Assignment-6

Machine learning

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1) Mathematical solution

given table + Distance Matrix for 6 Points

	P_1	P_2	P_3	P_4	P_5	P_6
P_1	0.0000	0.2352	0.2218	0.3688	0.3421	0.2347
P_2	0.2352	0.0000	0.1483	0.2042	0.1388	0.2540
P_3	0.2218	0.1483	0.0000	0.1513	0.2843	0.1100
P_4	0.3688	0.2042	0.1513	0.0000	0.2932	0.2216
P_5	0.3421	0.1388	0.2843	0.2932	0.0000	0.3921
P_6	0.2342	0.2540	0.1100	0.2216	0.3921	0.0000

→ In Single Linkage the distance between two clusters is minimum distance b/w the members of two clusters..

So Pair $[P_3\ P_6]$ → 0.1100 (first cluster)

	P_1	P_2	$P_3\ P_6$	P_4	P_5
P_1	0	0.2352	0.2218	0.3688	0.3421
P_2	0.2351	0	0.1483	0.2042	0.1388
$P_3\ P_6$	0.2218	0.1483	0	0.1513	0.2843
P_4	0.3688	0.2042	0.1513	0	0.2932
P_5	0.3471	0.1388	0.2843	0.2932	0

Now

Now pair $[p_2, p_5]$, forms second cluster

	p_1	$p_2 p_5$	$p_3 p_6$	p_4
p_1	0	0.2357	0.2218	0.3688
$p_2 p_5$	0.2357	0	0.1483	0.2042
$p_3 p_6$	0.2218	0.1483	0	0.1513
p_4	0.3688	0.2042	0.1513	0

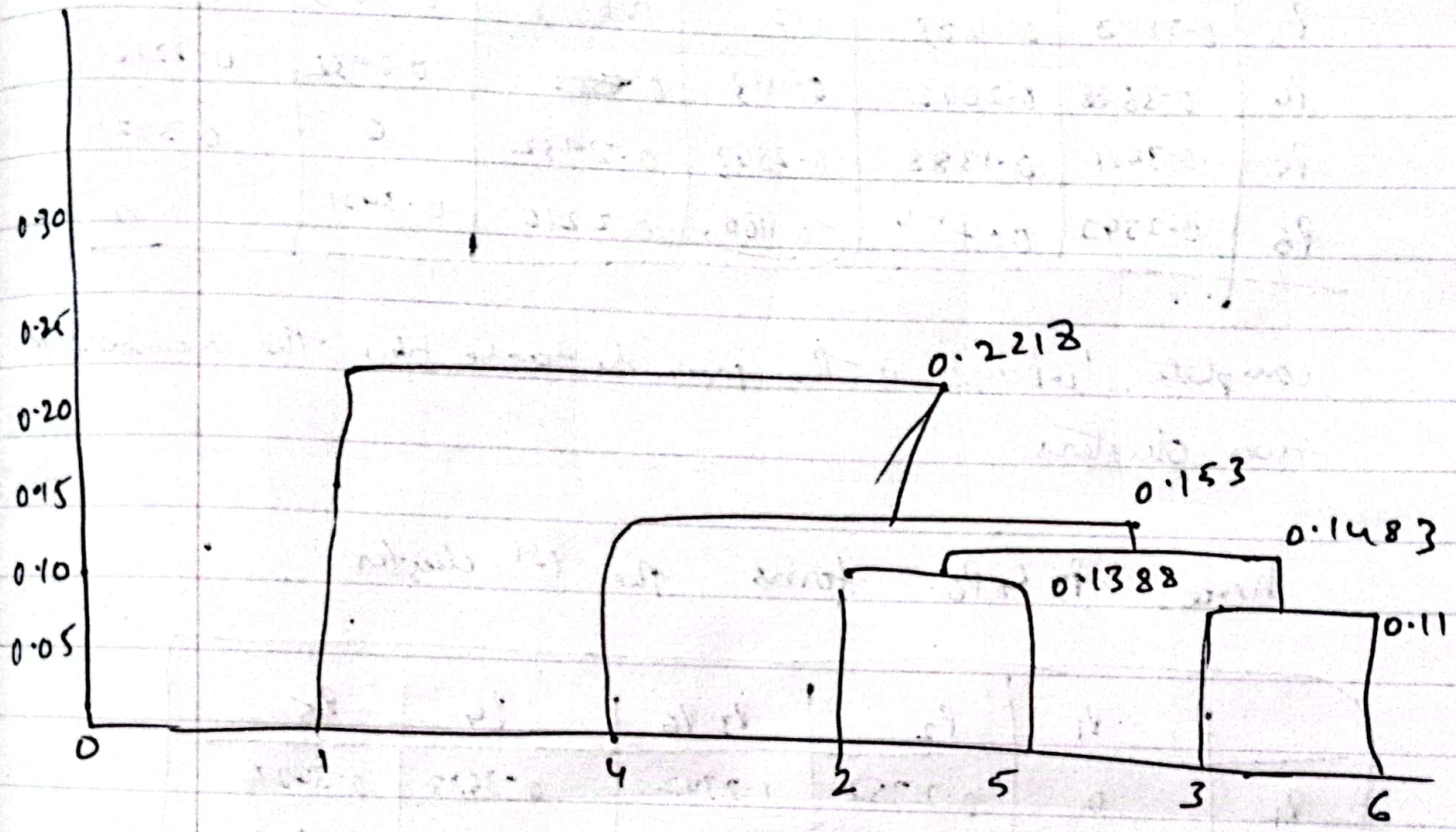
Now $p_2 p_5$ & $p_3 p_6$ forms 3rd cluster

