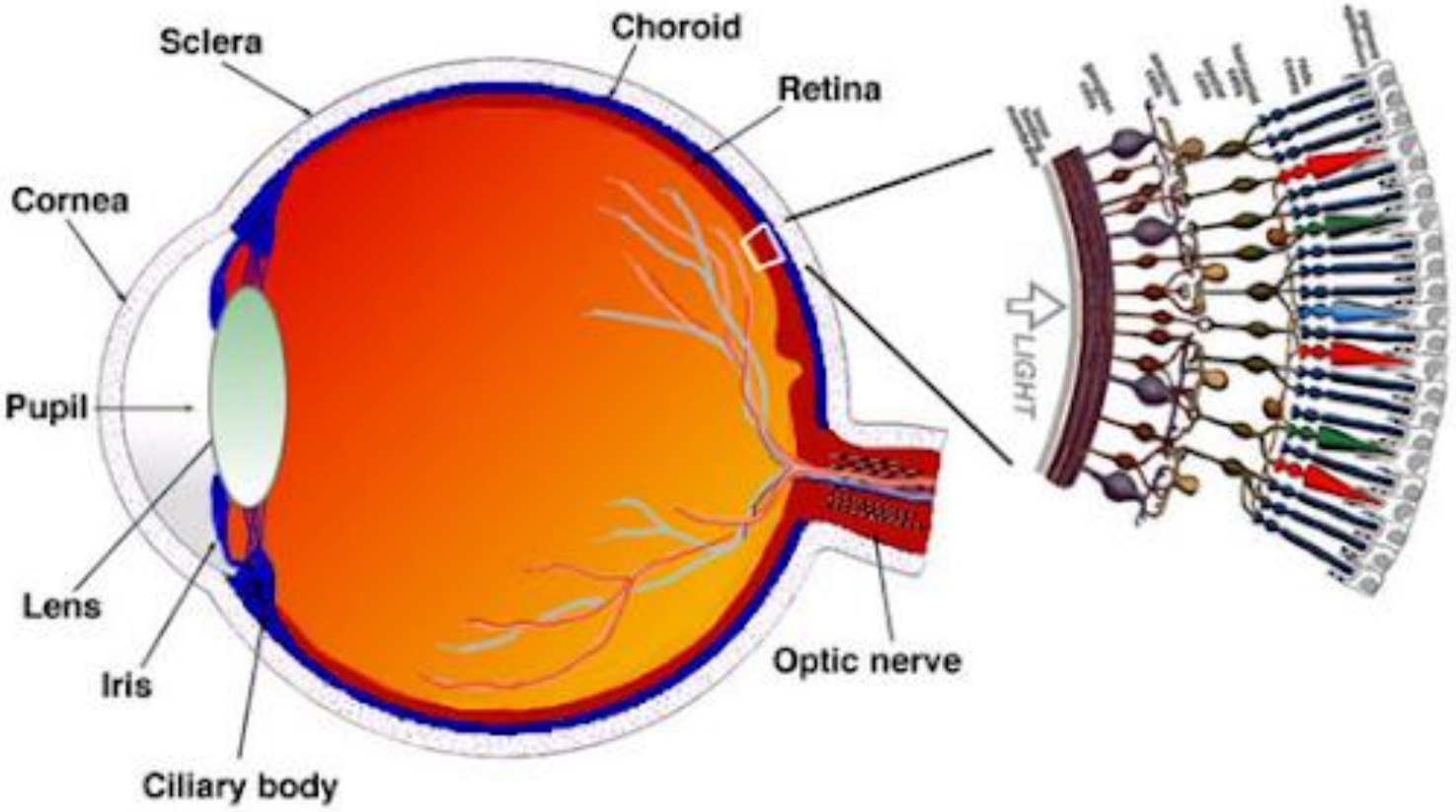
인공지능 딥러닝 활용
시각인지 시스템 구축 및 응용
(Computer Vision)

