

Style-based Real Estate Recommender

Connor Slagle
June 11, 2020

About Me

Chemical Engineer turned Data Scientist

Avid consumer of science-fiction

Motivated by exploration and knowledge



Motivation



Proposed Solution

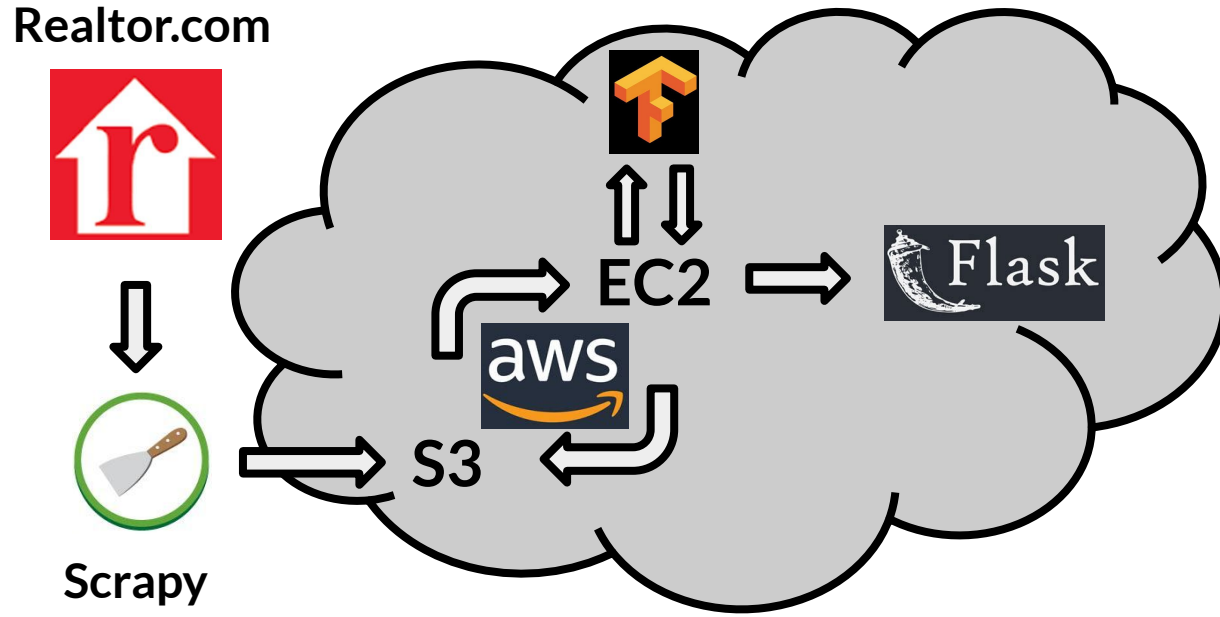
Hypothesis:

*If an algorithm could recommend **real estate** based on **user provided images**, then the time required to find a similar living room will be **reduced**.*

