HW14 CS 189

1.

Who else did you work with on this homework? In case of course events, just describe the group. How did you work on this homework? Any comments about the homework?

I worked on this homework with Ehimare Okoyomon, Prashanth Ganeth, and Daniel Mockaitis. We worked by getting together throughout the week and communicating on facebook.

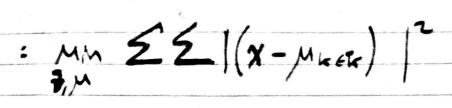
I certify that all solutions are entirely in my words and that I have not looked at another student's solutions. I have credited all external sources in this write up}

Nicholas Lorio, 26089160

4. When should you use k-svd and how can you determine the optimal k?

K-SVD is widely used in applications such as image processing, audio processing, biology, and document analysis to name a few. Logically, one of the best ways to determine k is by formulating a way to assign an empirical measure of the outcome from the SVD. We could test the results against a set of predetermined queries for which we know all the relevant documents in the set. For SVD representations of document files, a common measure to determine k has been to use synonym tests (TOEFL test for instance).

(3) MM & E ||x; -MK ||2 Z.a, TTi clusher Mi is outreiz thus we are minimery to distret press out the form: MILL Z ||X; -ME||2 || x-2n||2 = MM ZZ (x-2m) 2 MM 13:110=1 V; & 3; E [0,1]K $\frac{2}{3} = \frac{2}{3} \cdot \frac{1}{3} \cdot \frac{1}$ oby Let of Fredons Norm = MIN $\leq \leq |(\chi - 2\mu)|^2 = \leq \leq |\chi - \mu|$



 $= Min \leq \|\chi_i - \mu_K\|_2^2 = 0$

189 Za. (3) Min $\sum_{k=1}^{k} \sum_{i \in T_{k}} ||x_{i} - M_{k}||_{2}^{2}$ [Mi is the center's M= [Mi] 2 2 = [Zi] "Cootiant Malix" 7 = [Xi]

[Xi] => we only new to determe the control locations the chaice of control locations in; does not affect the distines of pts in Tij to G For ity is we can consider each cluster sporehely.

The chaice of control to control to G For ity is contained in exactly one partition.

Min & ||Xi - MX||

METERIAL 16TER · (X:-MK) (X:-ML) = (X:TX; +MJML -ZMKTX; T) Vóng ear 2) = { (Zzim/MKX: + METMIR - ZMKT Z ZIM MIRT)

2.6. For j	=1,2,,5	far de	0 7		Coeffat CF DL	
Slew	MIA /	4/4 X-	Zseizj.	,U[su] Be	De 2	1 11
	is Ac	n Morest	g i.e	, Can Jo	45 OMP	? we ?
assing	Free diction	old error	each 11x-7511}	spare s	tep in the	
gavante	for r	ISE A	of does	not Uto	lac sparsy	
will h	ae m	anotare ,	MSE - F	tourkin	faurovers.	
			1		2 Microcre	
we are	sphy A	e hat Sal	lish ce	twhets	give me t	he
we	alueys	get an	Mbronev	4,	nı y	
ox fer-	6-500:A spuse r	Prosettan			recomplike	
		M	rad Alway	Mordal !	tlay, 11,500 per i	lais ste. h

2.€. value of the obj five is non varing so ; we can fee 2, For (D, x, s) has any 70 as the gottend coepy of De -> we than compare the new iteram at come 7: W/ the process iterations at one Wing 11x; T-2; TD11 2 >11x, T- (2;) TD112 tren ? is updated to ? (if I true) i. iF NO Z; Modes this majurity true tray we are left w/ the save outcom for the obj five 11x-20113. 05; fire 11x-20113. IF my 7; complies he meanly than we wire a new 2' w/ differt 2 values since this 2 ensures 11 x;+-(Z))TD/2 15 Stoll the the ag, 2;'s value we can't move the avail objective firetion :. Also ? can't Marione the volve of obj five 1. They will eiter so he same or decrease.

```
3.

S) ||x - y - y||^2 = \sum_{i=1}^2 (y_i - y_i - y_i)^2
     4+1 = W+ -X Ow [(Y; - 1 (X; om) Tw) 2] M ~Bomilli (p) i.e
a. YE (x(1) x(2)]
                          P = 2/3
                                         F_{m} > \gamma' \quad , \gamma'
                                          S.t Som as bropat on
                                          O.G. Data.
Shew Pres (May each
                       upache is surfir augment & norm data)
(6)
                               WHITH -X VW (Y - X TW) ]
                             Ow = Z (Y; - x, Tw) (-x;)
                                 =-2(Y; -7; Tw) X;
                              WENT WE + ZX (Y; - x; Tuy) x'
                               imu(1, n)
```

3