



ALJABAR LINEAR

# APLIKASI ALJABAR LINEAR

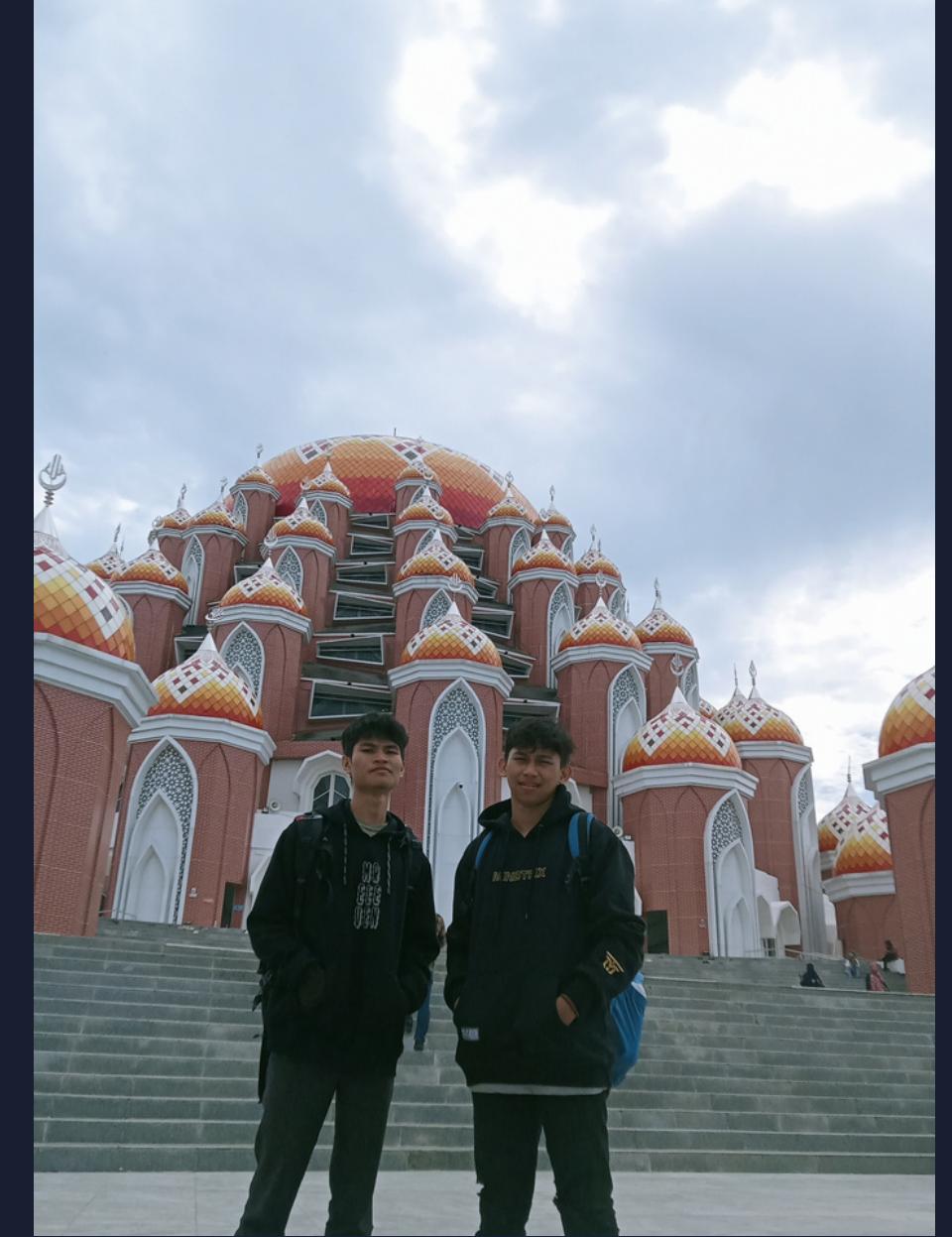
DOSEN : NURUL FUADY ADHALIA S.SI,M.SI



SAMPEL CITRA



PENGAPLIKASIAN ALJABAR LINEAR



# METODE 1

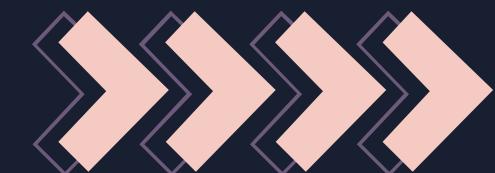
## LIGHTNESS

Lightness adalah metode konversi RGB dengan menggunakan sistem mencari nilai tertinggi dari matrix RGB kemudian menjumlahkan dengan nilai terendah dari matrix RGB dan membagi 2 dari hasil penjumlahan nilai max dan min RGB.

