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OpenCv Perspective Transformation

Raqueeb Shaikh · [Follow](#)

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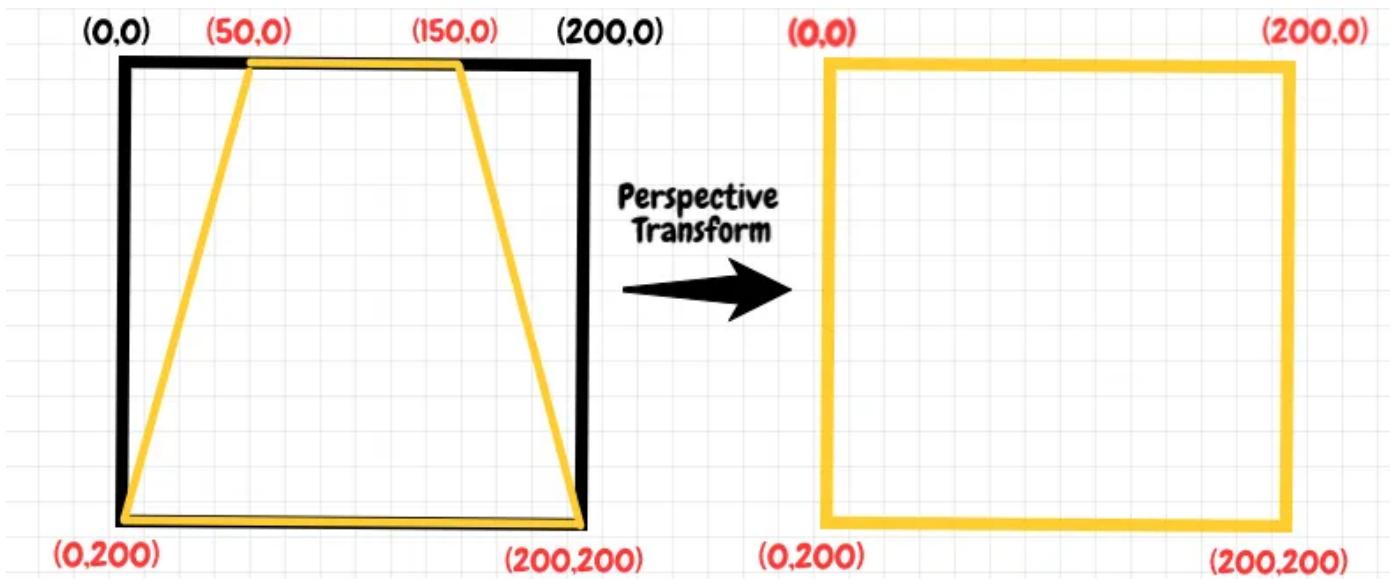
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Perspective Transform is a feature that is very useful if you want to align the image properly . It transform the image in a straight manner after Perspective Transformation is applied to it.

A classic Example of this if to transform the page on table to only select the page and transform it so that it appears as a top view of the image

Before we go into OpenCv Perspective Transform function we will look slightly into how the formula,algorithm looks and what goes behind the scene .



