Image Colourisation Project

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Priyansi | Sejal Gupta | Twisha Bansal

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About Us

Priyansi

2nd Year, CSE

Kalinga Institute of Industrial Technology, Bhubaneshwar

Sejal Gupta

2nd Year, CSE

Indian Institute of Technology, Goa

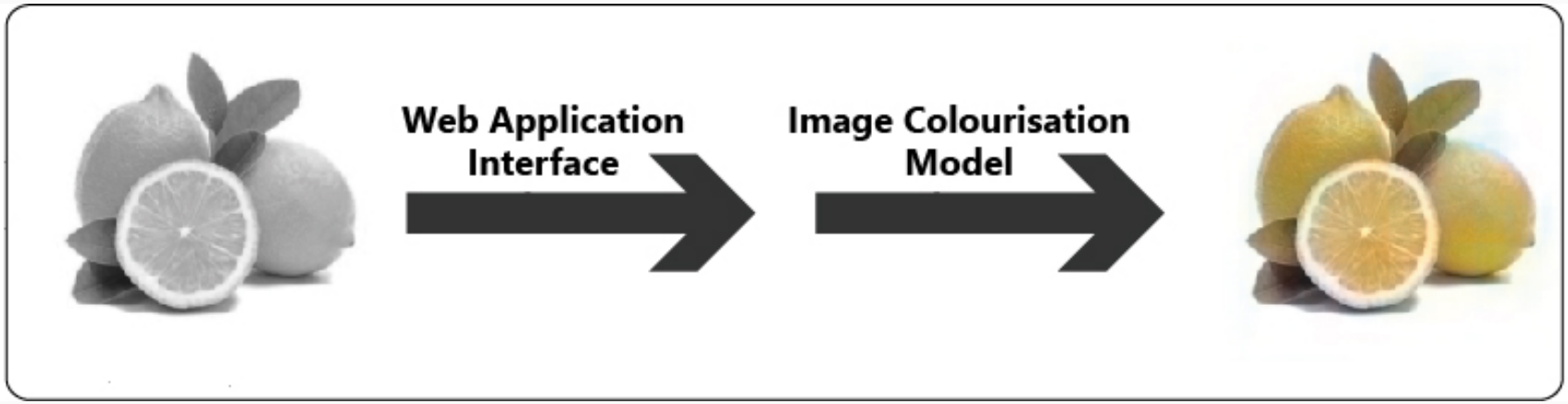
Twisha Bansal

2nd Year, CSE

Indian Institute of Technology, Goa

Our journey from being entirely clueless to completing an Image Colourisation project in Deep Learning

Objective



Colorful Image Colorization paper by Richard Zhang, Phillip Isola, Alexei A. Efros

To hallucinate the most plausible colour version by training a CNN, to map from a grayscale input to a distribution over quantized colour value outputs

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Challenges

- Advanced Mathematics
- Limited Resources

AutoEncoders

A type of Neural Network used to learn representation for a set of data in an unsupervised manner