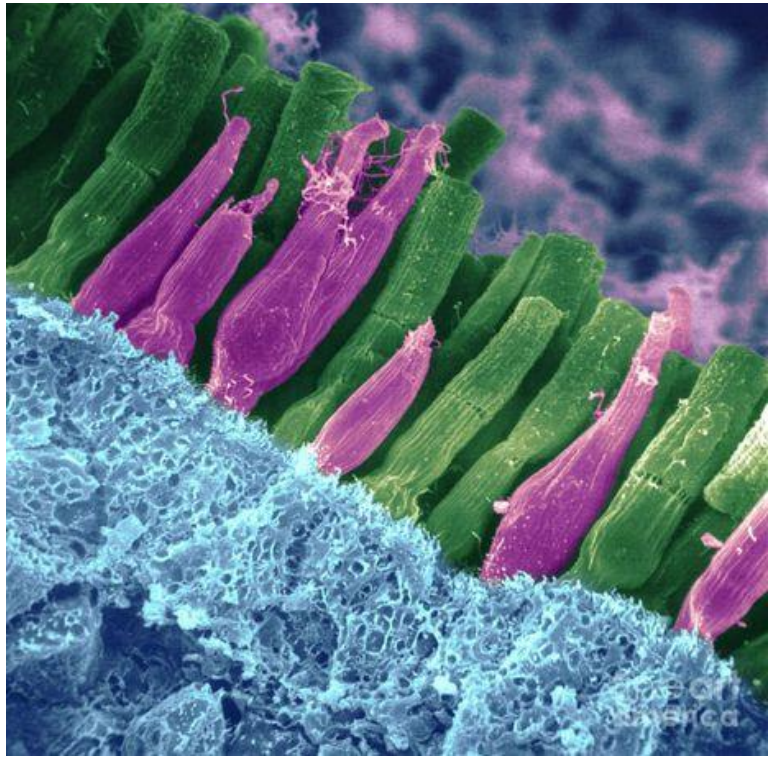
Chapter 2 – Color Space(색공간)