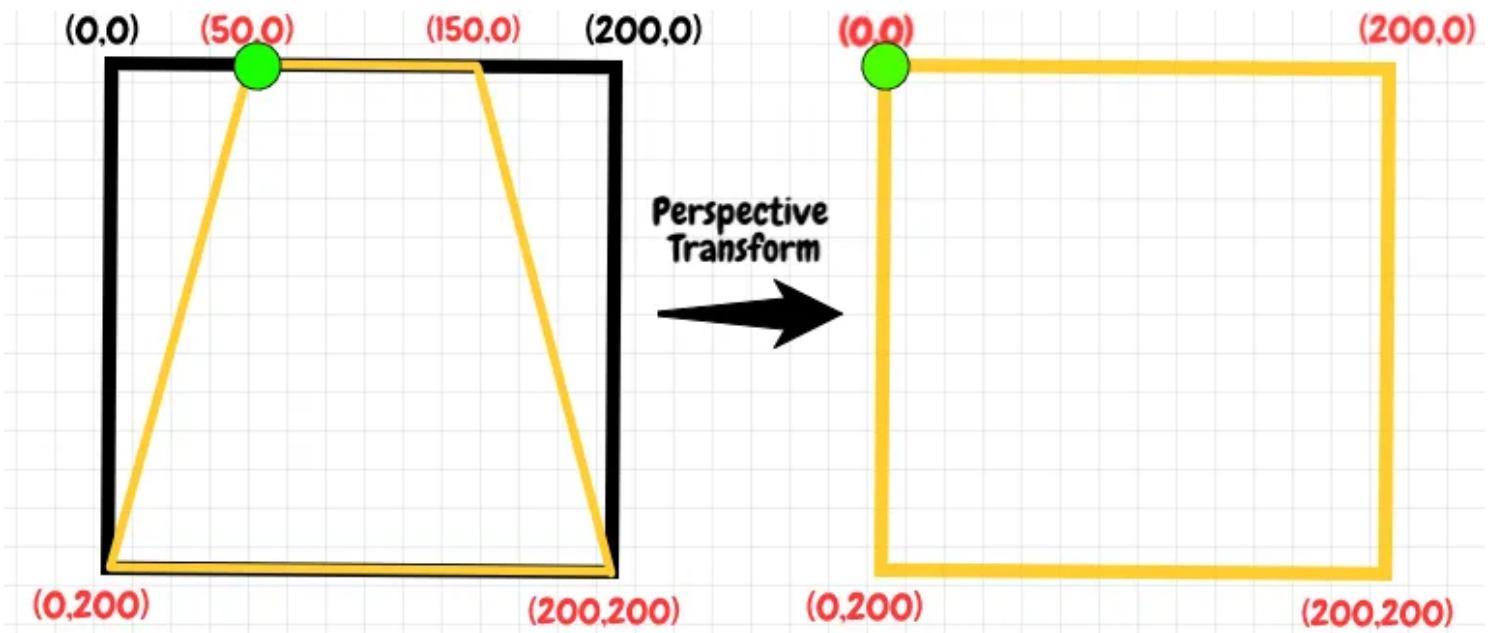
The above image on the left has —

Coordinates $[[50,0],[150,0],[0,200],[200,200]]$

Which have to be transformed to the new Coordinate —

New Coordinates $[[0,0],[200,0],[0,200],[200,200]]$

Calculation Example Given Below —



$$\begin{aligned} \text{Source} &= [[50, 0], [150, 0], [200, 0], [200, 0]] \\ \text{Destination} &= [[0, 0], [200, 0], [0, 200], [200, 200]] \end{aligned}$$

Transformaton Matrix

(Based on the above Source , Destination Values)

$$\begin{bmatrix} 2 & 0.5 & -100 \\ 0 & 2 & 0 \\ 0 & 0.005 & 1 \end{bmatrix}$$

To Calculate the location of values of each pixel on Destination . Source Pixel values are multiplied with Transformation Matrix as given below .

Step 1 -

Transformation Martix is multiplied with Pixel x,y coordinate values .

$$\begin{bmatrix} 2 & 0.5 & -100 \\ 0 & 2 & 0 \\ 0 & 0.005 & 1 \end{bmatrix} \cdot \begin{bmatrix} 50 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

Step 2 -

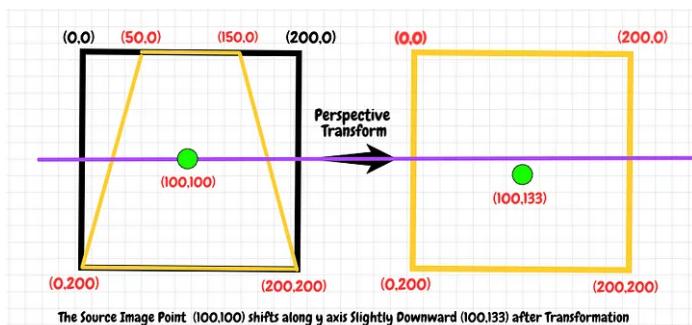
Values obtaiind of first two rows are divides by third row to obtain (x,y) as given below.

$$[0/1, 0/1] = [0, 0]$$

There for source to Destination Pixel location would be as Below

$$\text{Source } [50, 0] = \text{Destination } [0, 0]$$

Below is second calculation example



To Calculate the location of values of each pixel on Destination . Source Pixel values are multiplied with Transformation Matrix as given below .

Step 1 -

Transformation Martix is multiplied with Pixel x,y coordinate values .

$$\begin{bmatrix} 2 & 0.5 & -100 \\ 0 & 2 & 0 \\ 0 & 0.005 & 1 \end{bmatrix} \cdot \begin{bmatrix} 100 \\ 100 \\ 1 \end{bmatrix} = \begin{bmatrix} 150 \\ 200 \\ 1.5 \end{bmatrix}$$