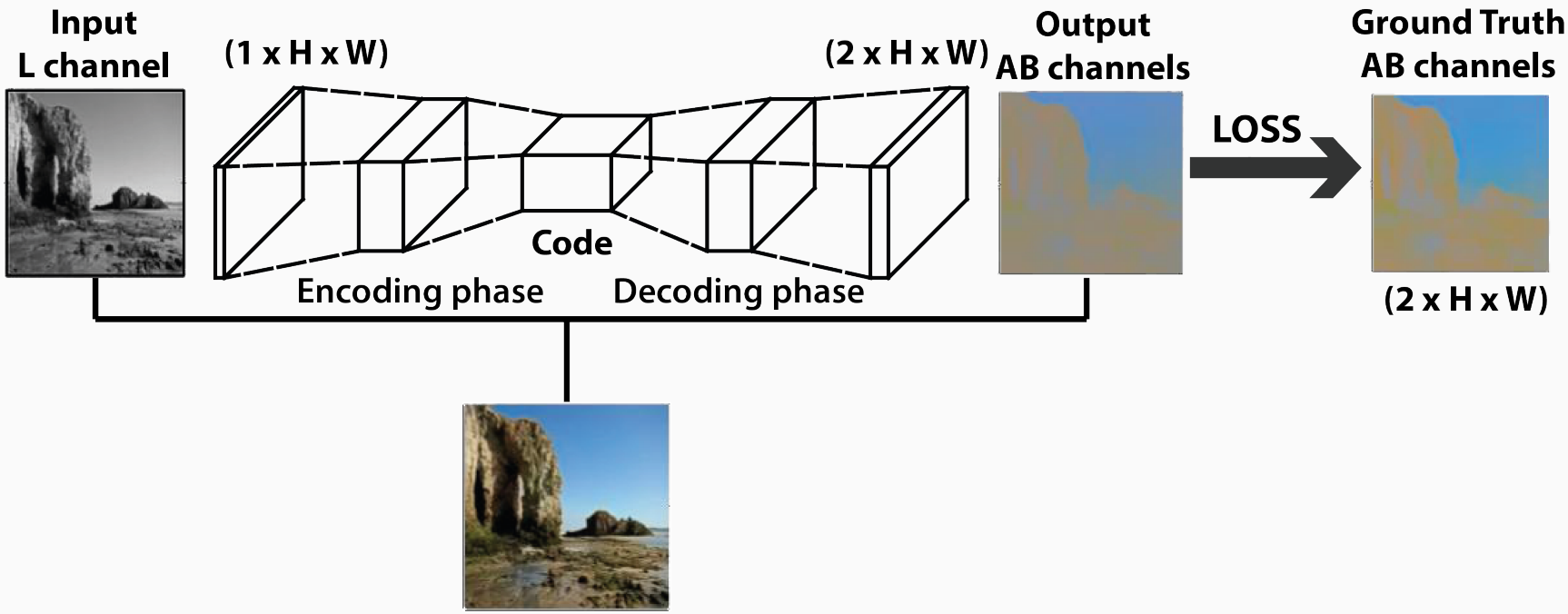
CIELAB Colour Space

- L channel: Lightness
- A channel: green to red
- B channel: blue to yellow

Technology Stack

- **Building the Model**
  - PyTorch
  - NumPy
  - Scikit-image
  - Matplotlib
- **Version Control**
  - Kaggle
- **Web App**
  - Streamlit
- **PaaS**
  - Heroku

Model


Input
L channel
(1 x H x W)
(2 x H x W)
Output
AB channels
Ground Truth
AB channels
LOSS
Code
Encoding phase
Decoding phase
(2 x H x W)

Model

- Loss Function: **MSE Loss**
- Optimiser: **Adam**
- Range of Learning Rates used for training: **1e-3 - 1e-6**

