Name:Islam,Rafiqul Id:17-34438-1 Sec:A

1. *single-link* clustering

	BOS+NY+DC	MIA	CHI	SEA	SF	LA	DEN
BOS+NY+DC	0						
MIA	1075	0					
CHI	671	1329	0				
SEA	2684	3273	2013	0			
SF	2709	3053	2142	808	0		
LA	2621	2687	2054	1121	379	0	
DEN	1616	2037	996	1307	1235	1059	0

2

. To update the distance matrix $\min[dist(LA, SA), BOS$
$BOS+NY+DC]$
$\min[dist((LA, BOS+NY+DC), (SA, BOS+NY+DC))]$
$= \min[2621, 2709] = 2621$

. To update the distance Matrix $\min[dist((LA, SF), MIA)$
$\min[dist((LA, MIA), (SF, MIA))]$
$= \min[2687, 3053] = 2687$

. To update the distance Matrix $\min[dist(LA, SF)$
$\min[dist((LA, CHI), (SF, CHI))] = \min[2054, 2142$
$CHI]$

. To update the distance matrix $= 2054$
$\min[dist((LA, SEA), (SF, SEA))]$ $\min[dist(LA, SF)$
$= \min(2054, 1121, 808) = 808$

2

To update the distance matrix, min[dist((LA,SF),DEN)]
min[dist((LA,DEN),(SF,DEN))] = min[1059, 1235]
= 1059

	BOS+NY+DC	MIA	CHI	SEA	SF+LA	DEN
BOS+NY+DC	0					
MIA	1075	0				
CHI	671	1329	0			
SEA	2684	3273	2013	0		
SF+LA	2631	2687	2054	808	0	
DEN	1616	2037	996	1307	1059	0

To update the distance matrix
Min[dist((BOS+NY+DC), CHI), MIA]
min[dist((BOS+NY+DC), MIA), (CHI, MIA)]
= min[1075, 1329] = 1075

To update the distance matrix
Min[dist((BOS+NY+DC), (CHI), SEA]
= min[dist((BOS+NY+DC), SEA), (CHI, SEA)]
= min[2684, 2013] = 2013

To update the distance matrix $\min[dist((BOS+NY+DC), CHI), SF+LA]$

$= \min[dist((BOS+NY+DC), SF+LA), (CHI, SF+LA)]$

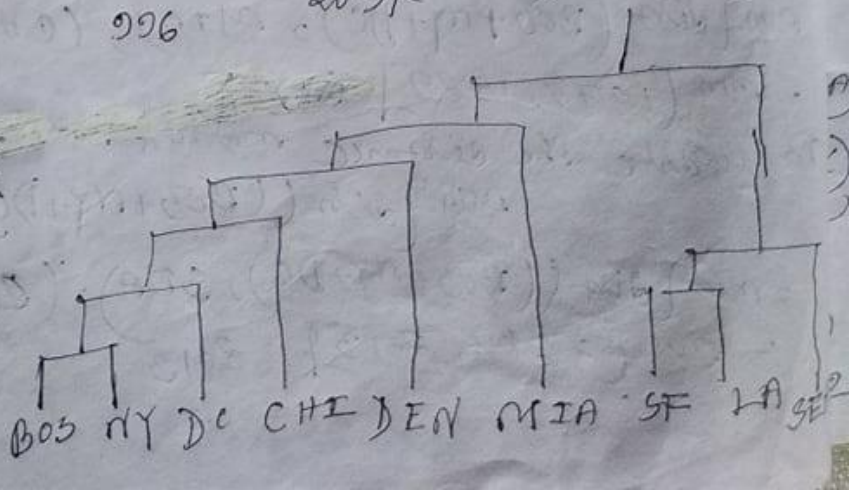
$= \min[2621, 2054] = 2054$

To update the distance matrix $\min[dist((BOS+NY+DC), CHI), DEN]$

$= \min[dist((BOS+NY+DC), DEN), (CHI, DEN)]$

$= \min[1616, 996] = 996$

	BOS+NY+DC+CHI	MIA	SEA	SF+LA	DEN
BOS+NY+DC+CHI	0				
MIA	1075	0			
SEA	2013	3273	0		
SF+LA	2054	2687	808	0	
DEN	996	2037	1307	1059	0

