R2 Presentation

Jolyai

COLOR

AUTO CORRECTION

Team **46**

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MOTIVATION & PROBLEM STATEMENT

R2

MOTIVATION

Photographers must tackle the tedious task of editing images manually.

As the number of images is high and every image must be dealt with individually, the process is lengthy.

R2

PROBLEM STATEMENT

Our project aims to automatically edit 100s of photos at one time and perform color correction on all of them by providing the user with a variety of options to choose from.

Our primary use case is wedding photography, but this software is potentially scalable to a variety of events.

R2

MARKET ANALYSIS

HOUSE ON THE CLOUDS

R2

Feedback collected after calling and interviewing 50+ photographers*

“Identifying competitors and regions of improvement”

“We are satisfied more or less”

“Quality Not Good, Desired Outputs not recieved”

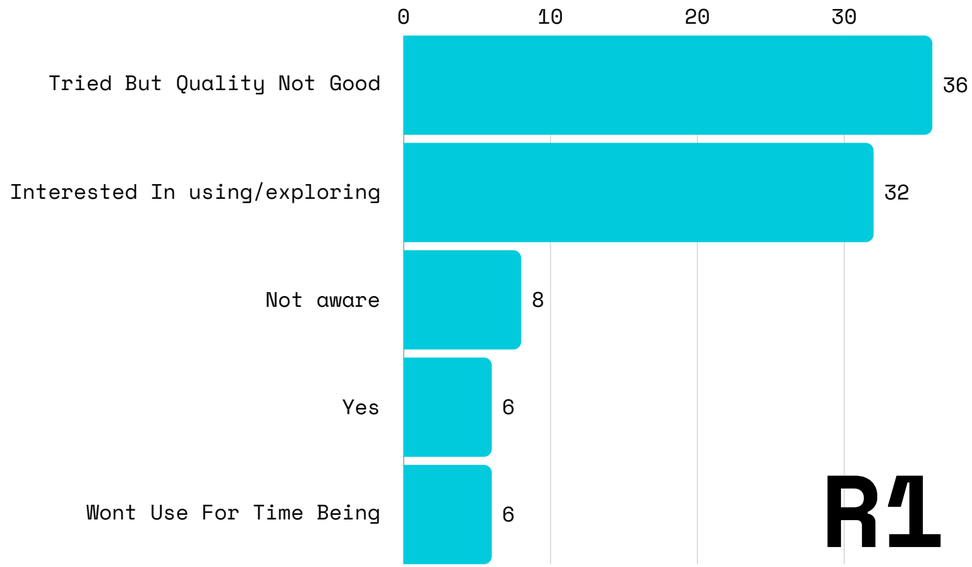
“In case of more work we hire people.”

“We use Adobe Lightroom and Photoshop ”

PROBLEMS FACED:

- Many didnt feel it was safe to answer questions.
- Very rude.
- Language Barrier in 1-2 cases.
- Didnt see any self gain so didnt want to help.

“Do you use the AI tools for editing your photos?”



R1

*39 responded and agreed to help out

SYSTEM DESIGN
and
WORK-FLOW

R2

The implementation is divided into 3 modules.

1. **Feature extraction** from raw and edited photos

2. **Training** with either of the 3 models

3. **Apply** the model to new set of photos

WORK FLOW.

R2

Elaborated work flow

1. HSV values are extracted from every image

2. HSV values of raw and edited images are written to a csv file

3. These csv files are read and 3 possible models are trained

NOTE:We have 9 pre trained models from Adobe5k dataset which the user can directly use.
Or user can upload his own photos which will generate personalised model.

