

Image Colorization through CNNs

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Introduction

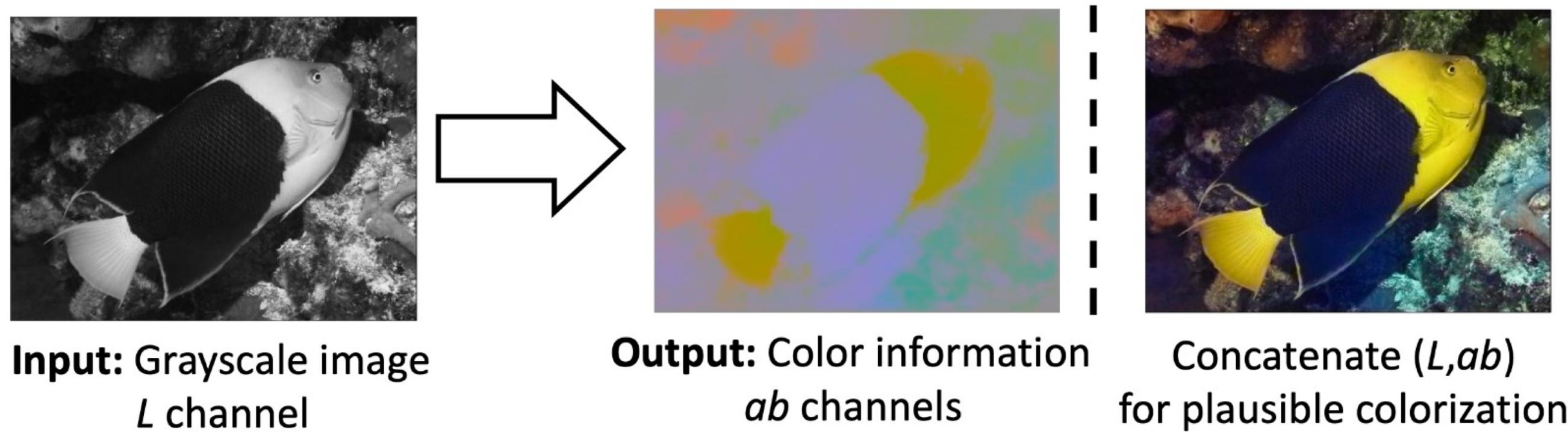
- Applications:** Colorize historical black-and-white images, enrich CCTV footage.
- Challenge:** A grayscale input image can have multiple plausible outputs.
- Objective:** Given a grayscale image, hallucinate a *plausible* colored output image.
- Importance:** Many other computer vision algorithms rely on color information in images (e.g. object detection, semantic scene segmentation etc.).
- Contribution:** We propose a CNN-based deep model that uses a combination of low-level local image features and high-level semantic features to colorize grayscale images

Related Work

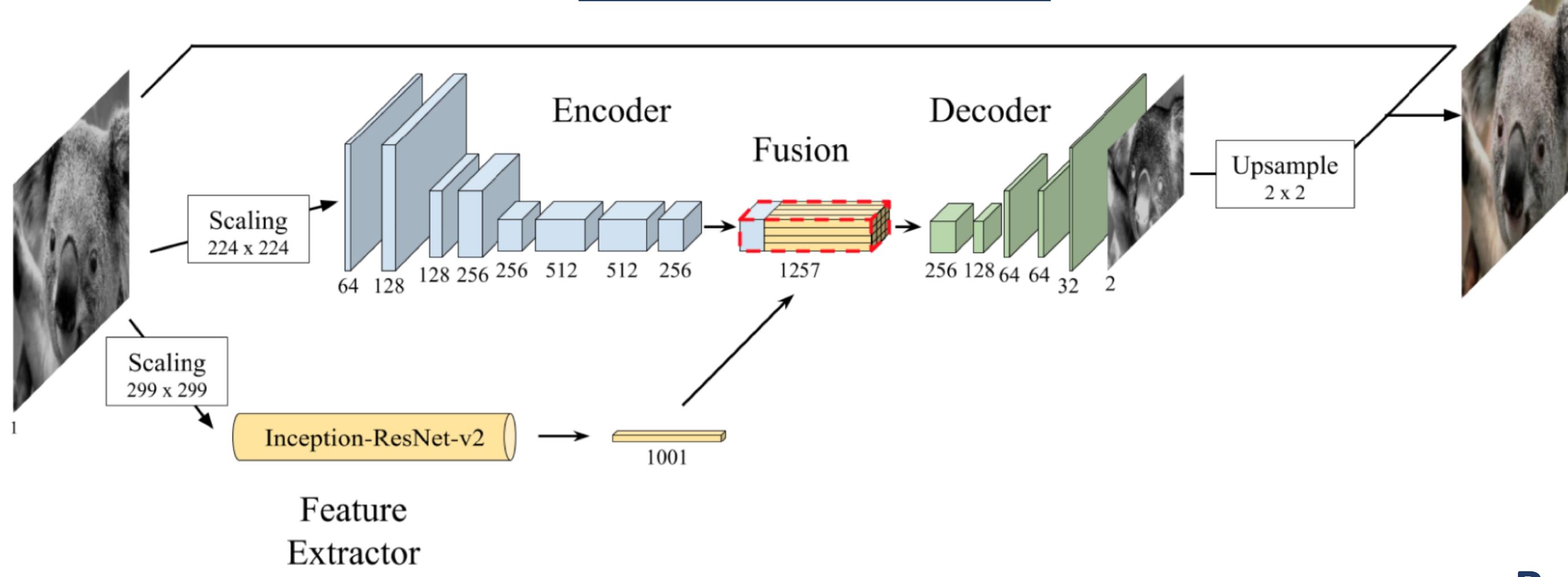
- Federico Baldassarre, Diego Gonzalez Morin, and Lucas Rodes-Guirao. Deep Koalarization: Image Colorization using CNNs and Inception-Resnet-v2. In: CVPR(2017)
- Billaut, Vincent & de Rochemonteix, Matthieu & Thibault, Marc. (2018). ColorUNet: A convolutional classification approach to colorization.
- Zhang R., Isola P., Efros A.A. (2016) Colorful Image Colorization. In: Leibe B., Matas J., Sebe N., Welling M. (eds) Computer Vision – ECCV 2016. ECCV 2016. Lecture Notes in Computer Science, vol 9907. Springer, Cham