Secara matematis dapat ditulis sebagai berikut

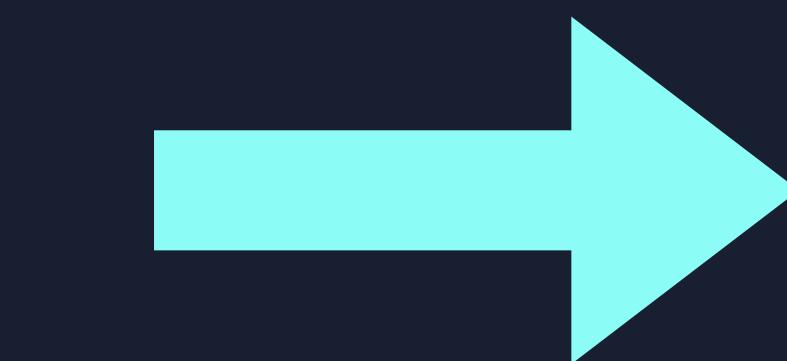
$$(\text{Max}(R,G,B)) + (\text{Min}(R,G,B)) / 2$$

## Matrix Lightness



```
[[[147 143 132]
 [147 143 132]
 [147 143 132]
 ...
 [176 172 161]
 [176 172 161]
 [176 172 161]]]
```

```
[[[147 143 132]
 [147 143 132]
 [147 143 132]
 ...]
```



Mengapa Berbeda?

```
[[[139 139 139]
 [139 139 139]
 [139 139 139]
 ...
 [168 168 168]
 [168 168 168]
 [168 168 168]]]
```

```
[[[139 139 139]
 [139 139 139]
 [139 139 139]]]
```

# MENGAPA MATRIX YANG DIHASILKAN BERBEDA?

KARENA TERJADI OPERASI MATEMATIS YAITU NILAI MAX DARI RGB DAN MIN RGB DIJUMLAHKAN KEMUDIAN DIBAGI 2

```
[[[147 143 132]
 [147 143 132]
 [147 143 132]]]
```

NILAI MIN RGB = 132

NILAI MAX RGB = 147

$$(132 + 147)/2 = 139$$

MAKA SELURUH BARIS PADA MATRIX ITU AKAN BERISI ENTRY 139

R	G	B
[147 143 132]	[147 143 132]	[147 143 132]



R	G	B
[139 139 139]	[139 139 139]	[139 139 139]

# MENGAPA SEMUA ENTRY PADA MATRIX LIGHTNESSINI BERBEDA (TIDAK SAMA DENGAN MATRIX SEBELUMNYA YANG ENTRY SEMUA MATRIXNYA SAMA)?

R      G      B

[	96	96	96]
[	96	96	96]
[	98	98	98]

MATRIX LIGHTNESS KE-4032

# KARENA DENGAN METODE LIGHTNESS OPERASI MATEMATIS DILAKUKAN SECARA BARIS PER BARIS SEBAGAI PENJELASAN :

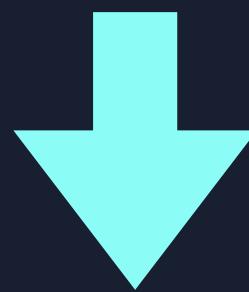
$\begin{bmatrix} [147 & 143 & 132] \\ [147 & 143 & 132] \\ [147 & 143 & 132] \end{bmatrix}$

Karena semua entrynya  
sama maka matrix  
yang dihasilkan akan  
bernilai sama

$\begin{bmatrix} [139 & 139 & 139] \\ [139 & 139 & 139] \\ [139 & 139 & 139] \end{bmatrix}$

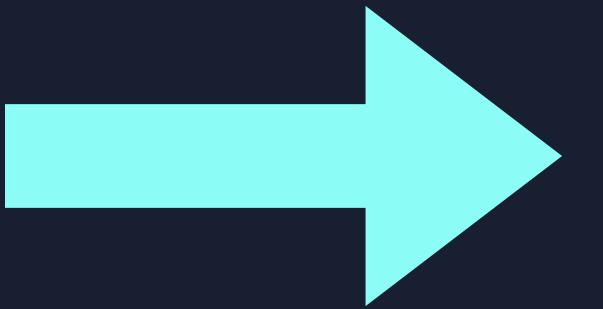
Berbeda dengan matrix  
ke 4032 entry pada  
kolom ke 3 berbeda  
dengan entry 1 & 2

$\begin{bmatrix} [140 & 83 & 53] \\ [140 & 83 & 53] \\ [142 & 85 & 55] \end{bmatrix}$



$\begin{bmatrix} [96 & 96 & 96] \\ [96 & 96 & 96] \\ [98 & 98 & 98] \end{bmatrix}$