	p_1	$p_2 p_5 p_3 p_6$	p_4
p_1	0	0.2218	0.3688
$p_2 p_5 p_3 p_6$	0.2218	0	0.1513
p_4	0.3618	0.1513	0

Therefore $p_2 p_5 p_3 p_6$ & p_4 forms 4th cluster

	p_1	$p_2 p_5 p_3 p_6 p_4$
p_1	0	0.2218
$p_2 p_5 p_3 p_6 p_4$	0.2218	0

Single link proximity



	P_1	P_2	P_3	P_4	P_5	P_6
P_1	0	0.2357	0.2218	0.3688	0.3421	0.2342
P_2	0.2357	0	0.1483	0.2042	0.1388	0.254
P_3	0.2218	0.1483	0	0.1513	0.2843	0.11
P_4	0.3688	0.2042	0.1513	0	0.2932	0.2216
P_5	0.3421	0.1388	0.2843	0.2932	0	0.3921
P_6	0.2342	0.254	0.1100	0.2216	0.3921	0

complete linkage is the max distance b/w the members of two clusters

Here P_3 & P_6 forms the 1st cluster

	P_1	P_2	P_3 P_6	P_4	P_5
P_1	0	0.2357	0.2342	0.3688	0.3421
P_2	0.2357	0	0.254	0.2042	0.1388
P_3P_6	0.2342	0.254	0	0.2216	0.3921
P_4	0.3688	0.2042	0.2216	0	0.2932
P_5	0.3421	0.1388	0.3921	0.2932	0