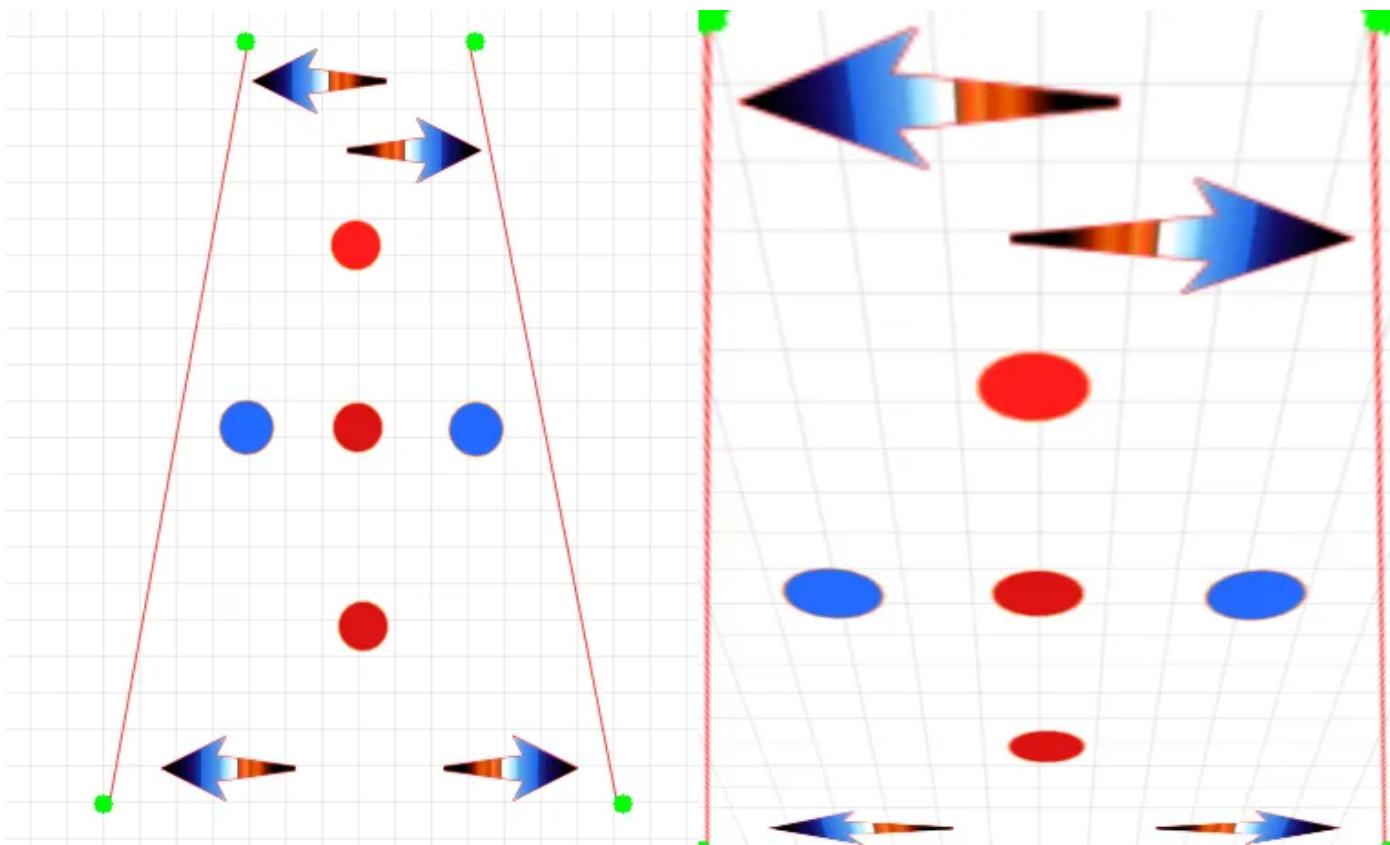
Step 2 -

Values obtaiind of first two rows are divides by third row to obtain (x,y) as given below.

$$[150/1.5, 200/1.5] = [100, 133.33]$$

There for source to Destination Pixel location would be as Below

$$\text{Source } [100, 100] = \text{Destination } [100, 133.33]$$

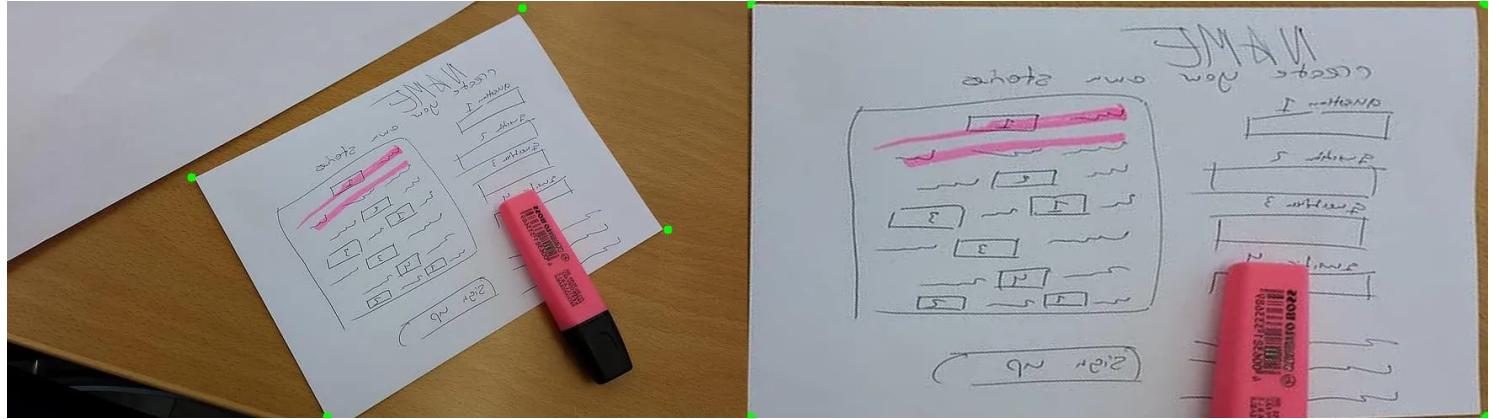


As you can see from the image all the horizontal Parallel lines are kept Parallel after transformation . Vertical Parallel lines are not Parallel to each other after Transformation .