SEBELUM DI KONVERSI



SETELAH DI KONVERSI

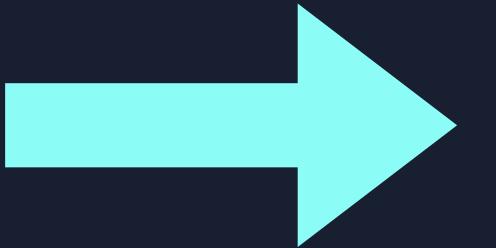


```
[[[190 210 234]
 [188 208 232]
 [188 208 232]
 ...
 [192 208 233]
 [192 208 233]
 [193 209 234]]]

[[189 209 233]
 [188 208 232]
 [188 208 232]
 ...
 [192 208 233]
 [192 208 233]
 [192 208 233]]]

[[189 209 233]
 [188 208 232]
 [188 208 232]
 ...
 [193 209 234]
 [193 209 234]
 [193 209 234]]]
```

MATRIKS GAMBAR



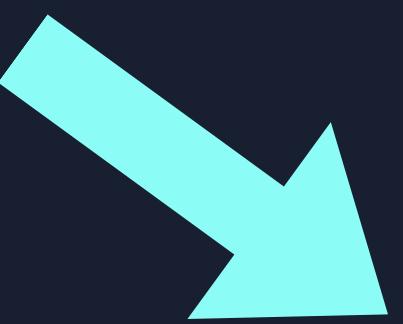
```
[[[212 212 212]
 [210 210 210]
 [210 210 210]
 ...
 [212 212 212]
 [212 212 212]
 [213 213 213]]]

[[211 211 211]
 [210 210 210]
 [210 210 210]
 ...
 [212 212 212]
 [212 212 212]
 [212 212 212]]]

[[211 211 211]
 [210 210 210]
 [210 210 210]
 ...
 [213 213 213]
 [213 213 213]
 [213 213 213]]]

...
```

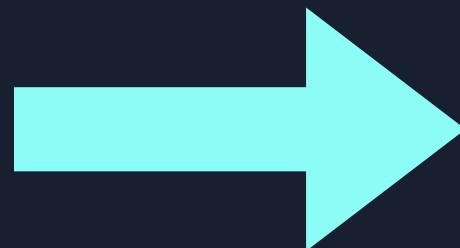
MATRIKS  
LIGHTNESS



# KARENA DENGAN METODE LIGHTNESS OPERASI MATEMATIS DILAKUKAN SECARA BARIS PER BARIS SEBAGAI PENJELASAN :

[ [ [	190	210	234	]
[188	208	232	]	
[188	208	232	]	

MATRIKS KE-1 DARI GAMBAR



[ [ [	212	212	212	]
[210	210	210	]	
[210	210	210	]	

MATRIKS LIGHTNESS

METODE LIGHTNESS( MIN(RGB)+MAX(RGB))/2  
JADI PERHITUNGAN MATRIKS BARIS KE-1 YAITU  
 $(190+234)/2=212$

MATEMATIS SETIAP METODE LIGHTNESS  
DILAKUKAN SECARA BARIS PER BARIS

```
[[[200 206 204]
 [200 206 204]
 [200 206 204]
 ...
 [224 225 227]
 [224 225 227]
 [224 225 227]]
 *
 [[200 206 204]
 [200 206 204]
 [200 206 204]
 ...
 [224 225 227]
 [224 225 227]
 [224 225 227]]
 [[200 206 204]
 [200 206 204]
 [200 206 204]
 ...
 [224 225 227]
 [224 225 227]
 [224 225 227]]]
```

MATRIKS GAMBAR

```
[[[203 203 203]
 [203 203 203]
 [203 203 203]
 ...
 [225 225 225]
 [225 225 225]
 [225 225 225]]
 [[203 203 203]
 [203 203 203]
 [203 203 203]
 ...
 [225 225 225]
 [225 225 225]
 [225 225 225]]
 [[203 203 203]
 [203 203 203]
 [203 203 203]
 ...
 [225 225 225]
 [225 225 225]
 [225 225 225]]]
```

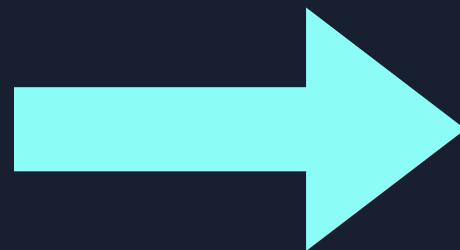
LIGHTNESS



# KARENA DENGAN METODE LIGHTNESS OPERASI MATEMATIS DILAKUKAN SECARA BARIS PER BARIS SEBAGAI PENJELASAN :

[	[	[	200	206	204	]
[	200	206	204	]		
[	200	206	204	]		

MATRIKS KE-1 DARI GAMBAR



[	[	[	203	203	203	]
[	203	203	203	]		
[	203	203	203	]		

MATRIKS LIGHTNESS

METODE LIGHTNESS  
(NILAI MIN RGB + NILAI MAX RGB)/2  
 $(200+206)/2 = 203$

MATEMATIS SETIAP METODE LIGHTNESS DILAKUKAN SECARA BARIS PER BARIS

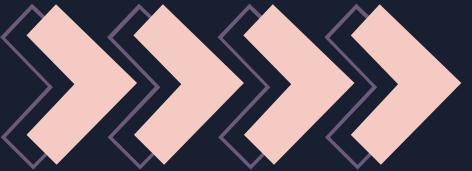
# METODE 2

## AVERAGE

Average adalah metode konversi RGB dengan menggunakan sistem menjumlahkan seluruh nilai RGB pada matrix-i kemudia dikalikan 1/3.

