This report outlines the use of OpenCV for image processing, specifically focusing on applying rotation to an image. OpenCV is a widely used library in computer vision and image processing. In this project, an image was uploaded and then subjected to various transformations, including rotation.

**Step 1: Installing OpenCV**

* Installed the opencv-python-headless package in a Google Colab environment to facilitate image processing without GUI support.

**Step 2: Importing Necessary Libraries**

* Imported cv2 for OpenCV functions, numpy for handling arrays and matrices, and matplotlib.pyplot for displaying images.
* Defined functions for displaying single and side-by-side images using matplotlib.

**Step 3: Loading the Image**

* The image was uploaded using Google Colab's file upload feature.
* Converted the uploaded image into a format suitable for OpenCV processing.

**Scaling and Rotation**

Scaling the Image:

* Implemented a function scale\_image() that resizes the image based on a scaling factor using cv2.resize().

Rotating the Image:

* Created the function rotate\_image() which rotates the image around its center.
* Used cv2.getRotationMatrix2D() to generate a transformation matrix for the desired rotation.
* Applied cv2.warpAffine() to perform the rotation based on the specified angle.

Step 4: Applying Rotation

* Called the rotate\_image() function with the uploaded image and an angle of 45 degrees.
* Displayed the resulting rotated image to visualize the effect of the transformation.

3. Results Achieved

* Successfully applied the rotation function to the image.
* The output showed the image rotated by 45 degrees around its center, demonstrating the effectiveness of cv2.getRotationMatrix2D() and cv2.warpAffine() for image transformation in OpenCV.

A person posing for a picture

Description automatically generated

4. Conclusion

The rotation of an image was achieved using OpenCV's functions for creating a rotation matrix and applying it to the image. The process demonstrated the flexibility and power of OpenCV in image manipulation. Further applications of this approach can involve rotating images at various angles or combining rotation with other transformations like scaling and blurring.