

SSP 100 - 10

How Computers See

09 / 15 / 2026

Instructor: Michael Eckmann

Today's Topics

- Questions? / Comments?
- Announcements
- Summer reading discussion
- Digital Images and RGB and Grayscale

Questions / comments?

- Anything on your mind since we last met?
Questions about anything?

One-on-one advising meetings

- Most meetings have been done.
- Meetings are scheduled with two of you.
- Still need to schedule a meeting with two others of you.

Reception today

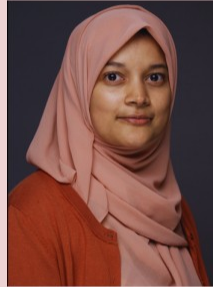
- TODAY 9/15 at 5:30 p.m. at President's house (Scribner House) --- if you wish to walk down together let's meet at 5:15 in the hallway outside this room and we will leave together at 5:20 to walk to Scribner House
- If you cannot go from 5:30 – 6:30 tonight, please let me know now.

Skidmore's Department of Computer Science Presents

Adapting in the Age of Intelligent Machines: Toward Circular Computing for Sustainable Society

TAHIYA CHOWDHURY

ASSISTANT PROFESSOR of COMPUTER SCIENCE
AND AI
COLBY COLLEGE



Wednesday, September 16

**Palamountain Hall
Davis Auditorium**

REFRESHMENTS 4:15

TALK 4:30-5:30

Can humans, machines, and our natural environment co-exist and still flourish? As a computer scientist, I have spent the past four years asking: ***How do we adapt in this era of intelligent machines?***

In this talk, I will begin with my approach to this question: by developing interdisciplinary, experiential education that helps prepare the next generation of technologists, practitioners, and policymakers to become informed, critical collaborators with AI systems. I will also show our ongoing work on improving reliability of data-driven automated tools for understanding human interaction. I will connect these two research threads to conclude with a vision for adopting circular computing practices that conserve energy, environment, and society.

**CO-SPONSORED BY
ENVIRONMENTAL STUDIES & SCIENCES
THE SUSTAINABILITY OFFICE**

Class discussion

You will discuss your thoughts in groups of 4 (1 group of 5).
AJ and I will not participate in the discussions. I will assign the groups.

I'll show the questions I wanted you to think about (but you of course may talk about anything related to the book with your group)

After some time I'll ask someone from each group to relate some thoughts that came up in your discussions

Also everyone will be given the opportunity to say anything about the book or your reading of it after the reports from the groups.

Computer Vision Topics

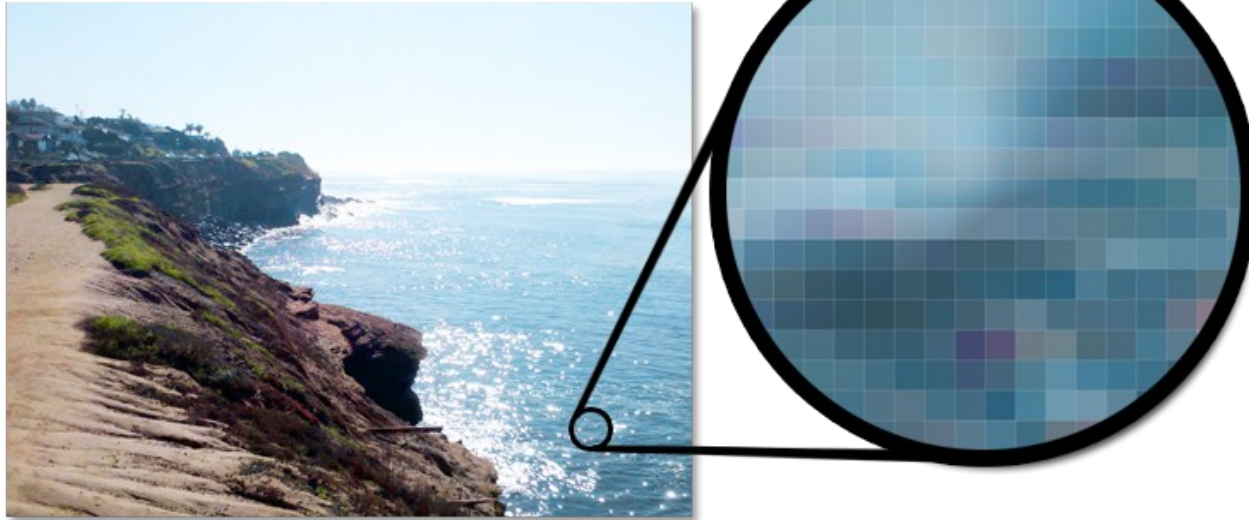
- Before we can even talk about computer vision applications, we must understand some key things about digital images.
- Image formation and representation
 - how do we acquire digital images and in what format are they stored?

