

# COMPUTER VISION

## INTRODUCTION TO IMAGES

This video lecture focuses on understanding:

# AGENDA

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- What are images and how they are formed ?

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- What are images and how they are formed ?
- What are pixels ?

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This video lecture focuses on understanding:

- What are images and how they are formed ?
- What are pixels ?
- What are color channels ?

## 1. IMAGE - A DEEP DIVE

Let us understand how a computer displays the image by preserving the essence of the information captured within the image.

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## 2. PIXEL – SMALLEST FRAGMENT OF AN IMAGE

An image can be broken into pixels as its smallest fragment. Let us understand what is a pixel and how it can be used to form an image.

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## 3. IMAGES & CHANNELS

An image can be of black & white format or colored format or an high definition [HD] format. Let us understand how these images are computed and displayed using channels.

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## 4. WORKING WITH IMAGES ON PYTHON

Let us simulate all the above topics all the above topics and

## 1. IMAGE A DEEP DIVE

Black & shades of gray image



## 1. IMAGE A DEEP DIVE

Black & shades of gray image



Black & white image

## 1. IMAGE A DEEP DIVE

Black & shades of gray image



Black, shades of gray & white image



Black & white image

## 1. IMAGE A DEEP DIVE

Color image



# 1. IMAGE A DEEP DIVE

Color image



Multi colored image

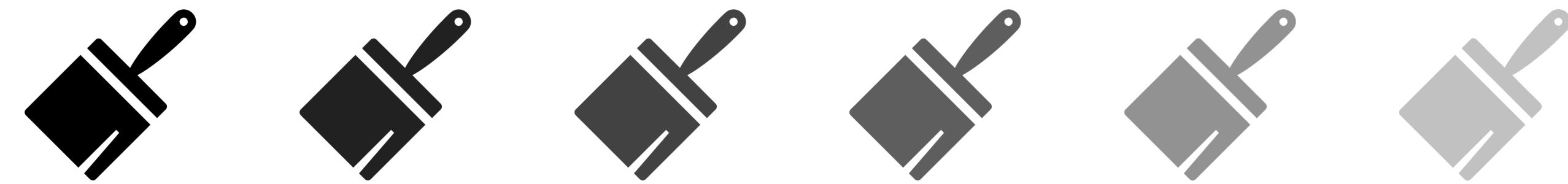
## 1. IMAGE A DEEP DIVE



An image is made of many colors combining together

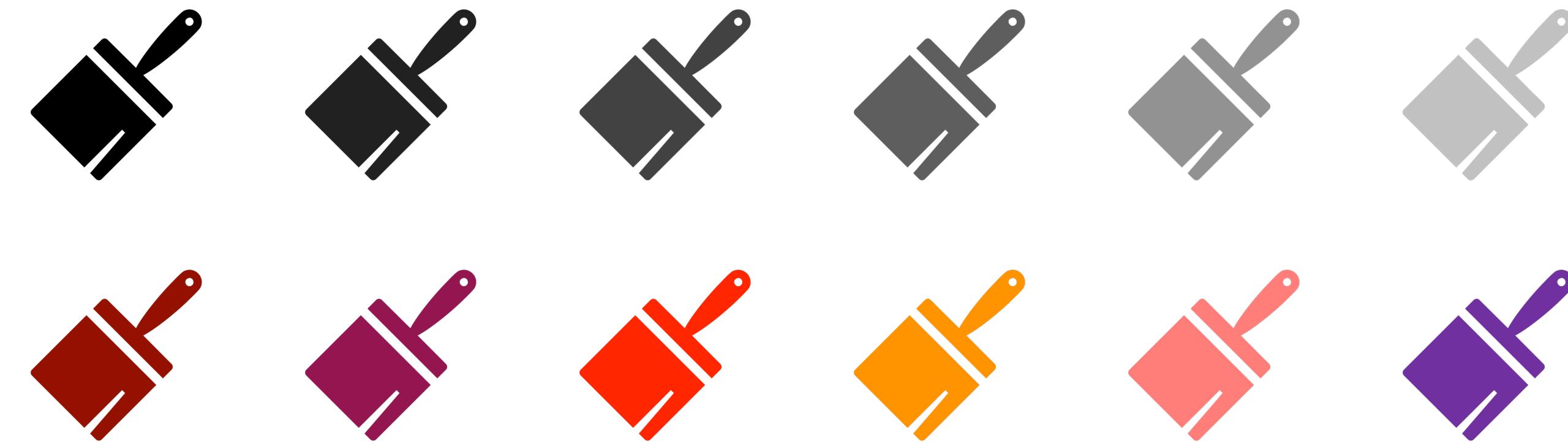
## 1. IMAGE A DEEP DIVE

An image is made of many colors combining together



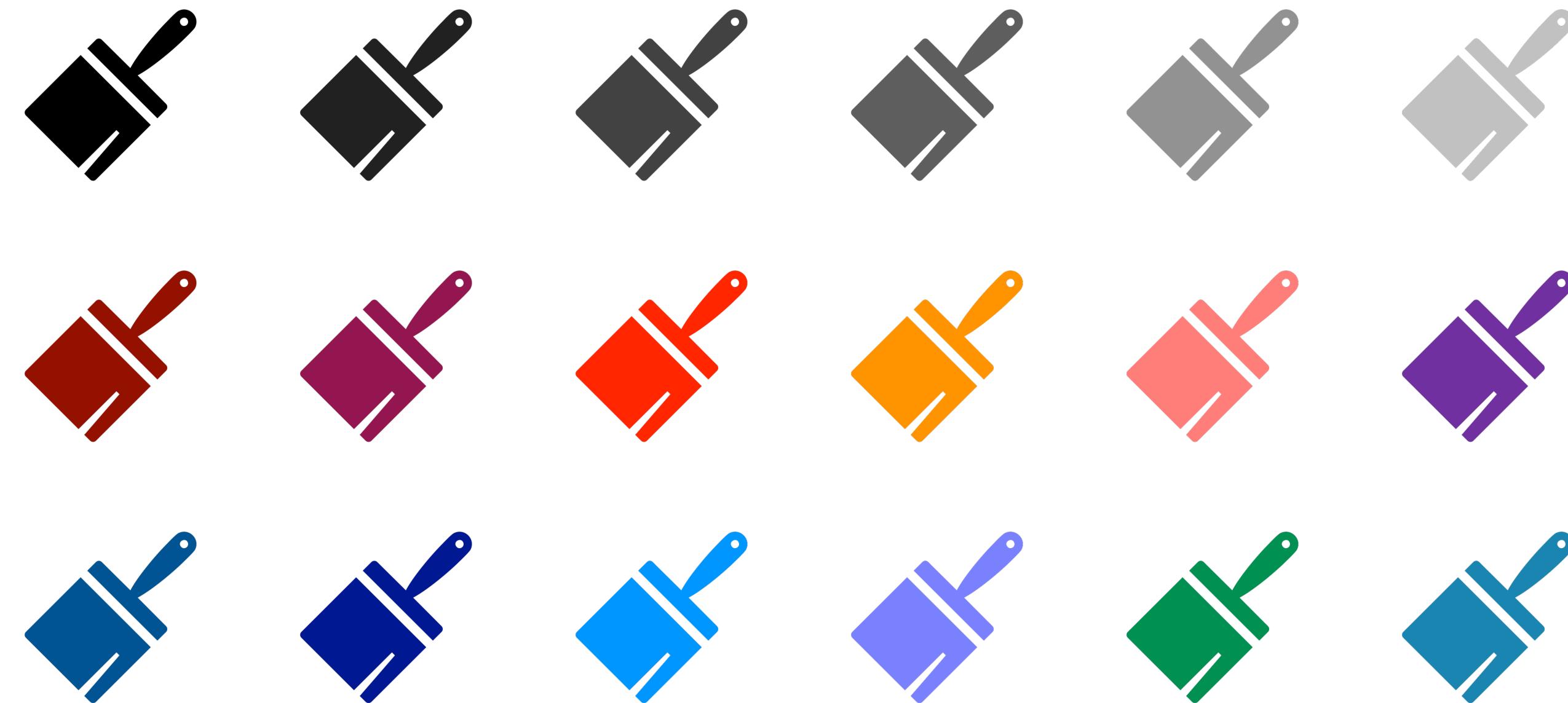
## 1. IMAGE A DEEP DIVE

An image is made of many colors combining together



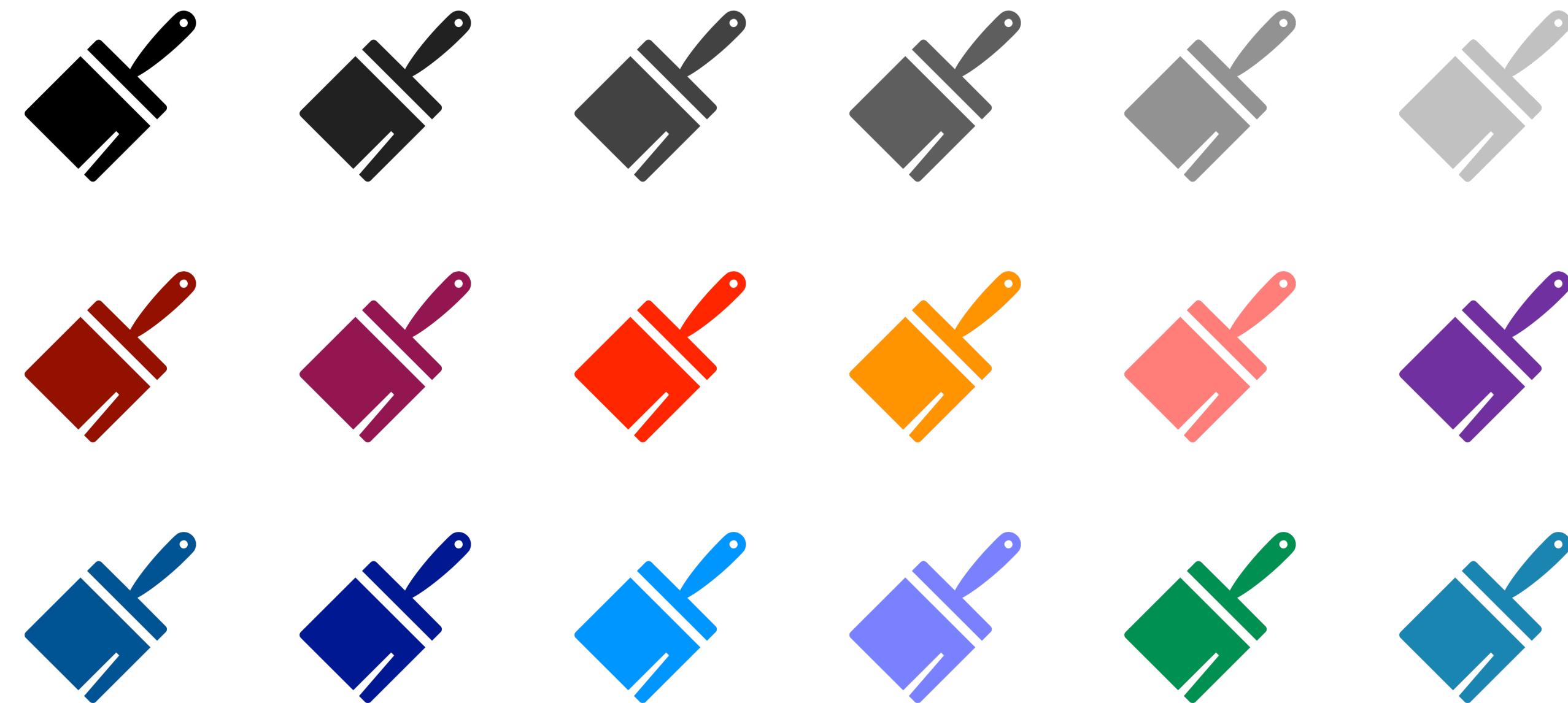
## 1. IMAGE A DEEP DIVE

An image is made of many colors combining together



## 1. IMAGE A DEEP DIVE

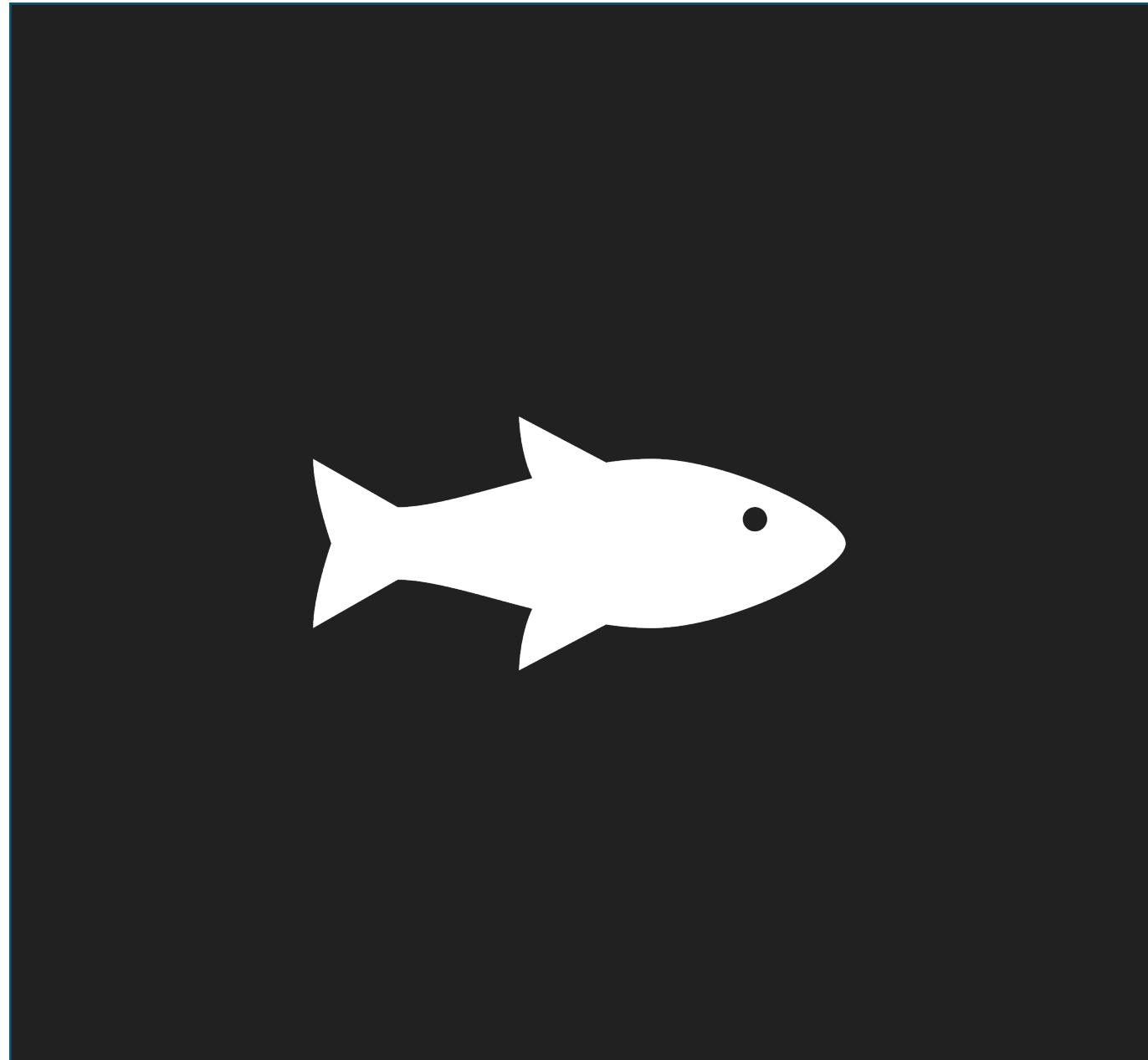
An image is made of many colors combining together



and many more shades . . . . .