2021

정 준 수 Ph.D

Men of vision

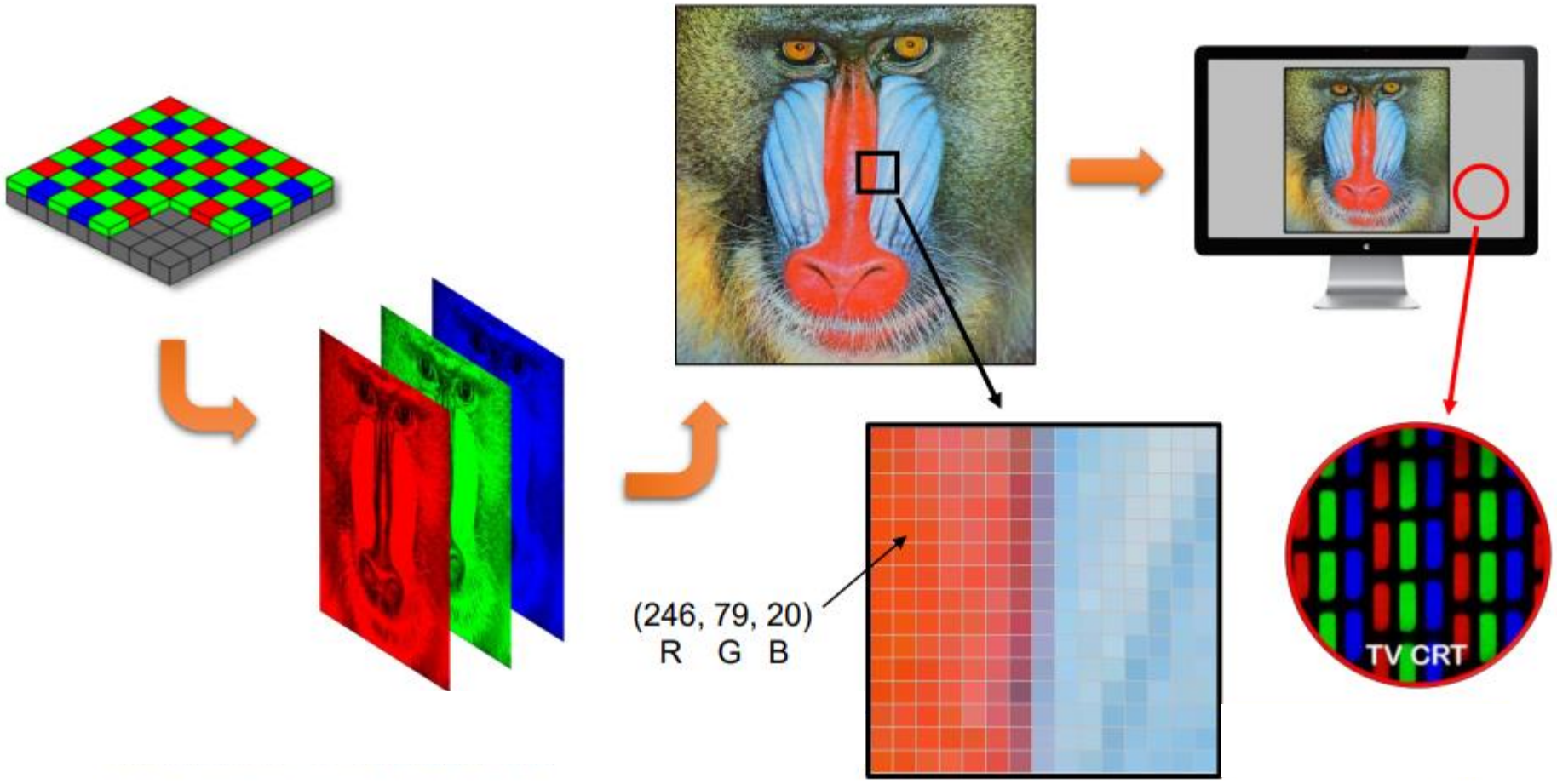




- 원추체 (색상)
- 간상체 (어둡과 밝) 물체의 모양

영상표현 방법

- 영상(image)이란?
  - 픽셀(pixel)이 바둑판 모양의 격자에 나열되어 있는 형태 (2차원 행렬)



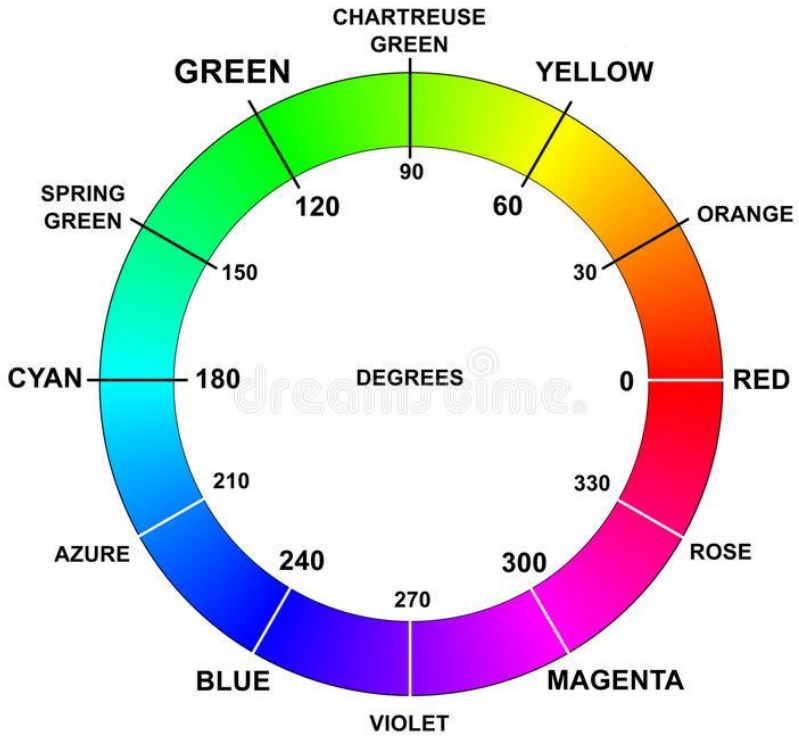
Color Space (색공간)