Secara matematis dapat ditulis sebagai berikut

$$(R+G+B) \times 1/3$$

Matrix Average 

```
[[[147 143 132]
 [147 143 132]
 [147 143 132]
 ...
 [176 172 161]
 [176 172 161]
 [176 172 161]]]
```

```
[[147 143 132]
 [147 143 132]
 [147 143 132]
 ...
 [176 172 161]
 [176 172 161]
 [176 172 161]]]
```

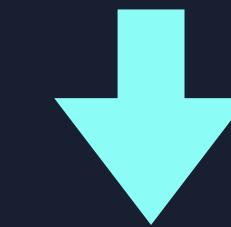
```
[[147 143 132]
 [147 143 132]
 [147 143 132]
 ...
 [176 172 161]
 [176 172 161]
 [176 172 161]]]
```

Mengapa Berbeda?

```
[[[140.66666667]
 [140.66666667]
 [140.66666667]
 ...
 [169.66666667]
 [169.66666667]
 [169.66666667]]]
```

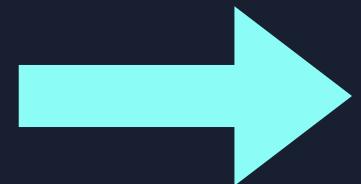
```
[[140.66666667]
 [140.66666667]
 [140.66666667]
 ...
 [169.66666667]
 [169.66666667]
 [169.66666667]]]
```

```
[[[140.66666667]
 [140.66666667]
 [140.66666667]
 ...
 [169.66666667]
 [169.66666667]
 [169.66666667]]]
```



# Secara Matematis :

```
[[[147 143 132]
 [147 143 132]
 [147 143 132]]]
```



```
[[[140.66666667]
 [140.66666667]
 [140.66666667]]]
```

$$\frac{147 + 143 + 132}{3} = 140,6667$$

**Pada Average matrix dioperasikan  
baris per baris**

# AVERAGE

```
[[[190 210 234]  
[188 208 232]  
[188 208 232]  
...  
[192 208 233]  
[192 208 233]  
[193 209 234]]  
  
[[189 209 233]  
[188 208 232]  
[188 208 232]  
...  
[192 208 233]  
[192 208 233]  
[192 208 233]]  
  
[[189 209 233]  
[188 208 232]  
[188 208 232]  
...  
[193 209 234]  
[193 209 234]  
[193 209 234]]  
...]
```



```
[[211.33333333 209.33333333 209.33333333 ... 211.  
212. ]]  
[[210.33333333 209.33333333 209.33333333 ... 211.  
211. ]]  
[[210.33333333 209.33333333 209.33333333 ... 212.  
212. ]]  
...  
[[143.33333333 142.33333333 143.33333333 ... 145.  
144. ]]  
[[145.33333333 143.33333333 144.33333333 ... 146.  
145. ]]  
[[142.33333333 143.33333333 146.33333333 ... 145.  
144. ]]
```



# Secara Matematis :

```
[[[190 210 234]
 [188 208 232]
 [188 208 232]]]
```



```
[[211.33333333 209.33333333 209.33333333 ...]]
```

$$\frac{190 + 210 + 234}{3} = 211,333..$$
$$\frac{188 + 208 + 232}{3} = 209,333..$$

Pada Average matrix dioperasikan  
baris per baris dan matriks yang  
tadinya 3 dimensi menjadi 2 dimensi

# AVERAGE

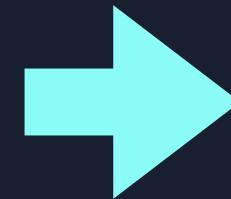
```
[[[200 206 204]
 [200 206 204]
 [200 206 204]
 ...
 [224 225 227]
 [224 225 227]
 [224 225 227]]]
```

```
[[200 206 204]
 [200 206 204]
 [200 206 204]
 ...
 [224 225 227]
 [224 225 227]
 [224 225 227]]]
```



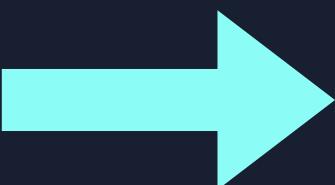
HASIL DARI METODE AVERAGE:



```
[[203.33333333 203.33333333 203.33333333 ... 225.33333333 225.33333333
 225.33333333]
[203.33333333 203.33333333 203.33333333 ... 225.33333333 225.33333333
 225.33333333]
[203.33333333 203.33333333 203.33333333 ... 225.33333333 225.33333333
 225.33333333]
...
[212.          212.          212.          ... 220.66666667 220.66666667
 220.66666667]
[212.          212.          212.          ... 220.66666667 220.66666667
 220.66666667]
[212.          212.          212.          ... 220.66666667 220.66666667
 220.66666667]]
```