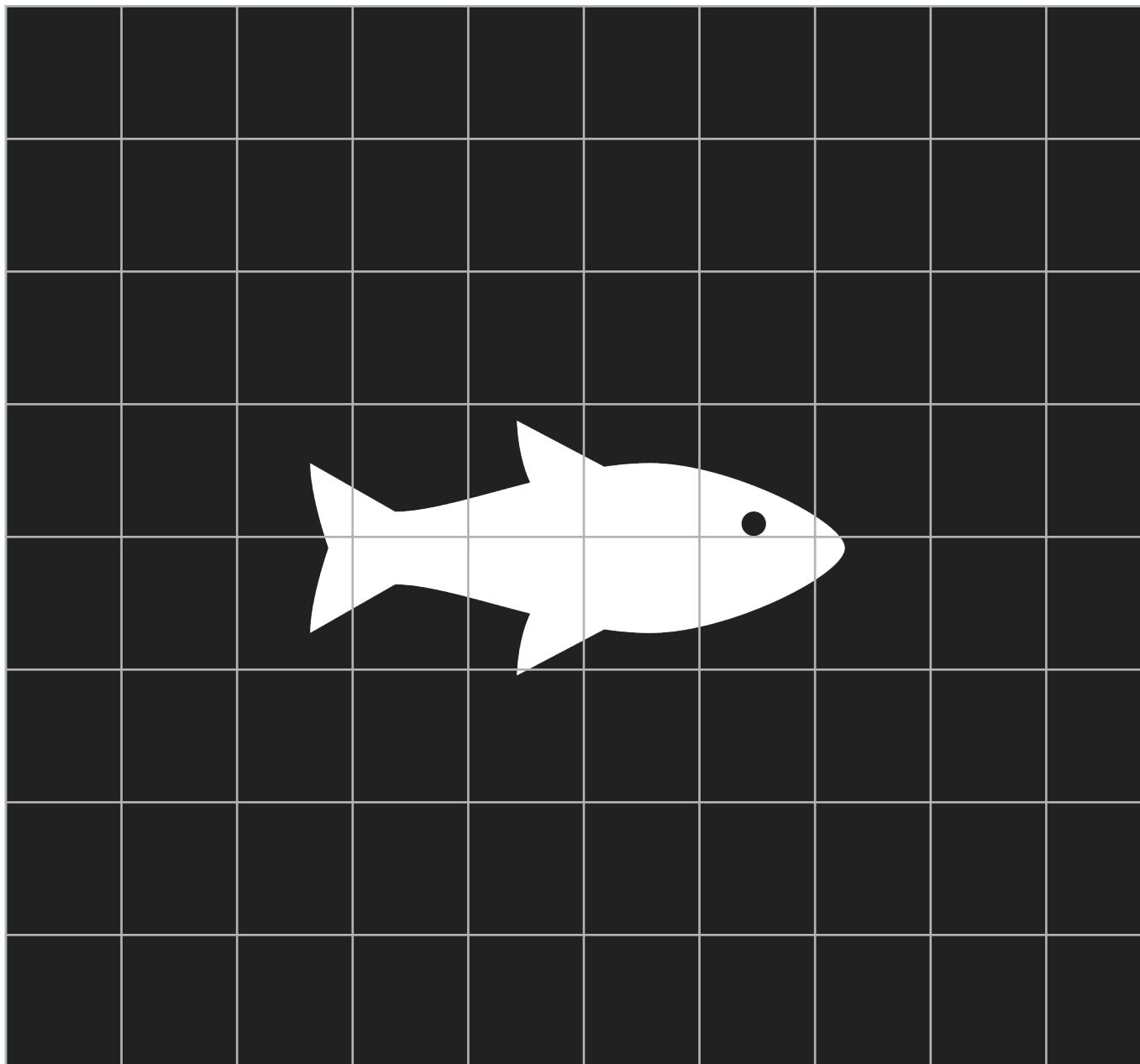
## 2. PIXEL – SMALLEST FRAGMENT OF AN IMAGE

Let us use a black and white image of a fish



## 2. PIXEL – SMALLEST FRAGMENT OF AN IMAGE

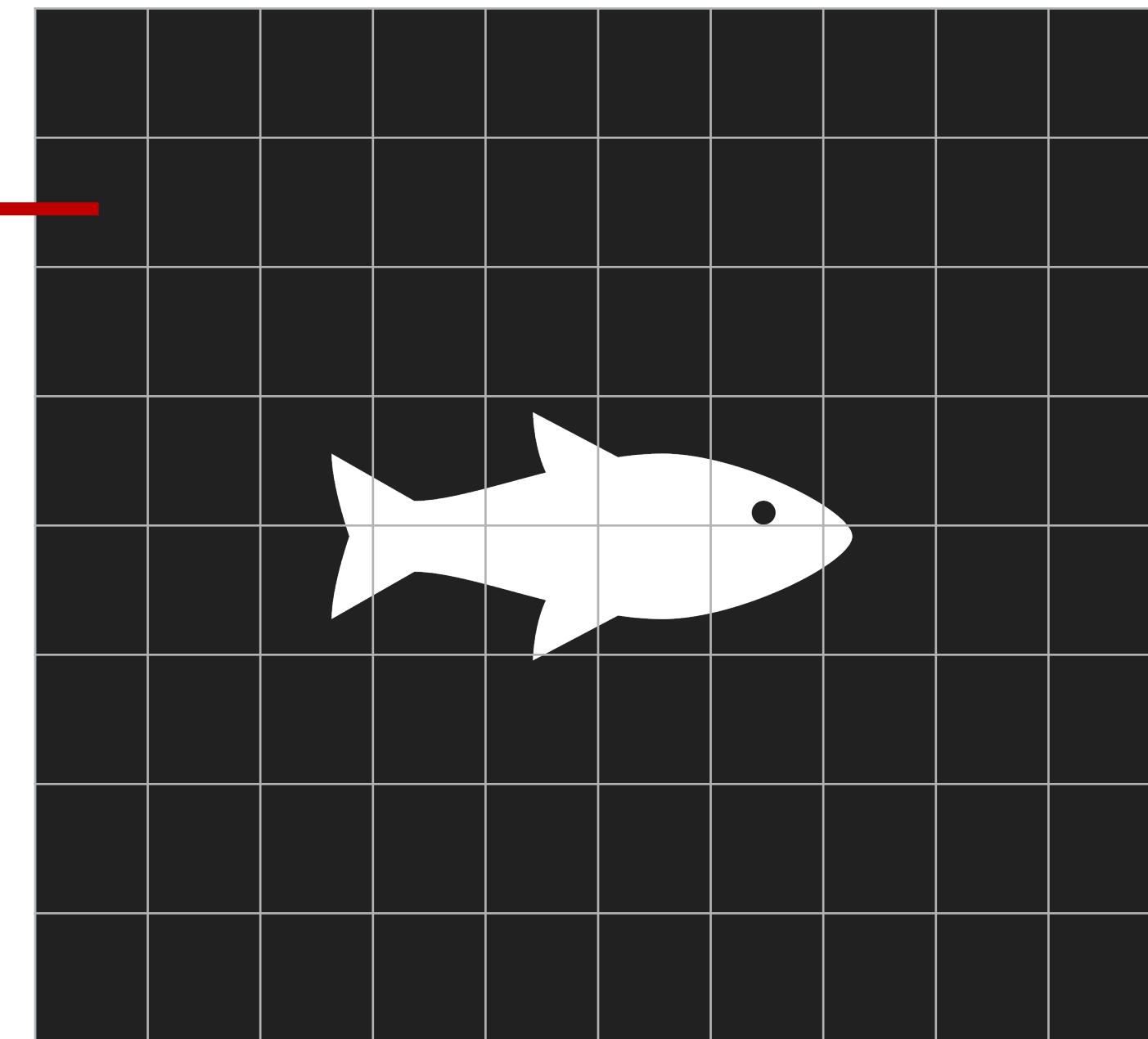
Image can be divided into fragments which represent a color