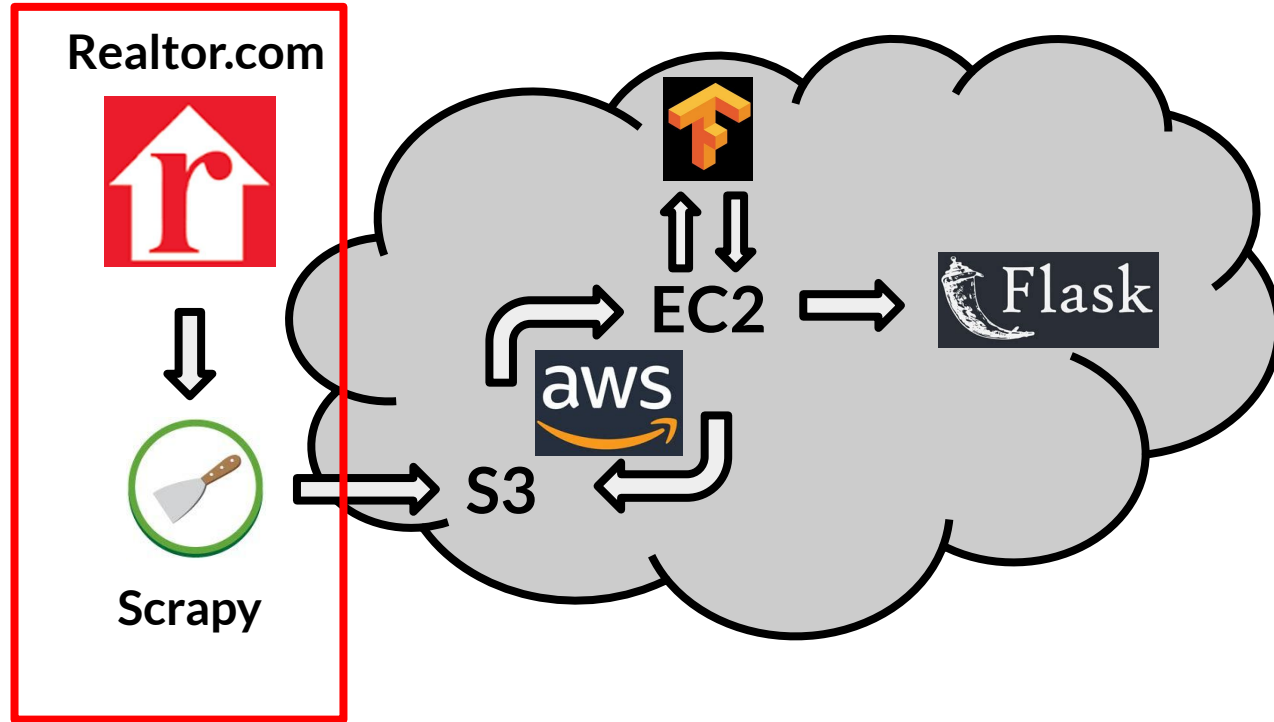
Goals:

- Collect current listing information from leading website
- Effective featurization of listing images
- Web application for user recommendations

