**Overview**

Color Detection System is a computer-vision project built using OpenCV and Pandas/Numpy. It enables users to click on an image to identify the closest named color via a CSV lookup, making it ideal for accessibility tools, design applications, or visual comps.

**Objective**

* Detect and label colors in an image by matching pixel RGB values to the nearest color name.
* Support beginners by offering a structured tutorial with visuals and code explanations.

**Key Components**

**a) Dataset**

* **colors.csv**: Contains ~865 known color names with RGB and hex values  
  (derived from open-source datasets).

**b) Libraries**

* opencv-python for image processing and UI
* pandas for handling CSV color data
* numpy for numeric operations

**Workflow**

1. **Load Image & Data**

img = cv2.imread(image\_path)

csv = pd.read\_csv('colors.csv', names=["color","color\_name","hex","R","G","B"], header=None)

1. **Set Mouse Callback**  
   Configure OpenCV window to detect double-click events and retrieve pixel RGB.
2. **Color Matching**  
   Use Euclidean distance to compare clicked pixel RGB to dataset samples, choosing the closest match.
3. **Display Results**  
   Shows a colored rectangle with the detected color name and RGB values. Adjusts text color for contrast.

**Usage Instructions**

1. Install dependencies:  
   pip install opencv-python numpy pandas
2. Run program:  
   python color\_detection.py --image path/to/image.jpg
3. Double-click on any region of the window to get the color information.

**Code Snippets**

Highlighting major parts:

* **Mouse callback setup**
* **Euclidean distance function**
* **Overlay drawing**

**Enhancements & Next Steps**

* Add CLI for real-time detection using webcam.
* Support for HSV/Dominant color detection using clustering.
* UI improvements and performance optimization.