## 2. PIXEL – SMALLEST FRAGMENT OF AN IMAGE

Each fragment representing a color is called PIXEL

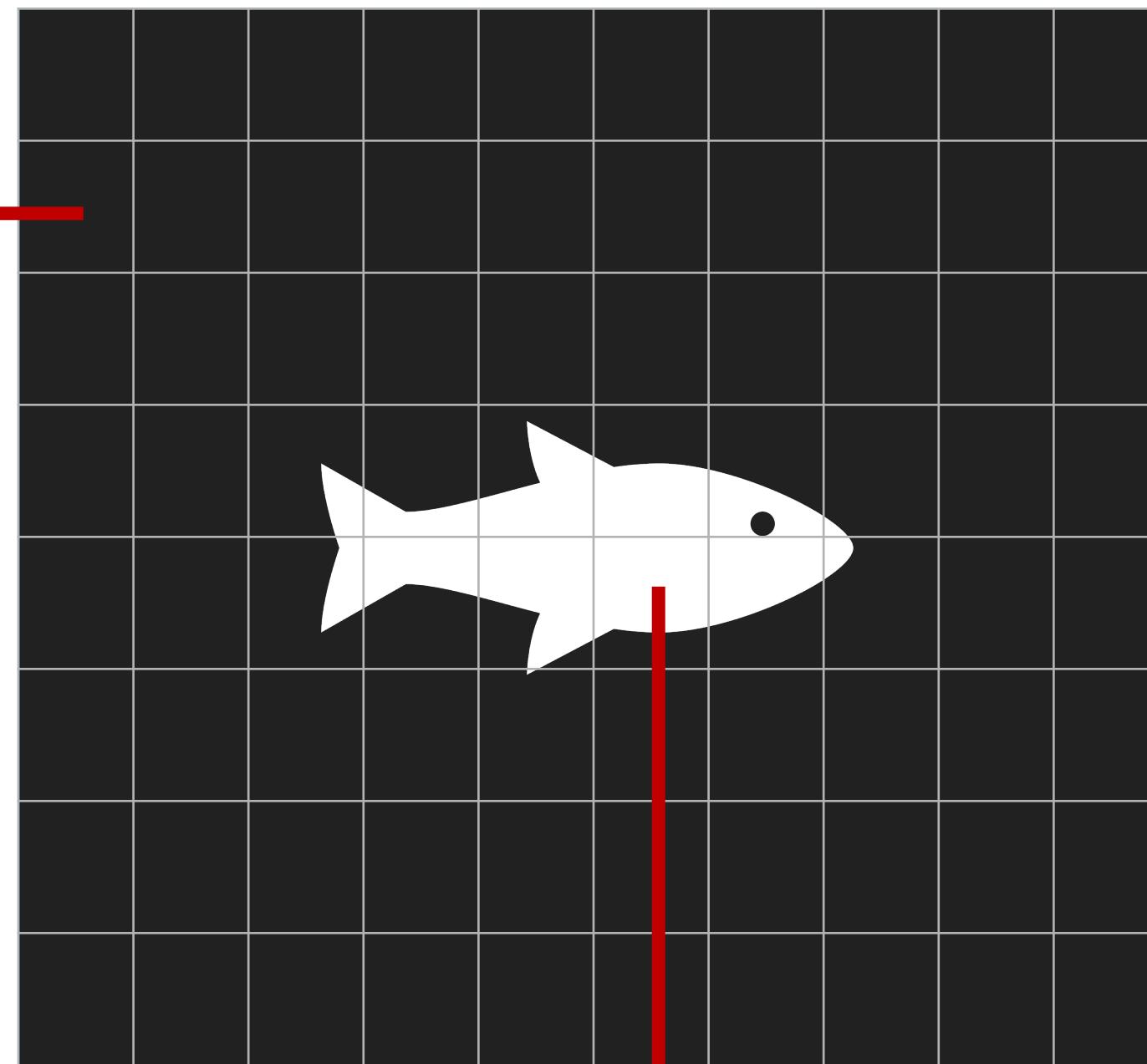
Black Pixel



## 2. PIXEL – SMALLEST FRAGMENT OF AN IMAGE

Each fragment representing a color is called PIXEL

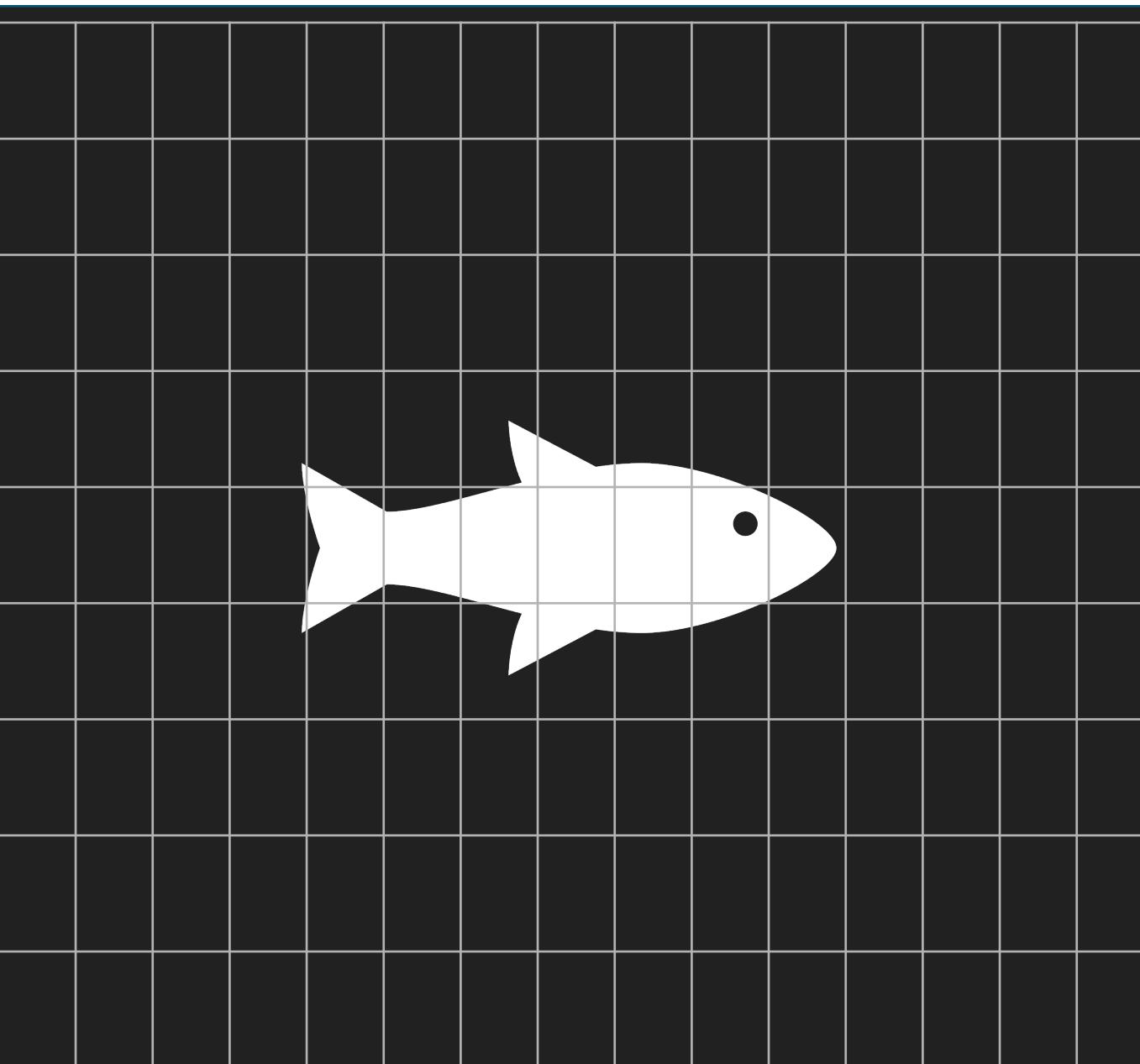
Black Pixel



White Pixel

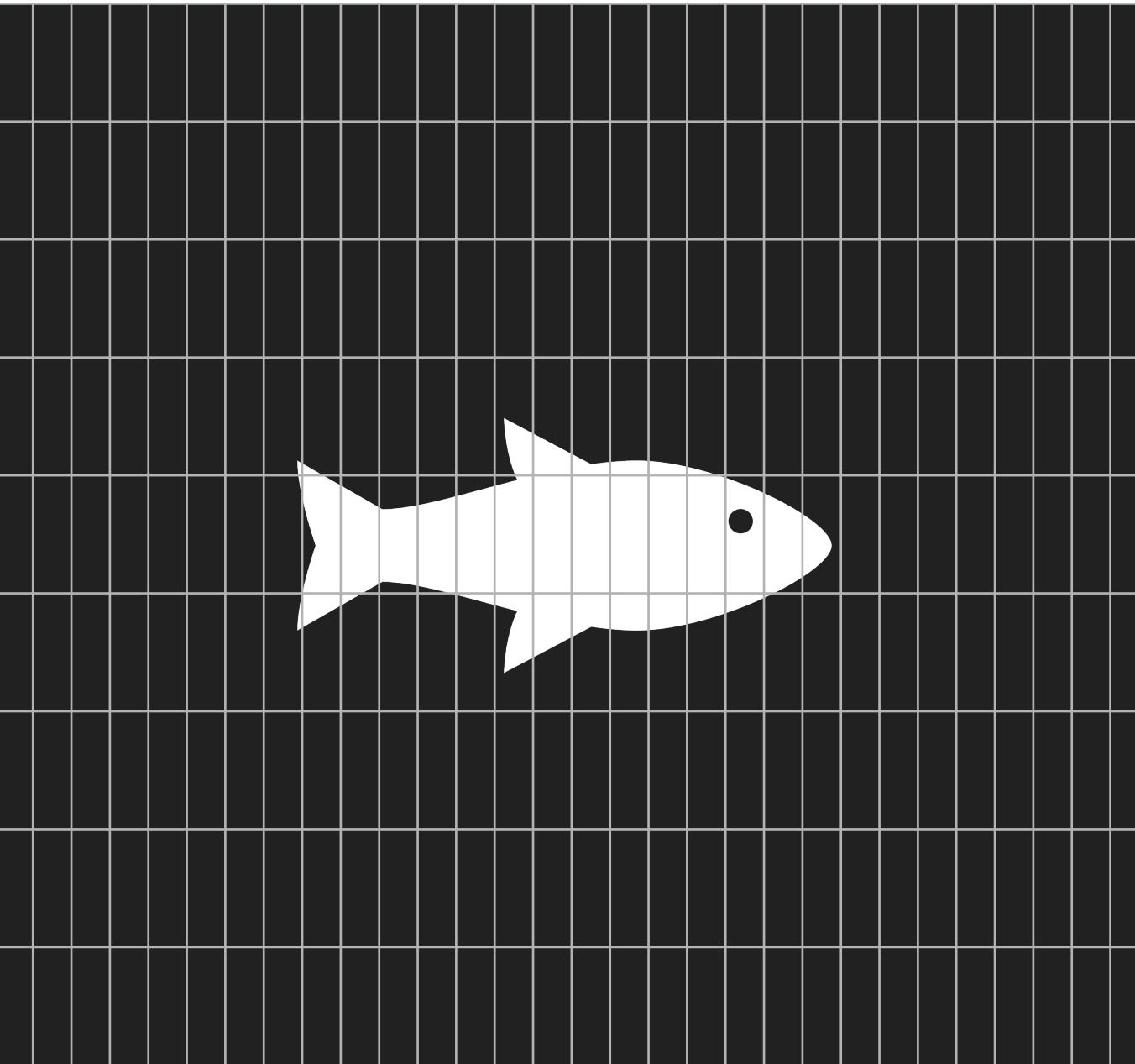
## 2. PIXEL – SMALLEST FRAGMENT OF AN IMAGE

Let us increase number of fragments



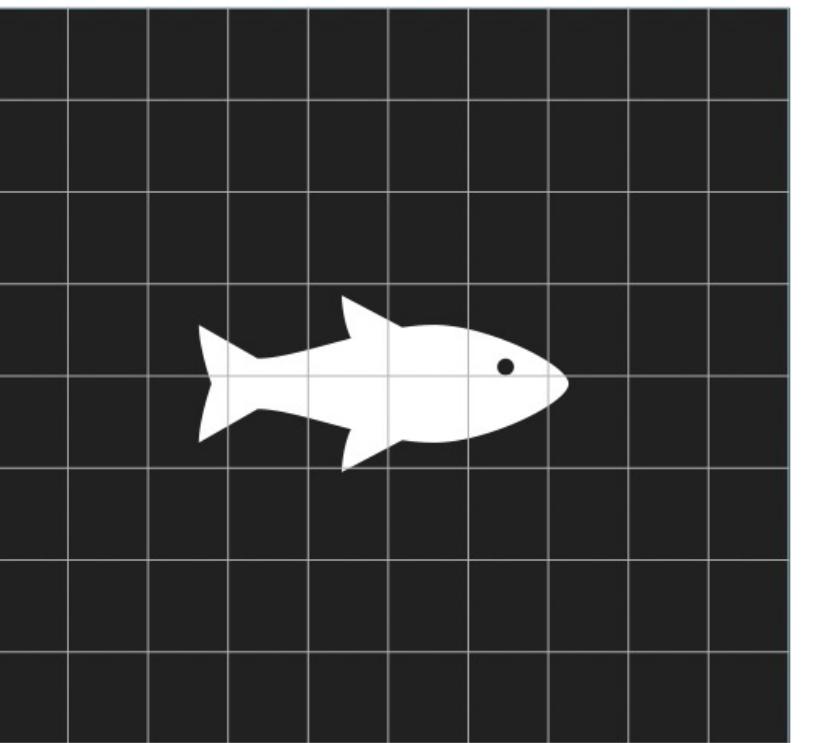
## 2. PIXEL – SMALLEST FRAGMENT OF AN IMAGE