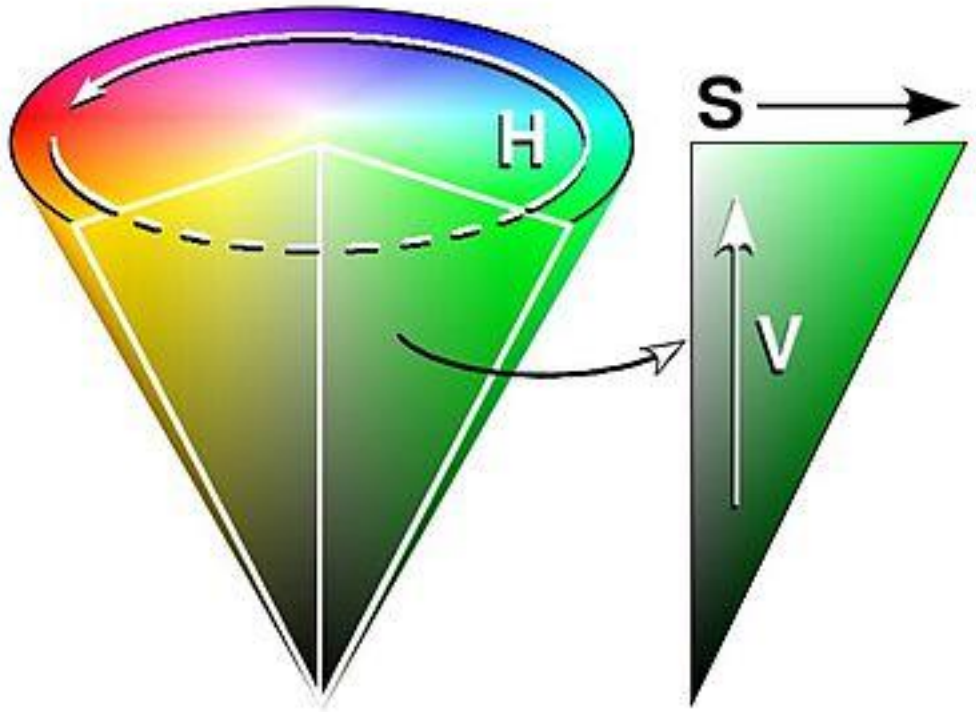
1. 색의 3속성인 색상(hue), 명도(lightness), 채도(chroma)를 3차원 공간의 각각의 축으로 형성된 색 공간은 컬러 디자인이나 컬러 공학 등의 학문 또는 산업분야에서 컬러를 다루는 데 있어서 기본적으로 이해하여야 할 개념이다.

2. 컬러 영상 장비에서 다루는 RGB는 시각의 RGB가 아니고 단지 코드에 불과할 뿐 아니라 균등색 공간(uniform color space)도 아니기 때문에 공학적인 계산의 의미도 없고 뿐만 아니라 부정확하다.

3. 색 공간의 응용에는 색감에 따른 색의 배열이나 배치(grouping)가 있다.

SHV Color Space (색공간)





색 공간 (Color Space)

1. RGB / BGR / Gray Image

2. HSV (hue, saturation, value)

H – Hue (Dominant Wavelength).
S – Saturation (Purity / shades of the color).
V – Value (Intensity).

Best thing is that it uses only one channel to describe color (H), making it very intuitive to specify color.
Device dependent.