# Secara Matematis :

$$\begin{bmatrix} [ [ 200 \ 206 \ 204 ] \\ [ 200 \ 206 \ 204 ] \\ [ 200 \ 206 \ 204 ] ] \end{bmatrix}$$



$$\begin{bmatrix} [ [ 203,333 \ 33333333 ] ] \end{bmatrix}$$

$$\frac{200+206+204}{3} = 203,333$$

Pada Average matrix dioperasikan  
baris per baris

# METODE 3 LUMINOSITY

mengalikan setiap nilai R, G, dan B dengan konstanta tertentu yang sudah ditetapkan nilainya, kemudian hasil perkalian seluruh nilai R, G, B dijumlahkan satu sama lain. Rumus matematisnya adalah:

$$\text{Cara 1} = (0.299 \times R) + (0.587 \times G) + (0.114 \times B)$$

$$\text{Cara 2} = (0.2126 \times R) + (0.7152 \times G) + (0.0722 \times B)$$

**Matrix Lumonisty** ➤➤➤➤

## HASIL MATRIX MENGGUNAKAN CARA 1

```
[[142.942 142.942 142.942 ... 171.942 171.942 171.942]
 [142.942 142.942 142.942 ... 171.942 171.942 171.942]
 [142.942 142.942 142.942 ... 171.942 171.942 171.942]
 ...
 [ 90.238  90.238  88.238 ...  98.623  96.993  95.993]
 [ 89.238  88.238  87.238 ...  96.623  96.623  96.623]
 [ 87.238  87.238  86.238 ...  96.623  96.623  98.623]]
```

## HASIL MATRIX MENGGUNAKAN CARA 2

```
[[143.0562 143.0562 143.0562 ... 172.0562 172.0562 172.0562]
 [143.0562 143.0562 143.0562 ... 172.0562 172.0562 172.0562]
 [143.0562 143.0562 143.0562 ... 172.0562 172.0562 172.0562]
 ...
 [ 91.0184  91.0184  89.0184 ...  94.9522  93.233   92.233 ]
 [ 90.0184  89.0184  88.0184 ...  92.9522  92.9522  92.9522]
 [ 88.0184  88.0184  87.0184 ...  92.9522  92.9522  94.9522]]
```

# CARA 1

MATRIX SAMPEL KE-1

```
[147 143 132]  
[147 143 132]  
[147 143 132]
```

$$\begin{aligned}\text{CARA 1} &= (0.299 \times 147) + (0.587 \times 143) + (0.114 \times 132) \\ &= (43,953) + (83,941) + (15,048) \\ &= (142,942)\end{aligned}$$



```
[[142.942 142.942 142.942  
 [142.942 142.942 142.942  
 [142.942 142.942 142.942
```

## CARA 2

MATRIX SAMPEL KE-1

```
[147 143 132]
[147 143 132]
[147 143 132]
```

$$\begin{aligned}\text{CARA 2} &= (0.2126 \times 147) + (0.7152 \times 143) + (0.0722 \times 132) \\ &= (43,953) + (83,941) + (15,048) \\ &= (142,942)\end{aligned}$$



```
[[143.0562 143.0562 143.0562
  [143.0562 143.0562 143.0562
  [143.0562 143.0562 143.0562
```

## HASIL MATRIX MENGGUNAKAN CARA 1

```
[[206.756 204.756 204.756 ... 206.066 206.066 207.066]
 [205.756 204.756 204.756 ... 206.066 206.066 206.066]
 [205.756 204.756 204.756 ... 207.066 207.066 207.066]
 ...
 [142.107 141.107 142.107 ... 144.836 144.836 143.836]
 [144.107 142.107 143.107 ... 145.836 144.836 144.836]
 [141.107 142.107 145.107 ... 144.836 144.836 143.836]]
```

## HASIL MATRIX MENGGUNAKAN CARA 2

```
[[207.4808 205.4808 205.4808 ... 206.4034 206.4034 207.4034]
 [206.4808 205.4808 205.4808 ... 206.4034 206.4034 206.4034]
 [206.4808 205.4808 205.4808 ... 207.4034 207.4034 207.4034]
 ...
 [142.592 141.592 142.592 ... 145.4436 145.4436 144.4436]
 [144.592 142.592 143.592 ... 146.4436 145.4436 145.4436]
 [141.592 142.592 145.592 ... 145.4436 145.4436 144.4436]]
 [[207.4808 206.4808 206.4808 ... 142.592 144.592 141.592 ]
 [205.4808 205.4808 205.4808 ... 141.592 142.592 142.592 ]
 [205.4808 205.4808 205.4808 ... 142.592 143.592 145.592 ]
 ...
 [206.4034 206.4034 207.4034 ... 145.4436 146.4436 145.4436]
 [206.4034 206.4034 207.4034 ... 145.4436 145.4436 145.4436]
 [207.4034 206.4034 207.4034 ... 144.4436 145.4436 144.4436]]]
```

