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In this lab, I learned something that really surprised me. I found out that digital images are not just color grouping like I thought. In fact, they are actually matrices, which means a big table made of numbers. Each number shows how bright or dark one pixel is. A pixel is just one tiny dot in a picture. For example, the selfies we take or the pictures we post on social media are all made of thousands of these small pixels. When I looked at the shape, data type, and RGB channels (I'm talking about Red, Green, and Blue), I understood that every photo is just data that computers can read and change. I also noticed that the bigger the image, the more memory it takes, kind of like how videos use more space than photos on our phone.

When we changed brightness and contrast, I learned that it's just math behind it. If you make an image brighter, it's like adding numbers to the pixels to make them lighter. Changing contrast means making the dark pixels darker and the light pixels lighter. I never knew that when you change the light or use filters on your phone, it's just math working in the background. Then we did neighborhood operations, which means changing pixels based on their neighbors. That includes blur, sharpen, and edge detection. For example, when you use portrait mode on your phone and the background gets blurry but your face stays clear, it's the same kind of math. The hardest part for me was learning how convolution kernels work. Those are small grids of numbers that move across the picture to change how it looks. I had some trouble when the kernel size didn't match, and I got an error, but fixing it helped me understand better. For my own experiment, I tried using different kernel sizes to see how much detail would change. It was cool to see how a small change could make a big difference, like when you try to focus on a camera lens to make something sharp or soft. In the end, we talked about Nano Banana, which is an AI simulation that uses the same idea as our filters. I learned that convolutional neural networks (CNNs) work the same way. They look at pixels to find shapes or edges automatically. That's how our phone can recognize our faces or how a self-driving car can see road lines. I didn't realize before that AI and image editing use the same kind of math. I also saw how what we learned is used in real life. In medical imaging, they use contrast to make things easier to see in X-rays or scans. In cars, edge detection helps cameras see the road. Even in apps like Snapchat or TikTok, when you use a beauty filter, it's doing the same operations we learned.

For me, I want to learn more about geometric transformations, like rotating, resizing, or moving an image. It's like when you turn or crop a photo on your phone to make it look better. Now that I know every photo is made of numbers, I don't see filters the same way anymore. I understand they are really math tools changing those numbers. This lab showed me that math, code, and art can all

work together, and that makes me more interested in studying computers, to understand what is really going on when we use machines.