What is a digital image

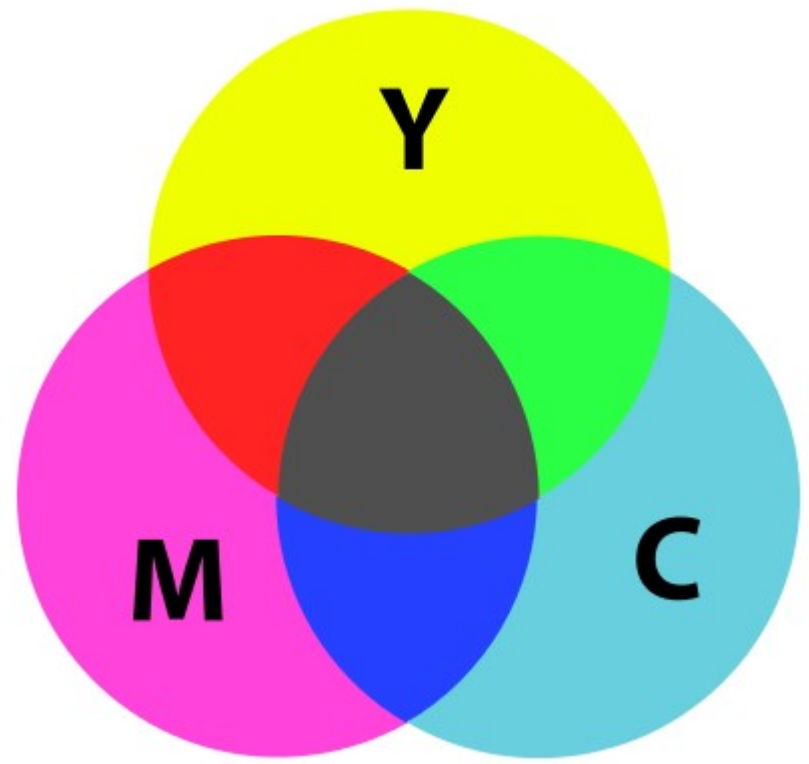
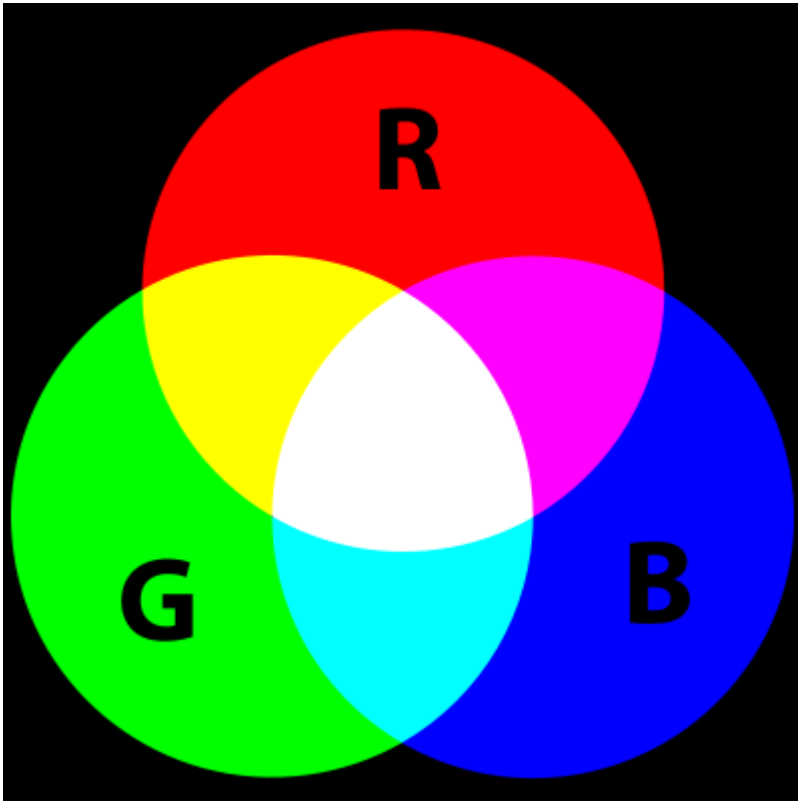
- 2 dimensional grid of pixels
- Each pixel contains numeric data that describe what color the pixel is (or what brightness the pixel is for grayscale images.)
- Depending on whether it is a color or grayscale image, each pixel contains either 3 numbers (Red, Green and Blue components) or 1 number (brightness).