3. L*a*b* (Like longitude, latitude, and altitude – L*a*b* color values give us a way to locate and communicate colors)

L*: Lightness a*: Red/Green Value b*: Blue/Yellow Value

LAB Color-Space

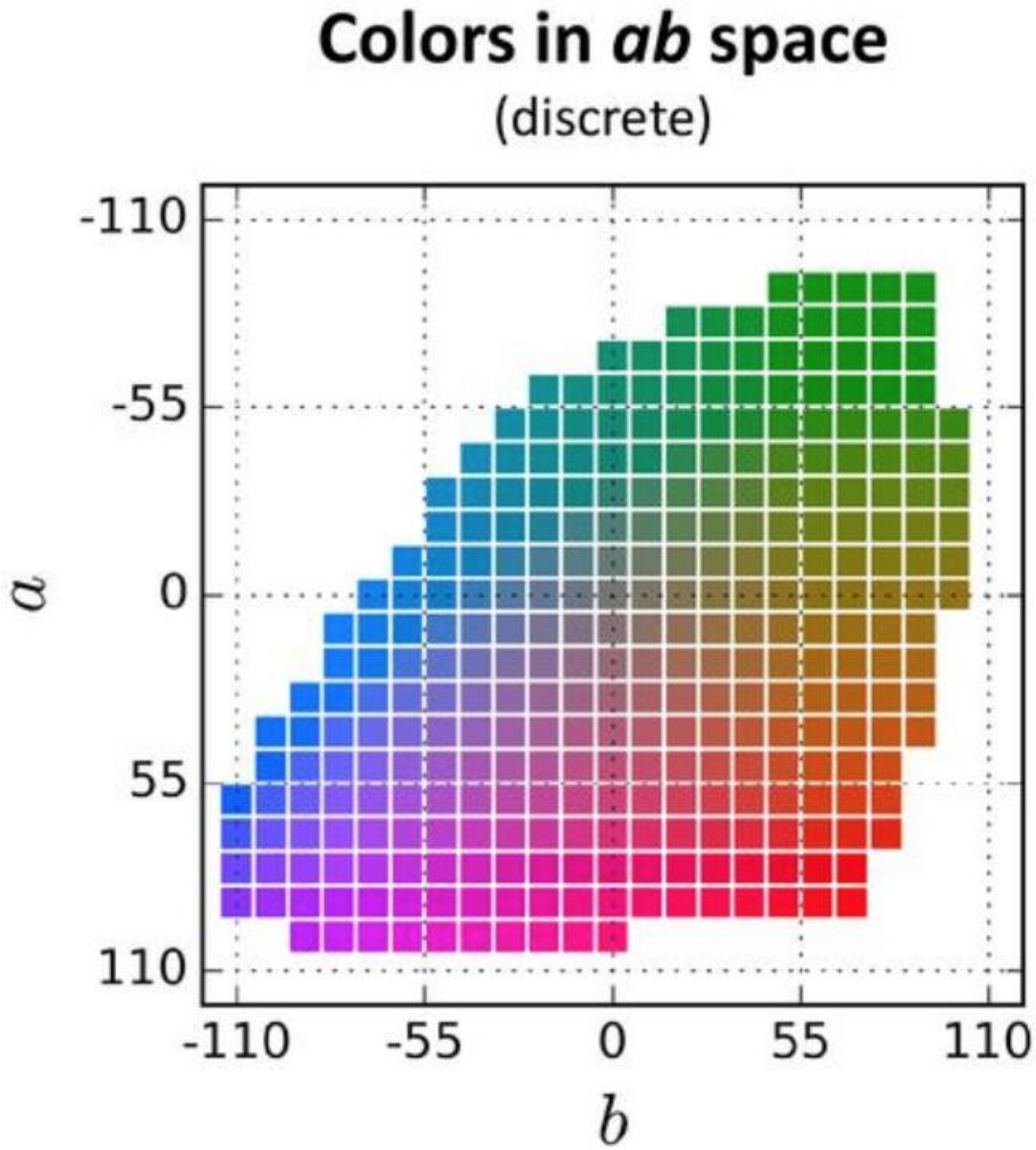
The Lab color space has three components.