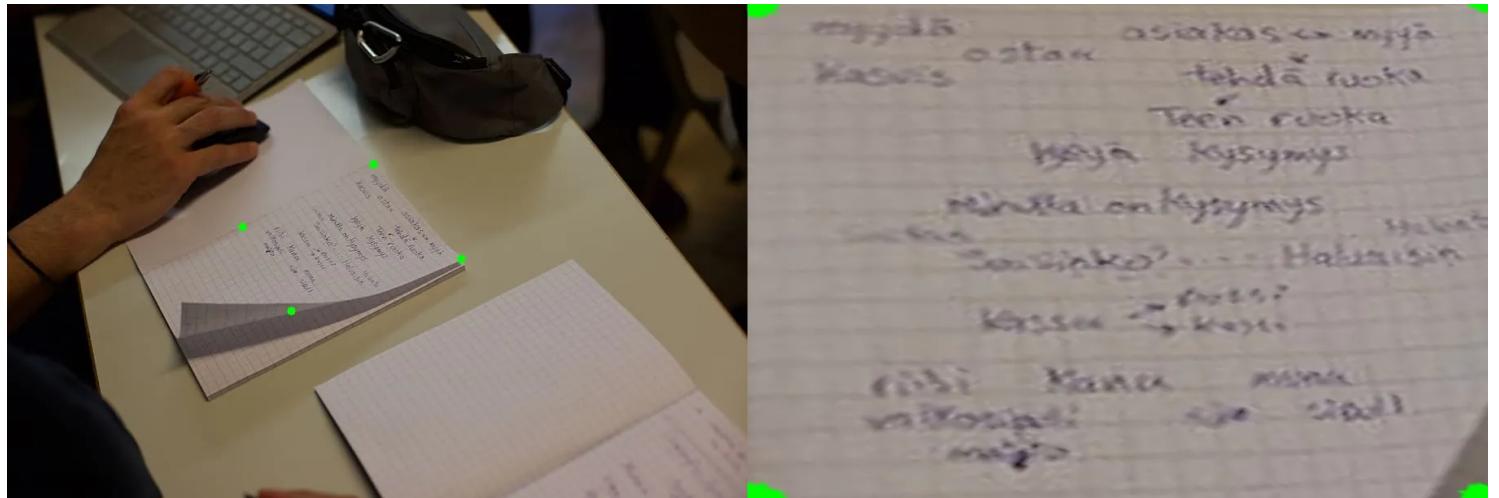
Implementation of Perspective Transformation in OpenCv