What is a digital image

- The smallest unit in an image is a pixel. Each pixel contains one color. This one color is represented as a combination of some amount of Red, Green and Blue light.



What is a digital image



RGB Color Model

- **Color** = $r\mathbf{R} + g\mathbf{G} + b\mathbf{B}$
- r , g and b range from 0.0 to 1.0
- notice:

white's $(r,g,b) = (1,1,1)$

black's $(r,g,b) = (0,0,0)$

complementary colors are
those that add up to $(1,1,1)$

- image from “Computer Graphics”
by Hearn and Baker

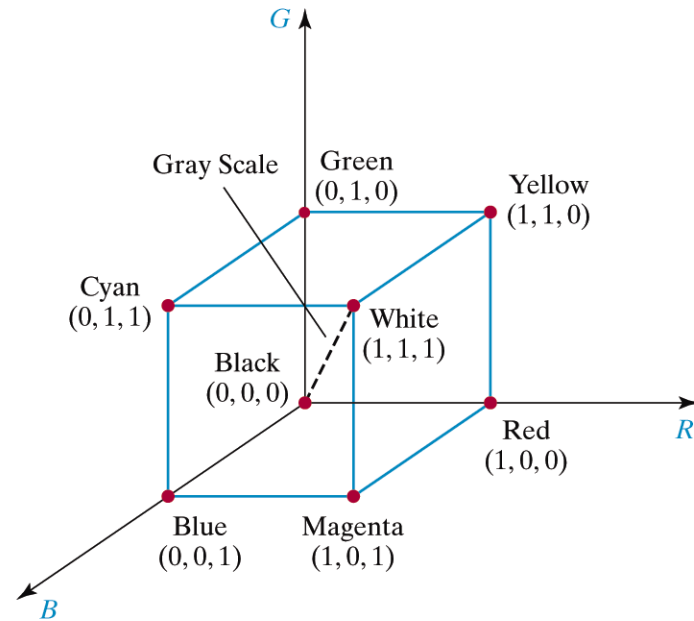


Figure 12-11

The RGB color model. Any color within the unit cube can be described as an additive combination of the three primary colors.

