PROJECT PRESENTATION

Optimal Ambulance Dispatch

Comparing Current, Random , SVD/QR, and K-means clustering algorithms

Project Overview

Points of Discussion

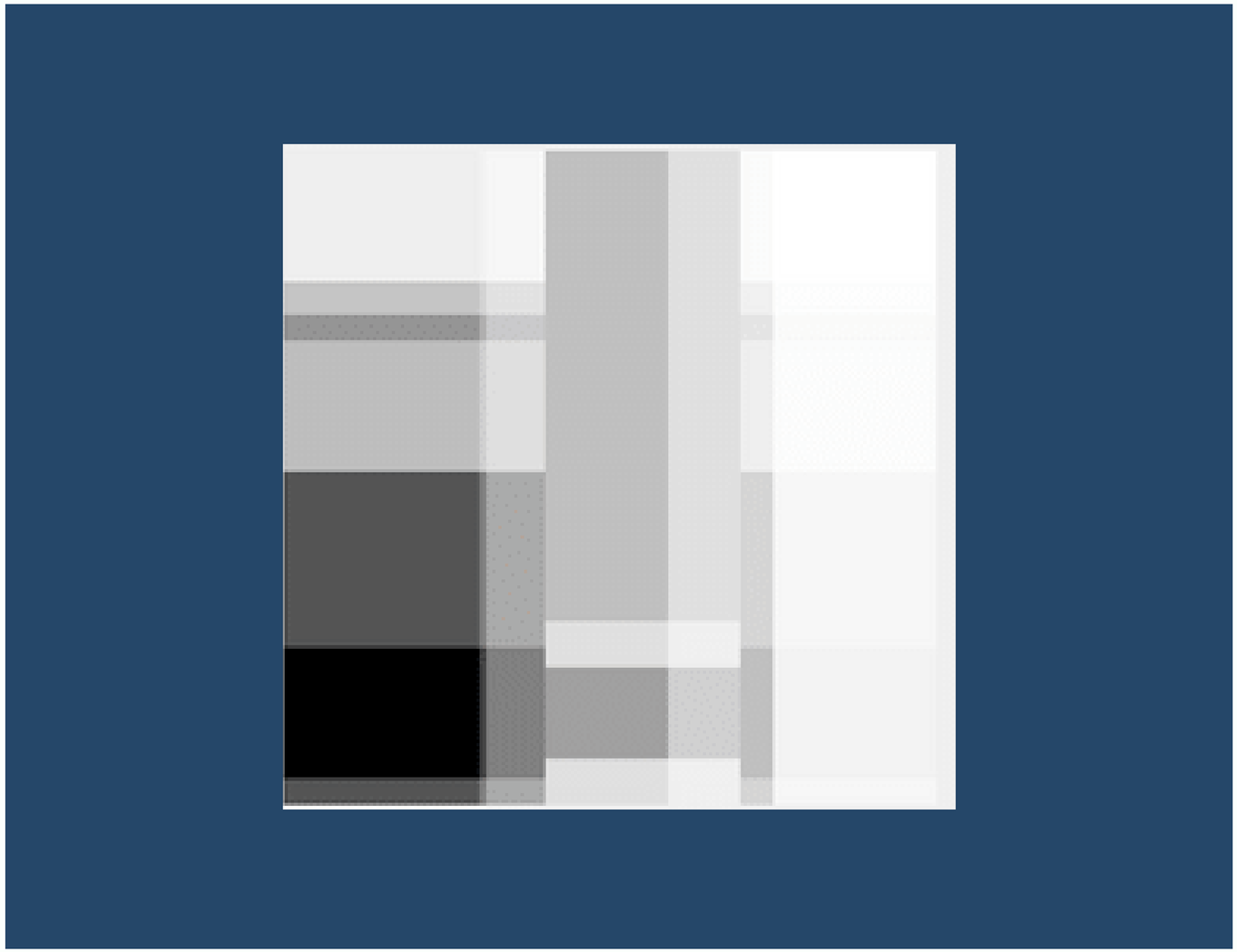
Introduction
Dataset Generation
Simulation
Results
Analysis
Limitations
Conclusion

