Super Colorization
Practical Machine Deep Learning

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Motivation

Goal: improving grayscale image processing through a pipeline of colorization followed by super-resolution.

- Super colorization could be applied to various grayscale, low quality media content.
- Image colorization and super resolution could be used in various applications as coloring old black and white movies and increasing their frames' resolution.
- It could be used in images lossy compression. Where on the sender side images could be scaled down and converted to a single channel image, then it could be colorized and scaled up on the receiver side.
- Image colorization and SR can additionally be used as a pre-stage layer in other image processing techniques.

Problem Statement

Colorization:
Input: grayscale image
Output: RGB image
Evaluation: visual evaluation

Super resolution :
Input: low quality RGB image
Output: High resolution
Evaluation: visual evaluation

Dataset

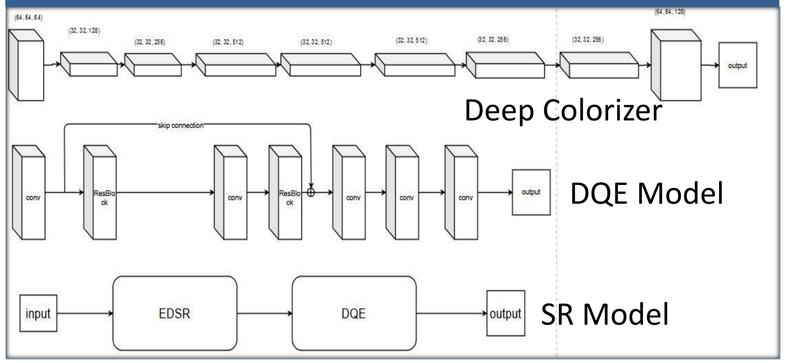
Colorization

- Processing:
  - RGB to CIELAB
- Size:
  - Training: 3300 Flowers, 25000 MIRFLICKR.
  - Validation: 600 images.

Super resolution :

- Processing:
  - Normalized with mean and std of ImageNet
- Size:
  - Training: 16000 MS-COCO.
  - Validation: 4000 images.

Models



Experiments

Colorization:

- Training the ConvNet directly with no feature extraction modules.
- Using Xception pretrained model on ImageNet for feature extraction
- Using ResNet50 pretrained model on ImageNet for feature extraction

Super Resolution:

- Adding content loss term (VGG5 and VGG20) on EDSR
- Using MSE and MAE losses
- Using a large dataset other than div2k
- Using higher number of Resblocks (8, 12, 16, 24)
- Scaling with factor of > 2 along with 16 Resblock.
- Adding a Deep network after EDSR to enhance quality.

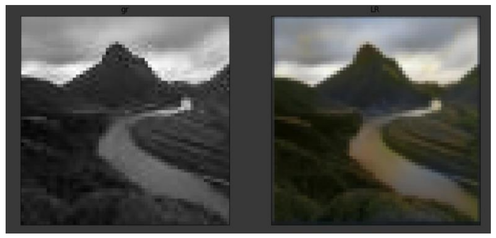
Conclusion

The intended task was given a low-quality grey scale image, our model will be able to colorize the image and increase its quality (resolution) by 2x so that it looks more natural and cleared. Due to lack of time and lack of resources to train the colorization image on a huge dataset, we put most of our focus on the super resolution task which can be achieved with less resources and less data. Super resolution with our proposed architecture works well and gives results that are close to natural. The colorization network is hungry for data; it gives acceptable results on images it's familiar with its color distribution.

Results

- image super resolution results:

- Image colorization Results



- Colorization + SR results

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