Workflow



Workflow



Dataset

Real estate listings for around the Denver Metro

Total Number of Listings: ~500

Total Number Images: ~10,000

Brokered by Homesmart Realty Group

NEW - 3 HOURS AGO

Virtual Tour

House for Sale

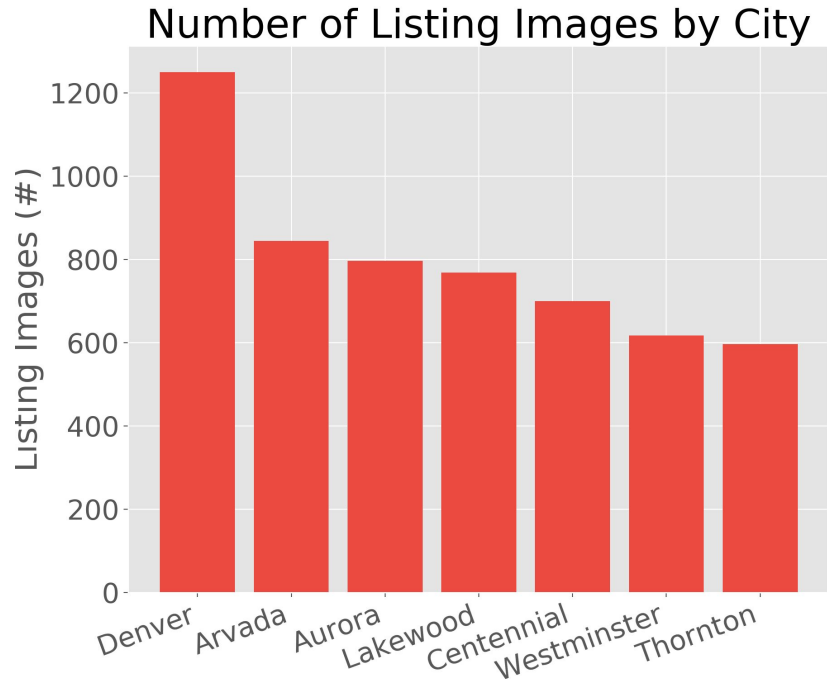
\$374,000 Est. \$1K/mo

3 bed 2 bath 1,632 sqft 8,146 sqft lot

14630 E Floyd Ave,
Aurora, CO 80014

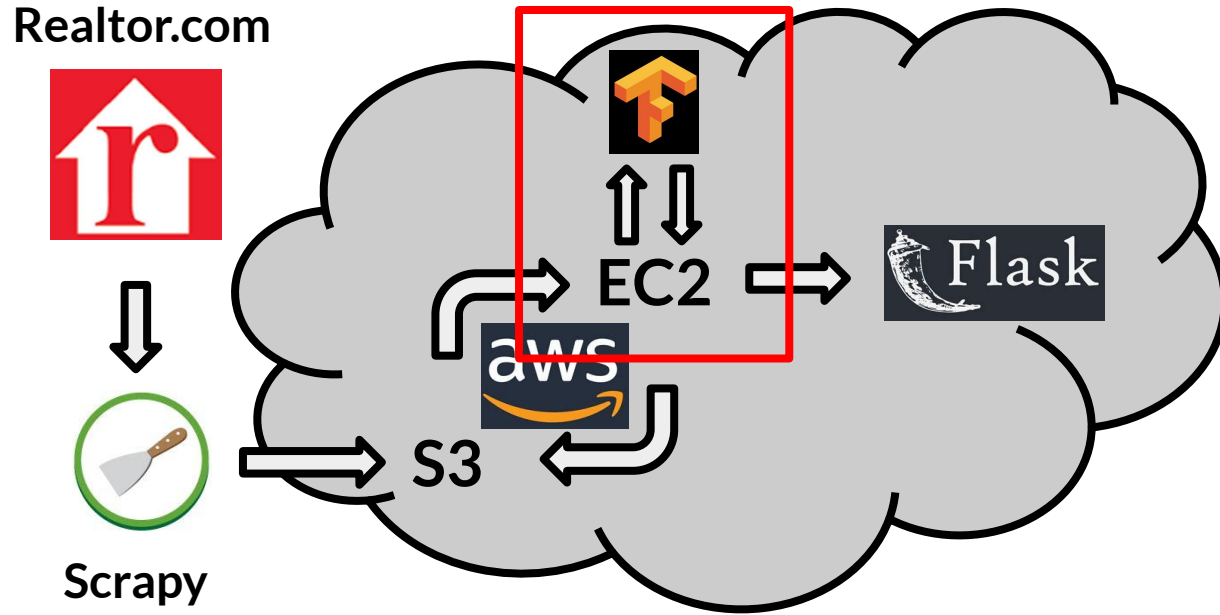
Email Agent

Dataset



Example Image
(1,000 x 700) px

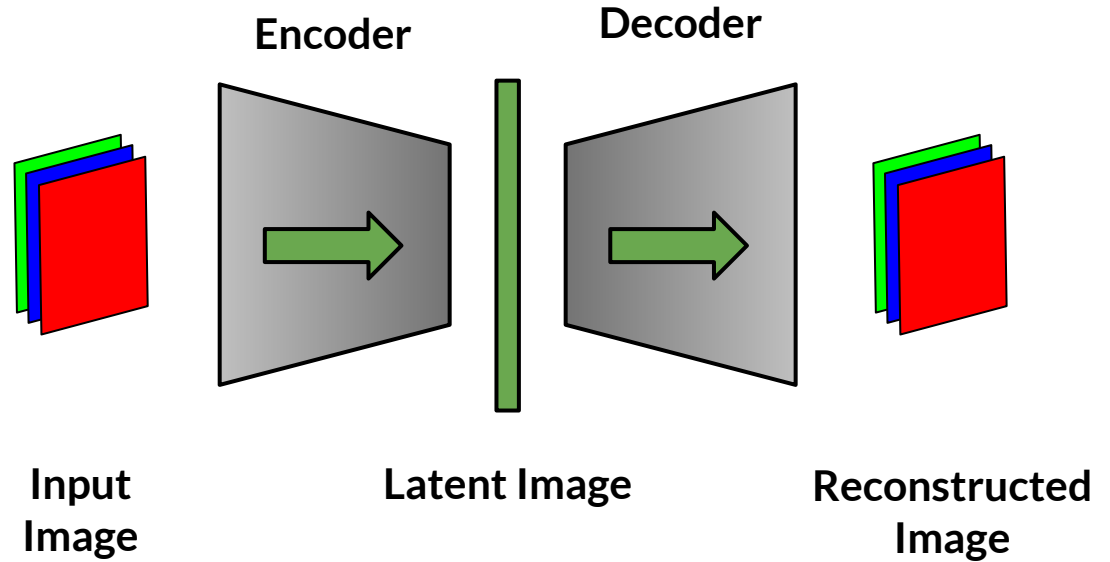