1.L – Lightness (Intensity).

2.a – color component ranging from Green to Magenta(Red).

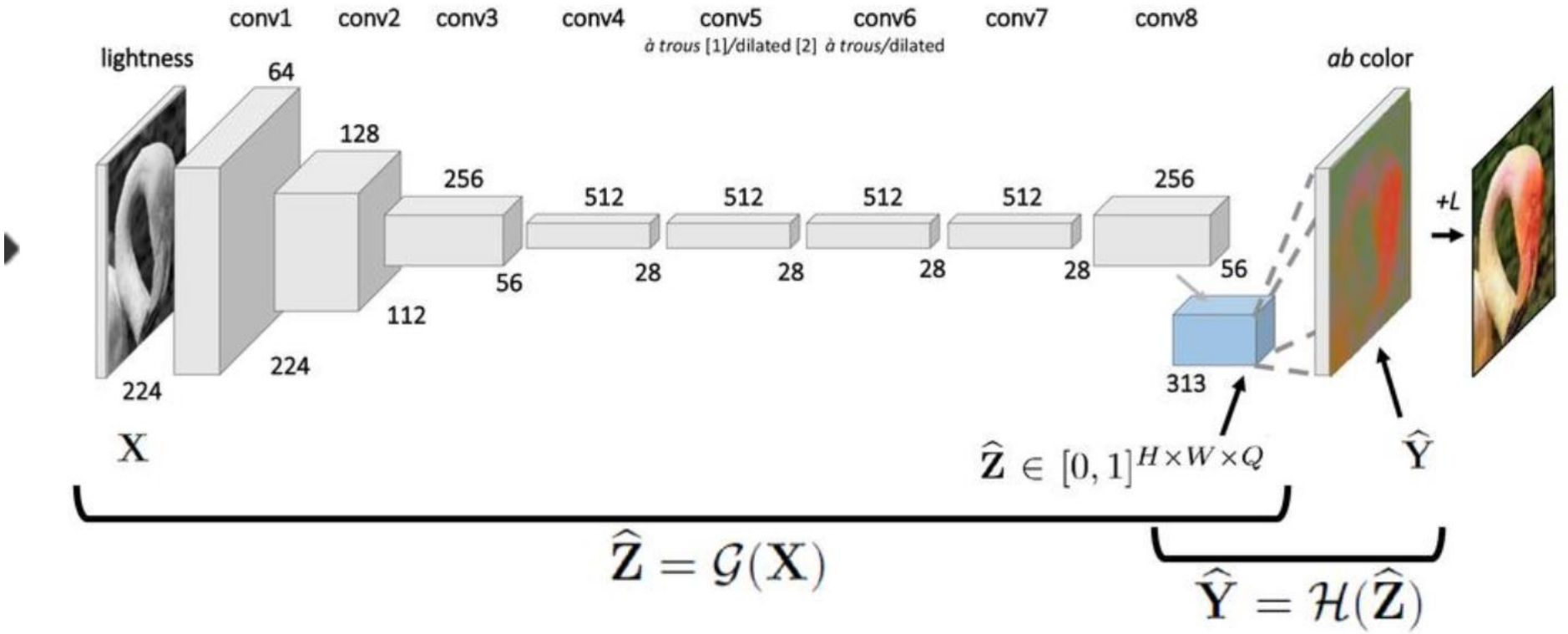
3.b – color component ranging from Blue to Yellow.

The Lab color space is quite different from the RGB color space. In RGB color space the color information is separated into three channels but the same three channels also encode brightness information. On the other hand, in Lab color space, the L channel is independent of color information and encodes brightness only. The other two channels encode color.