Introduction

Faster Response Times

Decreased Mortality Rate

More people saved



Probability Density

Darker = more probable

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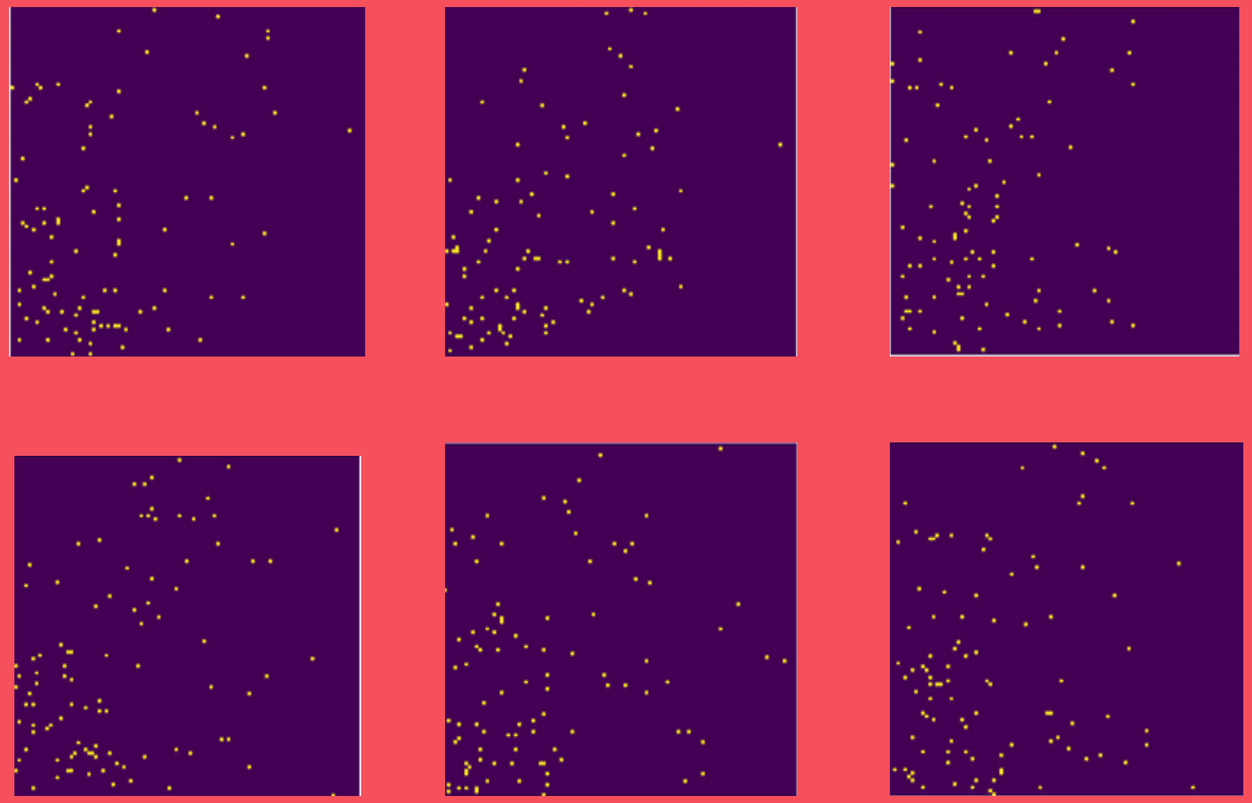
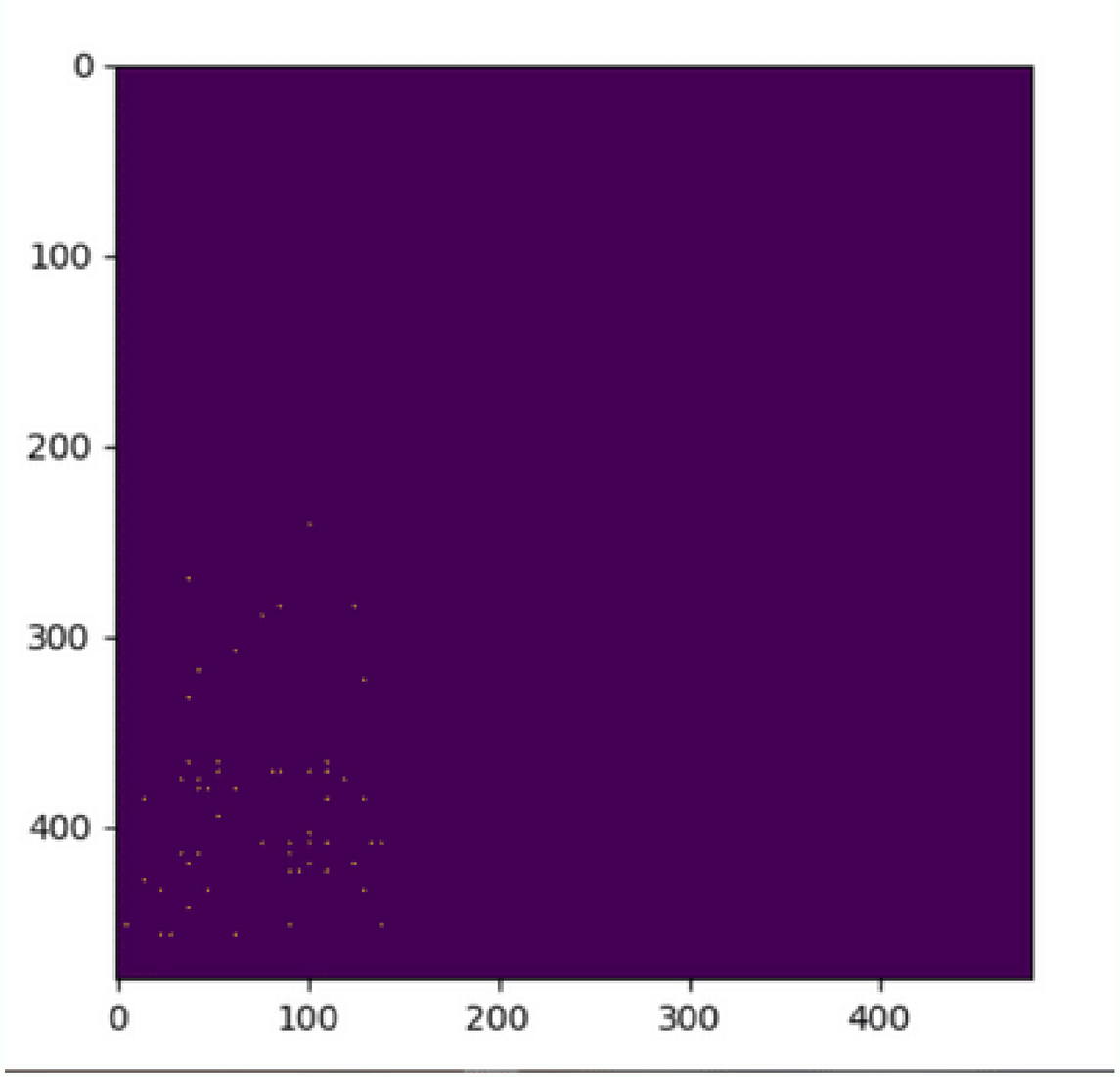
Darker = more probable