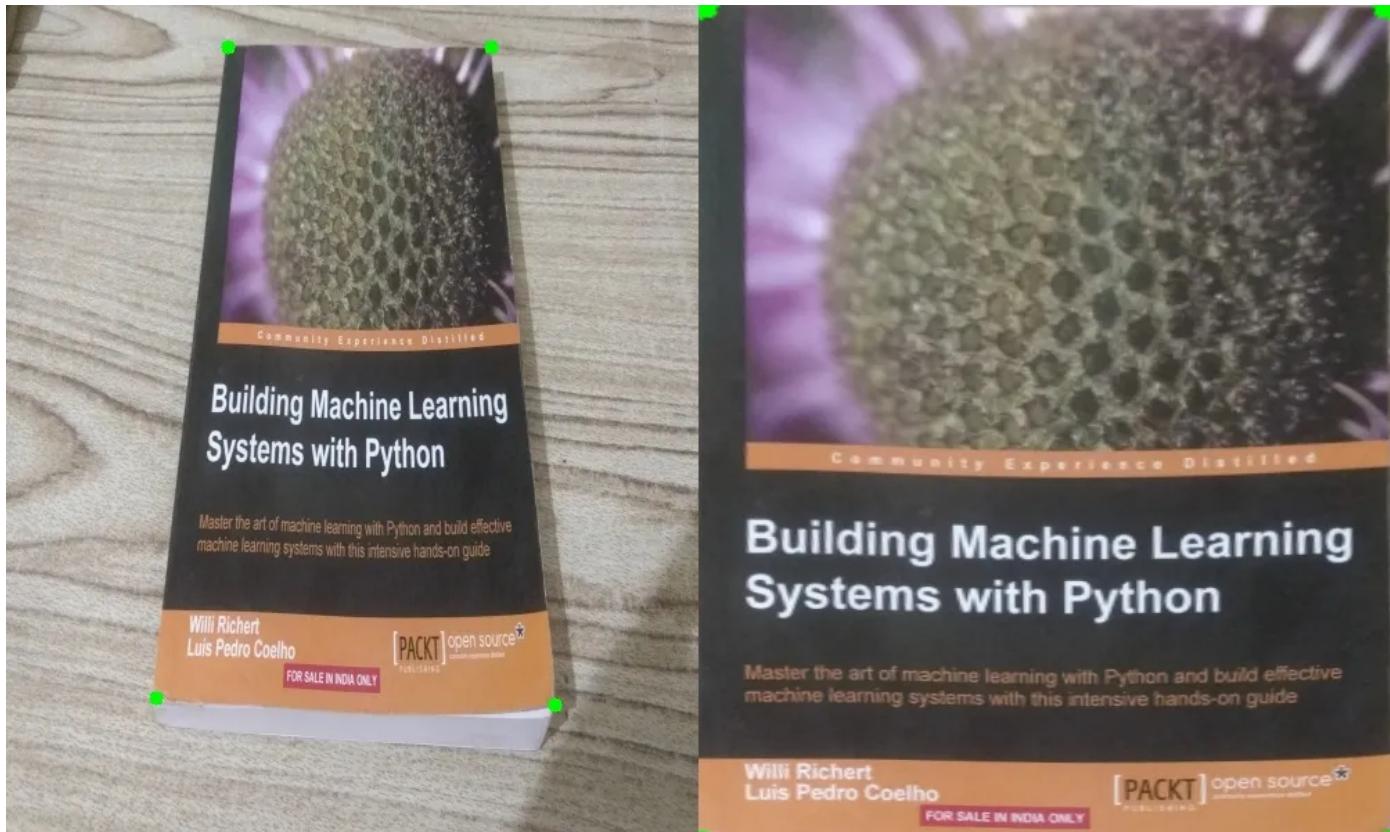
```
import cv2
from operator import itemgetter
from glob import glob
import matplotlib.pyplot as plt

paper = cv2.imread('./Photos/book.jpg')
# Coordinates that you want to Perspective Transform
pts1 = np.float32([[219,209],[612,8],[380,493],[785,271]])
# Size of the Transformed Image
pts2 = np.float32([[0,0],[500,0],[0,400],[500,400]])
for val in pt1:
    cv2.circle(paper,(val[0],val[1]),5,(0,255,0),-1)
M = cv2.getPerspectiveTransform(pt1,pts2)
dst = cv2.warpPerspective(paper,M,(500,400))
plt.imshow(dst)
```



As you can see from the above image how the Perspective Transform function maintains the Horizontal lines in the image and manages to get the top view for the paper . Some more example images given below





Reference –

https://opencv-python-tutorials.readthedocs.io/en/latest/py_tutorials/py_imgproc/py_geometric_transformations/py_geometric_transformations.html
<http://jlouthan.github.io/perspective-transform/examples/test-ui/index.html>

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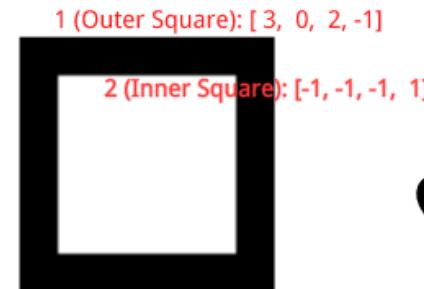
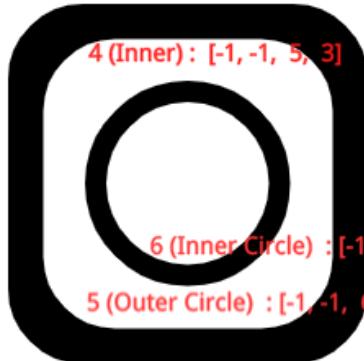
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3 (Outer) : [-1, 1, 4, -1]