Above P_2 & P_5 form the second cluster

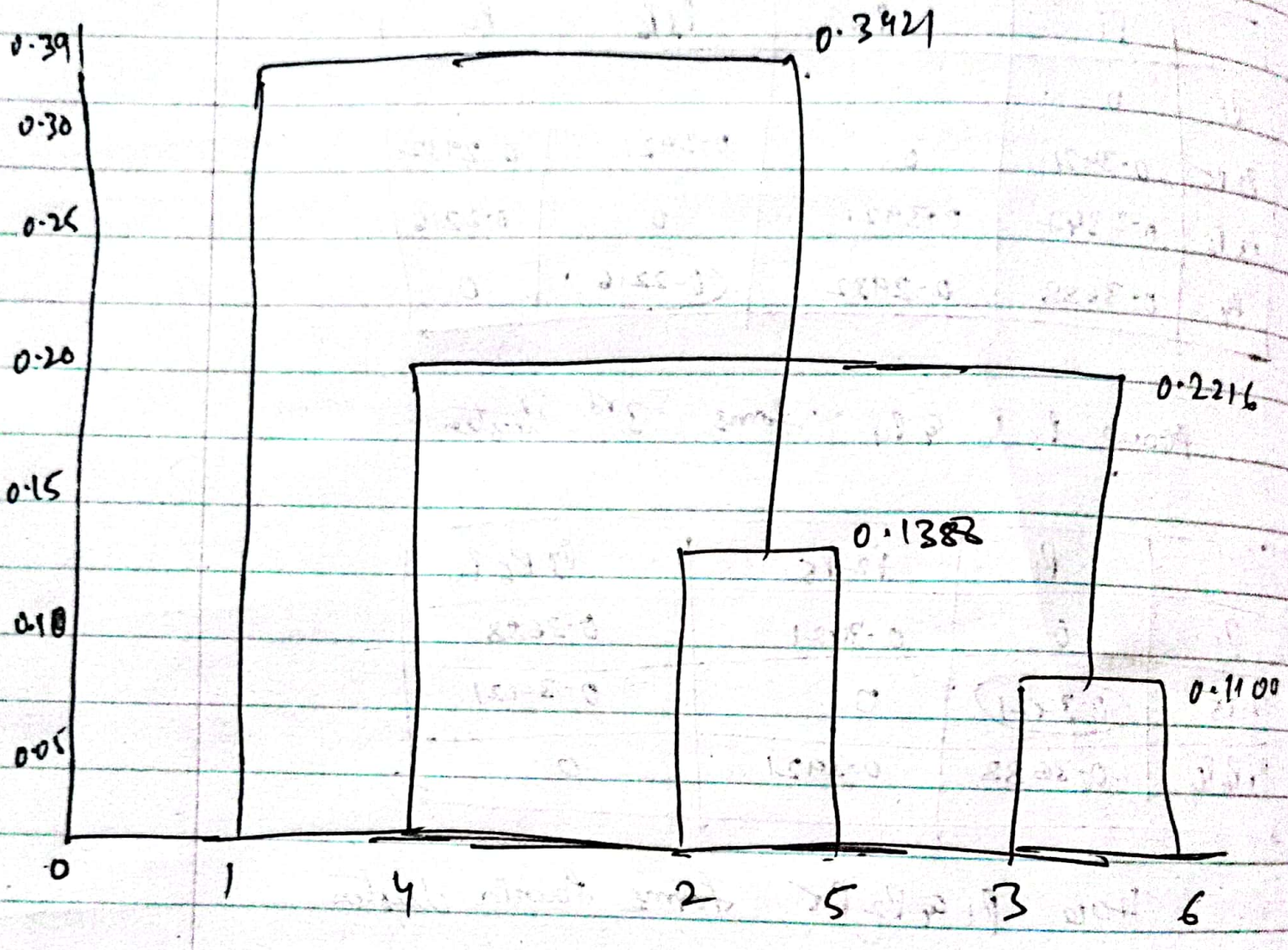
	P_1	$P_2 P_5$	$P_3 P_6$	P_4
P_1	0			
$P_2 P_5$	0.3421	0	0.3921	0.2932
$P_3 P_6$	0.2347	0.3921	0	0.2216
P_4	0.3688	0.2932	(0.2216)	0

Above P_3 P_6 & P_4 forms 3rd cluster

	P_1	$P_2 P_5$	$P_3 P_6 P_4$
P_1	0	0.3421	0.3688
$P_2 P_5$	(0.3421)	0	0.3921
$P_3 P_6 P_4$	0.3688	0.3921	0

Here P_1 & $P_2 P_5$ forms fourth cluster

	$P_1 P_2 P_5$	$P_3 P_6 P_4$
$P_1 P_2 P_5$	0	0.3124
$P_3 P_6 P_4$	0.3124	0



Complete link Proximity

In Average link Proximity we use the average of the distance between members of two clusters

	P_1	P_2	P_3	P_4	P_5	P_6
P_1	0.0000	0.2357	0.2218	0.3688	0.3421	0.2347
P_2	0.2357	0.0000	0.1483	0.2042	0.1388	0.2540
P_3	0.2218	0.1483	0.0000	0.1513	0.2843	0.1100
P_4	0.3688	0.2042	0.1513	0.0000	0.2932	0.2216
P_5	0.3421	0.1388	0.2843	0.2932	0.0000	0.3421
P_6	0.2347	0.2540	0.1100	0.2216	0.3421	0.0000

Now P_3 and P_6 forms the first cluster

	P_1	P_2	P_3 P_6	P_4	P_5
P_1	0				
P_2	0.2357	0	0.20115	0.2042	
P_3 P_6	0.22825	0.20115	0	0.18645	0.3382
P_4	0.3688	0.2042	0.18645	0	
P_5	0.3421	0.1388	0.3382	0.2932	0

Here P_2 and P_5 forms the second clusters

	P_1	$P_2 P_5$	$P_3 P_6$	P_4
P_1	0			
$P_2 P_5$	0.2889	0	0.269875	0.2487
$P_3 P_6$	0.2282	0.269875	0	0.18645
P_4	0.3421	0.2487	0.18645	0