Let us increase number of fragments



## 2. PIXEL – SMALLEST FRAGMENT OF AN IMAGE

Sample 1



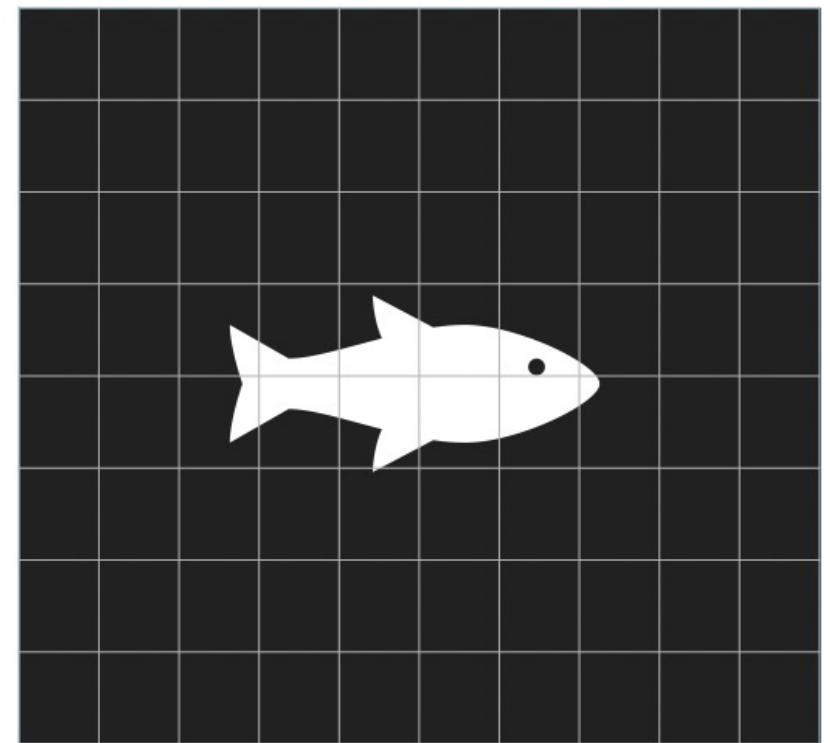
Rows = 8

Columns = 10

80 pixels

## 2. PIXEL – SMALLEST FRAGMENT OF AN IMAGE

Sample 1

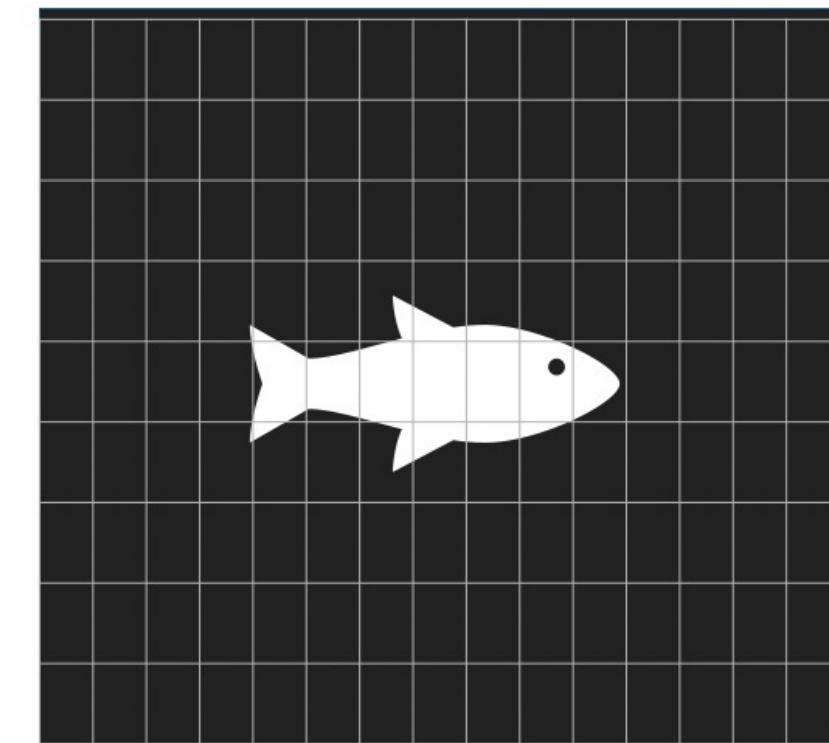


Rows = 8

Columns = 10

80 pixels

Sample 2



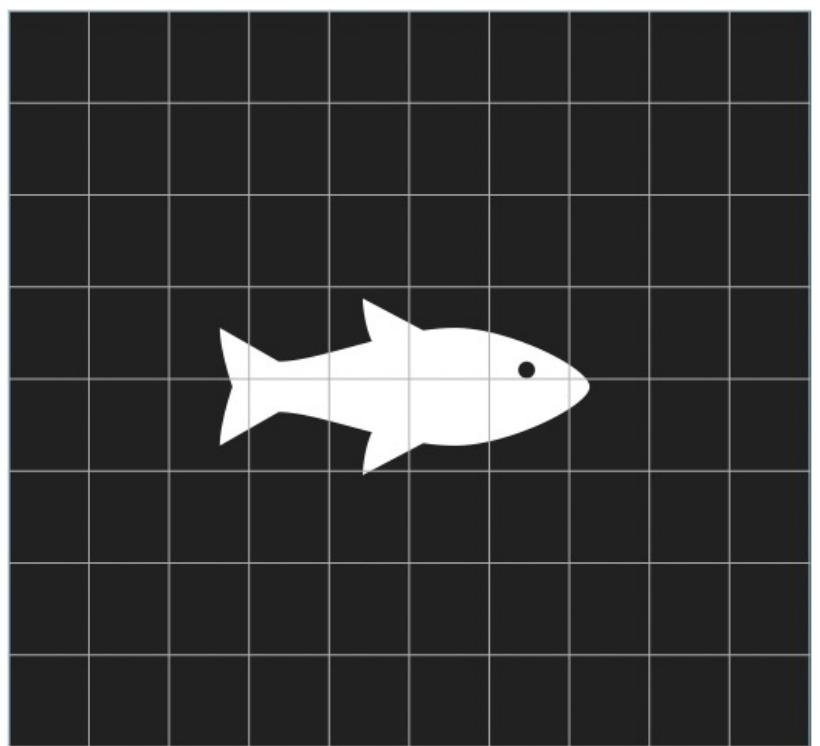
Rows = 10

Columns = 20

200 pixels

## 2. PIXEL – SMALLEST FRAGMENT OF AN IMAGE

Sample 1

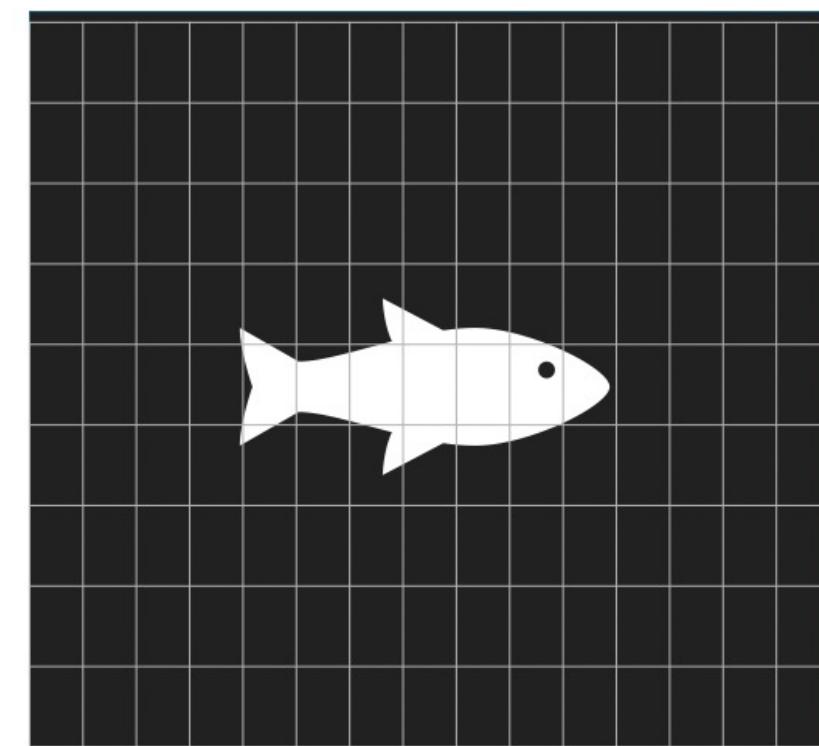


Rows = 8

Columns = 10

80 pixels

Sample 2

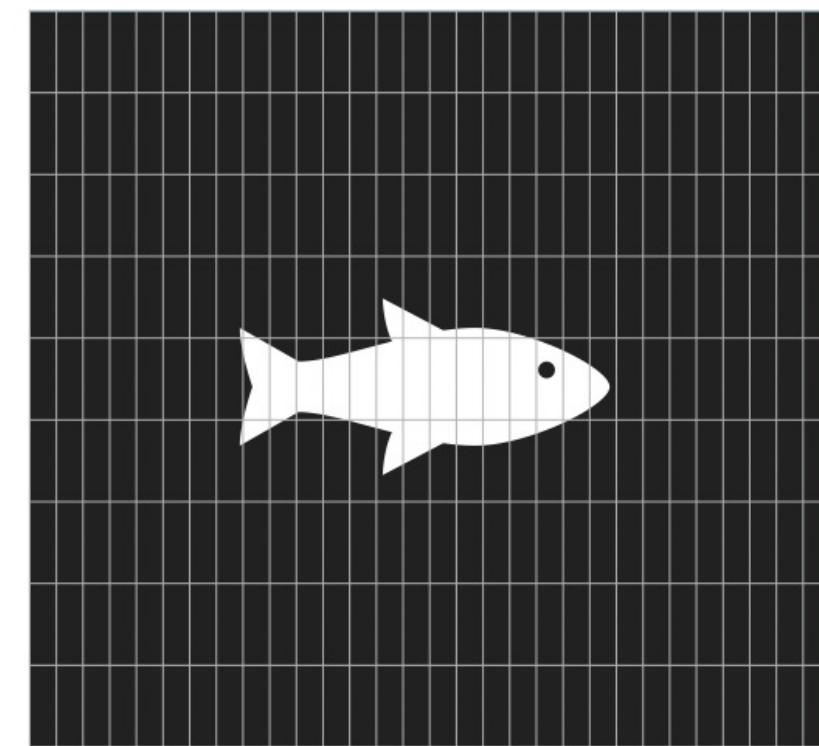


Rows = 9

Columns = 20

180 pixels

Sample 3



Rows = 9

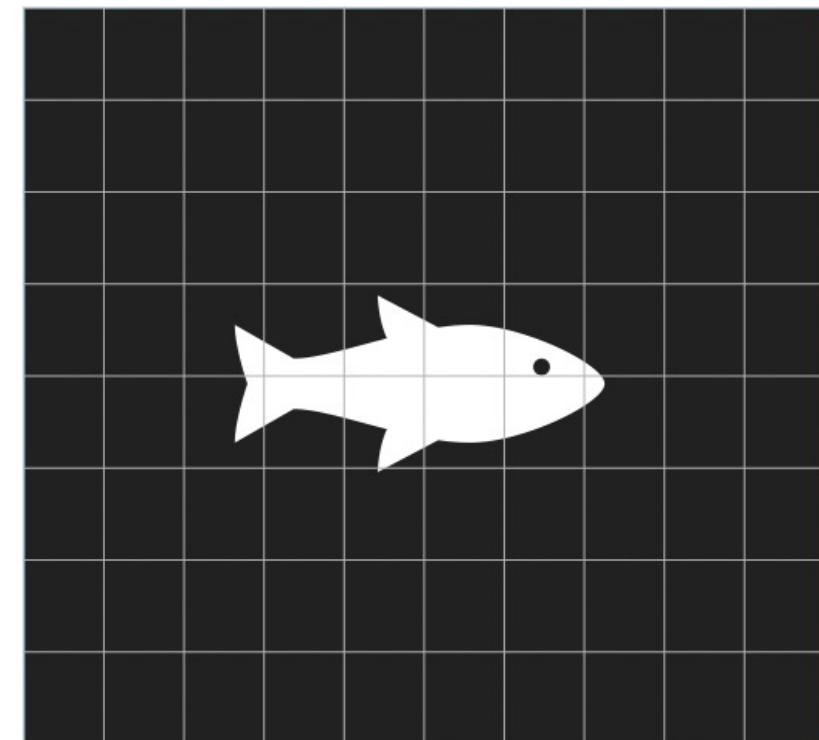
Columns = 40

360 pixels

## 2. PIXEL – SMALLEST FRAGMENT OF AN IMAGE

Compare all three images using computation and clarity

Sample 1

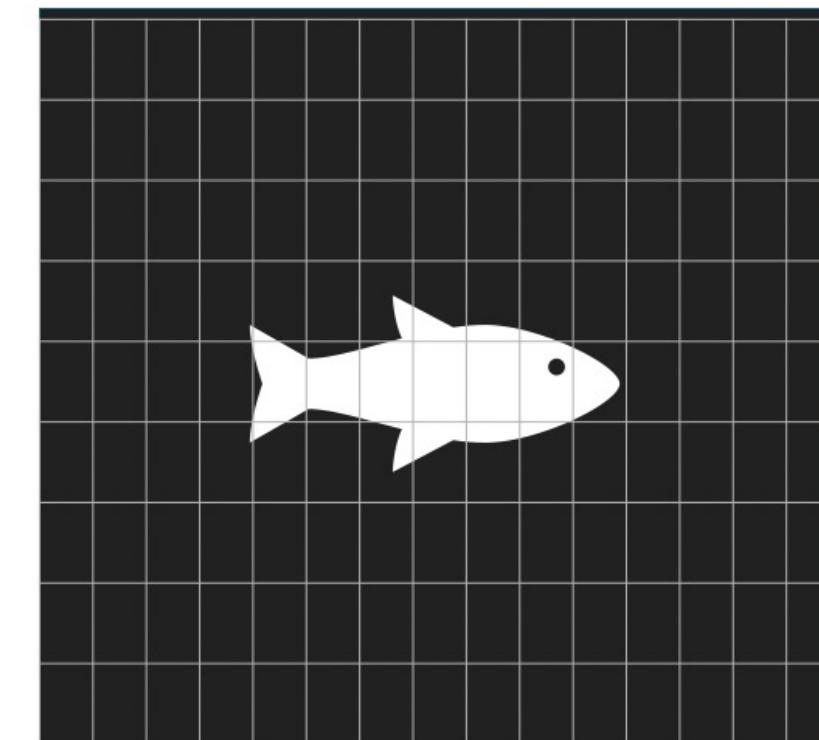


Rows = 8

Columns = 10

80 pixels

Sample 2

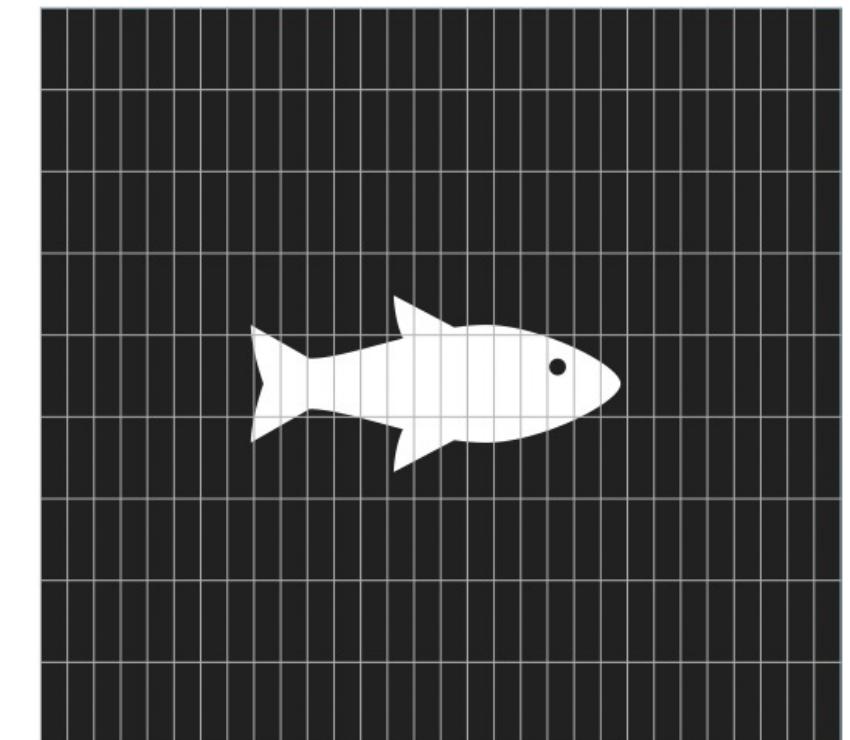


Rows = 9

Columns = 20

180 pixels

Sample 3



Rows = 9

Columns = 40

360 pixels

### 3. IMAGES & CHANNELS

1 Channel image



### 3. IMAGES & CHANNELS

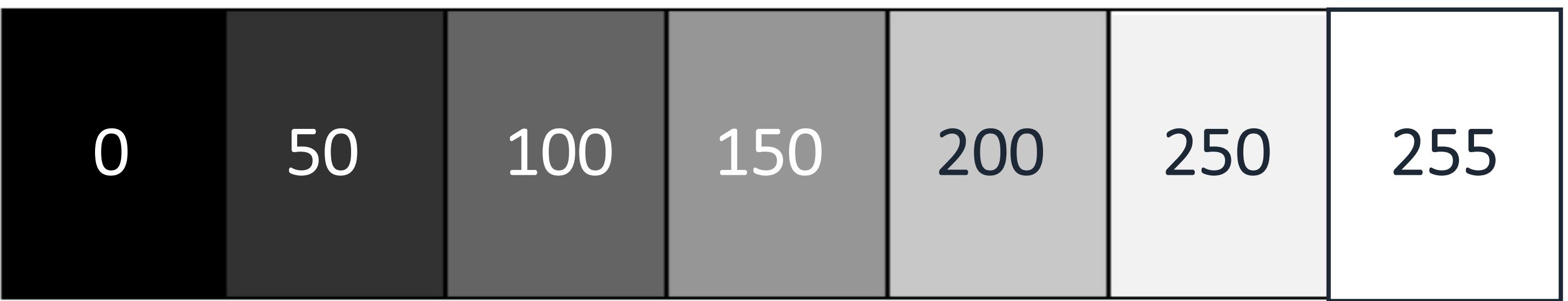
1 Channel image



3 Channel image

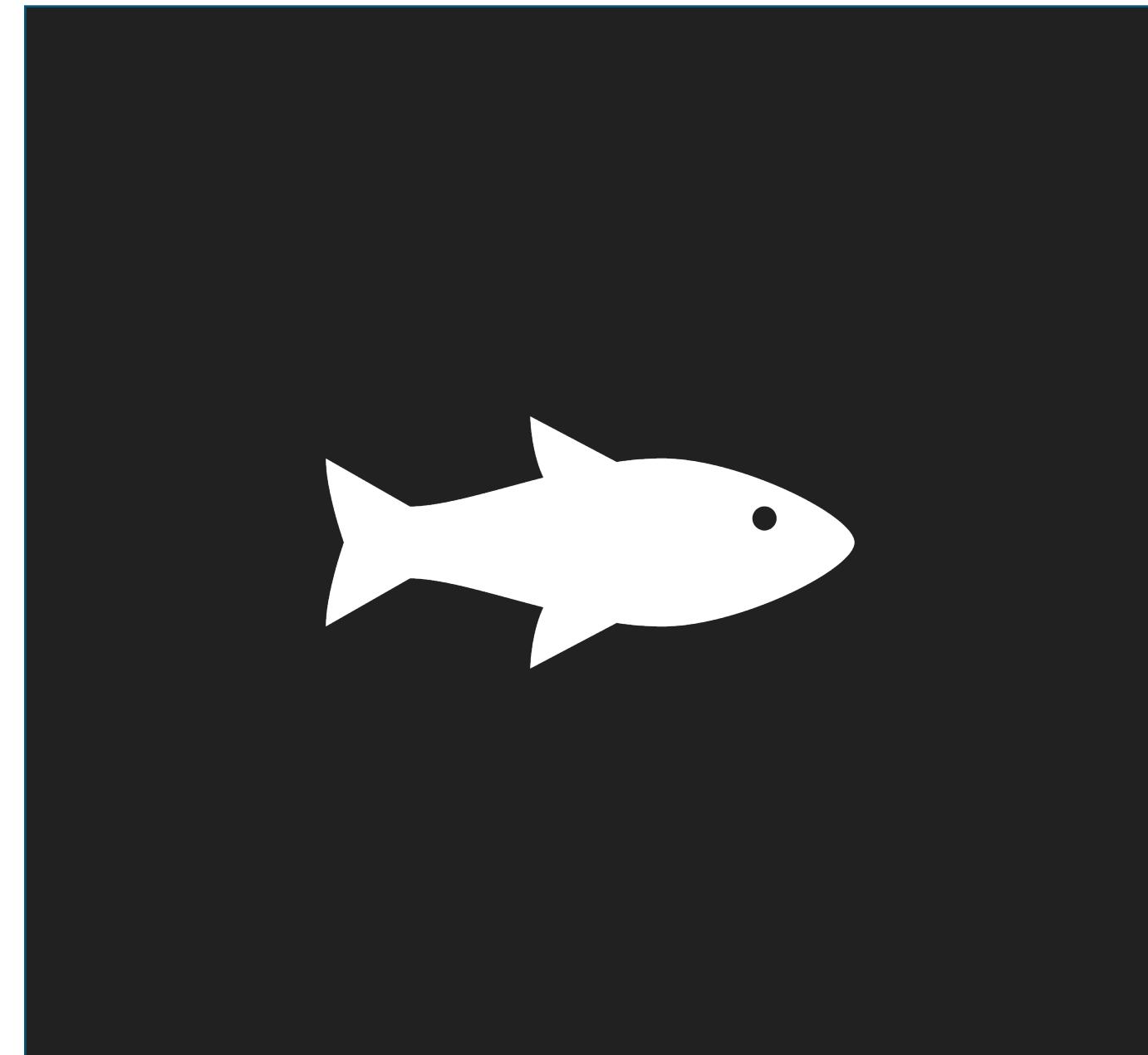