Lab color space is quantized into 313 bins

Colorization



[1] Chen *et al.* In arXiv, 2016.
[2] Yu and Koltun. In ICLR, 2016

For each of the ₩ HxW pixels, ₩hat{Z} contains a vector of Q(=313) values where each value represents the probability of the pixel belonging to that class. Our goal is to find a single pair of ab channel values for each probability distribution ₩hat{Z}_{h,w}.

https://learnopencv.com/convolutional-neural-network-based-image-colorization-using-opencv/?ck_subscriber_id=1172019946

Colorizing a Video

https://www.youtube.com/watch?v=HvaOiUTKbl0&t=4s

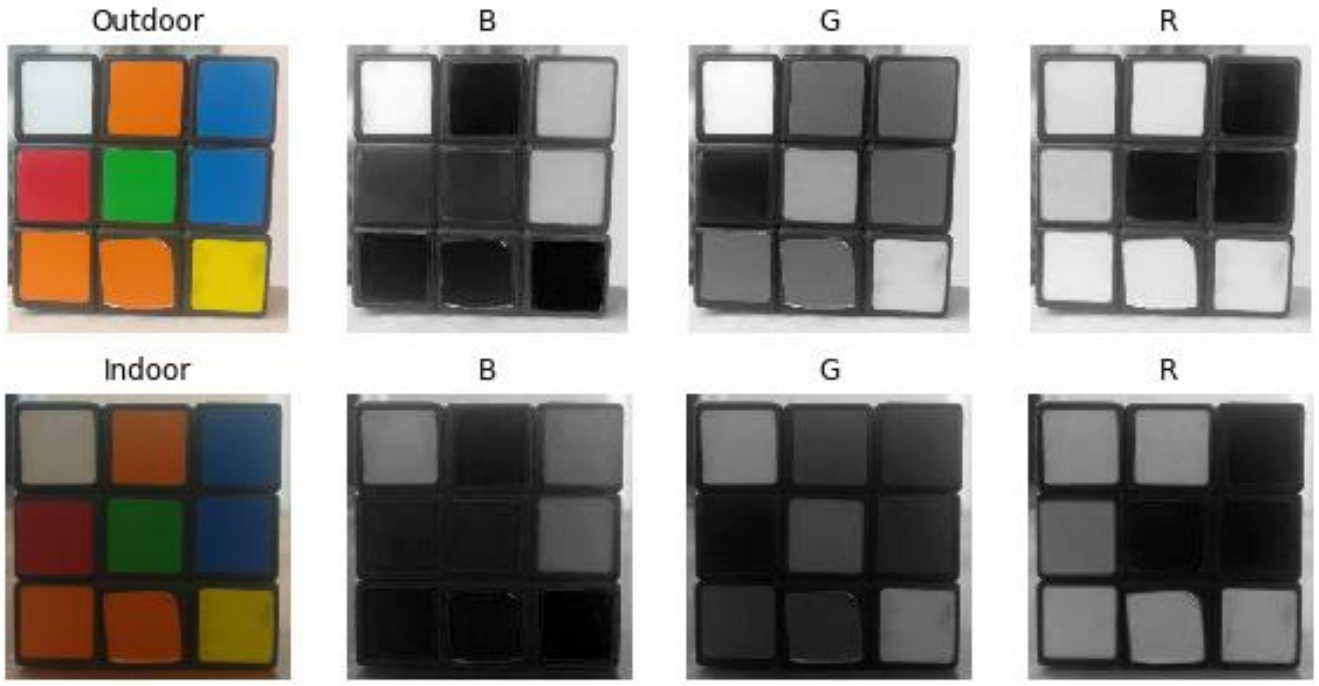


Figure 2 : Different Channels Blue (B), Green (G), Red (R) of the RGB color space shown separately