Workflow



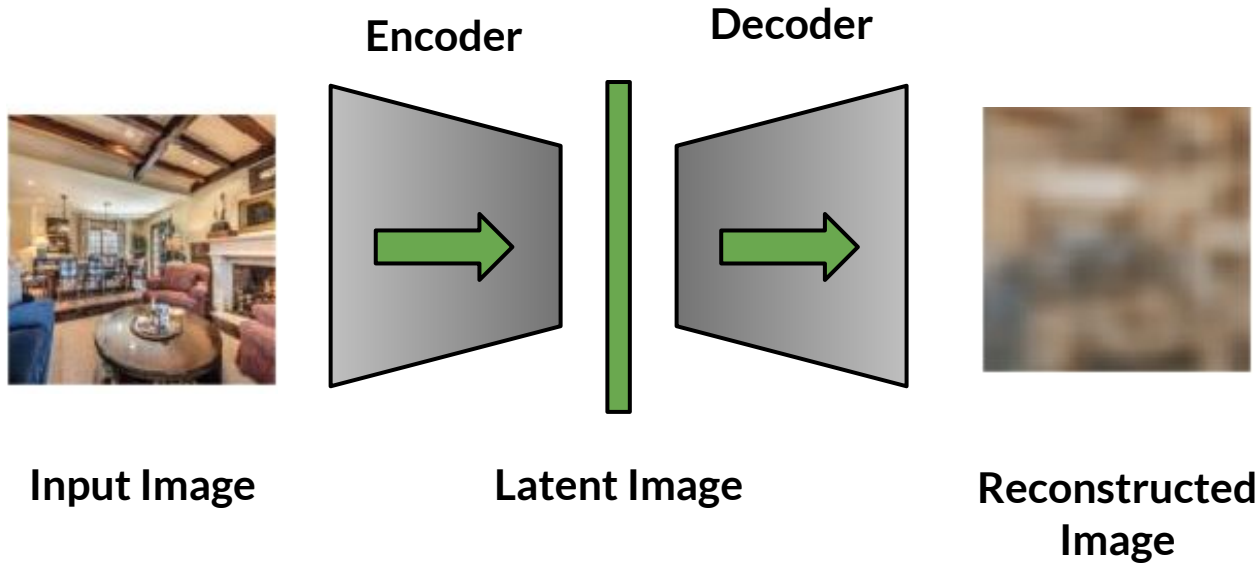
Modeling: Approach

Convolutional Neural Network (CNN) Autoencoder

- Encoder + Decoder
- Efficient, self-supervised



Modeling: Approach



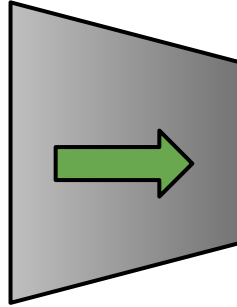
Modeling: Approach

Input Image



$128 \times 128 \times 3 = 49,152$

Encoder



Latent Image



$4,096 \times 1 = 4,096$

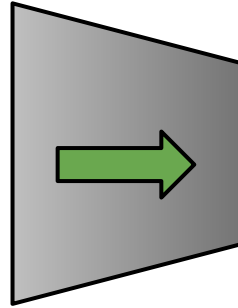
Modeling: Approach

Input Image



$$128 \times 128 \times 3 = 49,152$$