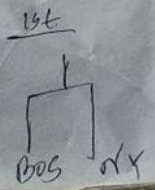


2. *average-link* clustering

	BOS	NY	DC	MIA	CHI	SEA	SF	LA	DEN
BOS	0								
NY	206	0							
DC	429	233	0						
MIA	1504	1308	1075	0					
CHI	963	802	671	1329	0				
SEA	2976	2815	2684	3273	2013	0			
SF	3095	2934	2799	3053	2142	808	0		
LA	2979	2786	2621	2687	2054	1131	379	0	
DEN	1949	1771	1616	2037	996	1307	1235	1059	0

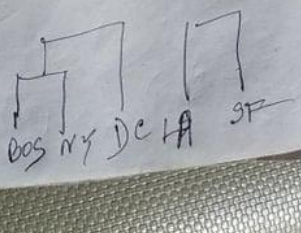
	BOS+NY	DC	MIA	CHI	SEA	SF	LA	DEN
BOS+NY	0							
DC	233	0						
MIA	1308	1075	0					
CHI	802	671	1329	0				
SEA	2815	2684	3273	2013	0			
SF	2934	2799	3053	2142	808	0		
LA	2786	2621	2687	2054	1131	379	0	
DEN	1771	1616	2037	996	1307	1235	1059	0

1st



2nd

3rd



4

	BOS+NY+DC	MIA	CHI	SEA	SF	LA	DEN
BOS+NY+DC	0						
MIA	1075	0					
CHI	671	1329	0				
SEA	2684	3273	2013	0			
SF	2799	3059	2142	808	0		
LA	2621	2687	2054	1121	387	0	
DEN	1616	2037	996	1307	1235	1059	0

The distance matrix is AVG [dist(LA, SF), BOS+NY+DC]

dist((LA, SF), BOS+NY+DC) = $\frac{1}{2}$ (dist(LA, BOS+NY+DC) + dist(SF, BOS+NY+DC))

= $\frac{1}{2}$ (2621 + 2799) = 2715

The distance matrix is AVG[dist(LA,SF), MIA]

dist((LA, SF), MIA) = $\frac{1}{2}$ (dist(LA, MIA) + dist(SF, MIA))

= $\frac{1}{2}$ (2687 + 3059) = 2873

The distance matrix is AVG[dist(LA,SF), CHI]

dist((LA, SF), CHI) = $\frac{1}{2}$ (dist(LA, CHI) + dist(SF, CHI))

= $\frac{1}{2}$ (2054 + 2142)

The distance matrix is AVG[dist(LA,SF), SEA]

dist((LA, SF), SEA) = $\frac{1}{2}$ (dist(LA, SEA) +

5

dist(SF, SEA) = $\frac{1}{2}$ (1131 + 808) = 969.5

BOS+NYC DC MIA CHI SEA SLA+SF DEN

	BOS+NYC	DC					
MIA	1075	0					
CHI	626	1329	0				
SEA	2684	3273	2013	0			
LA+SF	2215	2870	2008	969.5	0		
DEN	1616	2037	996	1307	1147	0	

To update the distance matrix AVG dist (LA, SF), DEN

dist ((LA, SF), DEN) = $\frac{1}{2}$ (dist (LA, DEN) + dist (SF, DEN))

= $\frac{1}{2}$ (1235 + 1059) = 1147

To update the distance matrix AVG dist (CHI, BOS+NYC), MIA

dist ((BOS+NYC), CHI) = $\frac{1}{2}$ (dist ((BOS+NYC), MIA) + dist (CHI, MIA))

= $\frac{1}{2}$ (1075 + 1329) = 1202

6. To update the distance matrix AVG [(BOS+NYT+DC), CHI)

dist [((BOS+NYT+DC), CHI), SEA] = 1/2 (dist (BOS+NYT+DC), SEA) + dist (CHI, SEA)]

= 1/2 (2684 + 2013)

= 2348.5

To update the distance Matrix AVG [dist ((BOS+NYT+DC), CHI), LA+SF]

dist [((BOS+NYT+DC), CHI), LA+SF] = 1/2 [dist ((BOS+NYT+DC), LA+SF) + dist (CHI, LA+SF)]