Data similar to actual population density of PH (2015 Census)

Sample Image

100 images used for training





SVD/QR Placement

Using similar algorithm to HW2 QR sensor placement, sensors = ambulance

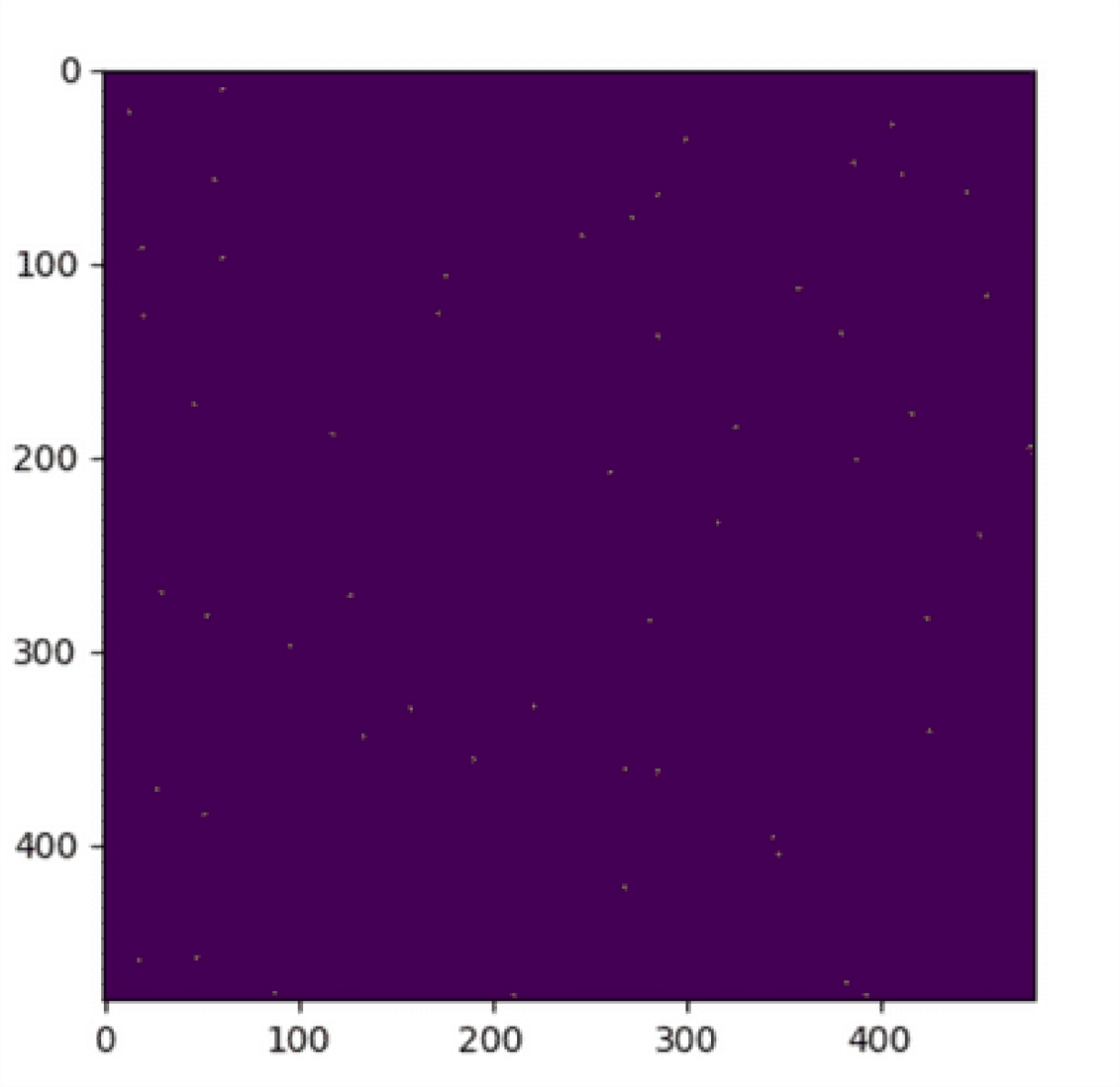
Algo:

