Resizing

Use TensorFlow to resize images with a variety of different image scaling algorithms.

Chapter Goals:

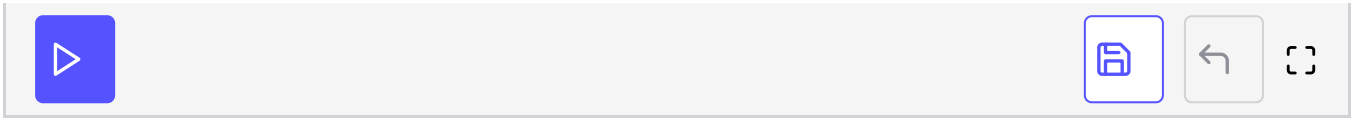
- Be able to resize pixel data when required
- Understand how resizing works in TensorFlow

A. Basic resizing

The function we use for resizing pixel data is `tf.image.resize_images`. It takes in two required arguments: the original image's decoded data and the new size of the image, which is a tuple/list of two integers representing `new_height` and `new_width`, in that order.

```
import tensorflow as tf

with tf.Session() as sess:
    print('Original: {}'.format(
        repr(sess.run(decoded_image))))  # Decoded image data
    resized_img = tf.image.resize_images(decoded_image, (3, 2))
    print('Resized: {}'.format(
        repr(sess.run(resized_img))))
```



Example usage of tf.image.resize_images. Note that the resized pixel array has type float, and the number of channels is still 1.

The function compresses or expands the image (depending on the relationship between the new image dimensions and the old image dimensions) and then returns the pixel data for the resized image, with the same number of channels. Note that if the resized dimensions don't match the same aspect ratio as the original dimensions, the new image data will be distorted.

In the example above, the original image's dimensions were 3x3, while the resized dimensions were 3x2. This resulted in the image data becoming

distorted.

B. Resizing methods

The TensorFlow `tf.image.resize_images` function allows us to specify a keyword argument called `method`. The `method` argument represents the image scaling algorithm. There are 4 possible values for `method`:

- `tf.image.ResizeMethod.BILINEAR`
- `tf.image.ResizeMethod.NEAREST_NEIGHBOR`
- `tf.image.ResizeMethod.BICUBIC`
- `tf.image.ResizeMethod.AREA`

The default value for `method` is `tf.image.ResizeMethod.BILINEAR`. A nice comparison of some of the methods can be found here. The comparison does not mention the `AREA` method, which is normally used for downsampling (resizing to a smaller size).

C. Unknown type

As mentioned in the previous chapter, a benefit to using `tf.image.decode_image` is when we don't know the type of input image (e.g. PNG vs. JPEG). However, we can't use `tf.image.resize_images` if the decoding function was `tf.image.decode_image`. This is because the input data for `tf.image.resize_images` needs to have a known number of dimensions, but the output of `tf.image.decode_image` can have 3 or 4 dimensions depending on the image type.

If it is still necessary to resize an image of unknown type (non-GIF), we can use `tf.image.resize_image_with_crop_or_pad`. This resizes pixel data by either padding the data with 0's (for a size increase) or cropping the pixel data (for a size decrease). Cropping the pixel data means removing certain pixels along each dimension that needs to be shrunk.

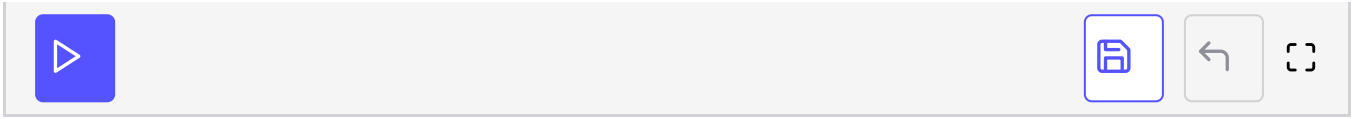
In contrast to `tf.image.resize_images`, the output of `tf.image.resize_image_with_crop_or_pad` is the same type as the original image data, since none of the individual pixels are transformed.

```
import tensorflow as tf

with tf.Session() as sess:
```

```
print('Original: {}'.format(
    repr(sess.run(decoded_image))))  # Decoded image data
resized_img = tf.image.resize_image_with_crop_or_pad(

    decoded_image, 5, 2)
print('Resized: {}'.format(
    repr(sess.run(resized_img))))
```



Example usage of tf.image.resize_image_with_crop_or_pad. Note that the resized pixel array remains the same type.

In the example, we resize a 4x3 image (with 1 channel) to new dimensions of 5x2. The second argument of `tf.image.resize_image_with_crop_or_pad` represents the new height, while the third argument represents the new width.

To decrease the width and increase the height, cropping is applied along the width dimension, while padding is applied along the height dimension.

Time to Code!

In this chapter we'll be completing the `decode_image` function.

We need to check that there is a specified `resize_shape` and the `image_type` is valid.

Create an `if` code block outside the previous `if...elif...else` block. The `if` condition checks that both `resize_shape` is not `None` and `image_type` is either `'png'` or `'jpeg'`.

If the previous conditions are met, then we can resize the decoded image.

Inside the `if` block, set `decoded_image` equal to the output of `tf.image.resize_images` with first argument `decoded_image` and second argument `resize_shape`.

To finish the function we'll return `decoded_image`, outside the scope of the `if` code block. This ensures that the pixel data is returned regardless of whether it is resized or not.

Return `decoded_image`, outside the scope of the `if` block.

```
import tensorflow as tf

# Decode image data from a file in Tensorflow

def decode_image(filename, image_type, resize_shape, channels=0):
    value = tf.read_file(filename)
    if image_type == 'png':
        decoded_image = tf.image.decode_png(value, channels=channels)
    elif image_type == 'jpeg':
        decoded_image = tf.image.decode_jpeg(value, channels=channels)
    else:
        decoded_image = tf.image.decode_image(value, channels=channels)
    # CODE HERE
```