= 1/2 (2715 + 2098) = 2406

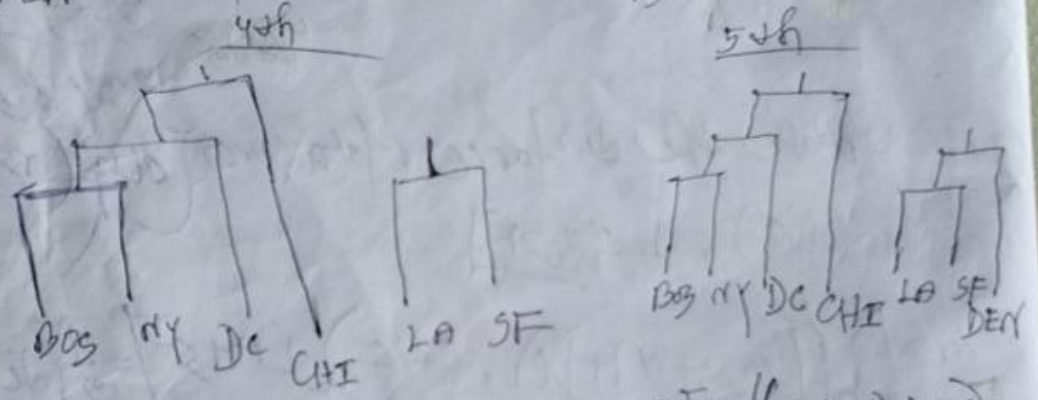
To update the distance Matrix AVG [dist ((BOS+NYT+DC), CHI), DEN]

dist [((BOS+NYT+DC), CHI), DEN] = 1/2 [dist ((BOS+NYT+DC), DEN) + dist (CHI, DEN)]

= 1/2 [1616 + 996] = 1306

7

	BOS	BOS+NY+DC+CHI	MIA	SEA	LA+SF	DEN
BOS+NY+DC+CHI	0					
MIA	1202	0				
SEA	2348	1329	0			
LA+SF	2406	2273	2013	0		
DEN	1306	2058	1307	1147	0	



To update distance matrix $\min[dist((LA+SF), DEN), (BOS+NY+DC+CHI)]$

$dist[((LA+SF), DEN), (BOS+NY+DC+CHI)]$

$= \frac{1}{2}[dist((LA+SF), (BOS+NY+DC+CHI)) + dist((DEN, (BOS+NY+DC+CHI))]$

$= \frac{1}{2}(2406 + 1306) = 1856$

8

• To update the distance matrix AVG[dist((LA+SF), DEN), MIA]

$$dist[((LA+SF), DEN), MIA] = \frac{1}{2}[dist((LA+SF), MIA) + dist(MIA, DEN)]$$

$$= \frac{1}{2}(3273 + 2037) = 2655$$

• To update the distance matrix AVG[dist((LA+SF), DEN), SEA]

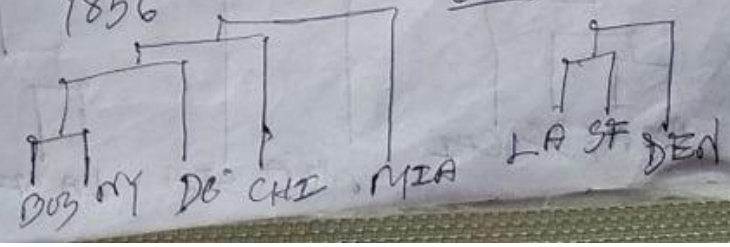
$$dist[((LA+SF, DEN), SEA] = \frac{1}{2}[dist((LA+SF), SEA) + dist(DEN, SEA)]$$

$$= \frac{1}{2}(2013 + 1307) = 1660$$

BOS+NY+DC+CHI MIA SEA LA+SF+DEN

BOS+NY+DC+CHI	0			
MIA	1202	0		
SEA	2968	1329	0	
LA+SF+DEN	1856	2655	1660	0

6th

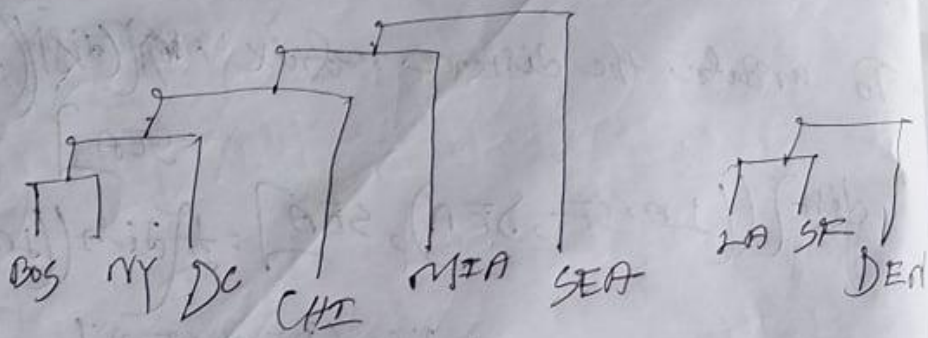


5)

