

```
In [33]:  
import numpy as np  
import pandas as pd  
import tensorflow as tf  
from tensorflow.keras.preprocessing.image import ImageDataGenerator  
from tqdm.notebook import tqdm  
import glob  
import matplotlib.image as mpimg  
from PIL import Image  
import os  
import matplotlib.image as mpimg  
import matplotlib.pyplot as plt
```

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In [24]: path = 'images/'
```

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In [25]: df = pd.read_csv('cadod.csv')  
img_shape = []  
img_size = np.zeros((df.shape[0], 1))  
  
for i,f in enumerate(tqdm(glob.glob(path, '*.jpg'))):  
    file = path+'/'+f  
    img = Image.open(file)  
    img_shape.append(f'{img.size[0]}x{img.size[1]}')  
    img_size[i] += os.path.getsize(file)
```

```
In [26]: TRAIN_DIR = path
```

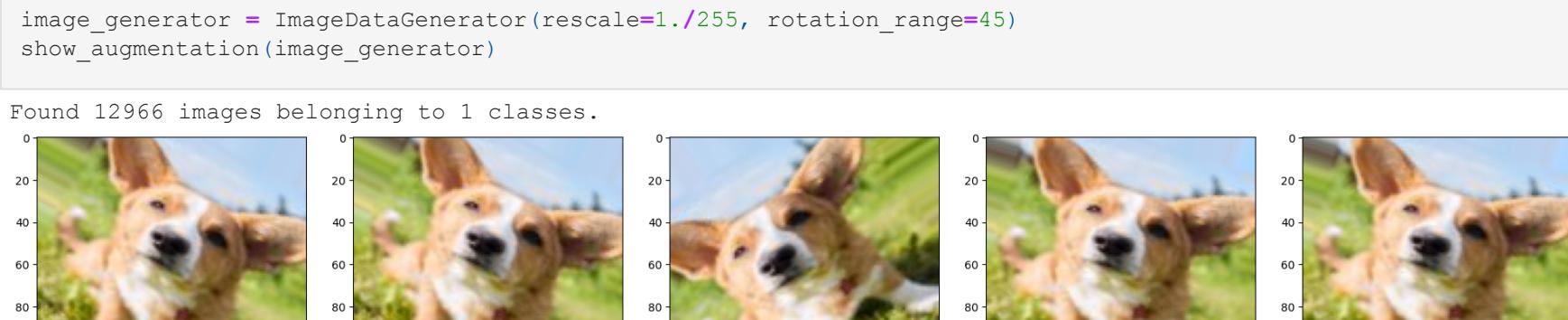
```
In [34]:  
BATCH_SIZE = 128  
IMAGE_SHAPE = 128  
def plot_images(images):  
    fig, axes = plt.subplots(1, 5, figsize=(20, 20))  
    for img, ax in zip(images, axes.flatten()):  
        ax.imshow(img)  
    plt.tight_layout()  
    plt.show()
```

```
In [35]:  
def show_augmentation(generator):  
    image_data = image_generator.flow_from_directory(  
        directory=TRAIN_DIR,  
        target_size=(IMAGE_SHAPE, IMAGE_SHAPE),  
        batch_size=BATCH_SIZE,  
        shuffle=True  
    )  
    augmented_images = [image_data[0][0][0] for _ in range(5)]  
    plot_images(augmented_images)
```

Horizontal flipping

```
In [36]:  
image_generator = ImageDataGenerator(rescale=1./255, horizontal_flip=True)  
show_augmentation(image_generator)
```