Challenges

- Lack of resources

Challenges

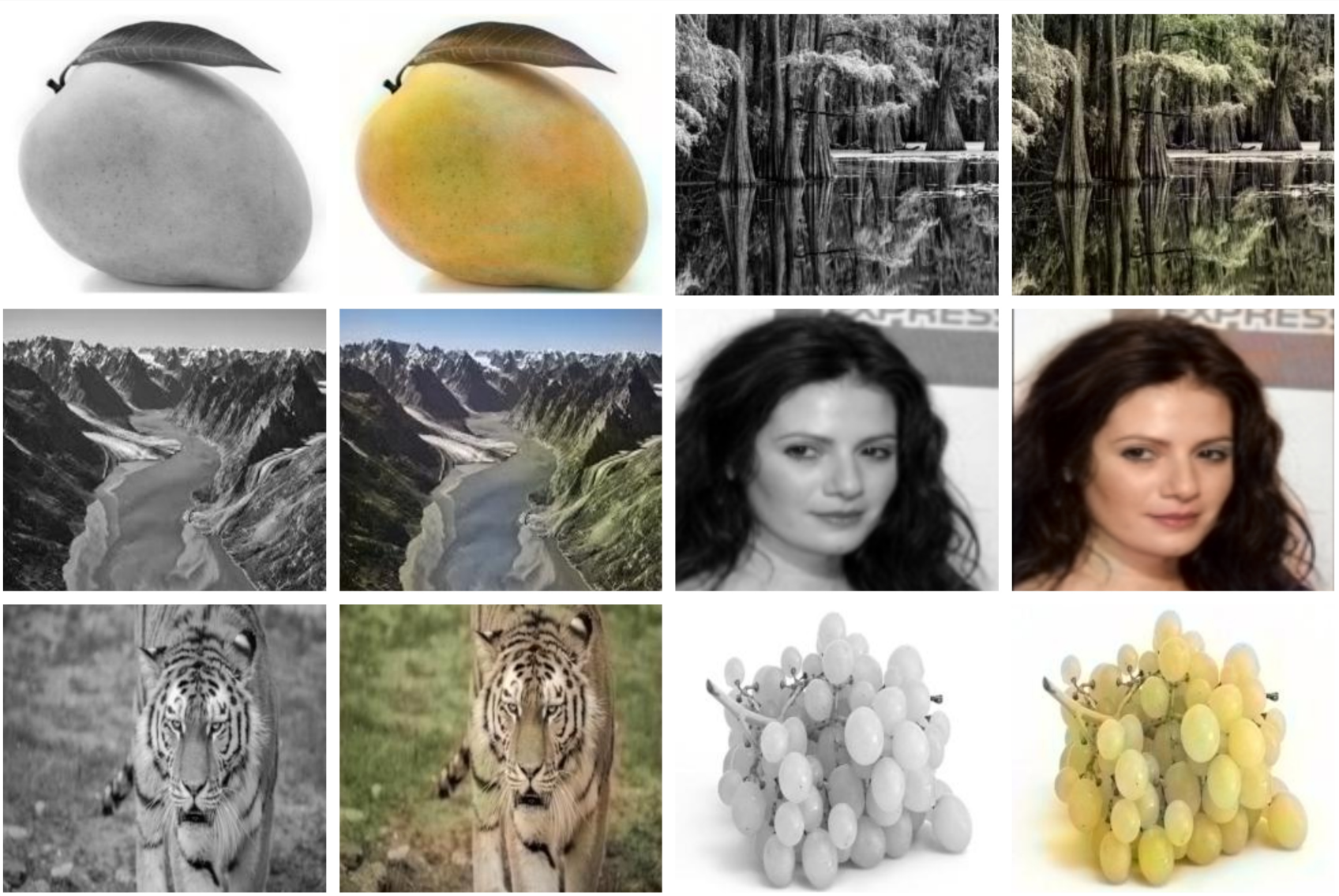
- Lack of resources
- MSE Loss is not a good parameter to measure human perception of colouring