# CARA 1

MATRIX SAMPEL KE-1

[190 210 234]
[188 208 232]
[188 208 232]

$$\begin{aligned} \text{CARA 1} &= (0.299 \times 190) + (0.587 \times 210) + (0.114 \times 234) \\ &= (206,756) \\ &= (0.299 \times 188) + (0.587 \times 208) + (0.114 \times 232) \\ &= (204,756) \end{aligned}$$



[[206.756 204.756 204.756]]

PERHATIKAN OUTPUT DARI MATRIKS SAMPEL KE 1 PADA GAMBAR DI ATAS  
OUTPUTNYA MELIPUTI (206.756),(204.756), DAN (204.756).  
CARA PEMBACAAN MATRIKS DILAKUKAN PERBARIS( KIRI KE KANAN)

## CARA 2

MATRIX SAMPEL KE-1

[190	210	234]
[188	208	232]
[188	208	232]



$$\begin{aligned} \text{CARA 2} &= (0.2126 \times 190) + (0.7152 \times 210) + (0.0722 \times 234) \\ &= (207,4808) \\ &= (0.2126 \times 188) + (0.7152 \times 208) + (0.0722 \times 232) \\ &= (205,4808) \end{aligned}$$

[[207.4808 205.4808 205.4808 .
--------------------------------

## HASIL MATRIX MENGGUNAKAN CARA 1

```
[[204.58 204.58 204.58 ... 224.9318 224.9318 224.9318]
 [204.58 204.58 204.58 ... 224.9318 224.9318 224.9318]
 [204.58 204.58 204.58 ... 224.9318 224.9318 224.9318]
 ...
 [213.9066 213.9066 213.9066 ... 221.0682 221.0682 221.0682]
 [213.9066 213.9066 213.9066 ... 221.0682 221.0682 221.0682]
 [213.9066 213.9066 213.9066 ... 221.0682 221.0682 221.0682]]
```

## HASIL MATRIX MENGGUNAKAN CARA 2

```
[[183.0476 183.0476 183.0476 ... 201.6388 201.6388 201.6388]
 [183.0476 183.0476 183.0476 ... 201.6388 201.6388 201.6388]
 [183.0476 183.0476 183.0476 ... 201.6388 201.6388 201.6388]
 ...
 [193.4128 193.4128 193.4128 ... 198.6016 198.6016 198.6016]
 [193.4128 193.4128 193.4128 ... 198.6016 198.6016 198.6016]
 [193.4128 193.4128 193.4128 ... 198.6016 198.6016 198.6016]]
```

# CARA 1

MATRIX SAMPEL KE-1

```
[[200 206 204]
 [200 206 204]
 [200 206 204]]
```

$$\begin{aligned}\text{CARA } 1' &= (0.2126 \times 200) + (0.7152 \times 206) + (0.0722 \times 204) \\ &= (42,52) + (147,3312) + (14,7288) \\ &= (204,58)\end{aligned}$$



```
[[204.58 204.58 204.58]
 [204.58 204.58 204.58]
 [204.58 204.58 204.58]]
```

# CARA 2

MATRIX SAMPEL KE-1

```
[[200 206 204]
 [200 206 204]
 [200 206 204]]
```

$$\begin{aligned}\text{CARA 2} &= (0.299 \times 200) + (0.587 \times 206) + (0.114 \times 204) \\ &= (59,8) + (120,922) + (23,256) \\ &= (203,978)\end{aligned}$$



```
[[203.978 203.978 203.978]
 [203.978 203.978 203.978]
 [203.978 203.978 203.978]]
```