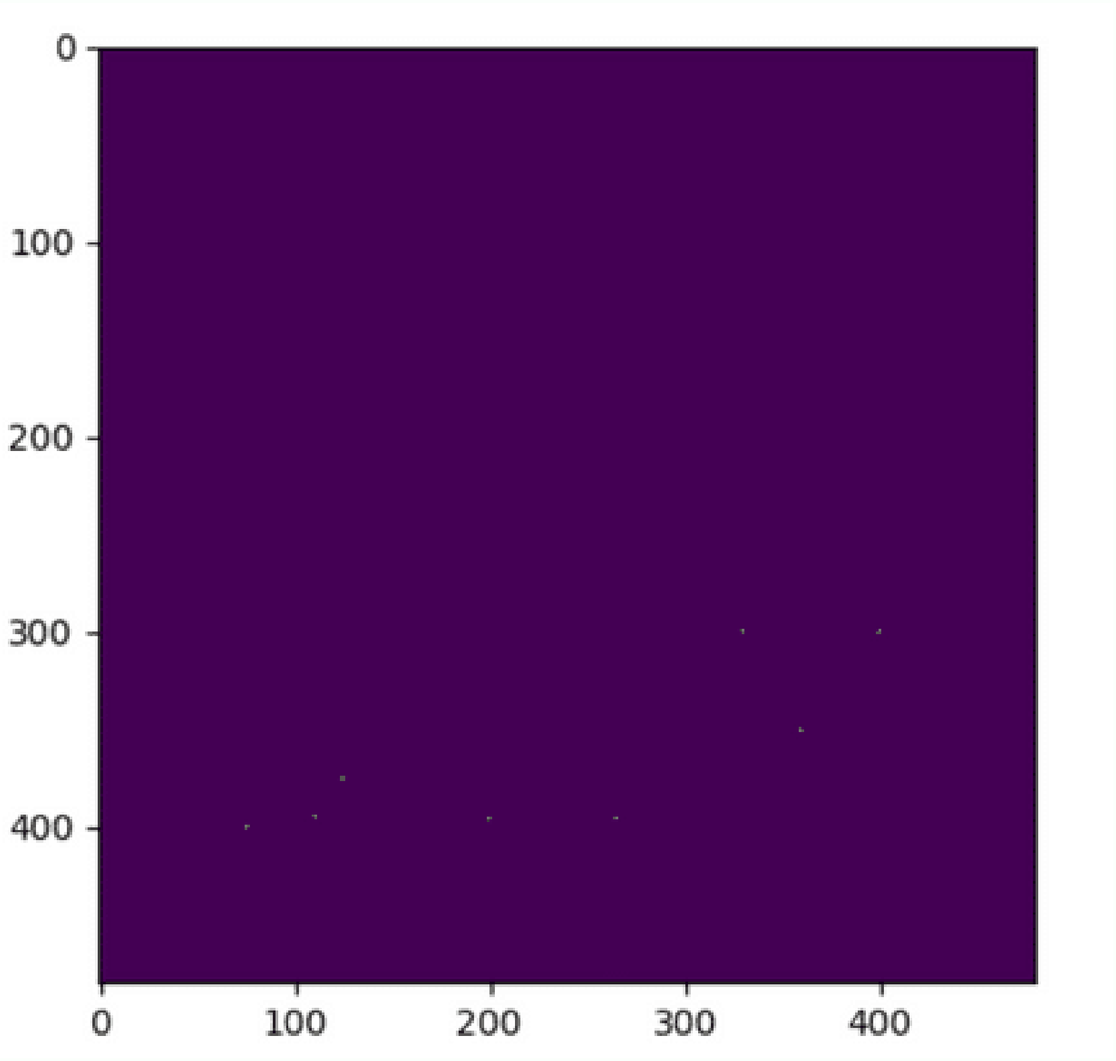
```
U,S,Vh = np.linalg.svd(Xtrain_s,full_matrices=False)

Psi= U[:,:r]
Q,R,P = qr(Psi.T,pivoting=True)
```

Random Placement

Place ambulances in random coordinates

Algo:
Pr = np.random.choice(np.arange(1,m*n,1),p-1)