### 3. IMAGES & CHANNELS

Each color has a number representing it on the computer.



### 3. IMAGES & CHANNELS

This is how image looks to a human



### 3. IMAGES & CHANNELS

This is how image looks to a computer

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	255	255	255	255	255	255	0	0
0	0	255	255	255	255	255	255	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

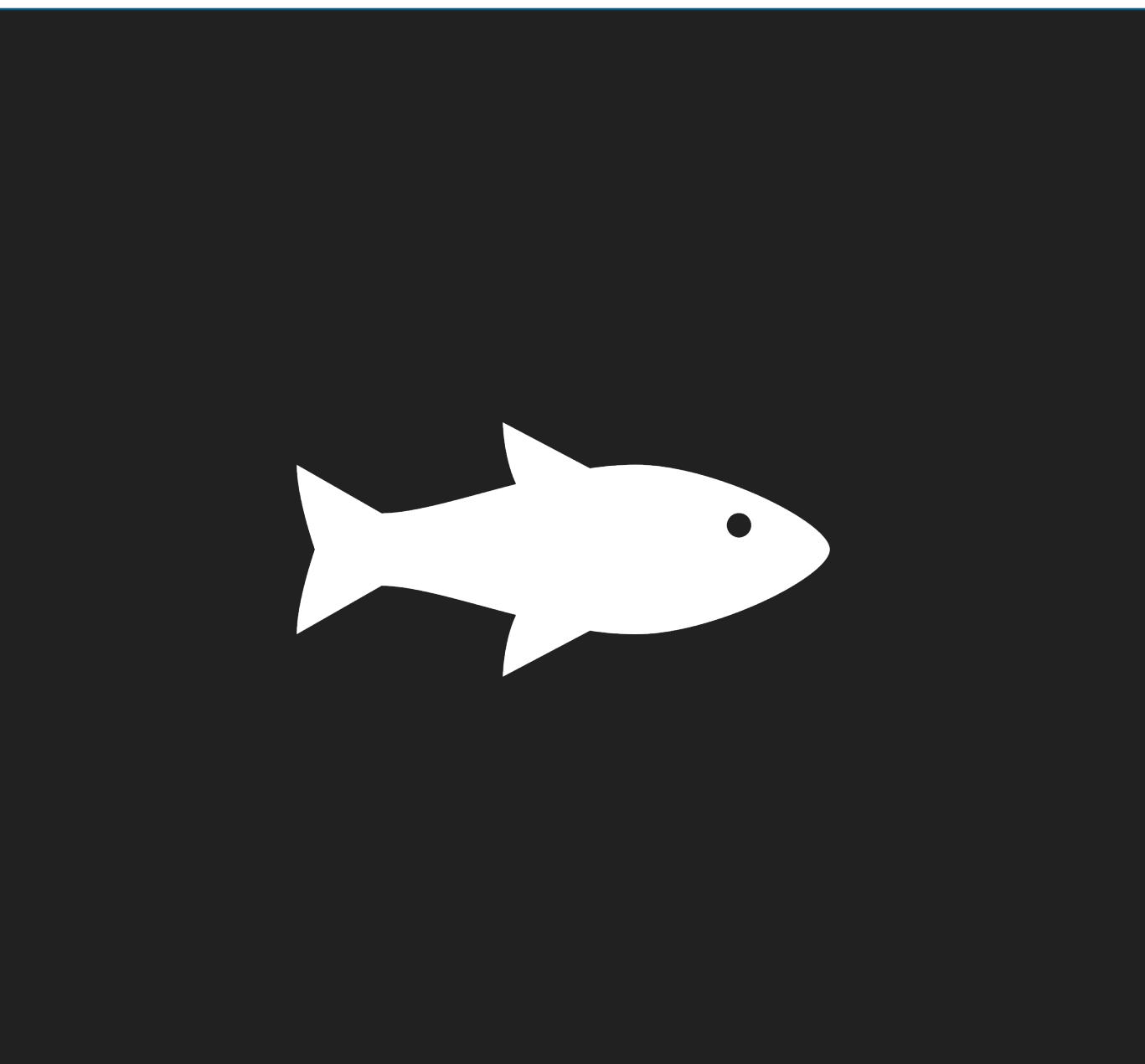
### 3. IMAGES & CHANNELS

Superimpose original image onto pixel number

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	255	255	255	255	255	0	0	0
0	0	255	255	255	255	255	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

### 3. IMAGES & CHANNELS

A detailed list of existing extensions in which images can be stored and retrieved. How each extension differs from other and scenarios where to use them specifically.

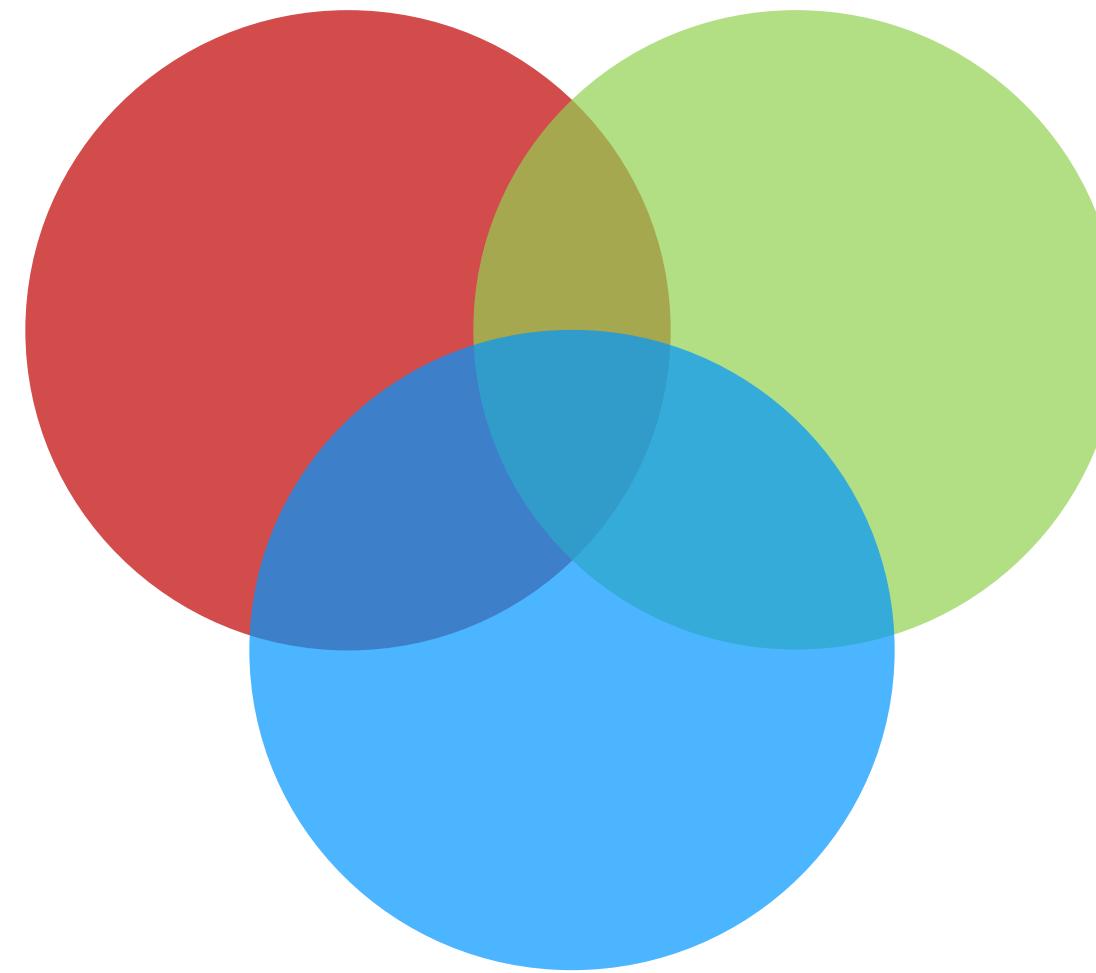


Separate image and pixels

0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	255	255	255	255	255	255	0	0	0
0	0	255	255	255	255	255	255	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0

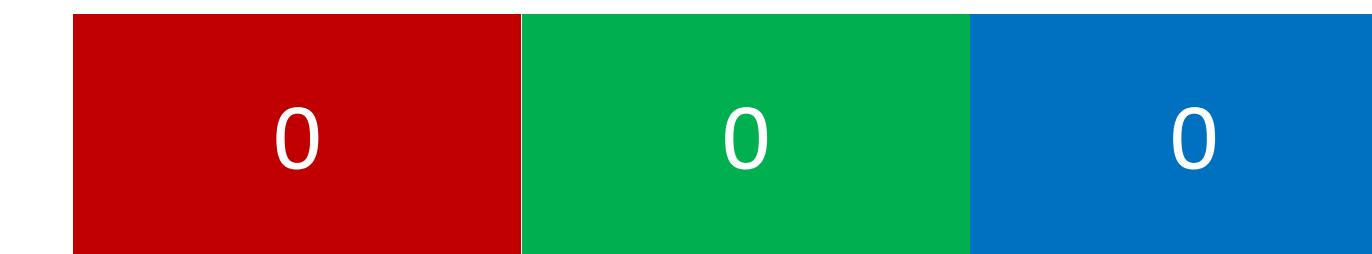
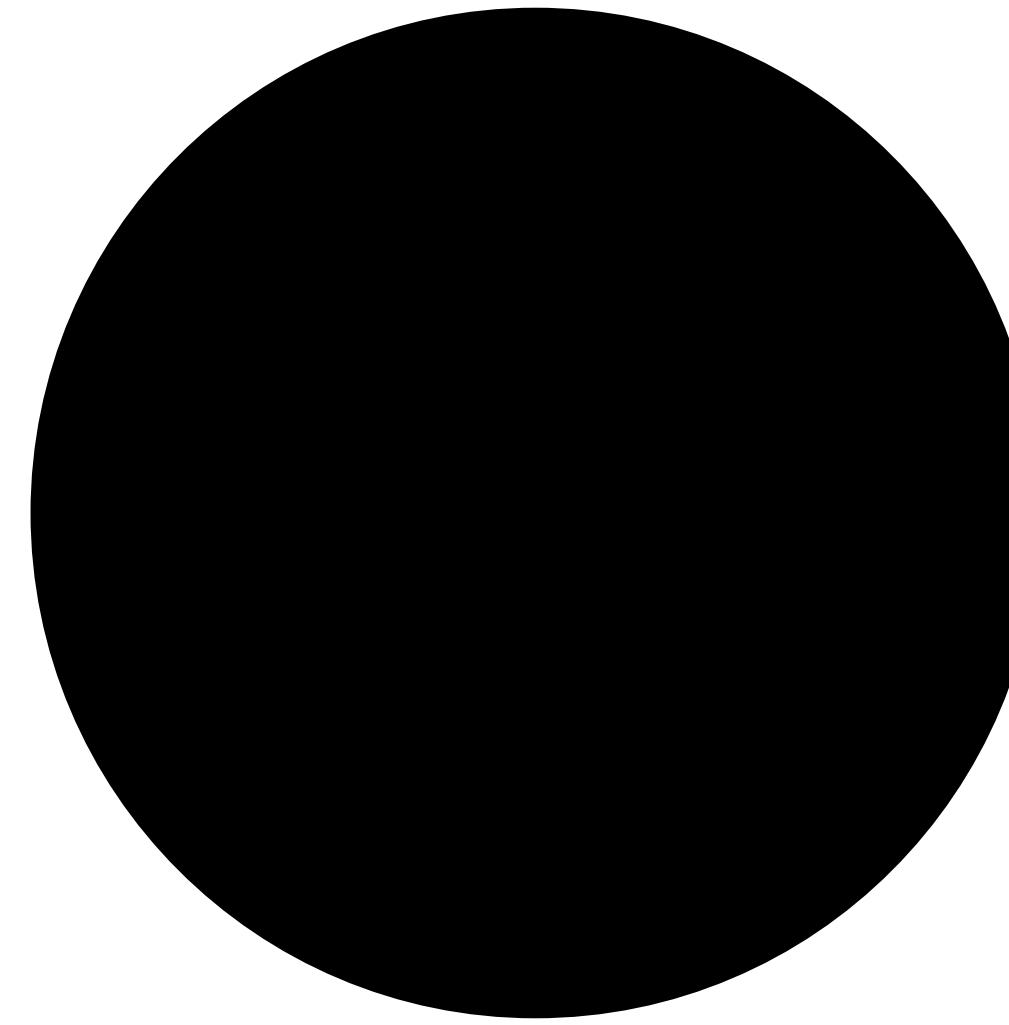
### 3. IMAGES & CHANNELS

