Homework: 2 CS 205. Introduction to Artificial Intelligence

Consider this color chart [a].

Pick five colors and build a dendrogram. Show all your work.

I recommend that you

- Pick two colors that are very similar
- Pick another two colors, that a somewhat similar (but different to the first pair)
- Pick the fifth color that is very different to the first pair

Pick randomly. If two people pick the same colors, I will make both of them redo the homework!

I will show you an example of what I want. However, **I have omitted sections in the below, but you should not do so.**

You can use Matlab (or other software) to confirm your answer, but you must also do it by hand.

Show only numbers to one decimal place.

You can do this paper and pencil and submit a scan/photo, or do it all digital, whatever you prefer.

For this homework, I am picking Lawngreen, Lime, Pink, Plum and Red.

I suspect that the hierarchal structure will be { { Lawngreen, Lime },{ Pink, Plum } , Red }

Here are the RDB values:

- Lawngreen = 124, 252, 0
- Lime = 0, 225, 0
- Pink (EK says, omitted, you need to fill in)
- Plum
- Red

I can start by filling in all the diagonals in the distance matrix with zeros:

	Lawngreen	Lime	Pink	(EK says, omitted, you need to fill in)	
Lawngreen	0				
Lime		0			
Pink			0		
				0	
					0

Now I can compute Euclidean Distance between Lawngreen and Lime
Dist(Lawngreen, Lime) = sqrt(sum((124- 0)^2 + (252 - 225)^2 + (0 - 0))^2) = 126.9

And the Euclidean Distance between Lawngreen and Pink
Dist(Lawngreen, Pink) = sqrt(sum((124- 255)^2 + (252 - 192)^2 + (0 - 203)^2)) = 248.9

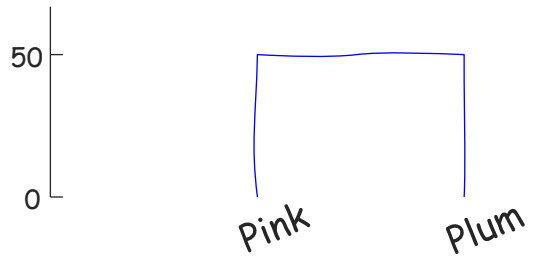
And the…
(EK says, omitted, you need to fill in)

The final distance matrix is shown below.

	Lawngreen	Lime	Pink		
Lawngreen	0	126.9	248.9	258.2	284.0
Lime		0	327.6	319.2	340.0
Pink			0	50.0	279.4
				0	274.9
					0

Next, I can begin to construct the tree.

The smallest (non-diagonal) value in my distance matrix is 50.0, which is the distance between Pink and Plum. So that is the first element in my tree.

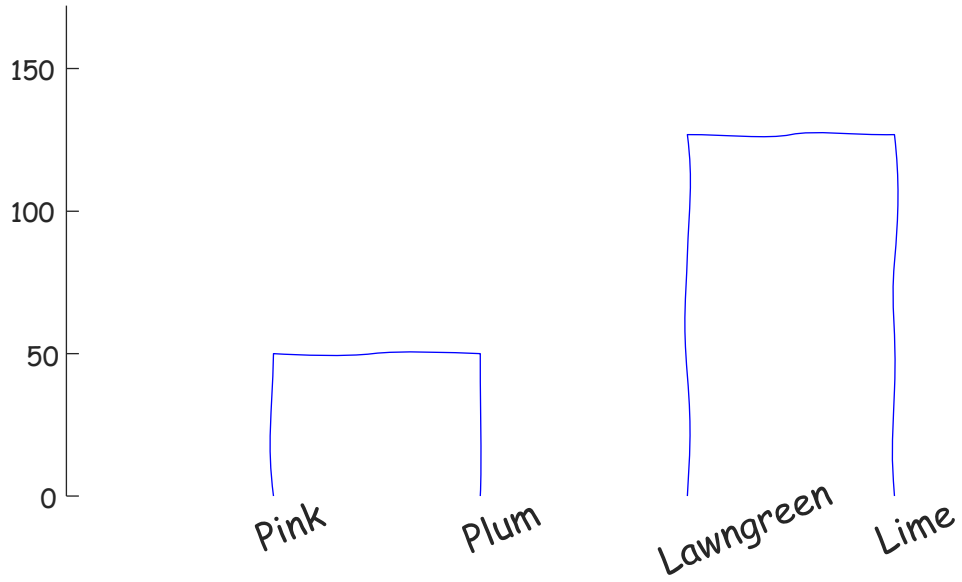


Now I am searching for the next smallest value, including the three virtual groupings of:

{Pink,Plum} with Red
{Pink,Plum} with Lime
{Pink,Plum} with Lawngreen

Using single linkage, the distance between {Pink,Plum} with Red is min{279.4, 274.9}
Using single linkage, the distance between {Pink,Plum} with (EK says, omitted, you need to fill in)
Using single linkage, the distance between {Pink,Plum} with (EK says, omitted, you need to fill in)

The smallest (non-diagonal) value in my distance matrix is 126.9, which is the distance between Lawngreen and Lime. So I can now add the following elements to my tree.