Current Placement

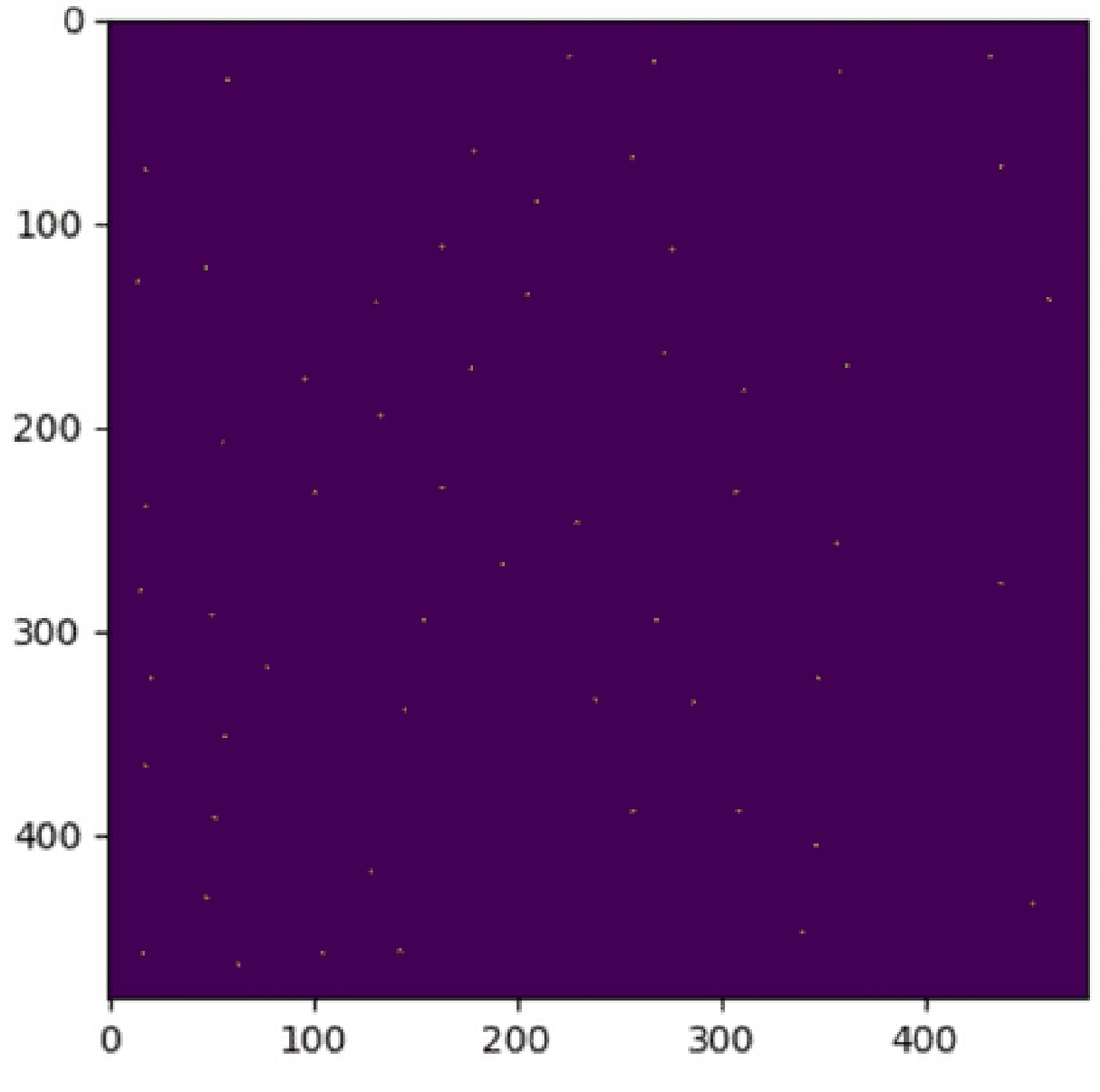
Fashioned from approximate positions of actual hospitals in the map.

K-means Clustering

Dispatches ambulances by separating data into clusters where most instances occur

Algo:
km = KMeans(n_clusters=99)
km.fit(pCk_temp)