Methods

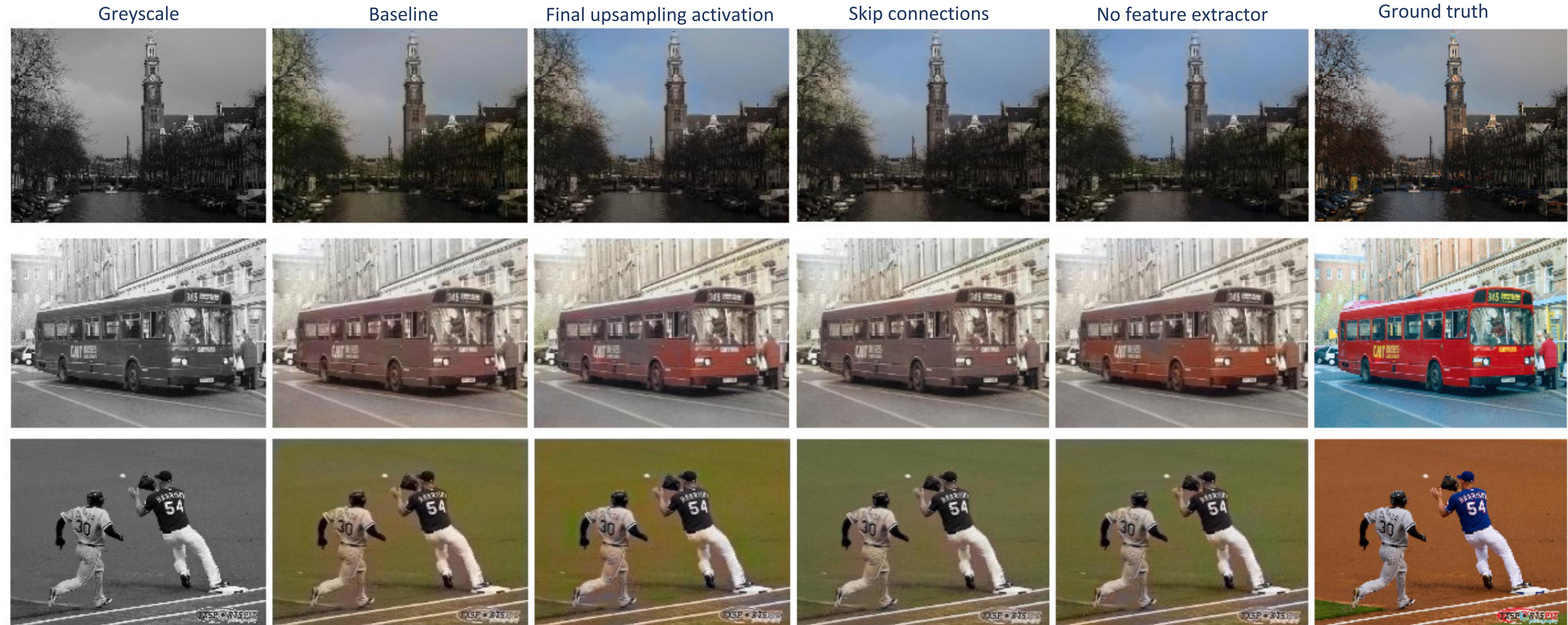
- All our models were **fully implemented by us in PyTorch from the ground up**. We did not use any existing code bases in our implementations. We used Google Colab and AWS to run our models.
- Initially, **fused an encoder-decoder** architecture (local features) with a **feature extractor** (global features).
- Tried 3 modifications on the baseline architecture and the results are showcased below.
- Used MSE Loss in all our implementations.



Baseline Architecture



Results



Dataset

	COCO	ImageNet
Train	70000	65400
Val.	5000	5000
Test	11000	7000

Common Color Segmentation

- Hoffman, G.: Cielab colorspace. Technical report, University of Applied Sciences, Emden (Germany), <http://docs-hoffmann.de/cielab03022003.pdf> (2003)
- Iizuka, S., Simo-Serra, E. and Ishikawa H. Let there be color!: joint end-to-end learning of global and local image priors for automatic image colorization with simultaneous classification. In: ACM Transactions on Graphics (TOG) 35(4) (2016)
- Lin TY. et al. Microsoft COCO: Common Objects in Context. In: Fleet D., Pajdla T., Schiele B., Tuytelaars T. (eds) Computer Vision – ECCV 2014. Lecture Notes in Computer Science, vol 8693. Springer, Cham

Additional References