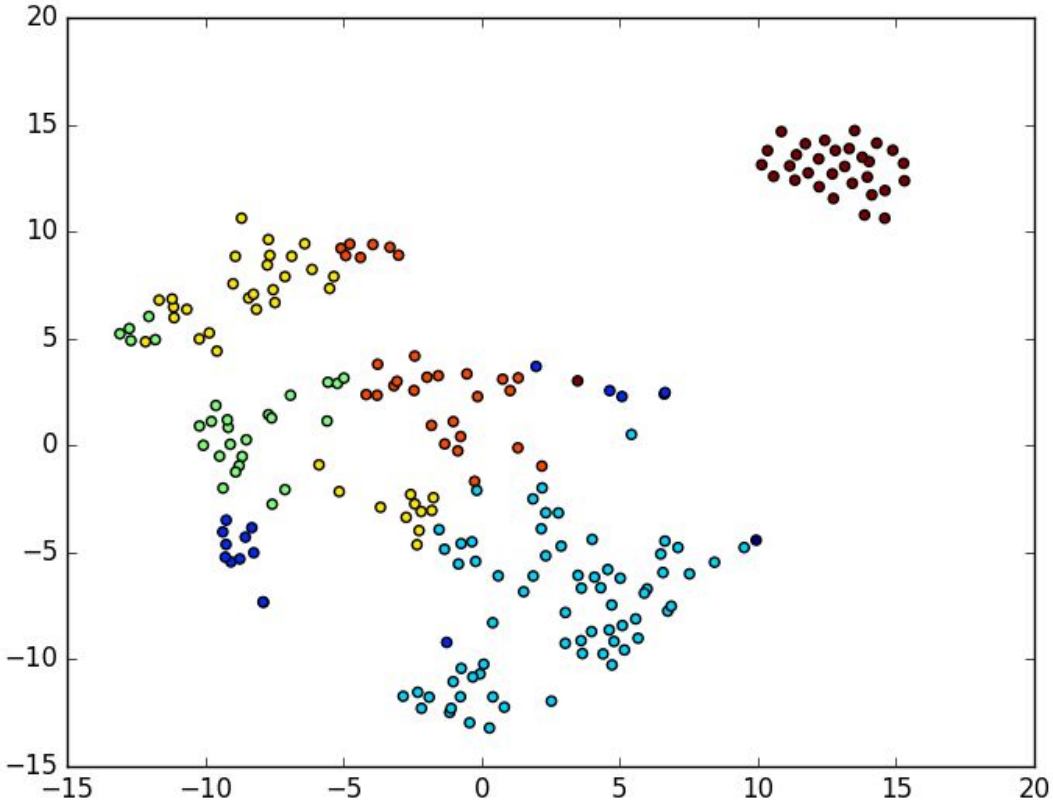
Segmentation.csv

1. t-SNE 2D scatter plot with original labels

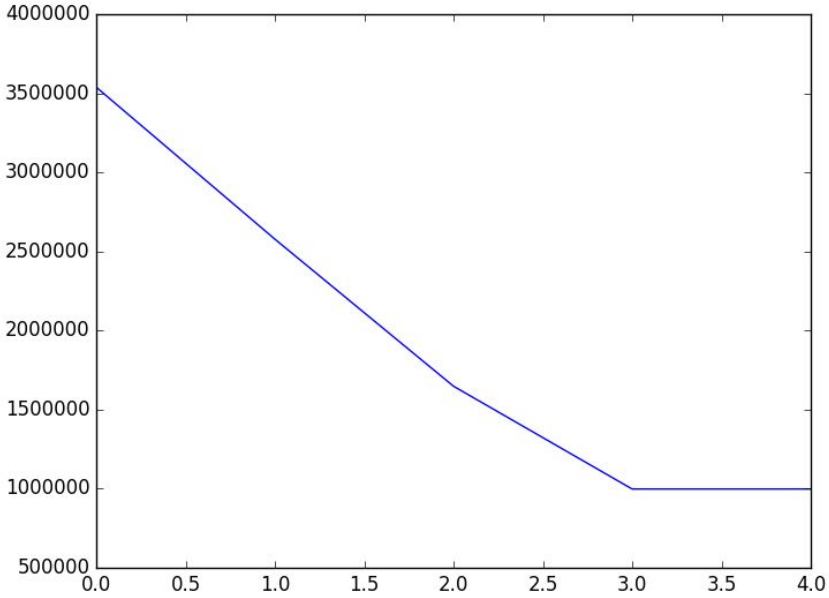


2. t-SNE 2D scatter plot with predicted labels

A decent attempt at clustering the dataset. Some of the labels are clearly separable, hence clustered properly, however some labels intermingle, thereby reducing the effect of clustering.