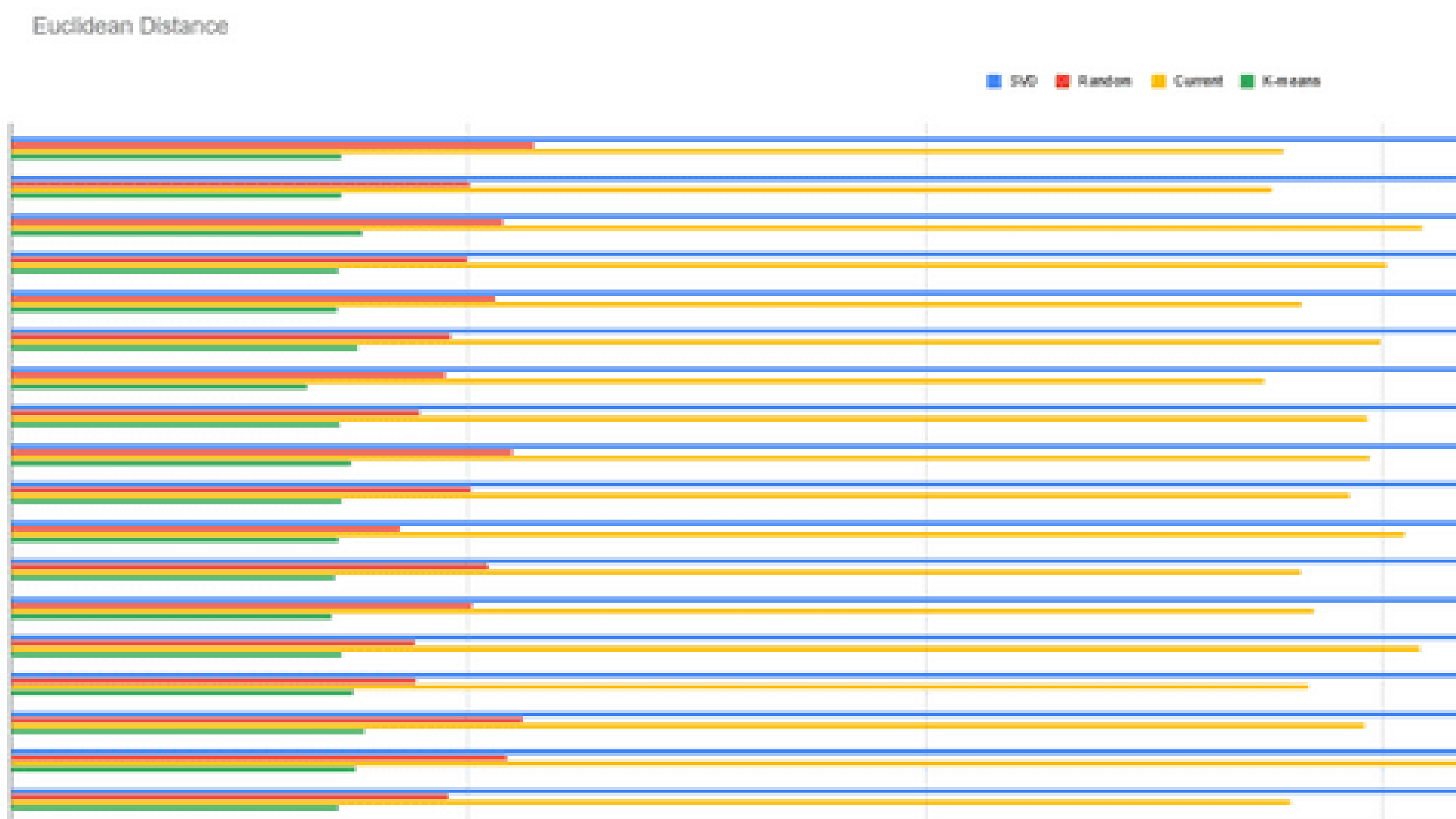
temp = km.cluster_centers_

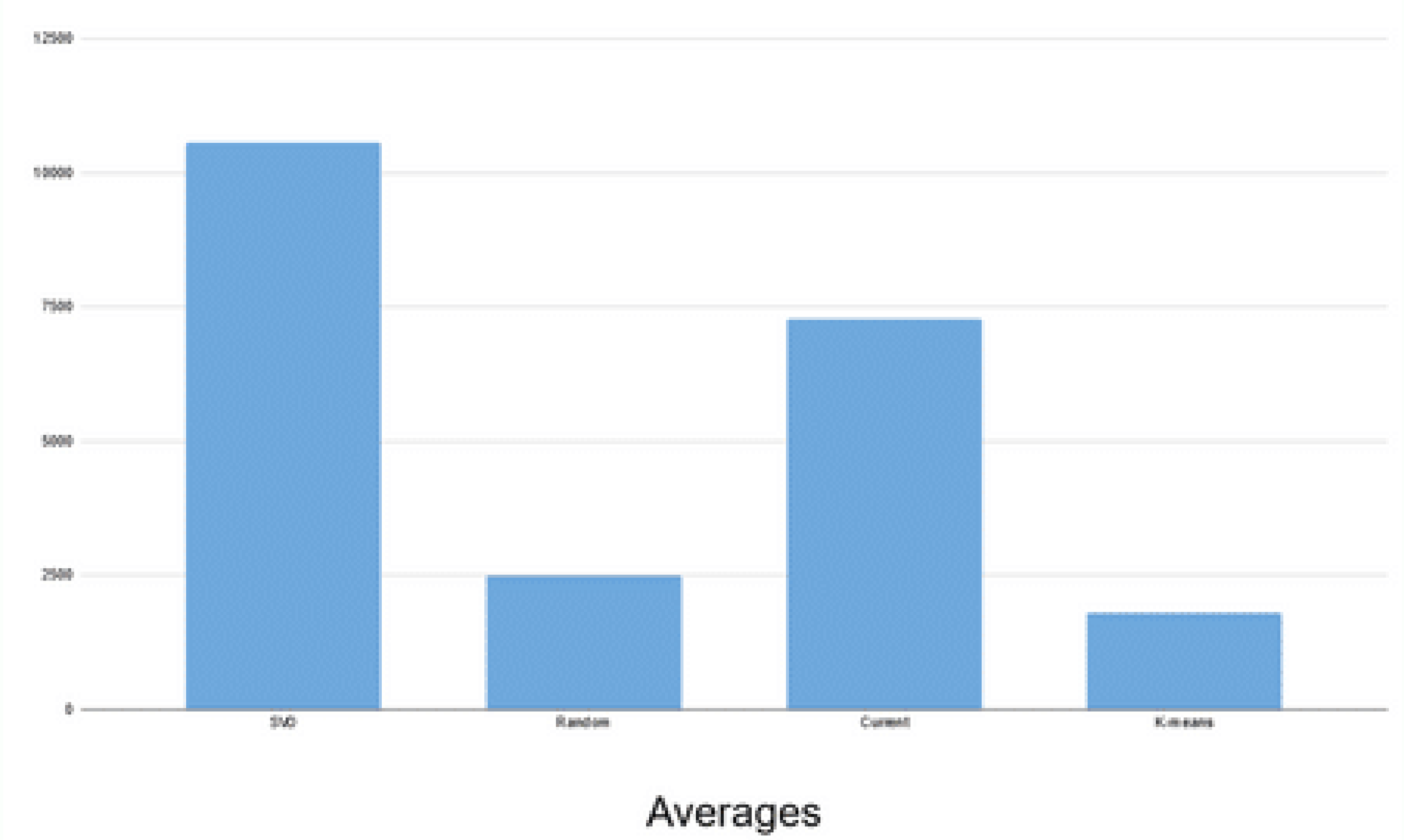


Results

SVD	Random	Current	K-means
9668.331437	2881.342715	6955.385038	1812.16753
10893.27385	2514.079358	6891.927864	1813.73546
12002.52284	2691.507629	7714.924189	1824.9594
10577.85203	2502.137659	7523.086974	1790.934369
9263.456819	2681.679279	7056.54702	1783.29508
10809.77763	2484.617379	7468.288432	1897.3651
10634.79484	2372.528741	6850.236744	1823.41463
11181.12534	2234.179386	7414.025869	1797.22348
10864.17914	2743.297637	7424.291843	1864.042648
10107.20307	2518.556203	7523.232845	1810.215867
10546.84781	2101.313462	7823.234609	1790.934369
10645.34091	2611.17462	7350.542823	1771.537971
10001.31283	2523.546631	7125.969037	1752.18137
10803.53121	2209.008012	7703.329815	1813.930889
10621.12312	2245.912344	7080.557841	1875.444883
11002.90902	2799.123909	7401.23591	1936.840664
10823.54864	2710.123032	7804.778911	1888.233275
10662.12145	2391.123063	6998.154023	1790.934369
11201.12868	2437.556743	6812.154849	1721.537971
10012.90737	2479.566321	7912.43511	1752.113062

After running n = 20


Euclidean Distance
SVD
Random
Current
K-means


12500
10000
7500
5000
2500
0
SVD
Random
Current
K-means
Averages

Limitations

Assumes all incidents occurs simultaneously and ambulances can cater to multiple incidents at once

Since only the euclidean distance is computed, all incidences are computed all at once and multiple sensors can be the nearest sensor from the incident

Roads and Traffic is ignored

Euclidean Distance could not take into account roads and the traffic which affect actual ambulance efficiency

Accurate data is needed

Ambulances can be dispatched properly when incident occurences are accurate

CONCLUSION