Datasets

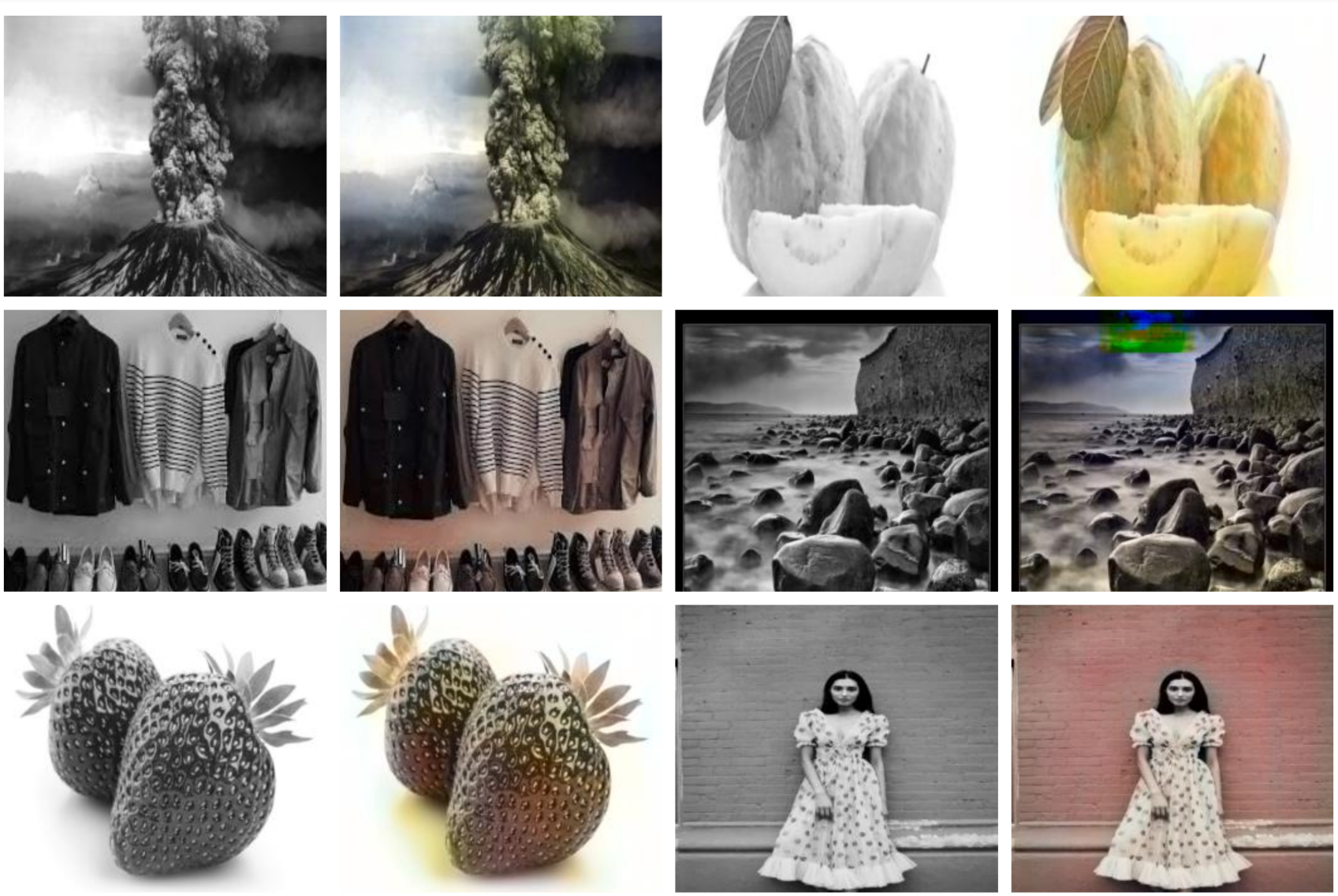
Trained on approximately **570K** images (Links provided below)

- ImageNet(50K Images)
- Flickr
- Landscape Classification
- Fruits 360
- Fruits Recognition
- Clothes Classification
- CelebA Dataset
- Animals 10
- Arthropod Taxonomy Dataset

Results: Good



Results: Bad



Web Application and Deployment

Web App:

- Made with Streamlit
- Why Streamlit:
    1. Reducing app code to Python scripts
    2. Treating widgets like variables
    3. Reusing data with memoization

Deployment:

- Heroku as the cloud platform

Improvements

- Adding more themes
- Automating the classification of themes
- Retrain with additional data generated using data augmentation

Sources

1. Colorful Image Colorization paper by Richard Zhang, Phillip Isola, Alexei A. Efros: https://arxiv.org/pdf/1603.08511.pdf
2. Applications of AutoEncoders - Image Colourisation: https://github.com/bnsreenu/python_for_microscopists

Our Project

- Web Application: https://image-colouriser-streamlit.herokuapp.com/
- Gitlab: https://gitlab.com/twishabansal/image-colourisation
- Kaggle Notebook: https://www.kaggle.com/sejalgupta01/image-colorization-starter

Questions and Suggestions?