BOS+NY+DC+CHI+MIA SEA LA+SF+DEN

BOS+NY+DC+CHI+MIA	0	
SEA	1320	0
LA+SF+DEN	2655	1660

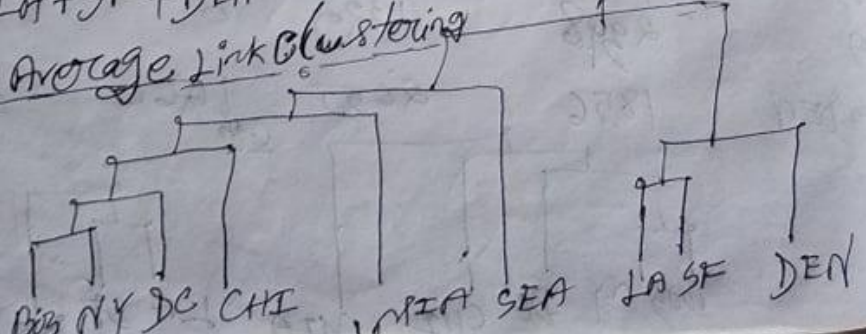
7th



BOS+NY+DC+CHI+MIA+SEA LA+SF+DEN

BOS+NY+DC+CHI+MIA+SEA	0	
LA+SF+DEN	1660	0

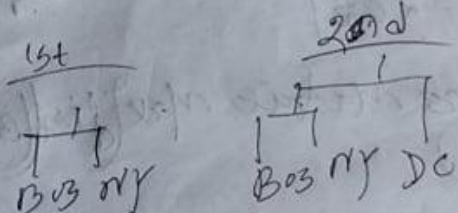
FIG: For Average Link Clustering



3. *complete-link* clustering

10

	BOS+NY+DC	MIA	CHI	SEA	SF	LA	DEN
BOS+NY+DC	0						
MIA	1075	0					
CHI	671	1329	0				
SEA	2684	3273	2013	0			
SF	2799	3053	2142	808	0		
LA	2631	2687	2054	1131	379	0	
DEN	1616	2037	996	1307	1235	1059	0



- To update the distance matrix MAX[dist((BOS+NY+DC), CHI), MIA]
  - MAX[dist((BOS+NY+DC), MIA), (CHI, MIA)]
  - = MAX[1075, 1329] = 1329
- To update the distance matrix MAX[dist((BOS+NY+DC), CHI), SEA]
  - = max[dist((BOS+NY+DC), SEA), (SEA, CHI)]
  - = max[2684, 2013] = 2684

• To update the distance Matrix max[dist((BOS+NY), CHI), SF]

max[dist((BOS+NY+DC), SF), (CHI, SF)]
= max[2299, 2142] = 2299

• To update the distance Matrix max[dist((BOS+NY), CHI), LA]

max[dist((BOS+NY+DC), LA), (CHI, LA)]
= max[2621, 2054] = 2621

• To update the distance Matrix max[dist((BOS+NY), CHI), DEN)

max[((BOS+NY+DC), DEN), (CHI, DEN)]

= max[1616, 996] = 1616

	BOS+NY+DC+CHI	MIA	SEA	SF	LA	DEN
BOS+NY+DC+CHI	0	0				
MIA	1320	3279	0			
SEA	2684	3053	808	0		
SF	2299	2687	1121	379		
LA	2621					
DEN	1616					

	BOS+NY+DC	MIA	CHI	SEA	SF	LA	DEN
BOS+NY+DC	0						
MIA	1075	0					
CHI	671	1329	0				
SEA	2684	3273	2013	0			
SF	2799	3053	2142	808	0		
LA	2621	2687	2054	1131	379	0	
DEN	1616	2037	996	1307	1235	1059	0

To update the distance matrix max[dist(LA, SF), BOS+NY+DC]
· max[dist(LA, BOS+NY+DC), (SF, BOS+NY+DC)]
= max[2621, 2799] = 2799

To update the distance matrix max[dist(LA, SF), MIA]
· max[dist(LA, MIA), (SF, MIA)] max[2687, 2053]
= 2053

To update the distance matrix max[dist(LA, SF), CHI]
· max[dist(LA, CHI), (SF, CHI)]
= max[2054, 2142] = 2142

To update the distance matrix max[dist(LA, SF), SEA]
max[dist(LA, SEA), (SF, SEA)] = max[1131, 808]
= 1131

To update the distance matrix max[dist(SF, LA), DEN]

Max[dist((SF, DEN), (LA, DEN))]