# HASIL GAMBAR



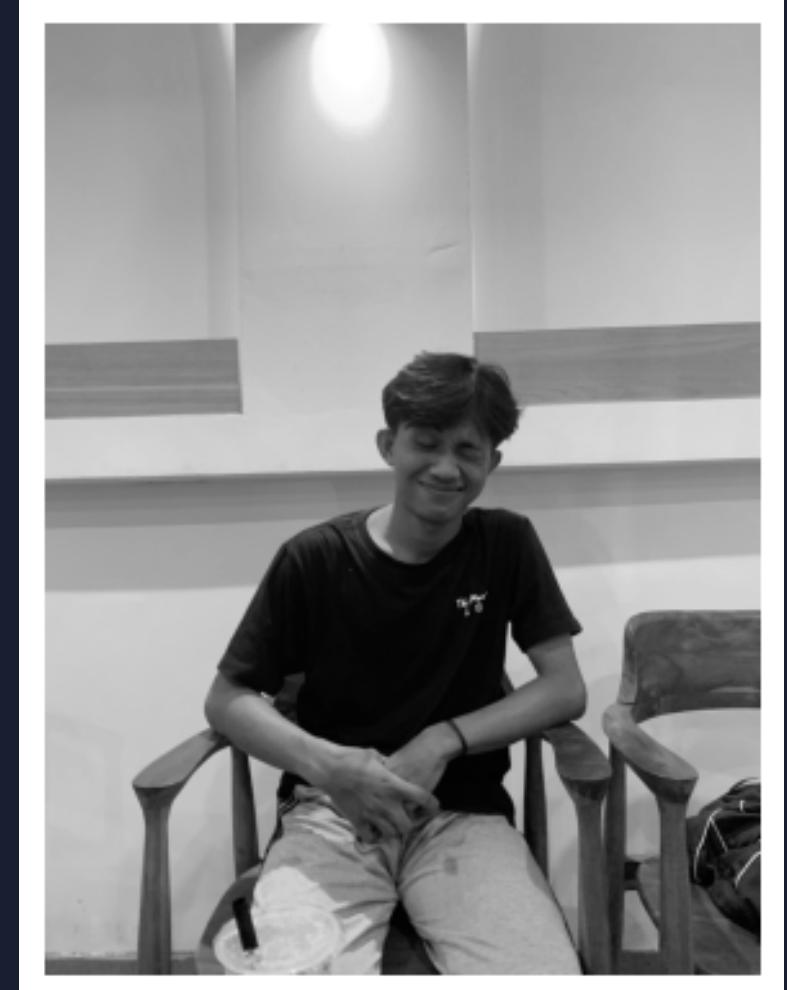
METODE  
WEIGHTED AVERAGE



METODE  
AVERAGE



METODE  
LIGHTNESS



METODE  
LUMONISITY

# HASIL GAMBAR



METODE  
LIGHTNESS



METODE  
AVERAGE



METODE  
LUMONISITY

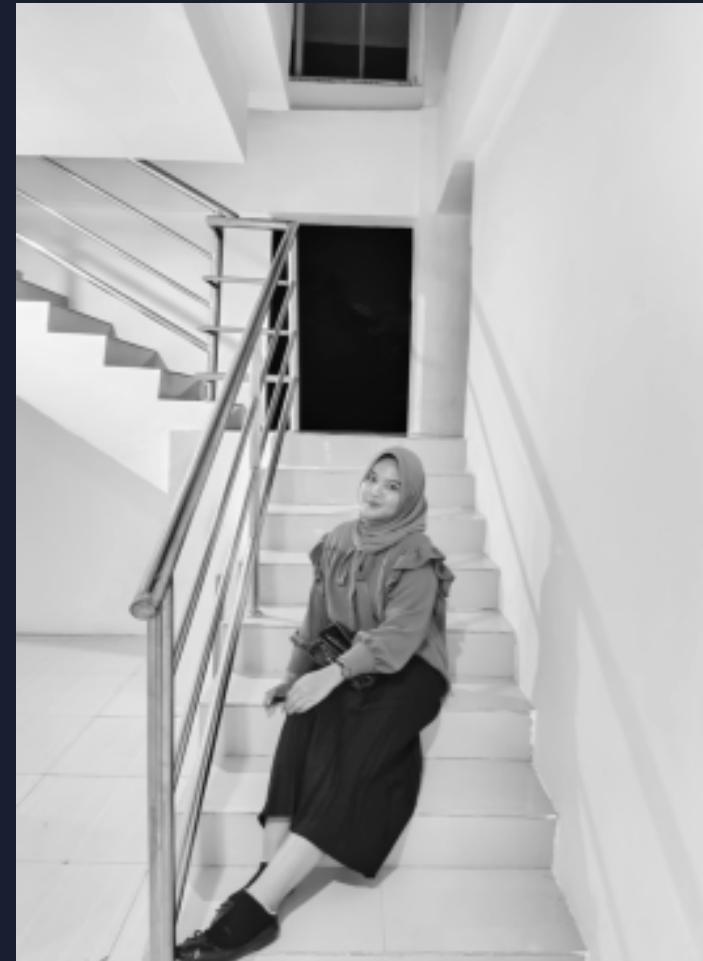


METODE  
WEIGHTED AVERAGE

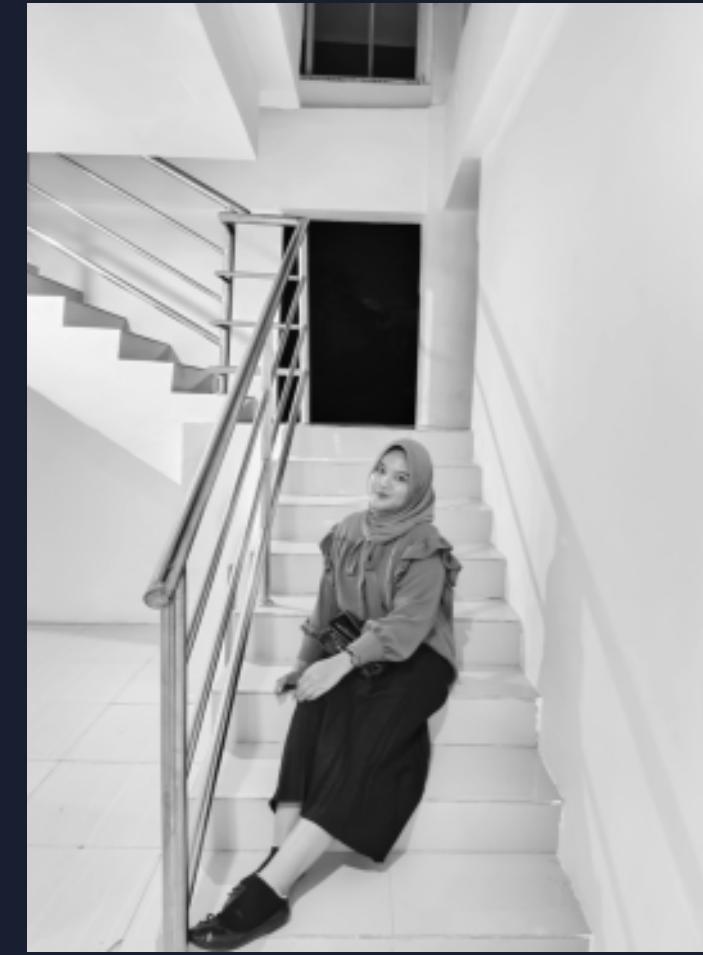
