# Exercise 1: Color capture by different cameras

1. Go to: ***Spectral Sensitivities*** and download the spectral sensitivity curves of one camera of your choice.

2. From Lab 1, you have the spectral responses of a Nikon D90, and a Canon 1Ds markII. Together with the third camera you chose, simulate how each of these three cameras would photograph a Macbeth ColorChecker under illuminant A.

   You will end up with a 24x3 matrix for each camera.

   Make a simple plot comparing the RGB values of each patch (see example below shown for one color channel). For a given color channel, the x-axis will be patch number (1-24) and the Y-axis will be the captured intensity in that color channel for a given camera. (Since there are 3 color channels, please make 3 subplots, one per color channel).

3. Don't forget to add a legend.
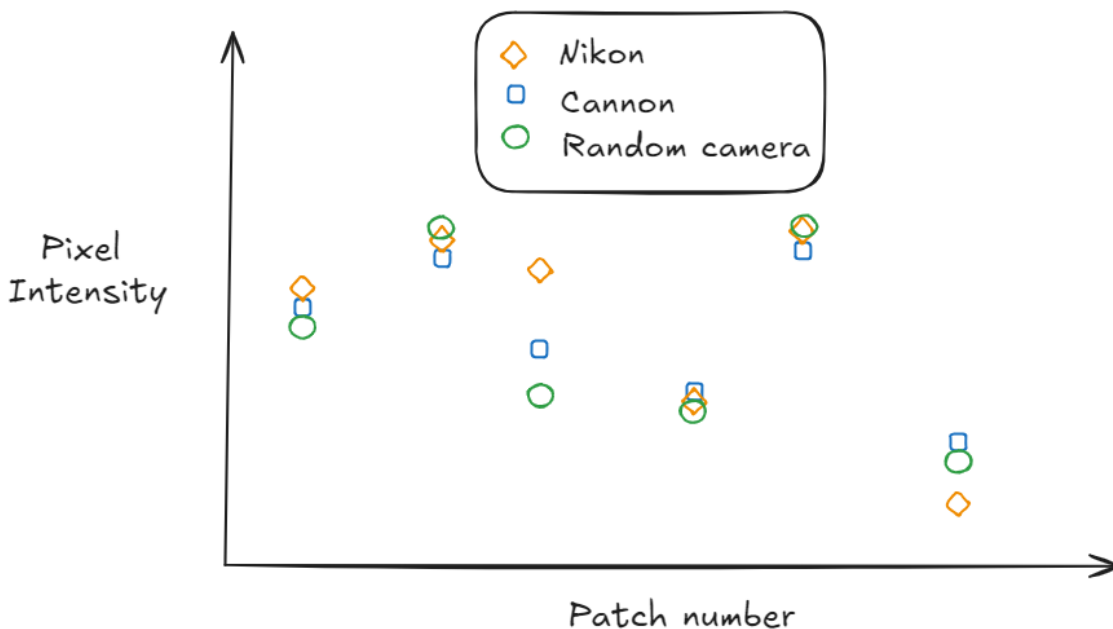
Exercise 2: Camera-RGB to XYZ Transformation

1. For each of the 3 cameras, under illuminant A, build a 3×3 transformation from the (white balanced) camera-RGB values to (white balanced) XYZ values.

2. From these XYZ values, calculate the xy values (for all cameras) and plot them on the CIE chromaticity diagram. Use different colors (or markers) to denote patches that came from each camera (see example below).