Encoder



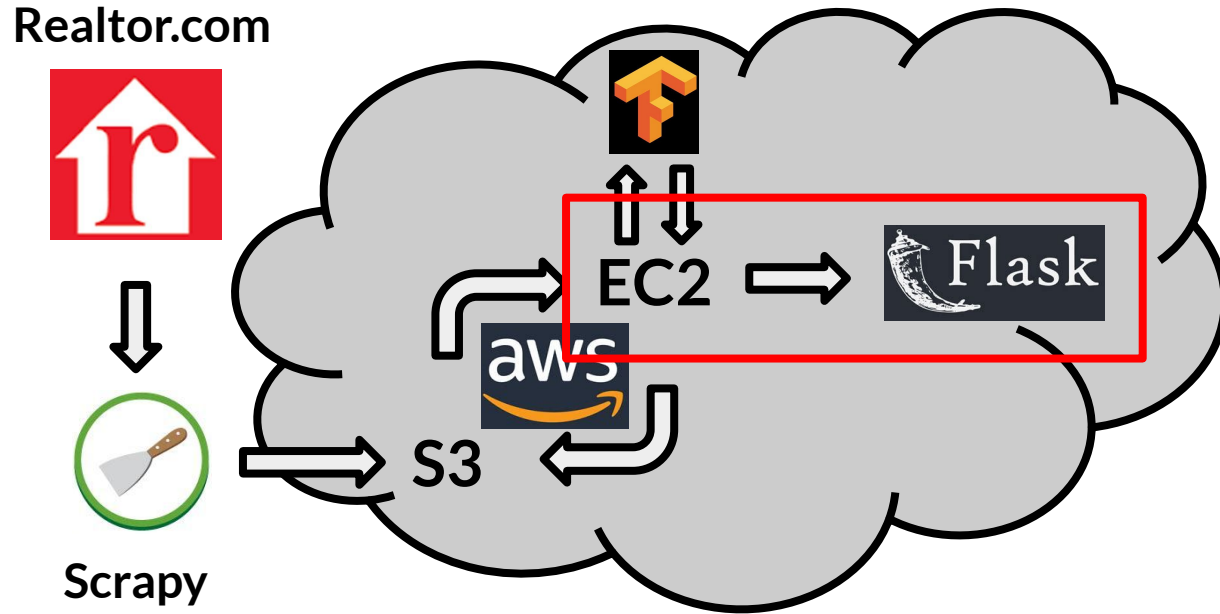
Latent Image



$$4,096 \times 1 = 4,096$$

12x Reduction of Features

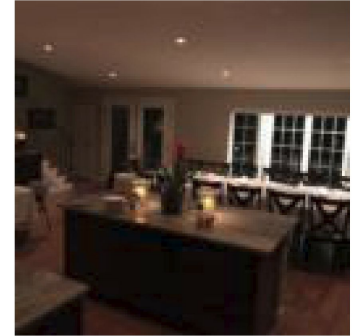
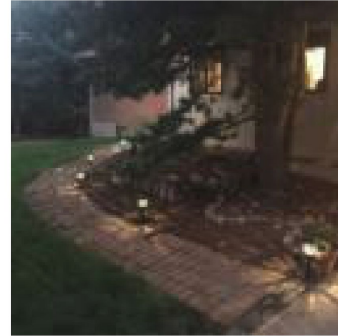
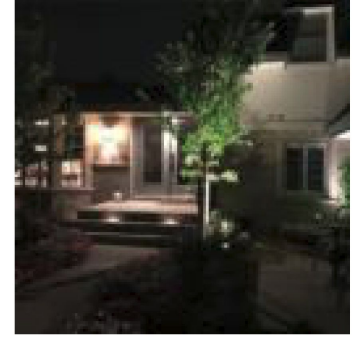
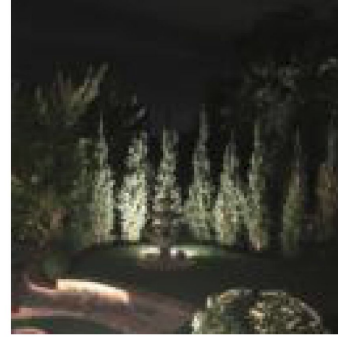
Workflow



Recommender



User Provided Image

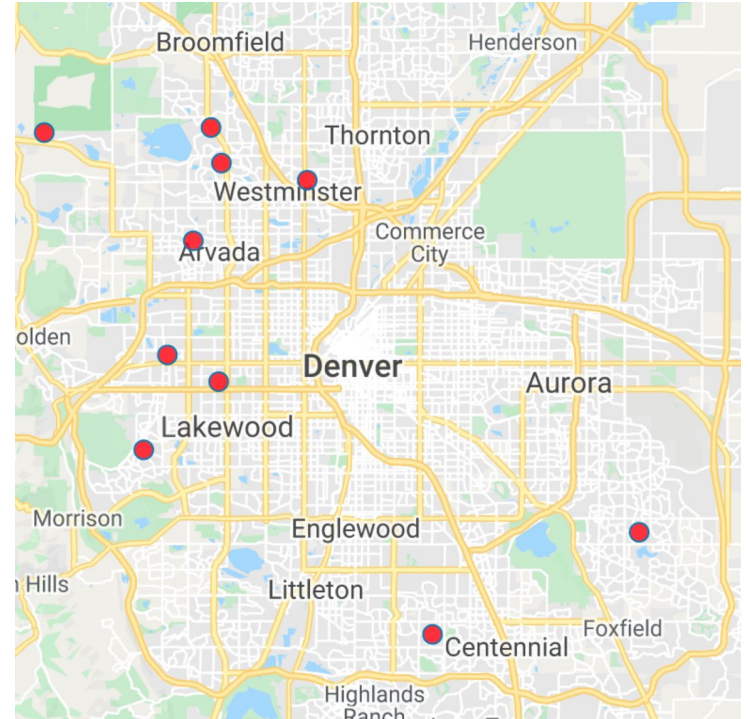


Top Matching Images

Recommender



User Provided Image



Recommended Listings

Concluding Remarks

Achieved the following:

- Developed scalable web-scraper to collect data from current listings
- Employed a CNN Autoencoder to featurize listing images
- Provided a proof-of-concept for a style-based real estate recommender

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Next Steps:

- Deploy Flask application on AWS
- Expand to additional metropolitan areas

To Learn More



/connorslagle



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connor.slagle@colorado.edu



Thank you!