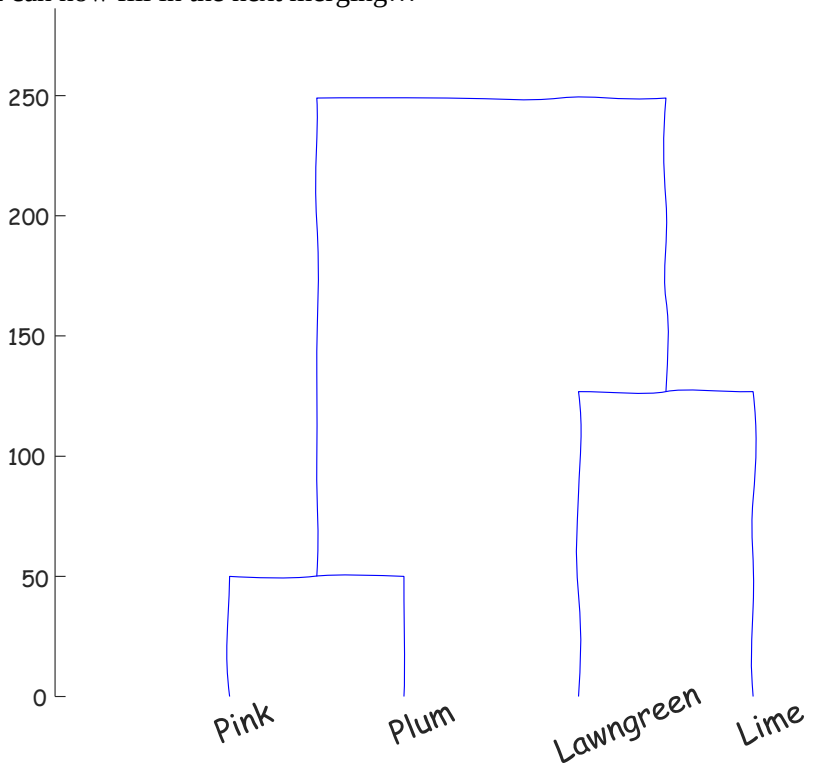


Now I am searching for the next smallest value, including the virtual groupings of:

{Pink,Plum} with Red
{Pink,Plum} with {Lawngreen,Lime}
{Pink,Plum} with Lawngreen

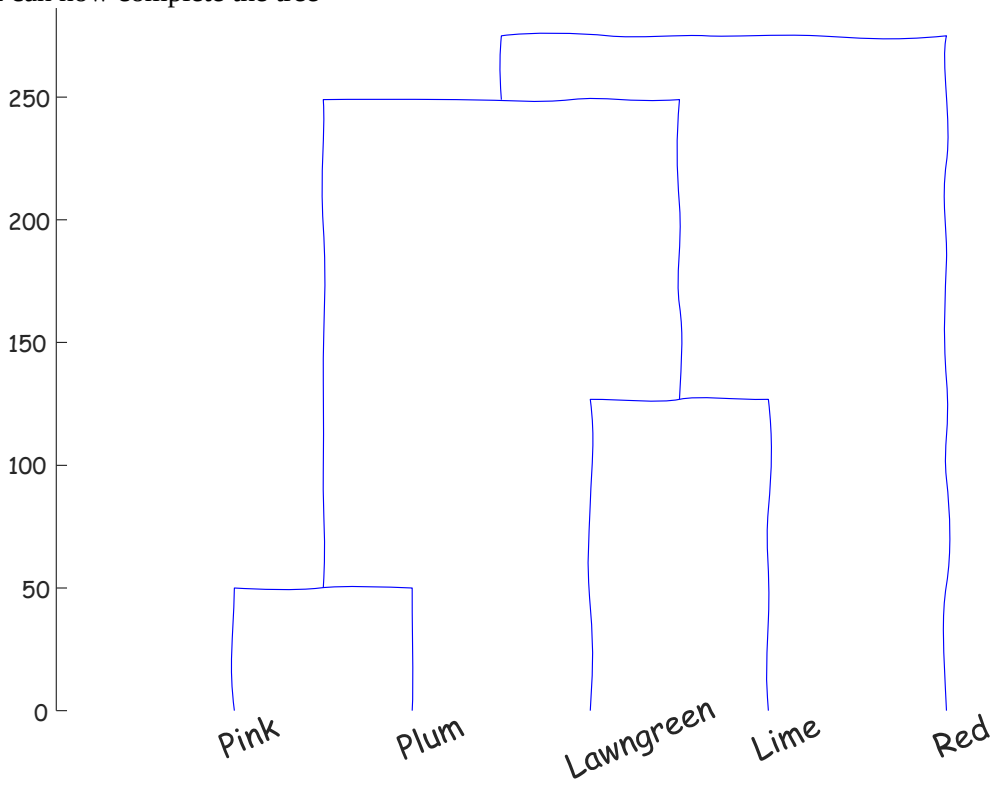
EK says, omitted, you need to fill in)