3. Plot the white point of the illuminant on the chromaticity diagram (show with a different marker that stands out).

   - You can use the build-in MATLAB function: `plotChromaticity`.
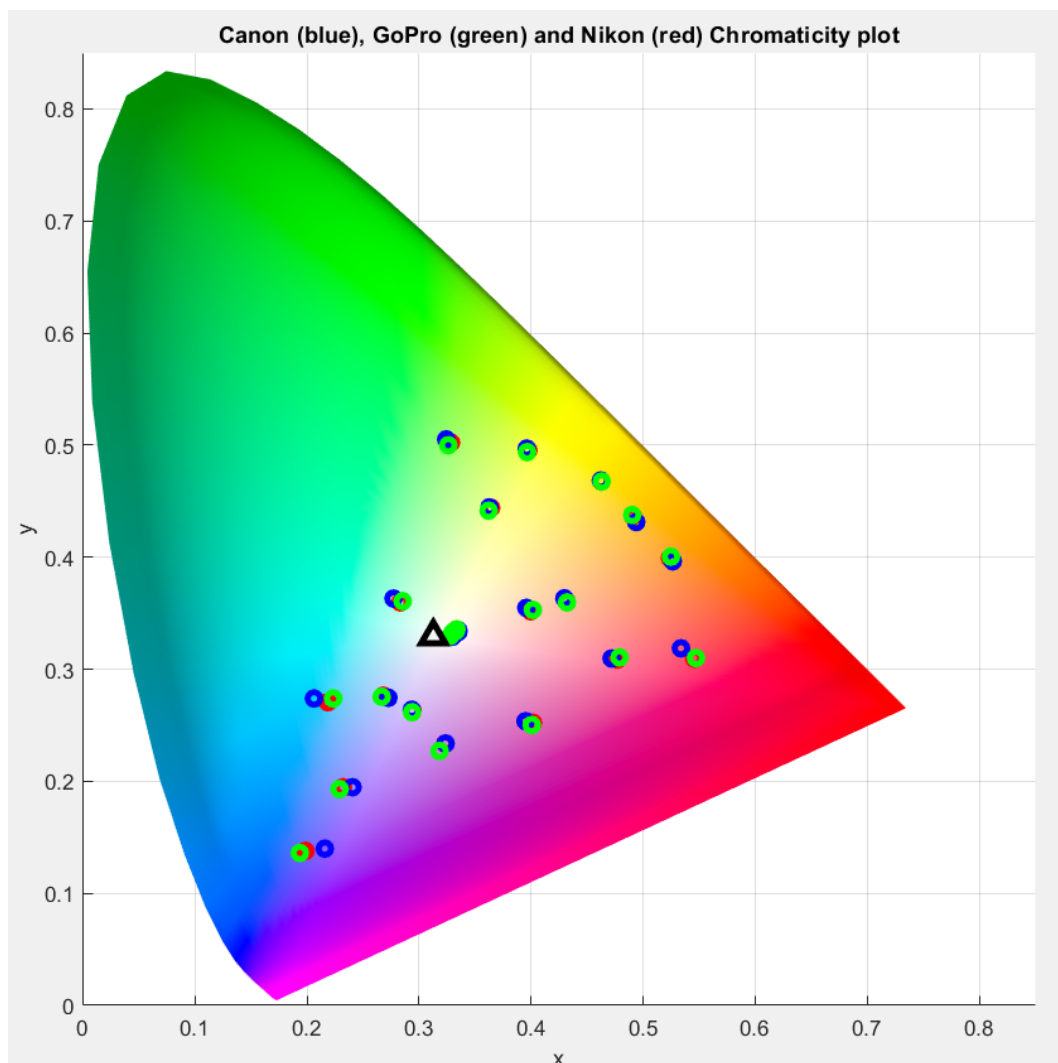
Exercise 3: XYZ to sRGB Transformation

1. As we learned in the lectures, XYZ to sRGB transformation is standard. Search for the XYZ to sRGB transformation matrix online. What is the reference white of the sRGB color space?

2. Don't forget to check if chromatic adaptation is needed (if the XYZ is already white balanced and the illuminants are similar, it is not needed).

3. Convert XYZ values from the 3 cameras to the sRGB color space.

4. Now make the same plot that you did in Exercise 1, using sRGB values from each camera. What is different?

5. Visualize the sRGB values from all cameras as a color chart (example below).