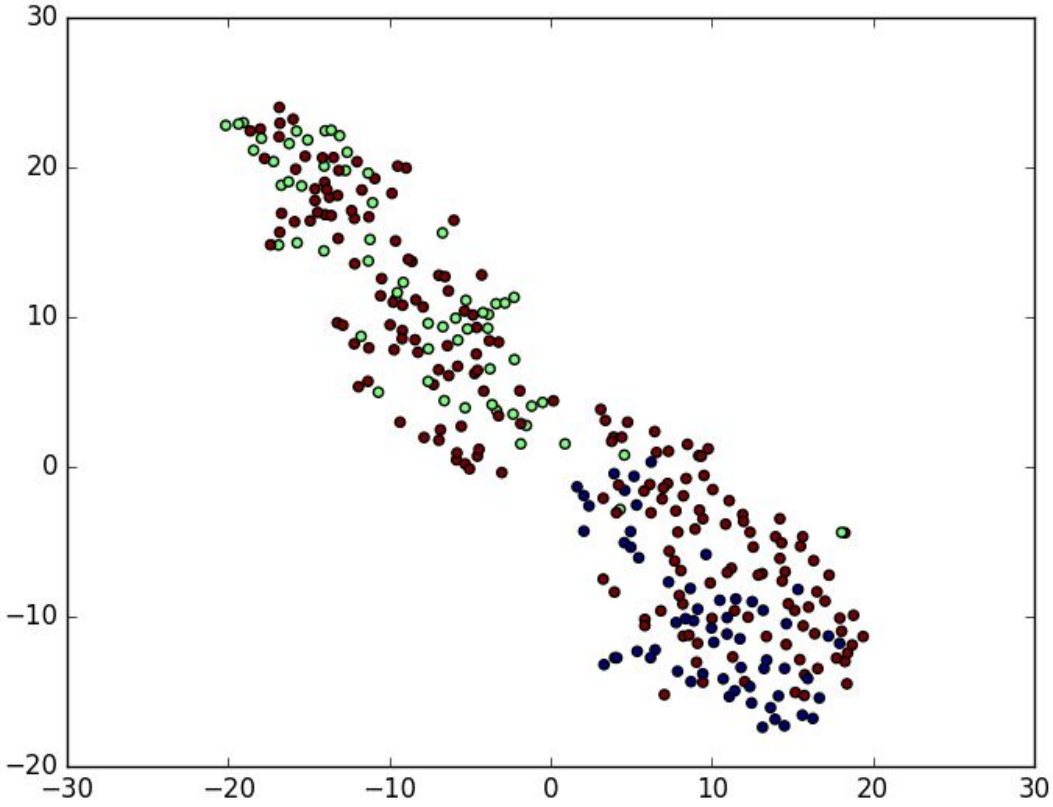


3. Objective function vs Iteration number



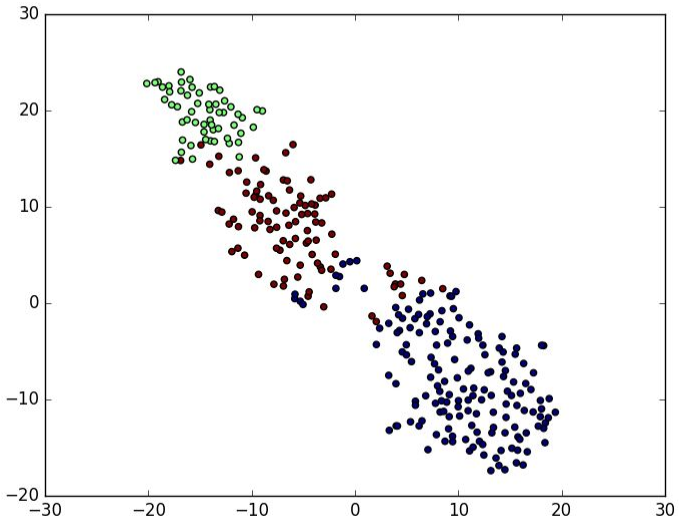
Column3C.csv

1. t-SNE 2D scatter plot with original labels

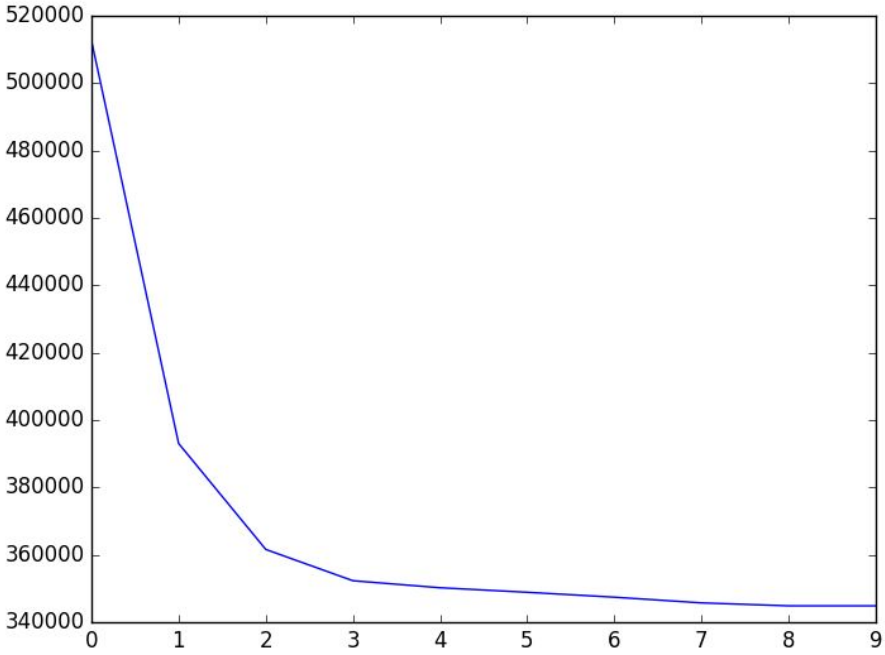


2. t-SNE 2D scatter plot with predicted labels

The clustering is poor because it can be seen that the clusters formed in pred plot are not matching with the dataset t-SNE plot of original labels. The dataset cannot be clustered properly since datapoints are mixed.