RGB – Red, Green and Blue channel



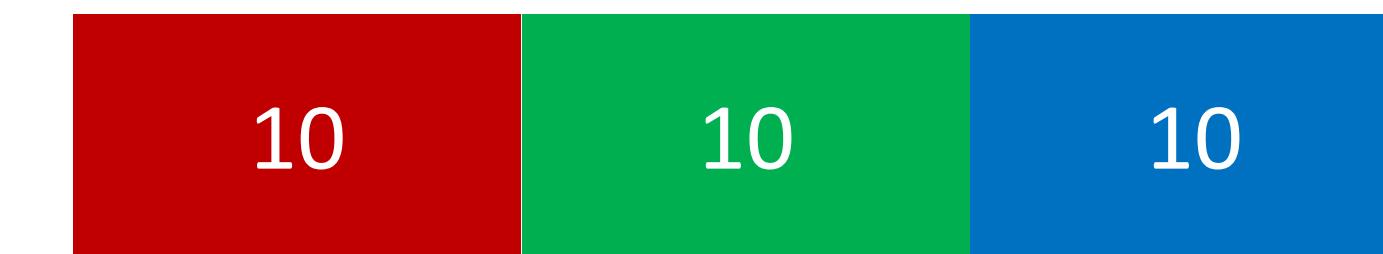
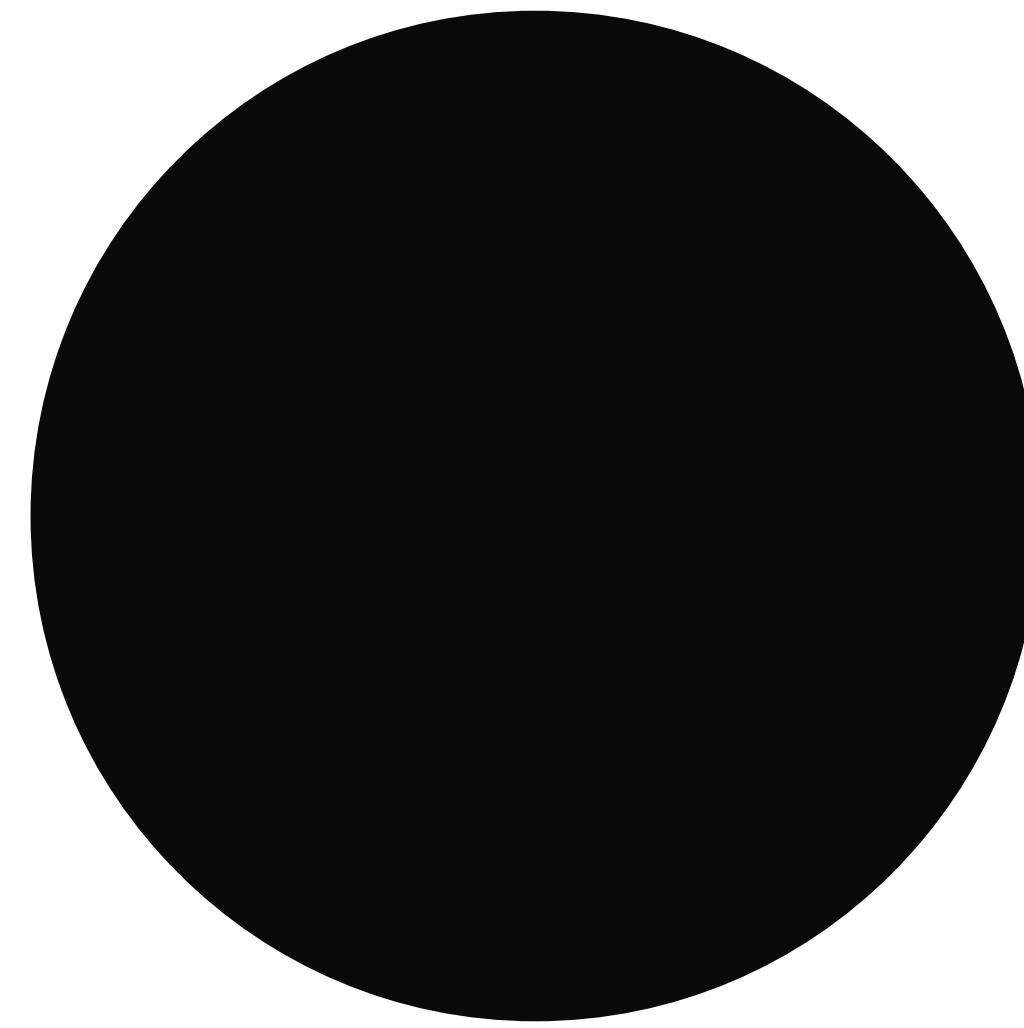
### 3. IMAGES & CHANNELS