= Max[1235, 1059] = 1235

	Bos+NY+DC	MIA	CHI	SEA	SF+LA	DEN
Bos+NY+DC	0					
MIA	1025	0				
CHI	671	1329	0			
SEA	2684	3273	2013	0		
SF+LA	2299	3053	2142	1121	0	
DEN	1616	2037	996	1307	1235	0

To update the distance matrix Max[dist((Bos+NY+DC), CHI), MIA]

max[dist((Bos+NY+DC), MIA), (CHI, MIA)]

= max[1025, 1329] = 1329

To update the distance matrix MAX[dist((Bos+NY+DC), CHI), SEA]

max[dist((Bos+NY+DC), SEA), (CHI, SEA)]

= max[2684, 2013] = 2684

To update the distance matrix max[dist((Bos+NY+DC), CHI), SF+LA]

max[dist((Bos+NY+DC), SF+LA), (CHI, SF+LA)]

= max[2299, 2142] = 2299

13

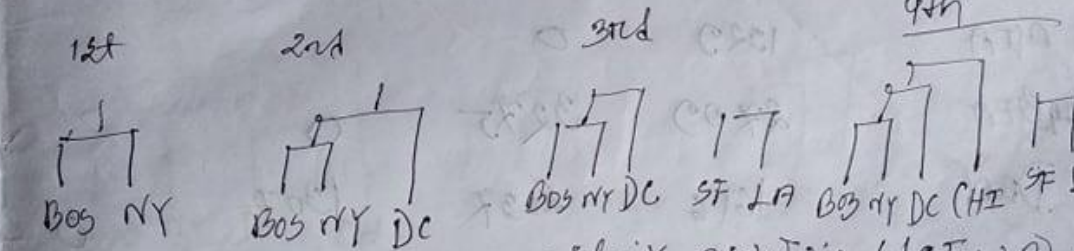
16

To update the distance matrix max[dist((BOS+NY+DC), CHI)
DEN]

· max[dist(BOS+NY+DC), DEN), (CHI, DEN)]

= max[1616,] = 1616

	BOS+NY+DC+CHI	MIA	SEA	SF+LA	DEN
BOS+NY+DC+CHI	0				
MIA	1329	0			
SEA	2684	3223	0		
SF+LA	2709	3053	1121	0	
DEN	1616	2037	1307	1235	0



To update the distance matrix max[dist((SF+LA), SEA)
(BOS+NY+DC+CHI)]

max[dist((SF+LA), (BOS+NY+DC+CHI)), (SEA, (BOS+NY+DC+CHI))]

= max[2709, 2684] = 2709

To update the distance matrix max[dist((SF+LA), SEA), MIA]

= max[dist((SF+LA), MIA), (SEA, MIA)]

= max[2059, 3273] = 3275

To update the distance matrix max[((SF+LA), SEA), DEN)

max[dist((SF+LA), DEN), (SEA, DEN)]

= max[1235, 1307] = 1307

	BOS+NY+DC+CHI	MIA	SF+LA+SEA	DEN
BOS+NY+DC+CHI	0			
MIA	1329	0		
SF+LA+SEA	2709	3275	0	
DEN	1616	2037	1307	0

To update the distance matrix max[dist((SF+LA+SEA), DEN), BOS+NY+DC+CHI]

max[dist((SF+LA+SEA), BOS+NY+DC+CHI), (DEN, BOS+NY+DC+CHI)]

= max[2709, 1616] = 2709

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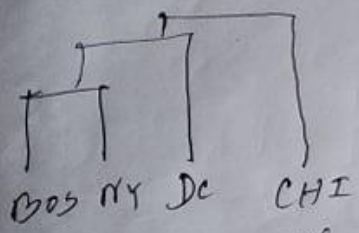
To update the distance matrix max[dist(DEN,(SF+LA+SEA)), MIA]

max[dist((SF+LA+SEA), MIA), (MIA, DEN)]

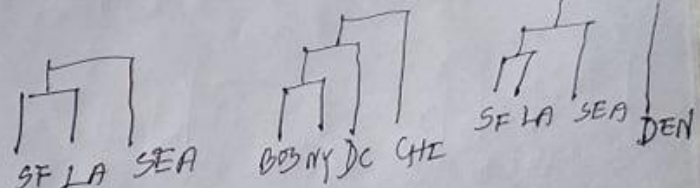
= max[3275, 2033] = 3275

	BOS+NY+DC+CHI	MIA	SF+LA+SEA+DEN
BOS+NY+DC+CHI	0		
MIA	1329	0	
SF+LA+SEA+DEN	2799	3275	0

5th



6th



7th