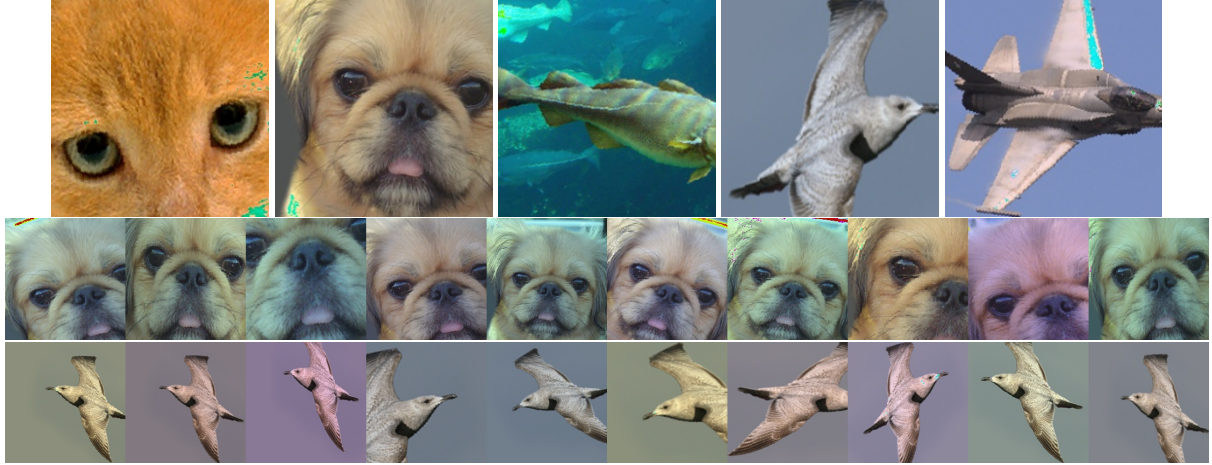


ASSIGNMENT 1 WRITEUP

Yelun Bao
ybao35@wisc.edu

In this homework, I implemented 4 transforming functions. Here are the results generated by notebook.



Results of transformed images

For the bonus question, according to symmetry, the max rectangle must be cropped on the center of the original image (it can also be verified by the monotonicity of quadratic functions). Based on this fact, we can derive the position of the cropped rectangle.

Suppose the original image is $W \times H$. WLOG, let rotating angle $d \in (0, 90)$. Assume the cropped height is x . Since cropped rectangle is on the center, the cropped width is $\frac{W}{H}x$. Consider the rotated image. W is divided by the lower-left point of cropped rectangle. Thus, we have equation

$$x \cos d + \frac{W}{H}x \sin d = H$$

$$x = \frac{H}{\cos d + \frac{W}{H} \sin d}$$

Then, we can know width is $\frac{W}{\cos d + \frac{W}{H} \sin d}$. The cropped rectangle's coordinate is decided as

$$\frac{W - \frac{W}{H}x}{2}, \frac{W + \frac{W}{H}x}{2}, \frac{H - x}{2}, \frac{H + x}{2}.$$