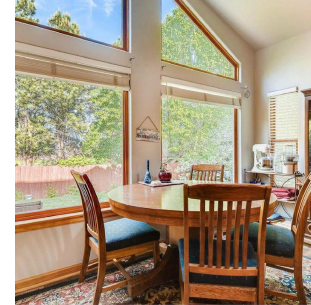
Appendix



Image Preprocessing



Original Image



Squared

Resized
(Gray CNN)



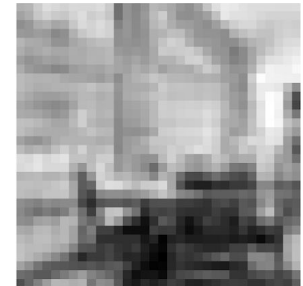
256 x 256



128 x 128



64 x 64

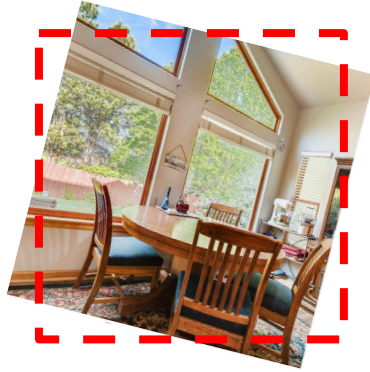


32 x 32

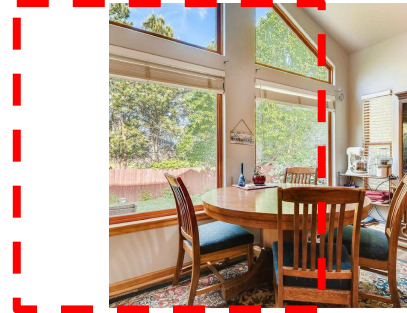
Image Augmentation



Horizontal Flip

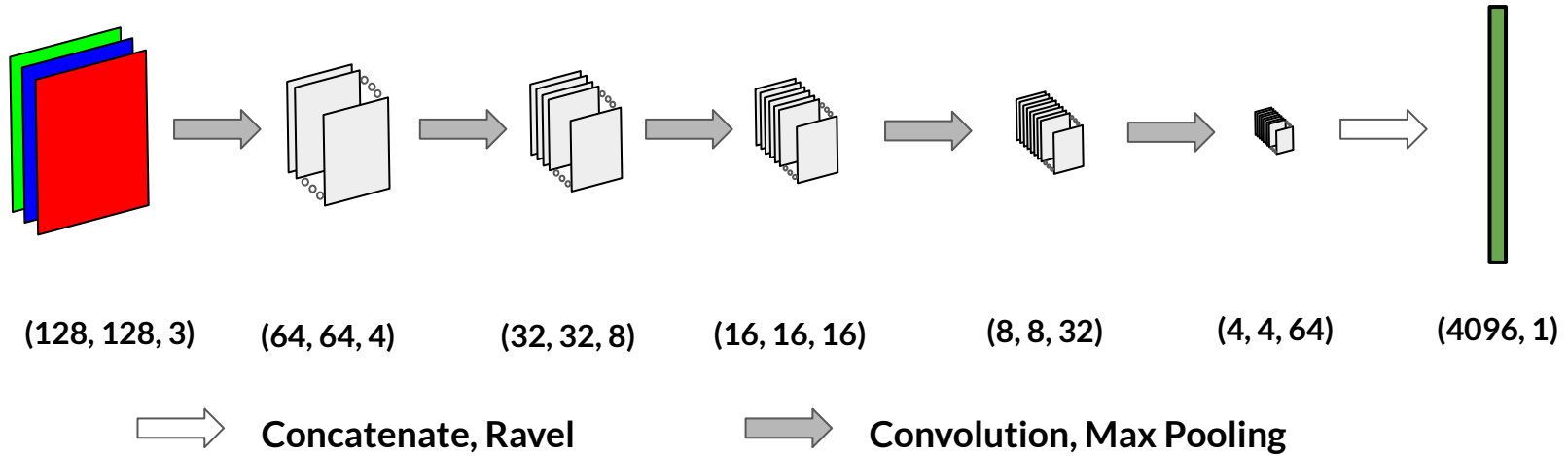


Rotation on Center



Horizontal Slide

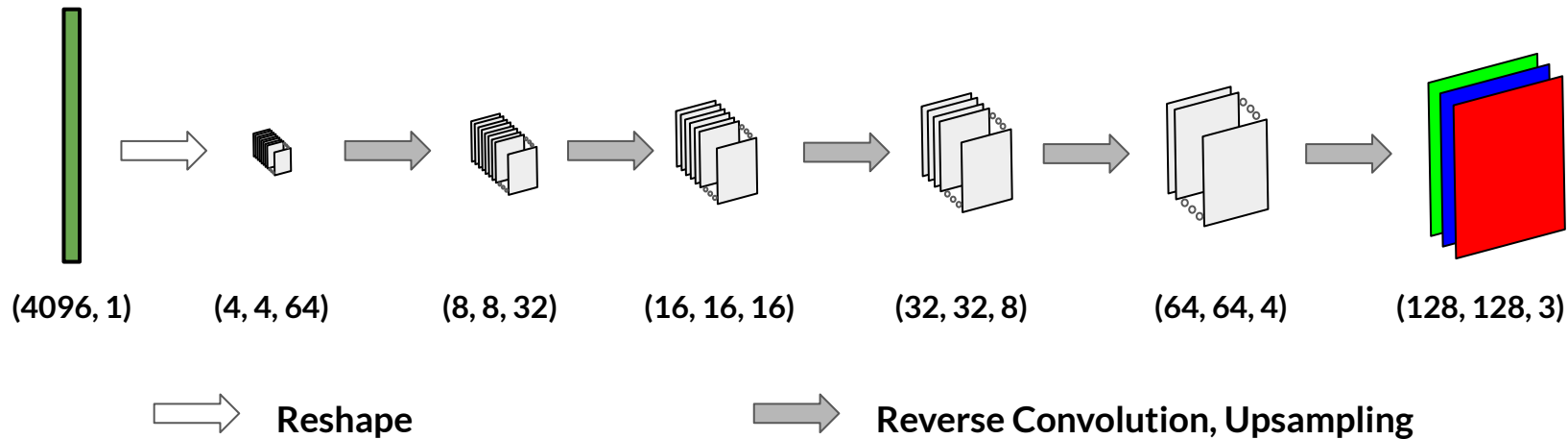