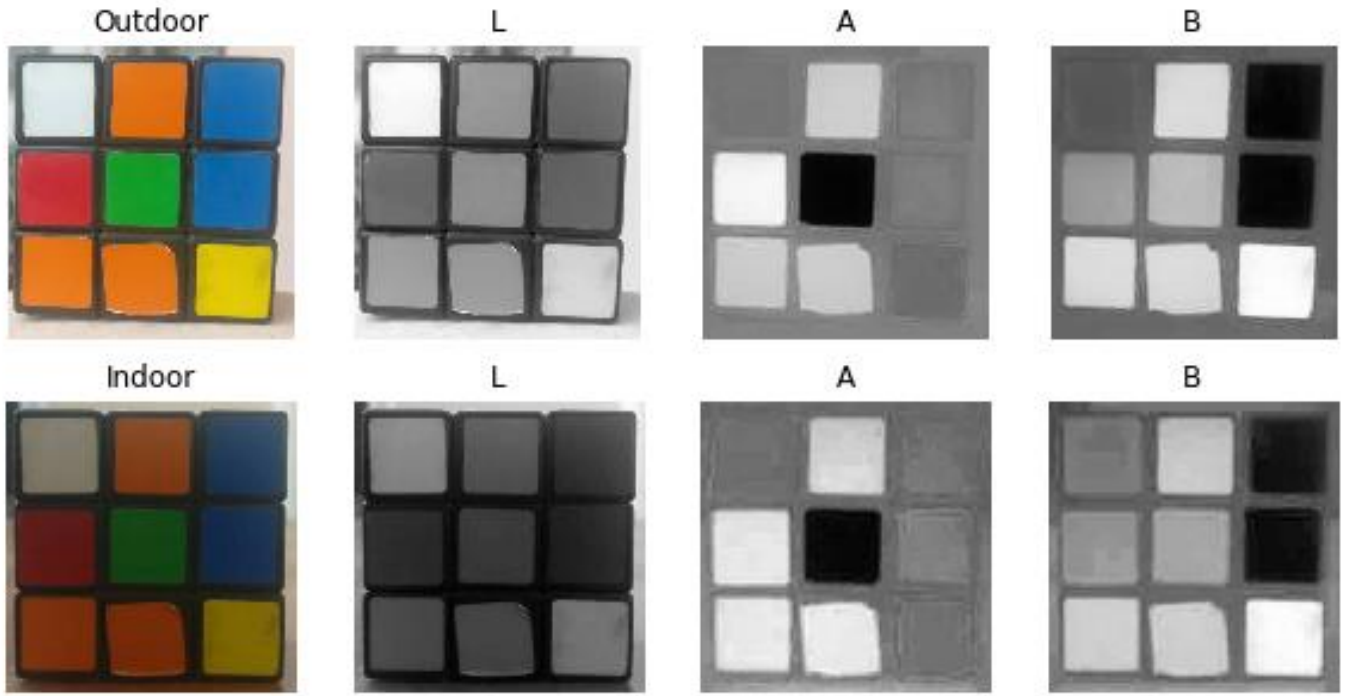


Figure 3 : The Lightness (L), and color components (A, B) in LAB Color space.

Observations

•It is pretty clear from the figure that the change in illumination has mostly affected the L component.

•The A and B components which contain the color information did not undergo massive changes.

•The respective values of Green, Orange and Red (which are the extremes of the A Component) has not changed in the B Component and similarly the respective values of Blue and Yellow (which are the extremes of the B Component) has not changed in the A component.

It has the following properties.

- Perceptually uniform color space which approximates how we perceive color.
- Independent of device (capturing or displaying).
- Used extensively in Adobe Photoshop.
- Is related to the RGB color space by a complex transformation equation.

How to use these color spaces for segmentation

https://learnopencv.com/color-spaces-in-opencv-cpp-python/

교안 및 실습 Code

https://github.com/JSJeong-me/OpenCV_Practitioner_Guide_1

강사 소개

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