I can now fill in the next merging…



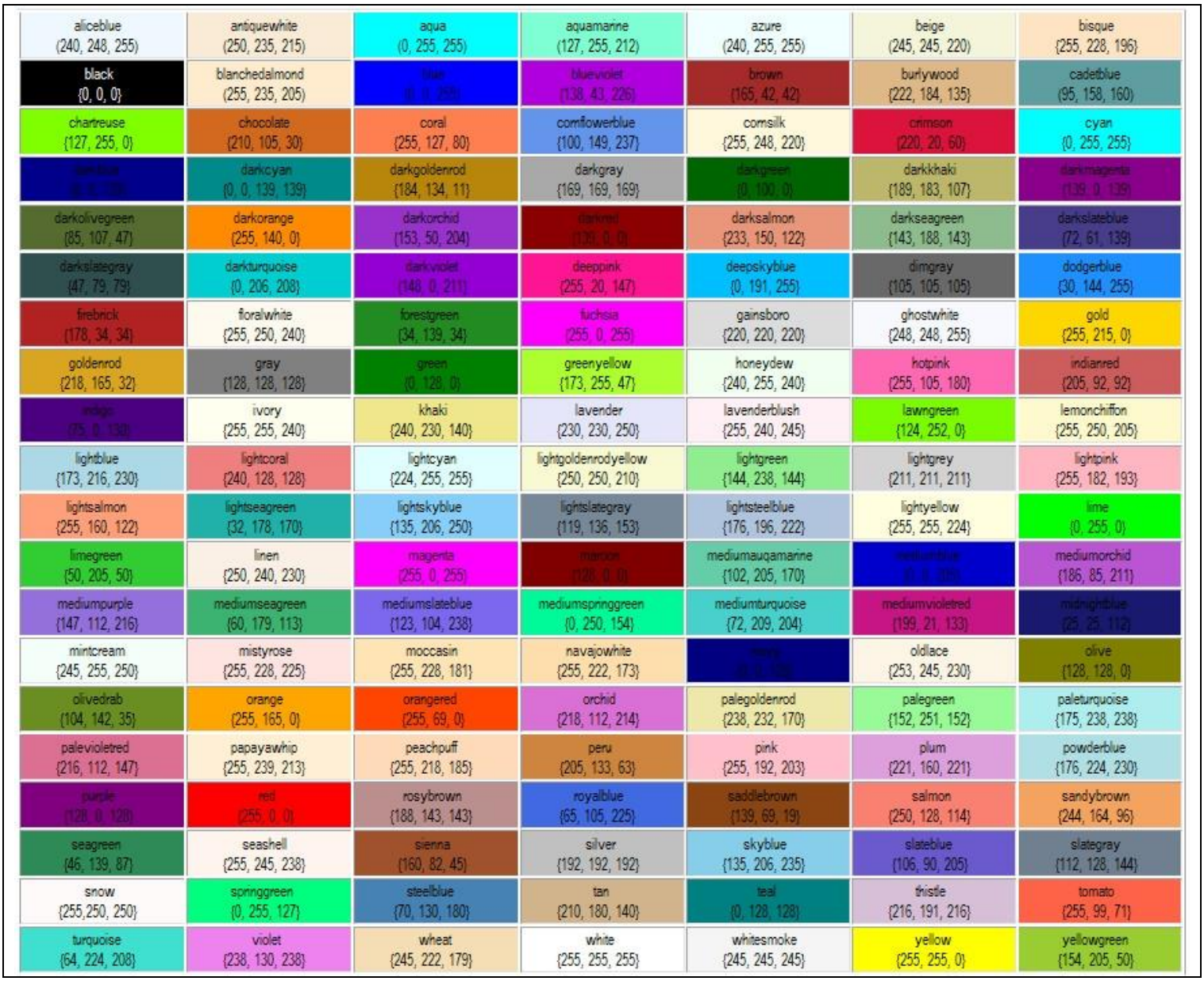
Finally, I must..

I can now complete the tree



That completes the assignment.