Model: Encoder



Conv2D: 3x3 filter, 1 stride, 2 max norm

Max Pooling: 2x2 filter

Model: Decoder

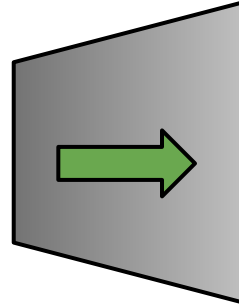
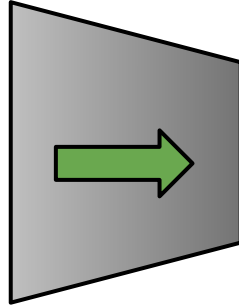


Conv2DTranspose: 3x3 filter, 1 stride, 2 max norm

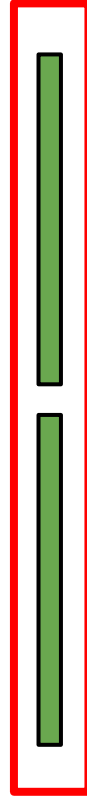
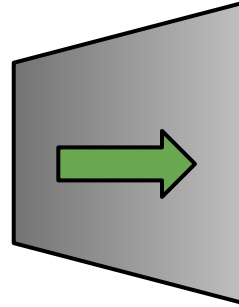
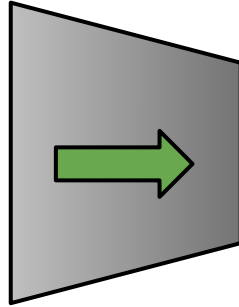
Upsampling: 2x2 filter

Modeling: Ensemble Architecture

Color CNN



Gray CNN



New Latent Image