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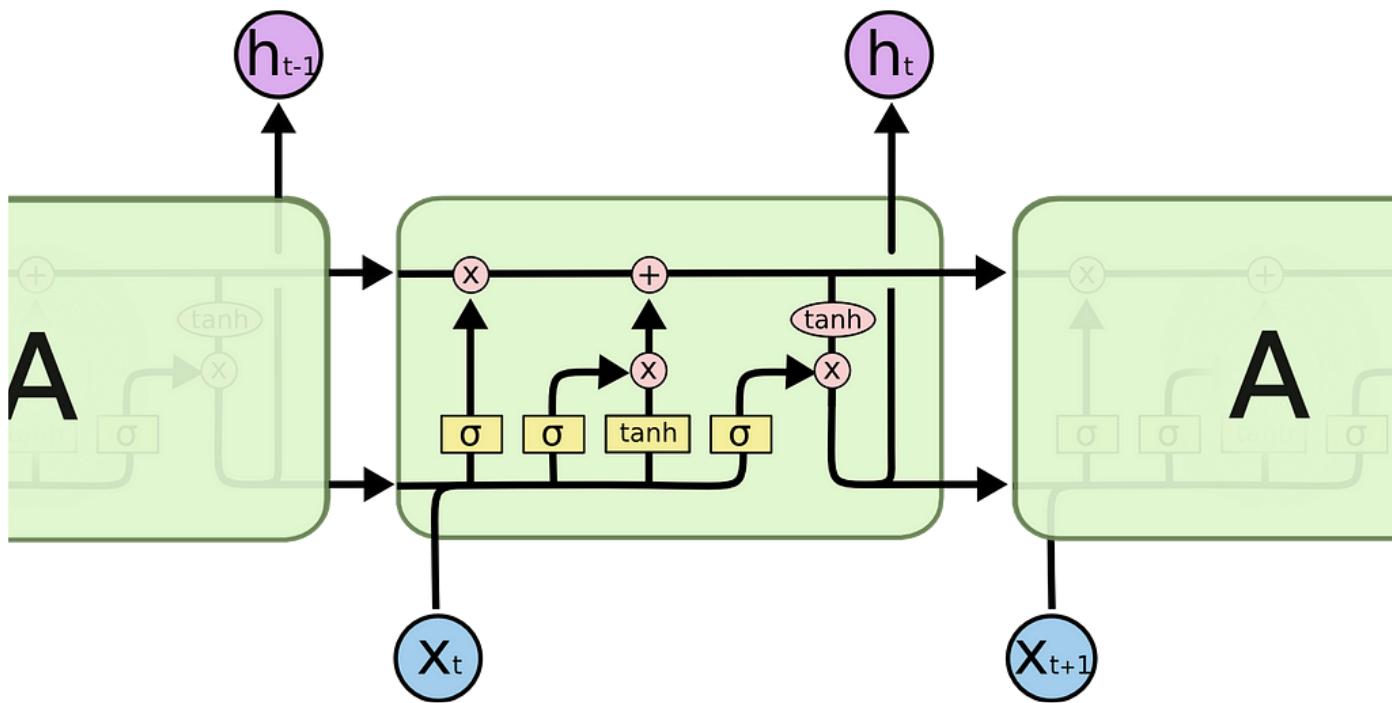
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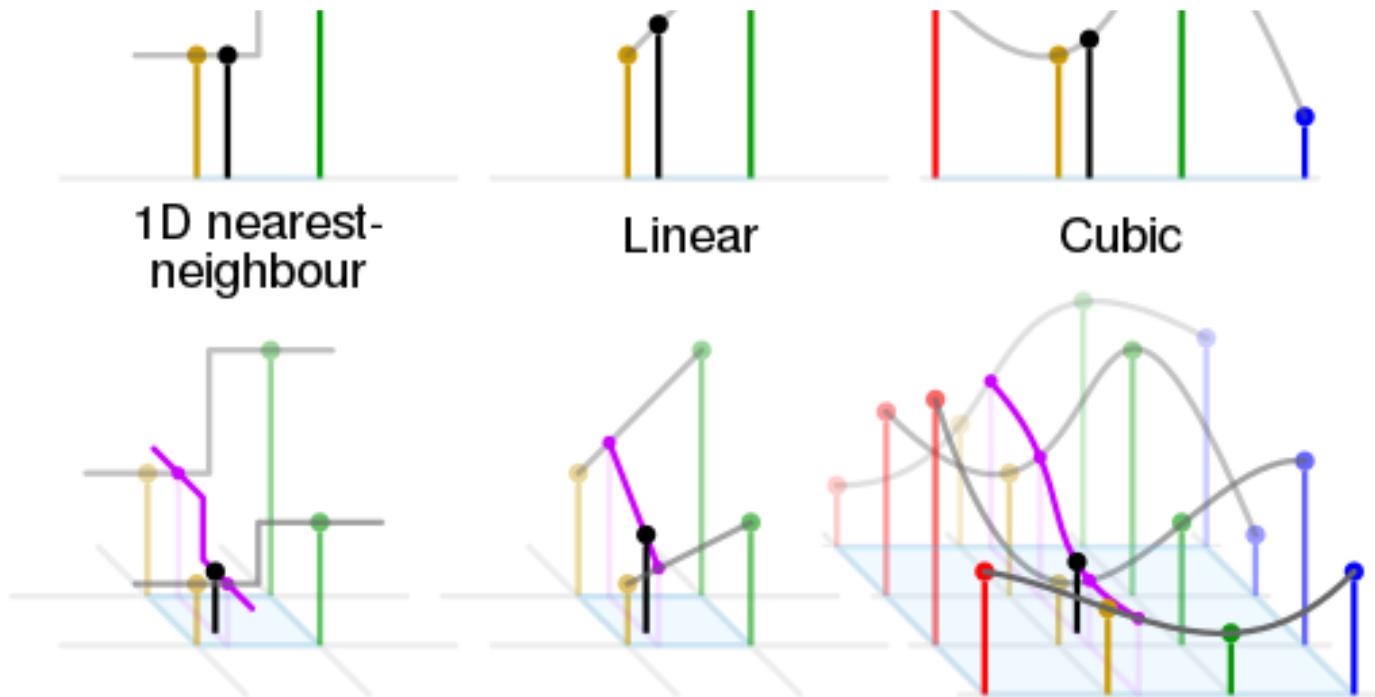
