	ORATHOD HARGKRISSNA OPENDRA OPARTH 17 DO 70001 OPRAJVAL PAGENO:
	MIC-Assignment-3
Q3,	(a) Let the 2 shapes be Z, Zz representations
	('in the point set of 3N dimension).
	First convert them to pre-shape space by subtratin
	the respective means ic.
	$Z_{1} \rightarrow Z_{1} - \left(\sum_{i=1}^{N} Z_{i} , \left(\sum$
	$Z_1 \rightarrow Z_1 - [Z_{1n}/N] \leftarrow 0$ codionoras con occe $Z_1 \rightarrow Z_1 - [Z_{2n}/N] \leftarrow 0$ codionoras con occe $Z_1 \rightarrow Z_1 - [Z_{2n}/N] \leftarrow 0$ codionoras con occe
	N 3XN
	$Z_2 \rightarrow Z_2 - \left(\sum Z_{2n}/N\right)$
	$Z_2 \rightarrow Z_2 - \left[\sum Z_{2n}/N\right]$ $Z_{2n} = \sum_{n=1}^{\infty} \sum$
	in 3N rector format)
	Then recale both shapes such that
	$Z_1 \rightarrow S_1 Z_1 \qquad S_1 = \frac{1}{\Sigma} \left(\frac{11}{\Sigma} \frac{11}{\Sigma} \right)$
	2 5262 St. 82.2 / 5 (1/2n/2)
	A Design of Maria
	Let these scaled and branslated shapes be 2 22
	Now they are in pre-shape space
	then the procrastes estandard) distance blo
	i n
	them is defined as: N N Z mm \(\sigma \) Zm - MoZ2n _2 \) where Mo is o ner the rotation
	de min Ellzin - Mozenlle where Mois
	0 ner the rotation
	min Mazan matrix cruces s
	O n21
	z mm tr (ZTMoZ2)
	i de tr (ZTMoZz)

11.11p denote the standard procrastes distance as defined in part (9)

& Ze denote the mean shape of all for poons



(c) We use k-means It algorithm for clustering, which is relatively lim-sensitive to outliers.

Initialization: Initially, choose a shape of sandom among {Zk}koli, m shapes

Now choose k-1 other shapes based on cost oclased to minimum distance among selected points. To be more specific,

pick Zi & {Zele-1, -, m of random, T + Zi

Pick Zi & Zele=1, m w.p. x cost (zi, T)

TE TU{zi}

= min || zi - z||

ZAT

so now we have carefully introlled k clan center points, now aisign all remaining shapes to a cluster based on the criteria of minimizing proetastes distance of the shape from center of that cluster

Vier + Zi & T do:

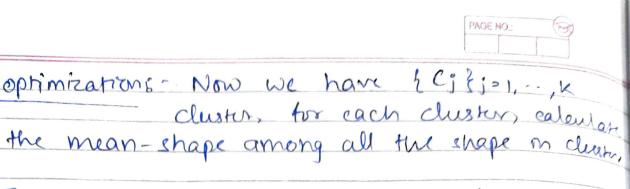
j = miselle asgmin 112; - Zell 1=1,2,..,k?

where 2e & T.

Cjulzil > Cj

Where Cj denotes the cluster Cone of the K)

Hence we have initialized all the shapes as a part of one of the k cluster



The mean-shape can be calculated by:

| Icil N | 2 |
| Z = arg min \(\times \times \) | \(\tim

To colve this optimization problem, consider initial Ze as the current eluster center, then colve for (mosm by colving independently for each date point in the cluster as deen'sed in pan- 1.

(Mo) m 2 to VUT where SVD (Zmn Zn) 2UENT of det (VUT) 2+1

2 (Mo) m 2 V (1. 1) UT it det (VUT) 2 -1

Now that we have optimal parameters solve for the optimal mean point set by arraging all aligned points in Zenewo = \(\int Zm / 1Cet where \(\int Zm^2 \) Mo\m Zm

make room zers (actually no need for this or it will already be like this for mean pant).

Hener we get Ze For each cluster (new center)



point following a similar strategy used

and repeat the ophimization step.

after each iteration

Convergence & contenta:

we define our algorithm to be satisfactory converged to an oping when

129-Li+11 < E where his is long at end
giteration i

h & is a user defined constant (could be very small)

At such (it) iteration, we tell our or o) algorithm has converged and the current cluster assignments are the most optimal