RGBaddies: Colorizing Grayscale Images

Hunter Adrian John Farrell Tyler Gurth Jania Vandevoorde

BROWN

CSCI 1430

Motivation

1. Predictive Colorization: Bring grayscale images to life
2. Natural Colorization: Ensure colors look authentic and realistic
3. Revive History: Convert old historical photos to color for modern viewing
4. Personal Memories: Allow for individuals to revisit old photos in full color

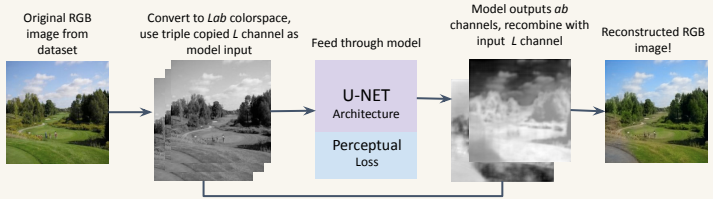
Data

- VGG19 pre trained on ImageNet
- U-Net architecture trained on MIT Places365
- Tested on MIT Places365

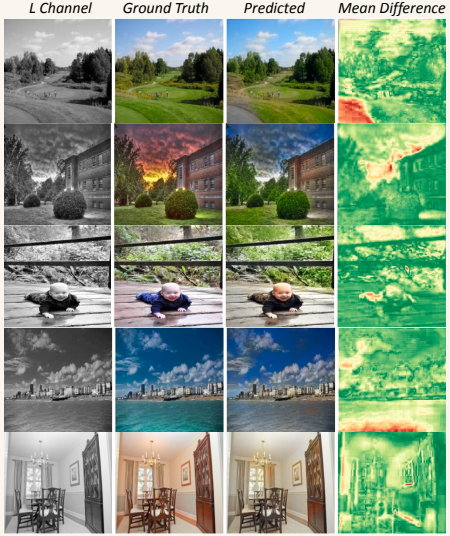
IMAGENET places THE SCENE RECOGNITION DATABASE

90/10 Train-Test Split

Method



Results



Applications Beyond the Dataset

Loss Function

We used a **perceptual loss function** to prioritize high-level feature difference. Loss *L* averages various blurred truth-prediction pairs.

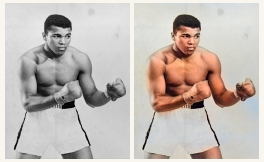
$$L(Y_i, \hat{Y}_i) = \frac{\sqrt{\mathrm{M}(\mathrm{Y_i}, \hat{\mathrm{Y}}_\mathrm{i})} + \mathrm{GD}(\mathrm{Y_i}, \hat{\mathrm{Y}}_\mathrm{i}, 3) + \mathrm{GD}(\mathrm{Y_i}, \hat{\mathrm{Y}}_\mathrm{i}, 5)}{3}$$

GD defines the root *MSE* difference with gaussian of *fxf* applied.

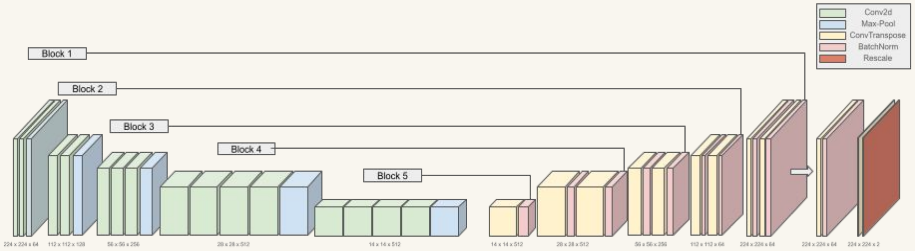
$$\mathrm{GD}((\mathrm{Y_i}, \hat{\mathrm{Y}}_\mathrm{i}, \mathrm{f}) = \sqrt{MSE(G(Y_i, f), G(\hat{Y}_i, f))} \quad \mathrm{MSE}((\mathrm{Y_i}, \hat{\mathrm{Y}}_\mathrm{i}) = \frac{1}{n}\sum_{i=1}^{n}(Y_i - \hat{Y}_i)^2$$

Social Impact

Providing plausible color predictions for legacy black and white photos.



Architecture (VGG19 U-Net)



References

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[4] R. Zhang, P. Isola, and A. A. Efros. Colorful image colorization. Proceedings of the University of California, Berkeley, 2016.

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