Use the power point color slider to demonstrate RGB channel



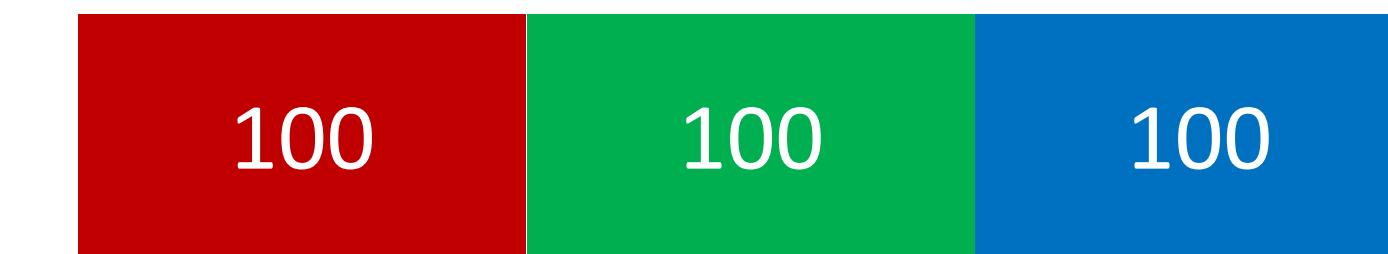
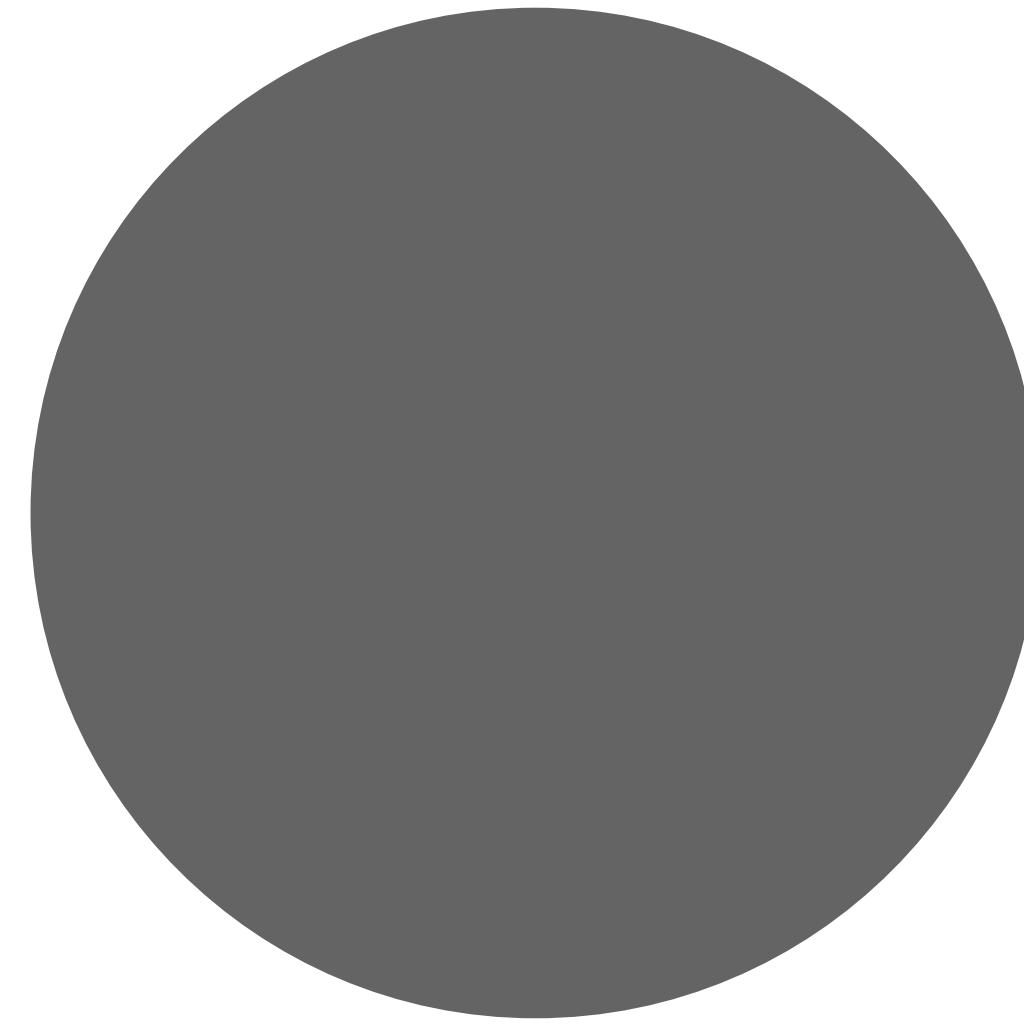
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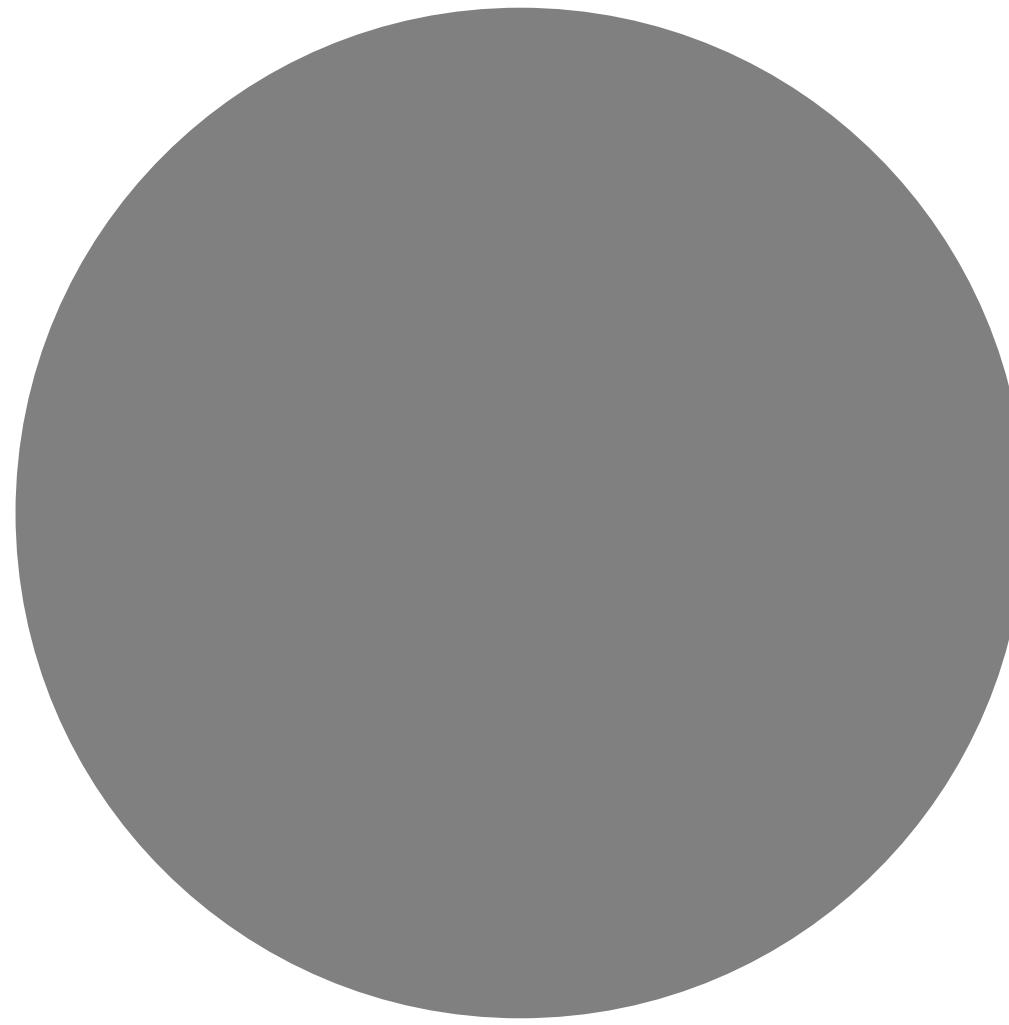
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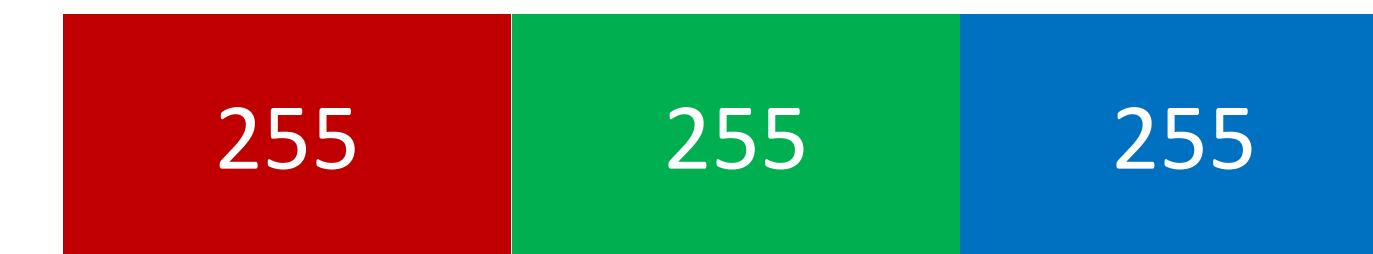
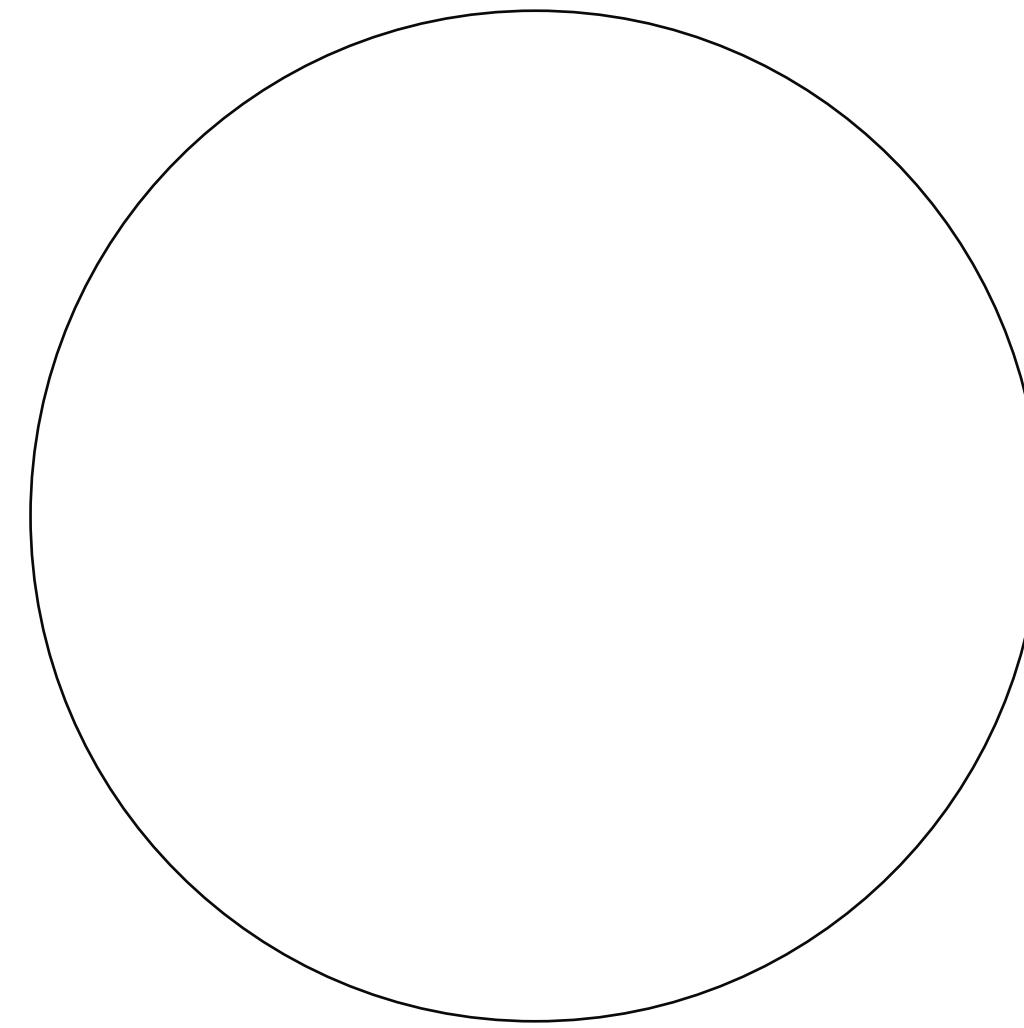
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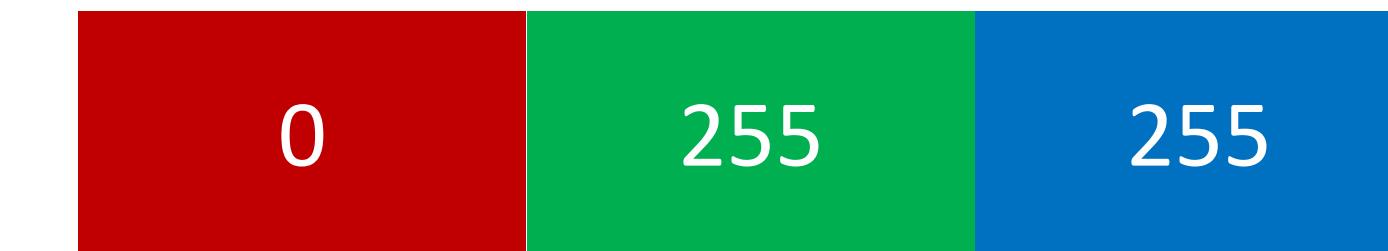
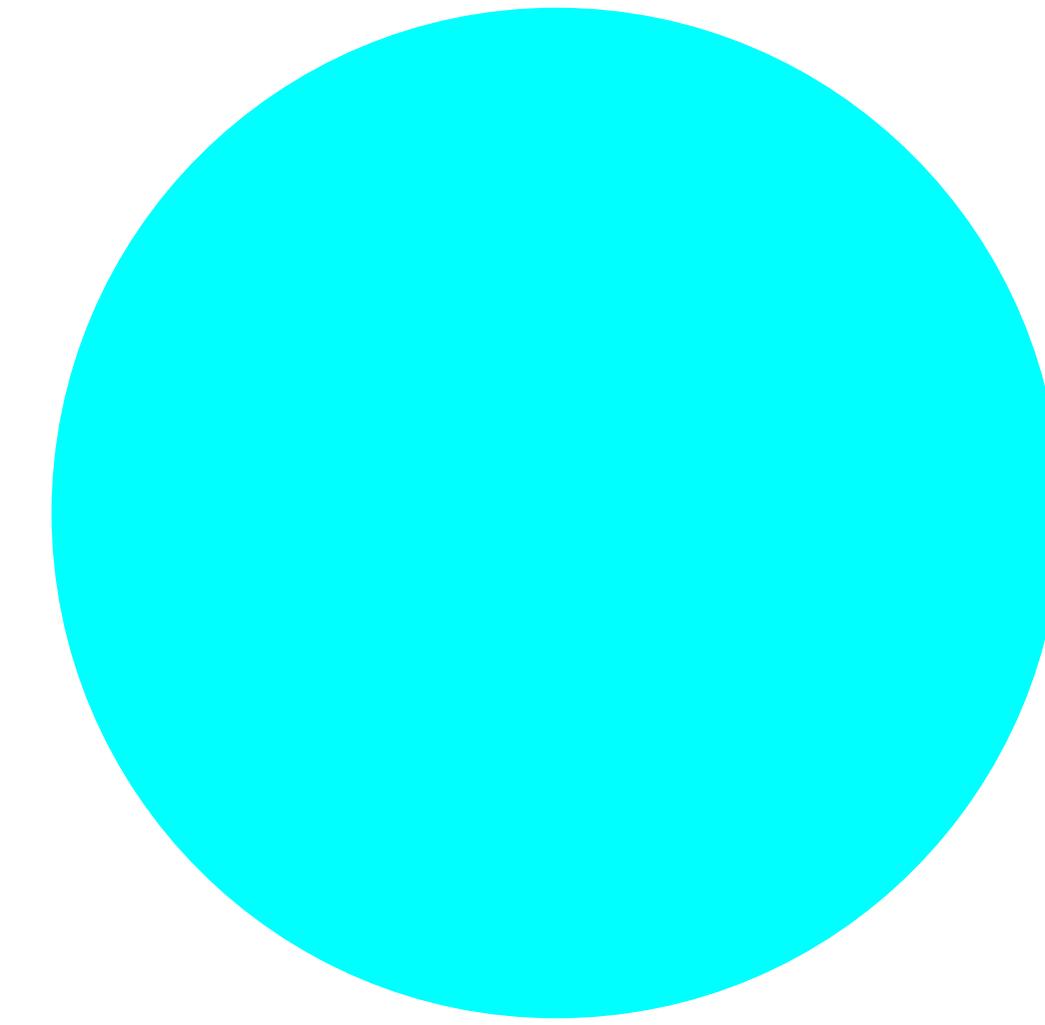
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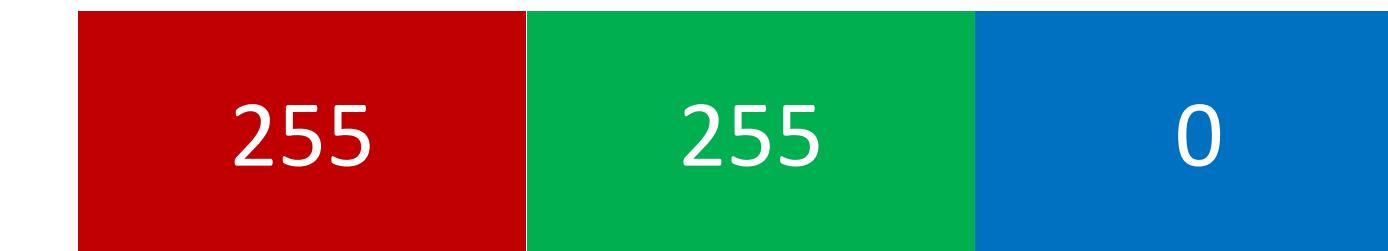
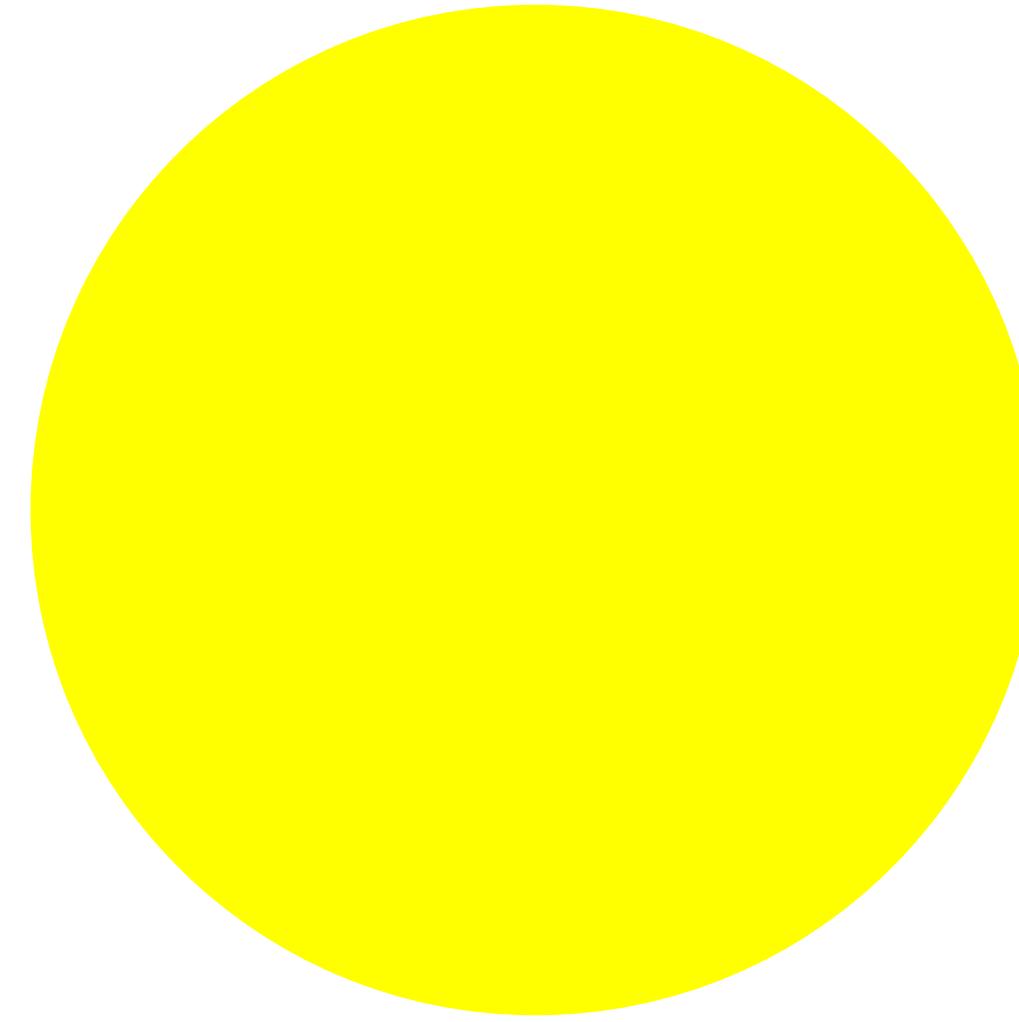
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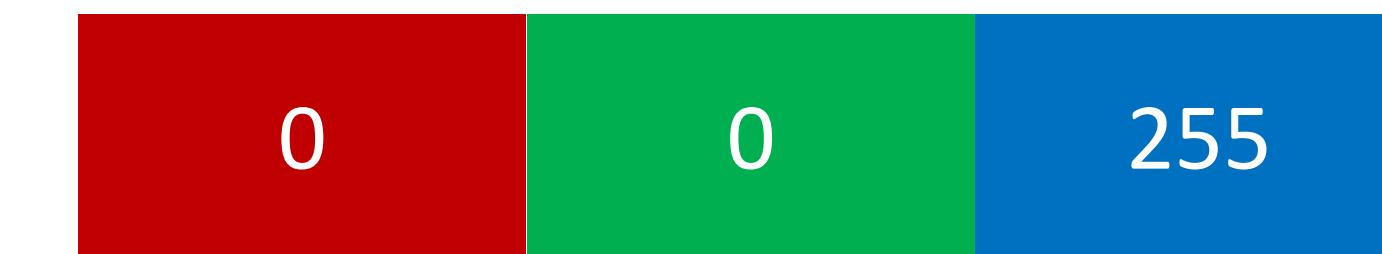
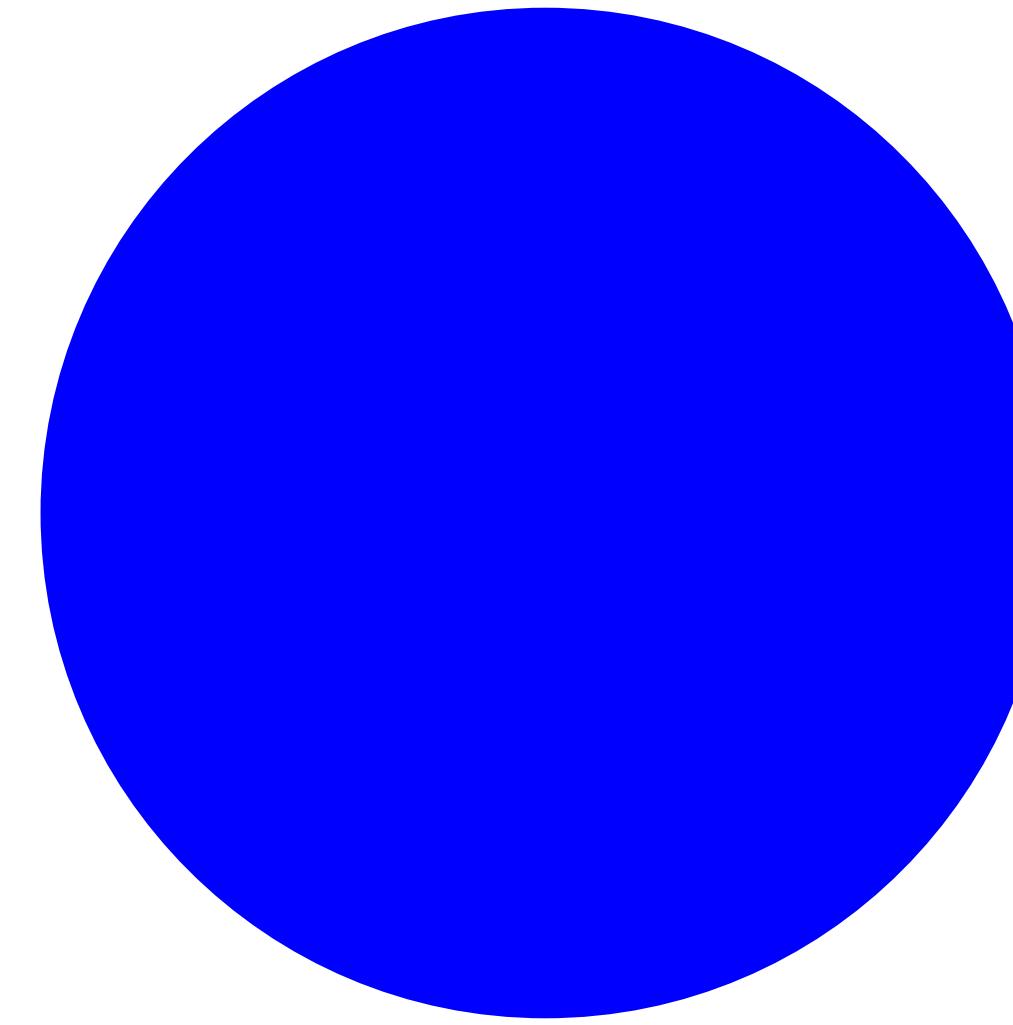
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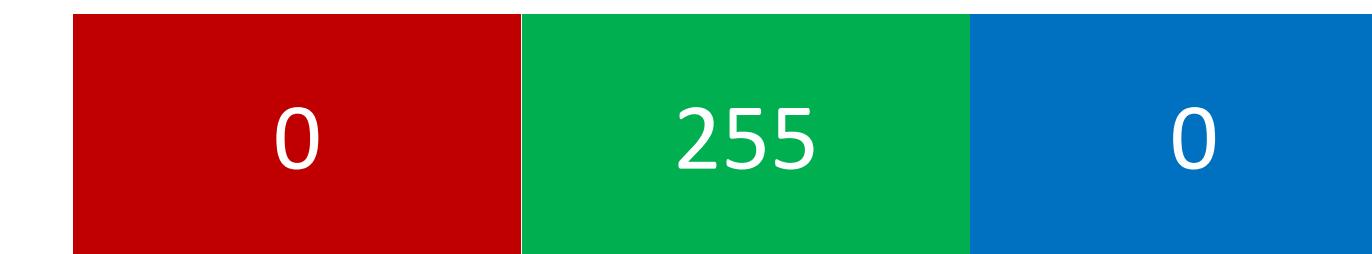
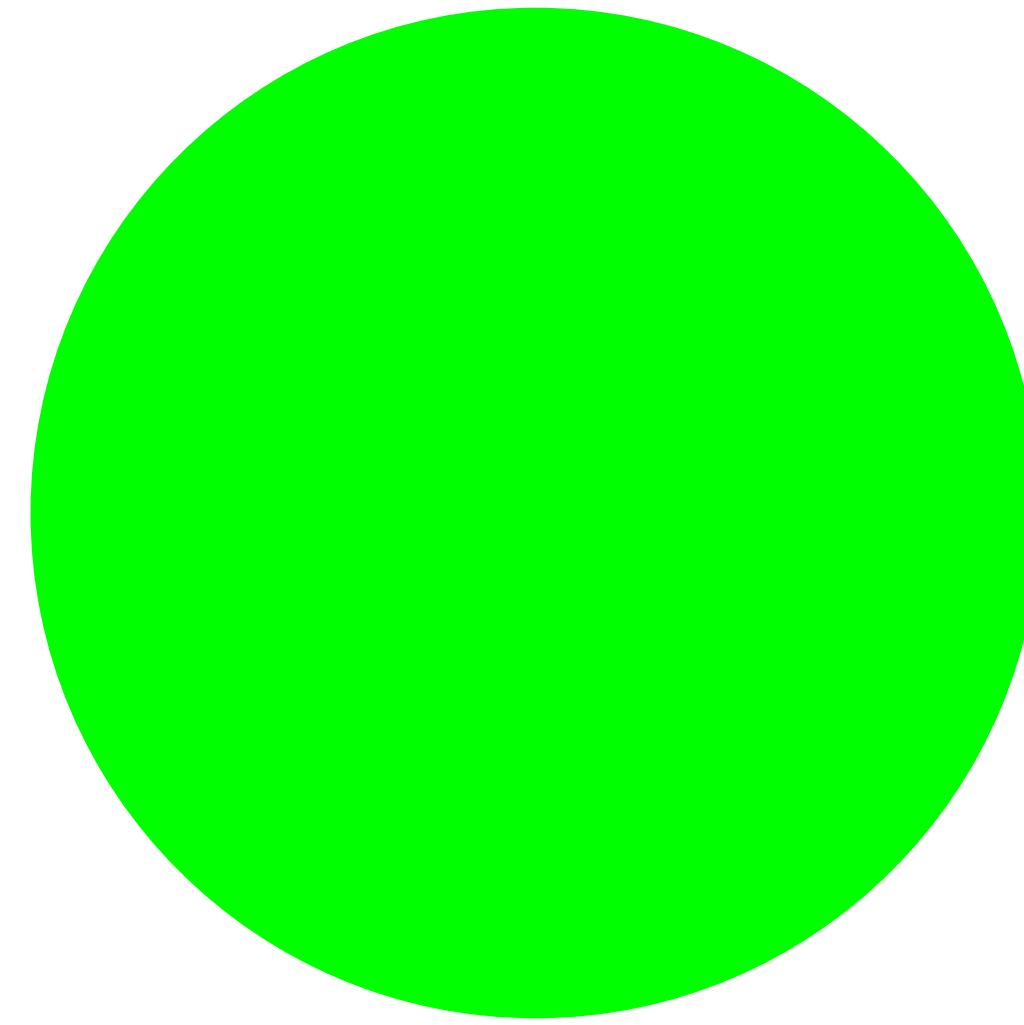
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Use the power point color slider to demonstrate RGB channel