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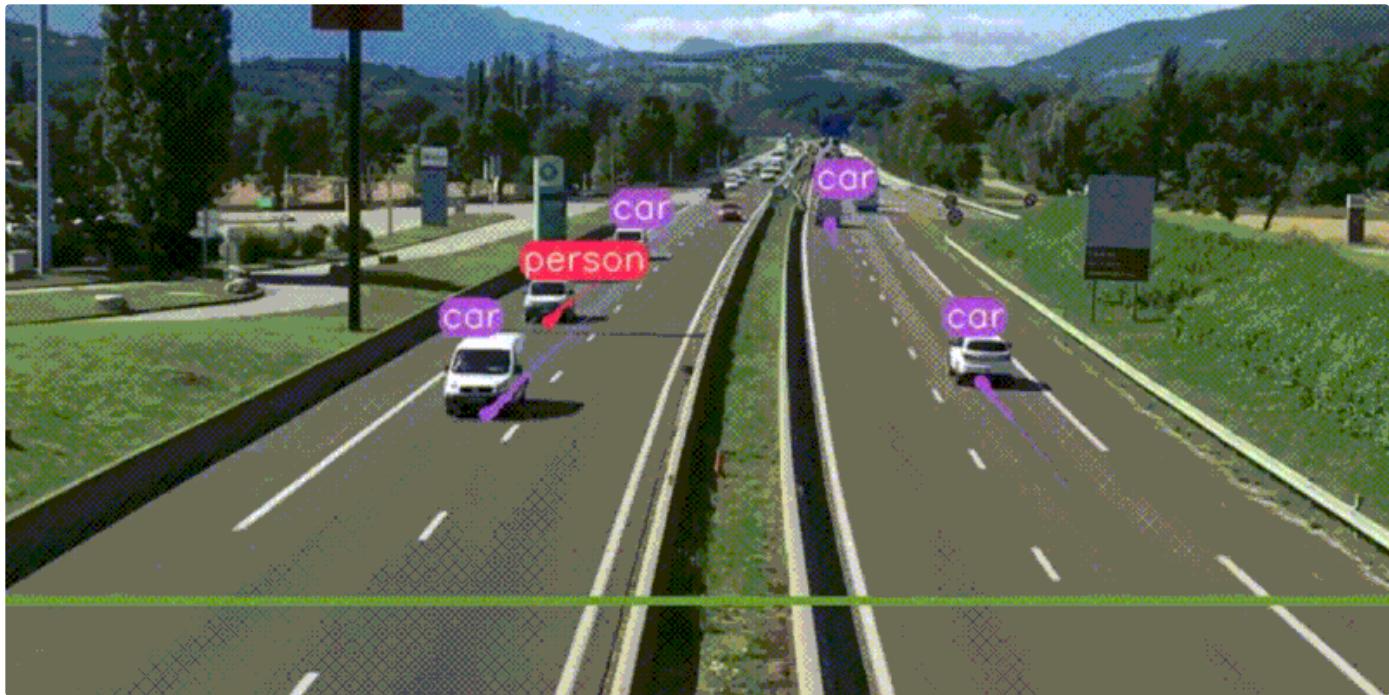
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