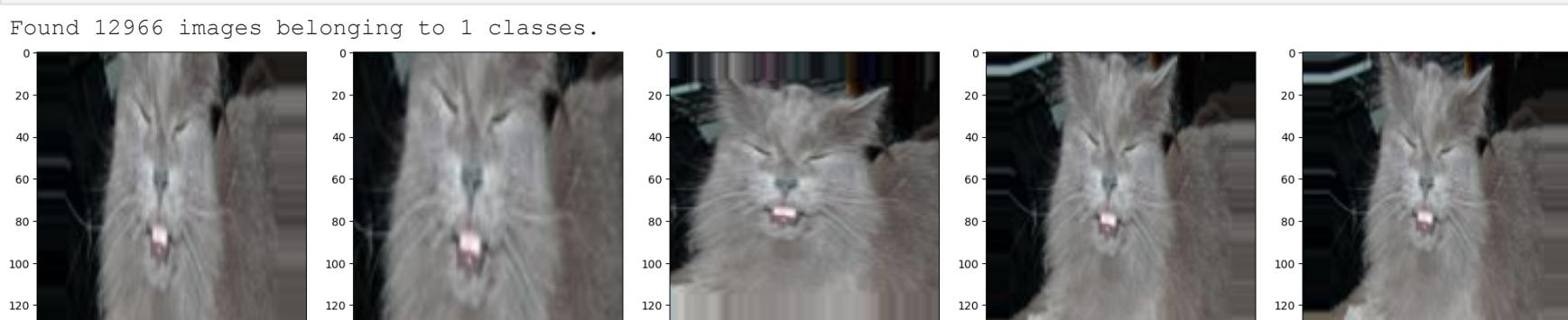
Found 12966 images belonging to 1 classes.



Rotation

```
In [37]:  
image_generator = ImageDataGenerator(rescale=1./255, rotation_range=45)  
show_augmentation(image_generator)
```

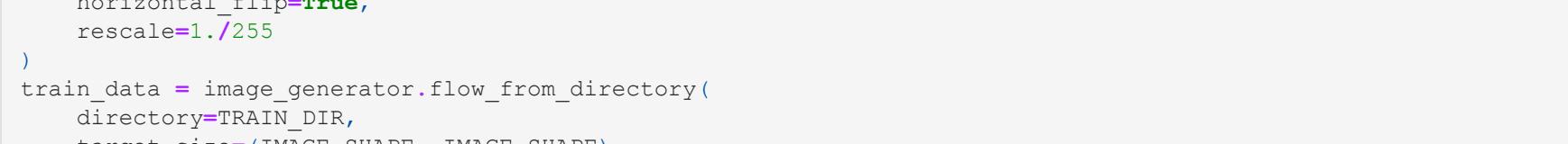
Found 12966 images belonging to 1 classes.



Zoom

```
In [38]:  
image_generator = ImageDataGenerator(rescale=1./255, zoom_range=0.5)  
show_augmentation(image_generator)
```

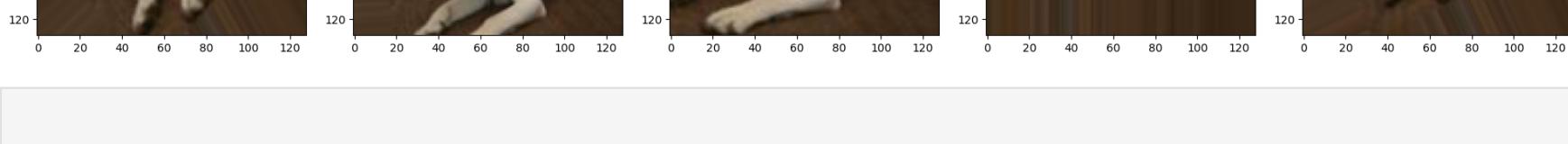
Found 12966 images belonging to 1 classes.



Combining

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In [39]:  
image_generator = ImageDataGenerator(  
    rotation_range=40,  
    width_shift_range=0.2,  
    height_shift_range=0.2,  
    shear_range=0.2,  
    zoom_range=0.2,  
    horizontal_flip=True,  
    rescale=1./255  
)  
train_data = image_generator.flow_from_directory(  
    directory=TRAIN_DIR,  
    target_size=(IMAGE_SHAPE, IMAGE_SHAPE),  
    batch_size=BATCH_SIZE,  
    shuffle=True,  
    class_mode='binary'  
)  
show_augmentation(image_generator)
```

Found 12966 images belonging to 1 classes.
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In [ ]:
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