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Homework 11

R	G	B
1	0	0
0	1	0
0	0	1

C	Y	M	K
1	0	0	0
0	1	0	0
0	0	1	0
0	0	0	1

$$(R, G, B) \rightarrow \mathbb{R}^3$$

$$(C, Y, M, K) \rightarrow \mathbb{R}^4$$

Dimensional Argument

$$\rightarrow RGB \text{ is } \mathbb{R}^3$$

$$\rightarrow CMYK \text{ is } \mathbb{R}^4$$

\rightarrow An \mathbb{R}^3 space can never span \mathbb{R}^4 because of missing components in \mathbb{R}^4 .

The black component in (K) cannot be expressed as a linear combination of RGB colors

For RGB to span CMYK we need to express K in terms of linear combination of RGB: -

$$K = \lambda \cdot R + \alpha G + \beta \cdot B \quad \text{linear combination}$$

for some scalars λ, α, β

for K in CMYK

$$K = 1 - \max(R, G, B)$$

But

if we take any two colors (R_1, G_1, B_1) & (R_2, G_2, B_2) the K component should also add in the same way but K has a subtractive nature violating the additivity