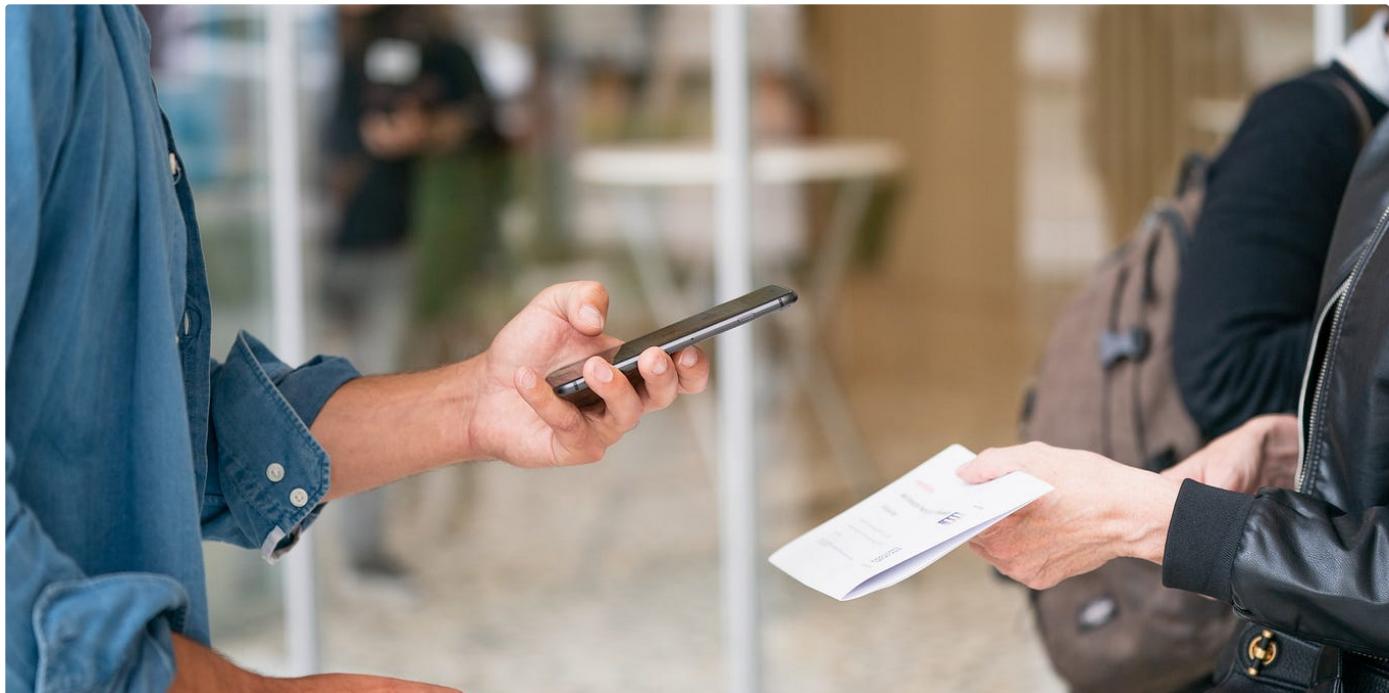
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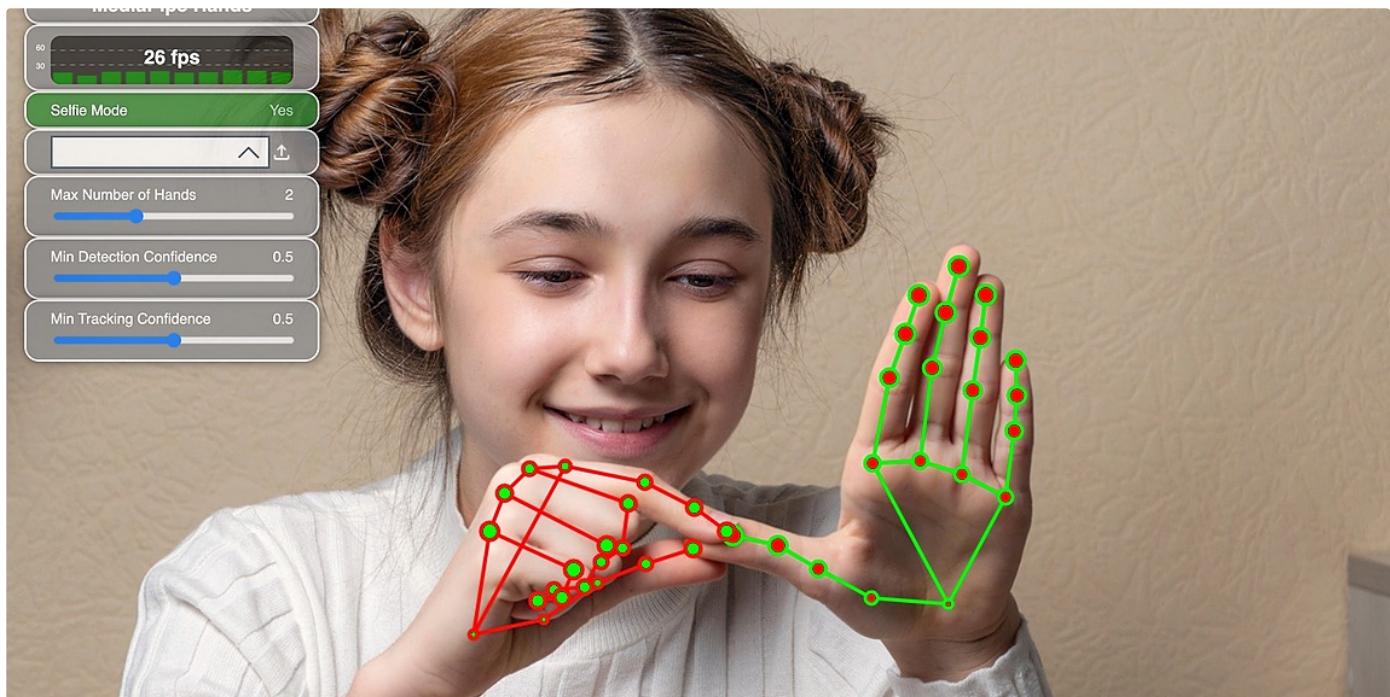
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