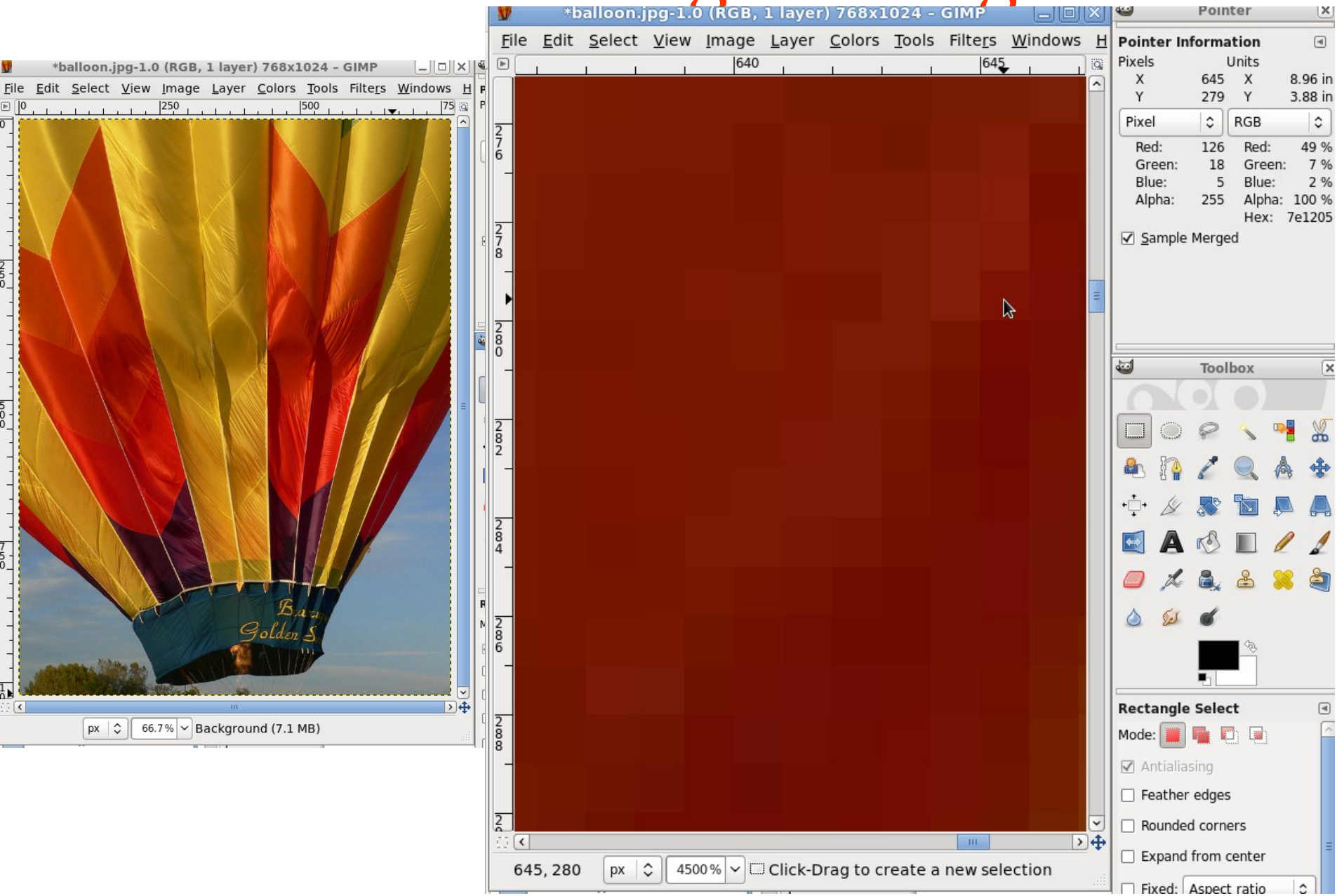
What is a digital image

- Let's examine a digital image using gimp (Gnu Image Manipulation Program) that has similar functionality to Photoshop.
- I'll zoom in and point out RGB values of pixels
- I'll convert to grayscale and show the brightness values of pixels