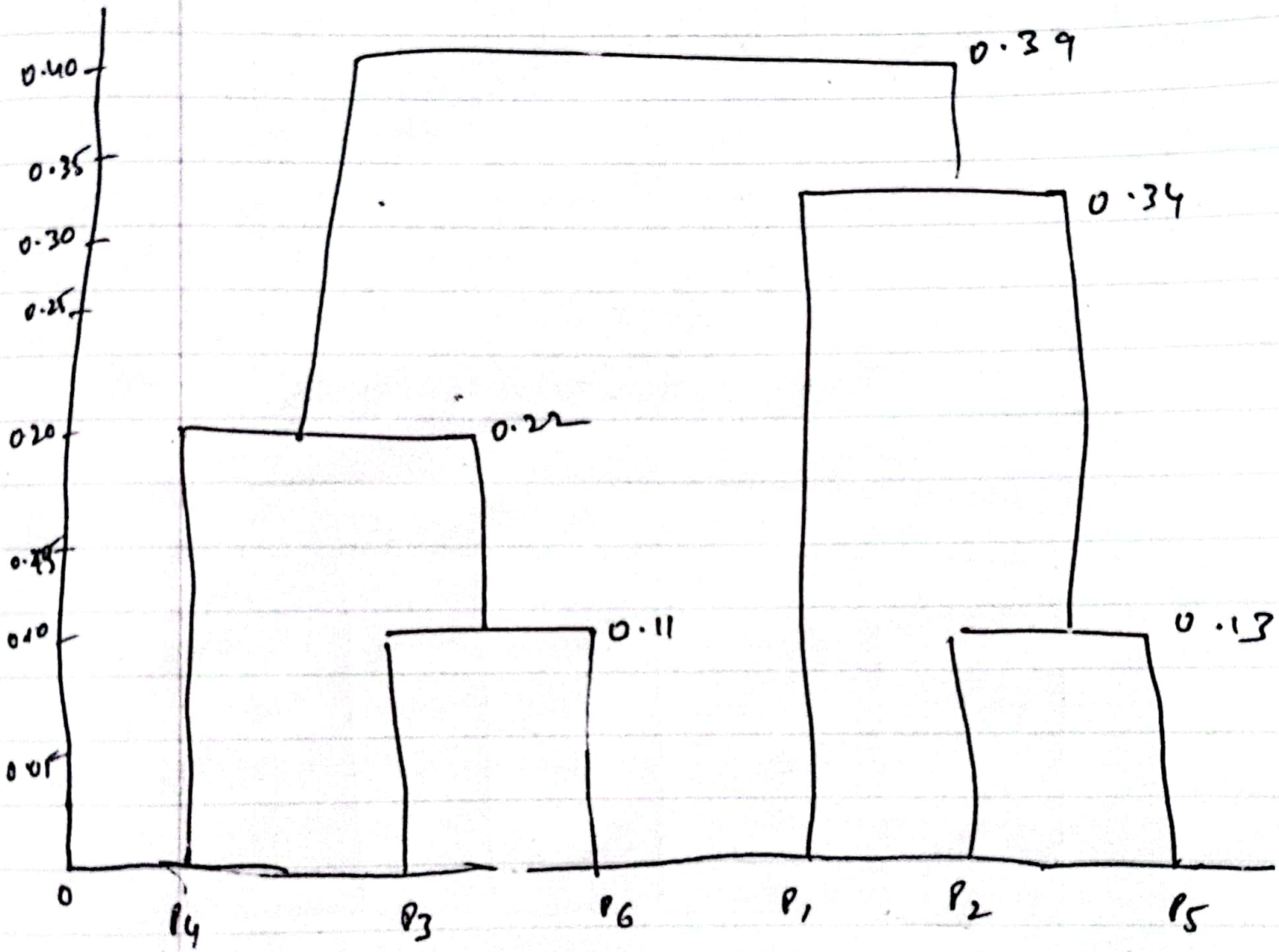
$P_3 P_6$ & P_4

Now ~~$P_2 P_5$ & $P_3 P_6 P_4$~~ forms a cluster

	P_1	$P_2 P_5$	$P_3 P_6 P_4$
P_1	0		0.2815
$P_2 P_5$	0.2889	0	0.259187
$P_3 P_6 P_4$	0.2815	0.259187	0

here $P_2 P_5$ & $P_3 P_6 P_4$ forms a cluster

	P_1	$P_2 P_5 P_3 P_6 P_4$
P_1	0	0.285
$P_2 P_5 P_3 P_6 P_4$	0.285	0



Complete linkage