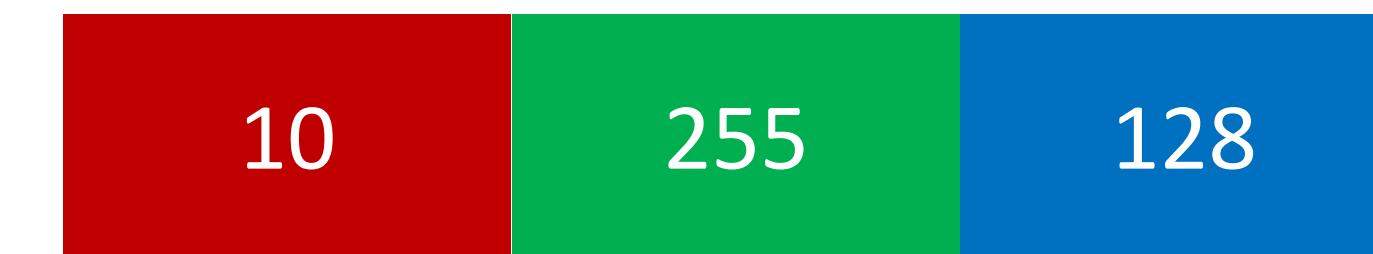
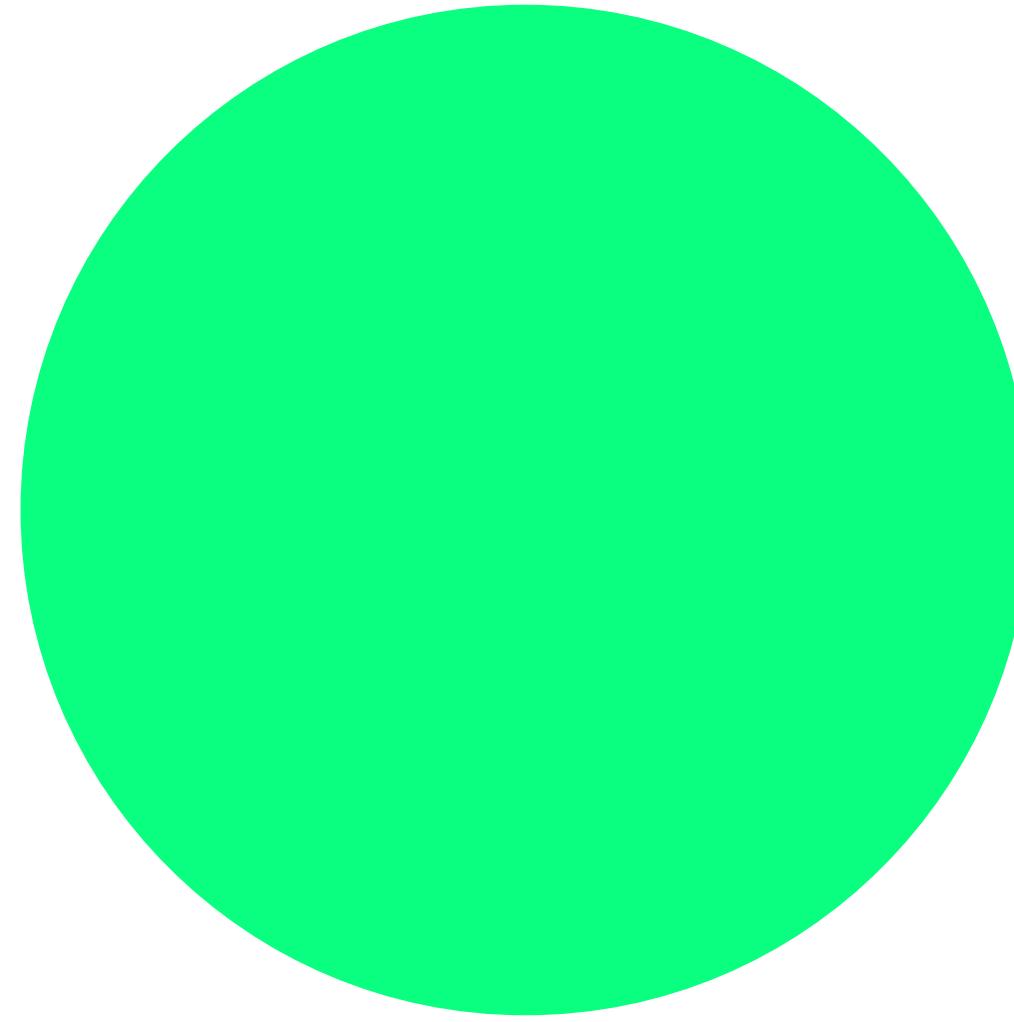
### 3. IMAGES & CHANNELS

Use the power point color slider to demonstrate RGB channel



### 3. IMAGES & CHANNELS

Use the power point color slider to demonstrate RGB channel



# SUMMARY

Image is a collection of numbers from 0 to 255. Each number represents a shade of color. Alter the number and the image color changes accordingly.

## 4. Working with Python



# COMPUTER VISION

## INTRODUCTION TO IMAGES