# HASIL GAMBAR



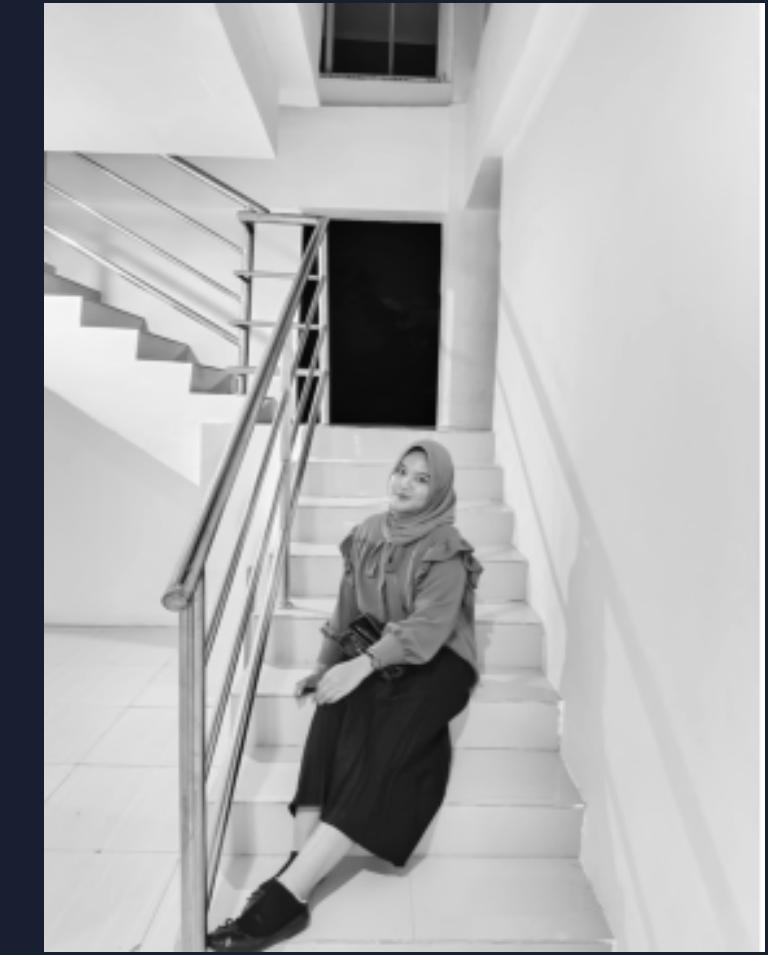
METODE  
LIGHTNESS



METODE  
AVERAGE



METODE  
LUMONISITY



METODE  
WEIGHTED AVERAGE

# KESIMPULAN

HASIL KESIMPULAN DARI KELOMPOK KAMI BERDASARKAN 3 METODE TERSEBUT, METODE LIGHTNESS YANG JAUH LEBIH BAIK DARI SEGI ASPEK CAHAYA YANG MEMBUATNYA LEBIH UNGGUL DAN NAMPAK LEBIH MENDOMINASI DARI SEGI TAMPILAN.