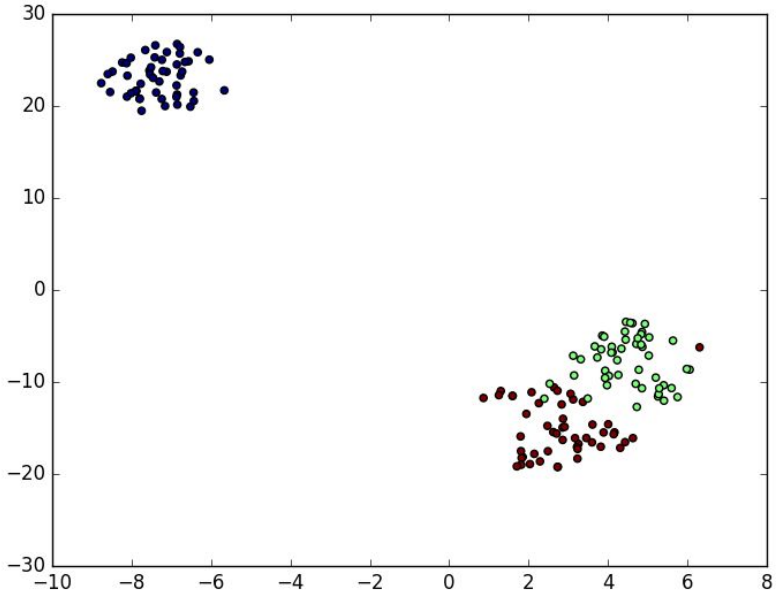


3. Objective function vs Iteration number



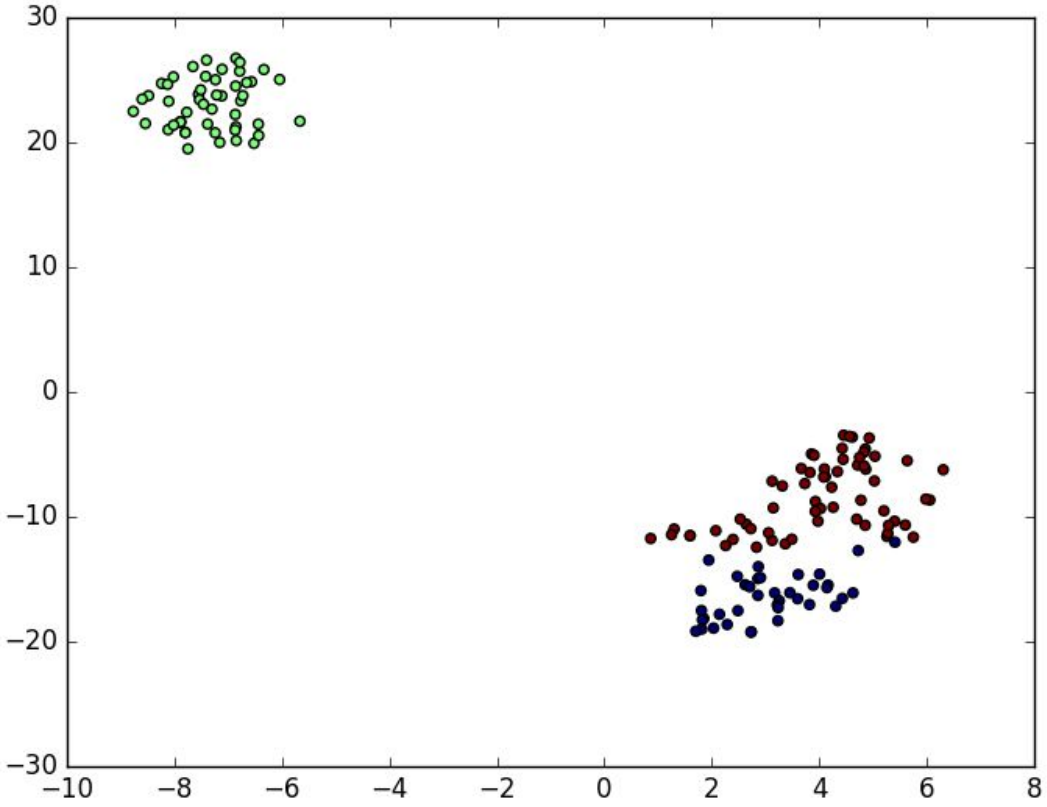
Iris.csv

1. t-SNE 2D scatter plot with original labels

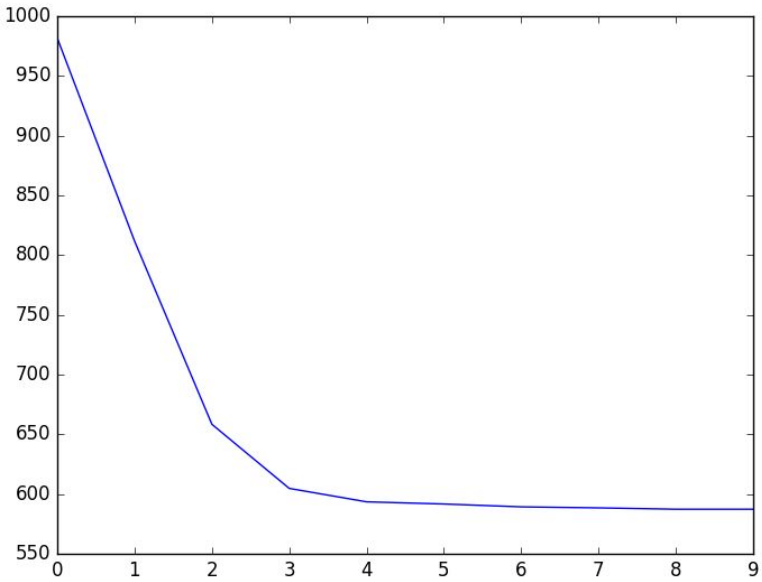


2. t-SNE 2D scatter plot with predicted labels

The clustering was really nice since all the datasets are clustered similar to original labels



3. Objective function vs Iteration number



Quantitative Evaluation

Data set	K = 2			K = truth label			k=12		
	ARI	**NMI**	**AMI**	**ARI**	**NMI**	**AMI**	**ARI**	**NMI**	**AMI**
Iris	0.54	0.679	0.519	0.73	0.758	0.748	0.344	0.633	0.413
Vertebral Column	0.076	0.176	0.144	0.074	0.178	0.166	0.046	0.215	0.123
Segmentation	0.1	0.395	0.185	0.41	0.571	0.525	0.385	0.601	0.508
Seedset	0.468	0.552	0.43	0.717	0.695	0.691	0.277	0.534	0.346

Quantitatively *Iris* dataset and *seedset* dataset are good enough datasets which are separable using k means as is evident from their relatively higher than others.
Clustering was the decent for *Segmentation* dataset since the values near 50% score. Thus, a poor-decent clustering.
Poorest clustering is achieved in *VertebralColumn* dataset since their scores are < 0.2. The dataset isn't separable/clusterable. Hence clusters are not clear.

All the quantitative analysis match with the qualitative analysis since nicely clustered datasets have recorded higher ARI,NMI and AMI scores.