# LAB Mask Range Tuner — README

This utility script (lab\_mask\_tuner.py) helps you discover accurate LAB color ranges for masking colors in your camera feed.  
It is especially useful for robotics, vision-based sorting, or any project using OpenCV color segmentation.

## Features

* **Live USB camera feed**
* **Movable region-of-interest (ROI) for focused tuning**
* **Interactive sliders for LAB lower and upper bounds**
* **Real-time mask preview**
* **Shows percent of detected pixels in ROI**
* **Prints final LAB values when you press ‘q’**

## How to Use

1. **Connect your USB camera** and place a sample of your target color in the ROI area.
2. **Run the script**:  
   python lab\_mask\_tuner.py
3. **Adjust the sliders** in the “Trackbars” window to isolate the target color in the ROI:
   * Move L, A, B sliders for both lower and upper bounds.
   * Watch the “ROI Mask” window — white pixels indicate detected color.
   * The percentage above the ROI shows how much of the area matches your mask.
4. **Press ‘q’ to quit**.  
   The script prints the final lower and upper LAB values you selected.
5. **Copy these values** into your color mask definitions (e.g., masks.py in your robot project).

## Example Output

When you press ‘q’, you’ll see something like:

Final Range:  
Lower: [40, 130, 80]  
Upper: [220, 200, 180]

Use these numbers for your LAB mask in your robotics code.

## Customization

* **ROI position**: Change roi\_x, roi\_y, roi\_w, roi\_h at the top of the script to place the ROI over your sample.
* **Camera index**: If you have multiple cameras, adjust cv2.VideoCapture(0).

## Tips

* Use in similar lighting conditions as your robot will operate.
* Tune for each color you need (orange, blue, black, etc).
* If the mask is too broad, you may get false positives; if too narrow, some target pixels may be missed.

## Requirements

* Python 3.x
* OpenCV (opencv-python)
* NumPy

Install dependencies with:

pip install opencv-python numpy

## Applications

* Robotics (WRO, FIRST, etc.)
* Color sorting systems
* Industrial automation vision
* Any LAB color segmentation project

## References

* [OpenCV Color Spaces](https://docs.opencv.org/4.x/de/d25/imgproc_color_conversions.html)
* [LAB Color Tuning](https://docs.opencv.org/4.x/df/d9d/tutorial_py_colorspaces.html)