[a]


aliceblue (240, 248, 255)
antiquewhite (250, 235, 215)
aqua (0, 255, 255)
aquamarine (127, 255, 212)
azure (240, 255, 255)
beige (245, 245, 220)
bisque (255, 228, 196)
black (0, 0, 0)
blanchedalmond (255, 235, 205)
blue
blueviolet (138, 43, 226)
brown (165, 42, 42)
burlywood (222, 184, 135)
cadetblue (95, 158, 160)
chartreuse (127, 255, 0)
chocolate (210, 105, 30)
coral (255, 127, 80)
cornflowerblue (100, 149, 237)
cornsilk (255, 248, 220)
crimson (220, 20, 60)
cyan (0, 255, 255)
darkblue
darkcyan (0, 0, 139, 139)
darkgoldenrod (184, 134, 11)
darkgray (169, 169, 169)
darkgreen (0, 100, 0)
darkkhaki (189, 183, 107)
darkmagenta (139, 0, 139)
darkolivegreen (85, 107, 47)
darkorange (255, 140, 0)
darkorchid (153, 50, 204)
darkred (139, 0, 0)
darksalmon (233, 150, 122)
darkseagreen (143, 188, 143)
darkslateblue (72, 61, 139)
darkslategray (47, 79, 79)
darkturquoise (0, 206, 208)
darkviolet (148, 0, 211)
deeppink (255, 20, 147)
deepskyblue (0, 191, 255)
dimgray (105, 105, 105)
dodgerblue (30, 144, 255)
firebrick (178, 34, 34)
floralwhite (255, 250, 240)
forestgreen (34, 139, 34)
fuchsia (255, 0, 255)
gainsboro (220, 220, 220)
ghostwhite (248, 248, 255)
gold (255, 215, 0)
goldenrod (218, 165, 32)
gray (128, 128, 128)
green (0, 128, 0)
greenyellow (173, 255, 47)
honeydew (240, 255, 240)
hotpink (255, 105, 180)
indianred (205, 92, 92)
indigo
ivory (255, 255, 240)
khaki (240, 230, 140)
lavender (230, 230, 250)
lavenderblush (255, 240, 245)
lawngreen (124, 252, 0)
lemonchiffon (255, 250, 205)
lightblue (173, 216, 230)
lightcoral (240, 128, 128)
lightcyan (224, 255, 255)
lightgoldenrodyellow (250, 250, 210)
lightgreen (144, 238, 144)
lightgrey (211, 211, 211)
lightpink (255, 182, 193)
lightsalmon (255, 160, 122)
lightseagreen (32, 178, 170)
lightskyblue (135, 206, 250)
lightslategray (119, 136, 153)
lightsteelblue (176, 196, 222)
lightyellow (255, 255, 224)
lime (0, 255, 0)
limegreen (50, 205, 50)
linen (250, 240, 230)
magenta (255, 0, 255)
maroon (128, 0, 0)
mediumauqamarine (102, 205, 170)
mediumblue
mediumorchid (186, 85, 211)
mediumpurple (147, 112, 216)
mediumseagreen (60, 179, 113)
mediumslateblue (123, 104, 238)
mediumspringgreen (0, 250, 154)
mediumturquoise (72, 209, 204)
mediumvioletred (199, 21, 133)
midnightblue (25, 25, 112)
mintcream (245, 255, 250)
mistyrose (255, 228, 225)
moccasin (255, 228, 181)
navajowhite (255, 222, 173)
navy
oldlace (253, 245, 230)
olive (128, 128, 0)
olivedrab (104, 142, 35)
orange (255, 165, 0)
orangered (255, 69, 0)
orchid (218, 112, 214)
palegoldenrod (238, 232, 170)
palegreen (152, 251, 152)
paleturquoise (175, 238, 238)
palevioletred (216, 112, 147)
papayawhip (255, 239, 213)
peachpuff (255, 218, 185)
peru (205, 133, 63)
pink (255, 192, 203)
plum (221, 160, 221)
powderblue (176, 224, 230)
purple (128, 0, 128)
red (255, 0, 0)
rosybrown (188, 143, 143)
royalblue (65, 105, 225)
saddlebrown (139, 69, 19)
salmon (250, 128, 114)
sandybrown (244, 164, 96)
seagreen (46, 139, 87)
seashell (255, 245, 238)
sienna (160, 82, 45)
silver (192, 192, 192)
skyblue (135, 206, 235)
slateblue (106, 90, 205)
slategray (112, 128, 144)
snow (255,250, 250)
springgreen (0, 255, 127)
steelblue (70, 130, 180)
tan (210, 180, 140)
teal (0, 128, 128)
thistle (216, 191, 216)
tomato (255, 99, 71)
turquoise (64, 224, 208)
violet (238, 130, 238)
wheat (245, 222, 179)
white (255, 255, 255)
whitesmoke (245, 245, 245)
yellow (255, 255, 0)
yellowgreen (154, 205, 50)