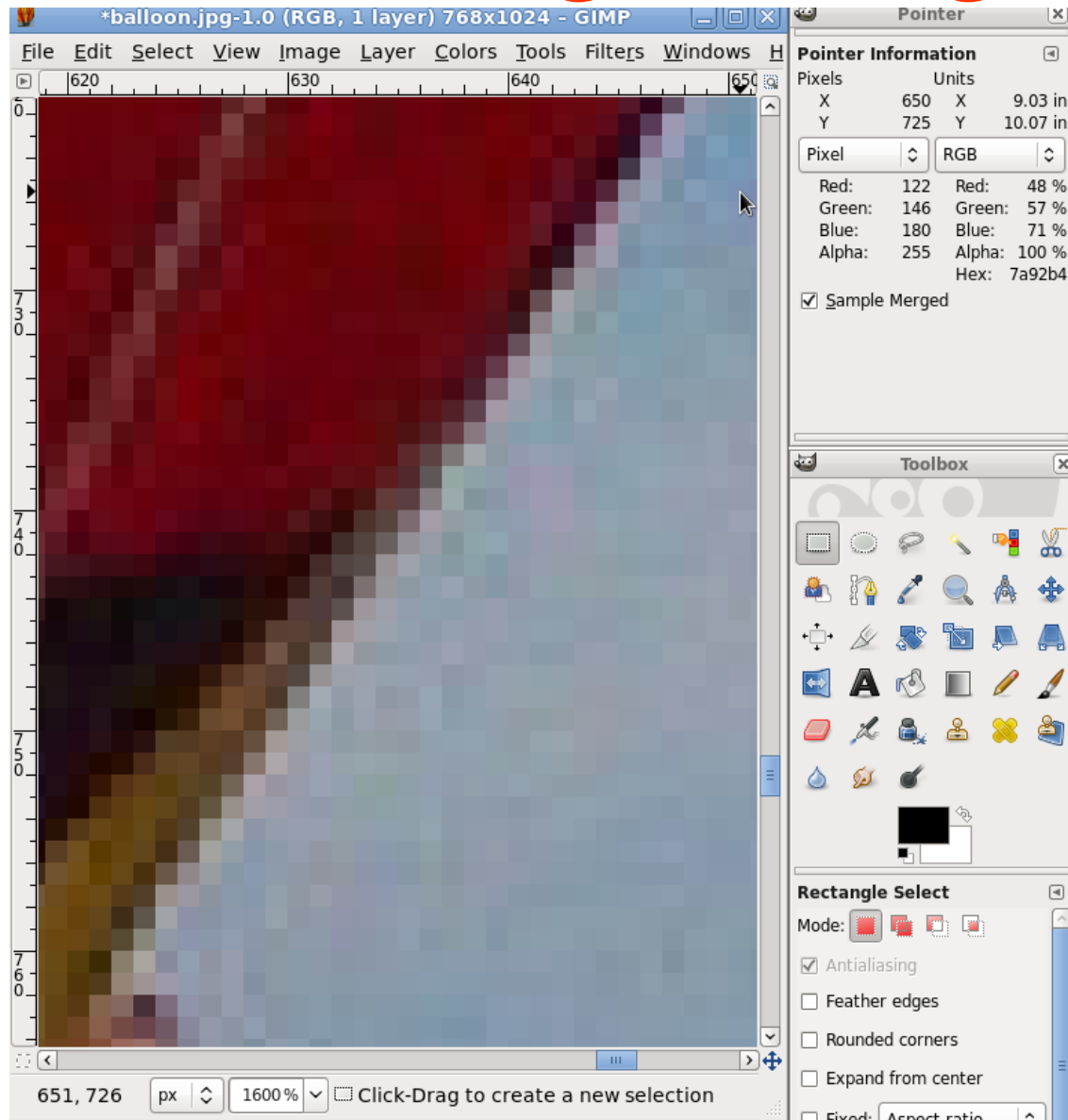
What is a digital image



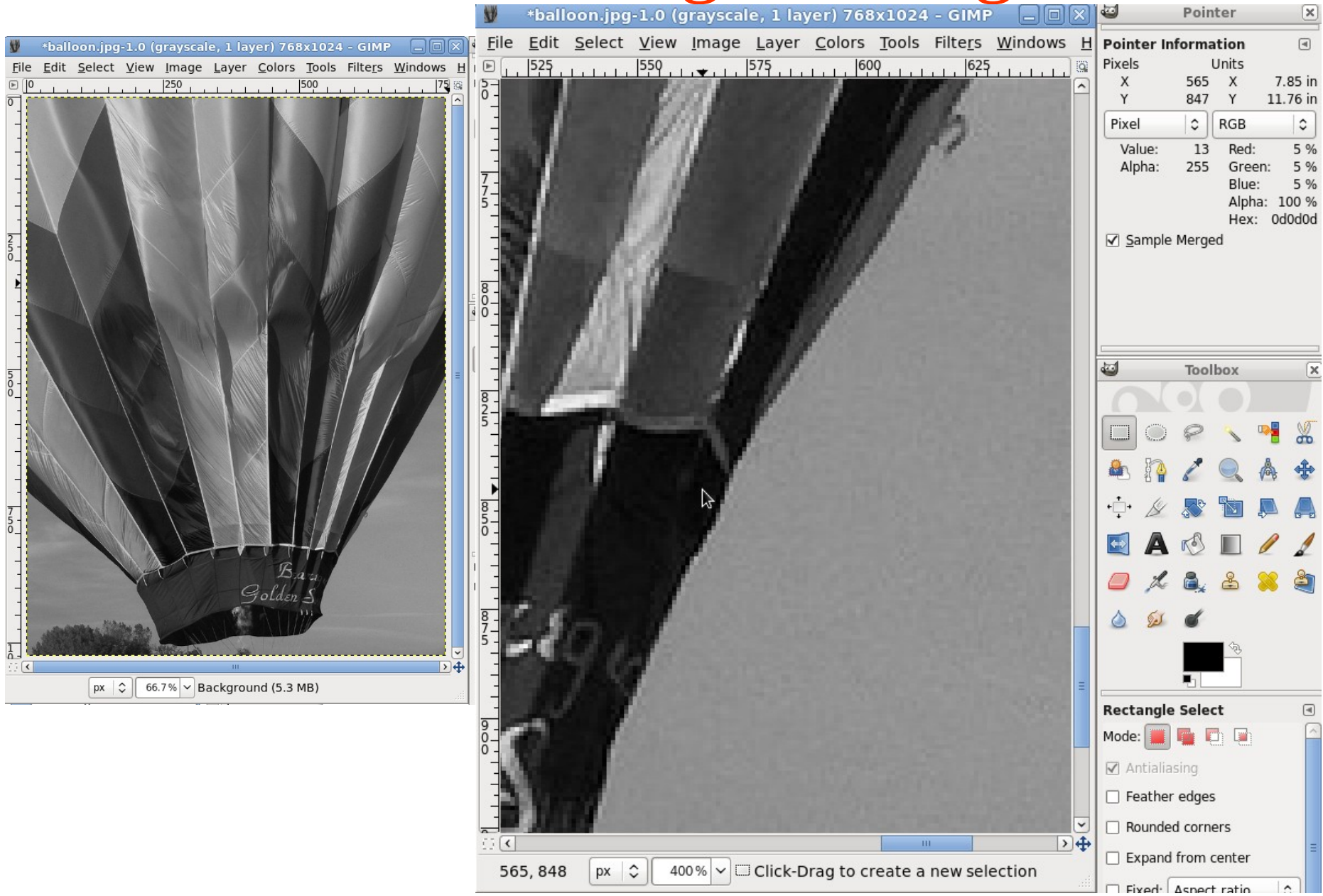
What is a digital image



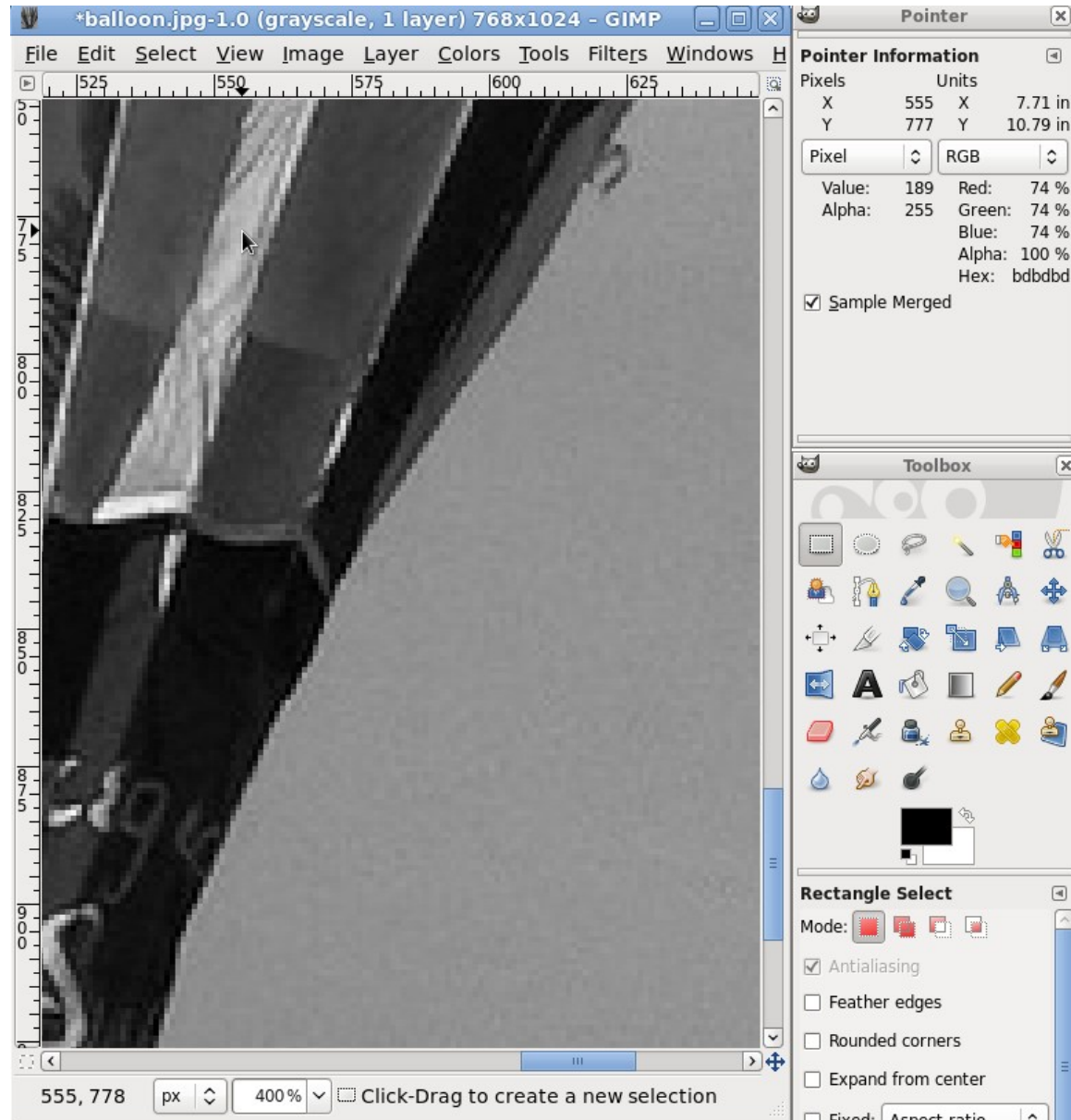
What is a digital image



What is a digital image



What is a digital image



RGB

- You can get a feel for what values of R, G and B channels describe what colors, using this site:

<https://yuilibrary.com/yui/docs/color/rgb-slider.html>

Observe what colors you get when all 3 are equal (R=G=B).

Let's keep two channels constant and slide the other channel among all values.

RGB

- Often the size of each of the R, G and B color channels is 1 byte which has a range of 0-255.
- How many different colors can be made if each channel has 1 byte of space?

RGB

- Often the size of each of the R, G and B color channels is 1 byte which has a range of 0-255.
- How many different colors can be made if each channel has 1 byte of space?
- $256 * 256 * 256 = 16,777,216$
- One of 16,777,216 different colors can be specified when 1 byte per color channel is used to store the color.

Grayscale

- Grayscale images hold 1 number per pixel.
- Each pixel is usually 1 byte.
- So, one of 256 different brightness values can be stored per pixel.
- 0 = black
- 255 = white
- All numbers in between are varying levels of gray



Grayscale



- An original color image
- Michael Eckmann - Skidmore
College - SSP 100 - Fall 2026

Grayscale



- Grayscale using the formula $0.299 \cdot R + 0.587 \cdot G + 0.114 \cdot B$

Michael Eckmann - Skidmore
College - SSP 100 - Fall 2026