4. HSV values of new set of images are extracted and the model is applied to predict the final HSV values

5. These HSV values are applied to new images to predict the final images from the models

6. Then the option of manual editing is given to the user to edit the photos and save the final version of the same

Performance Analysis

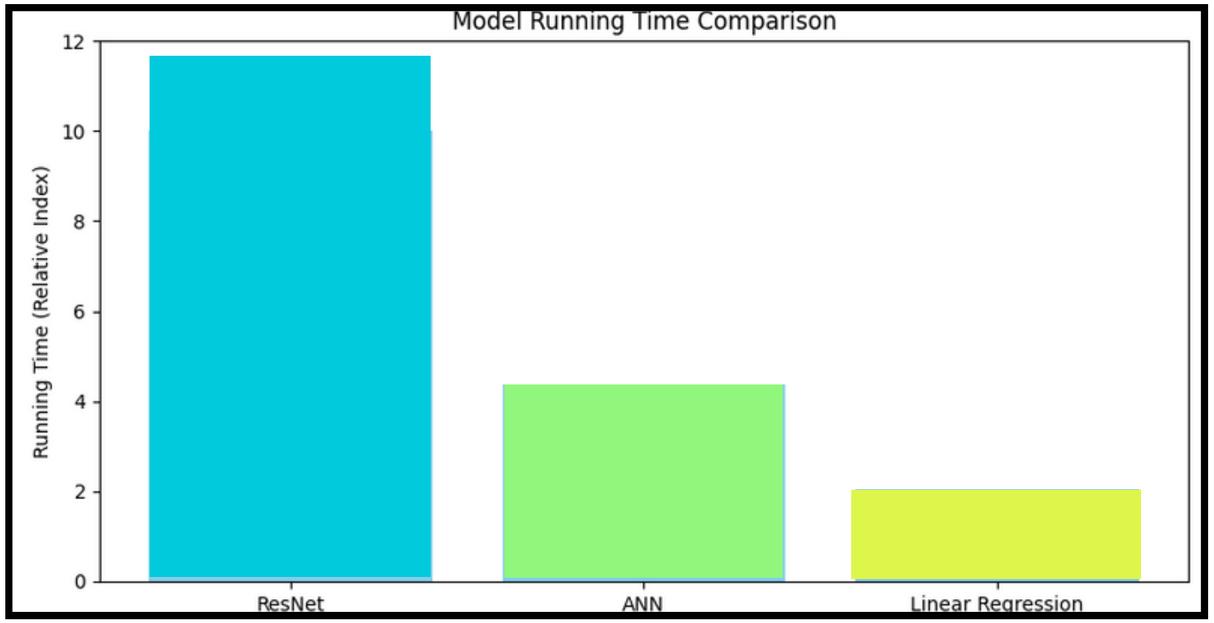
Comparing Model Efficiency and Output Quality Across ResNet, ANN, and Linear Regression

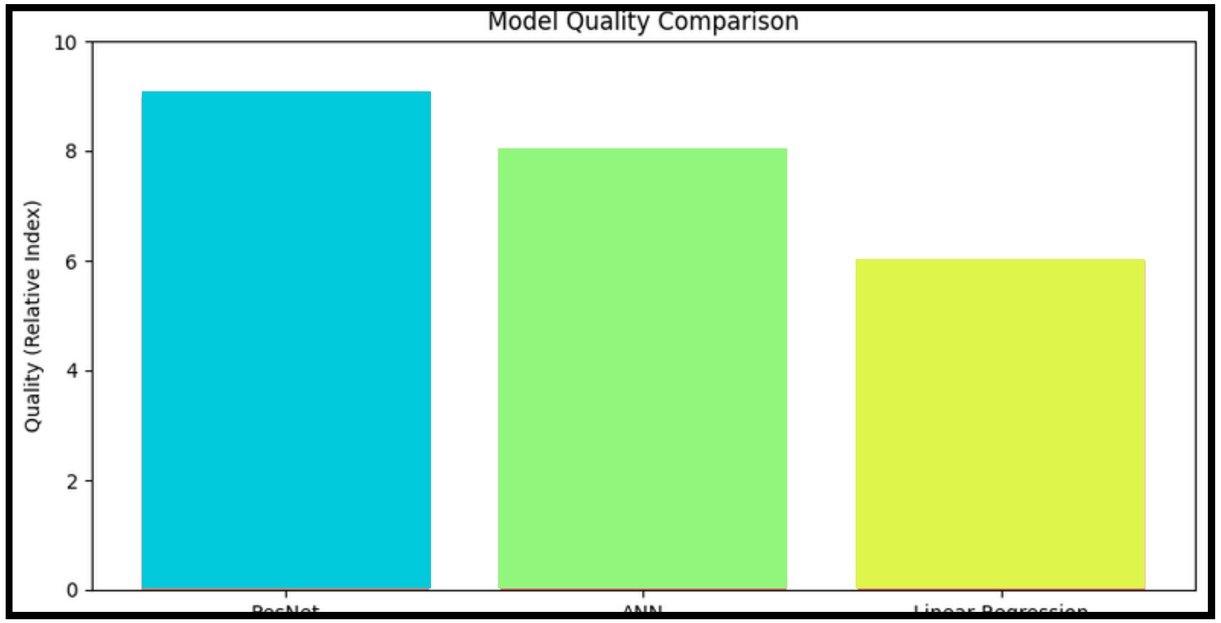
1. **ResNet:** This model provides the highest quality output among the three. However, it also requires the most training and predicting time, which might be a factor to consider depending on throughput needs.
2. **Artificial Neural Network (ANN):** This model offers good quality outputs, slightly less than ResNet, but has the advantage of requiring less processing time compared to ResNet. It balances between quality and speed effectively.
3. **Linear Regression:** The fastest model in terms of processing time among the three, making it highly efficient. While it delivers good quality, it does not perform as well as ResNet or ANN in terms of output quality.

Each model offers different advantages in terms of quality and processing time, allowing for flexibility based on specific needs or constraints.

R2

Computational Comparison and Quality Assessment among models





R2

R2

Linear Regression Model: Fast but basic, offered for free, to attract entry-level clients and encourage upgrades.

ANN Model: Balances quality with performance, priced moderately to serve a broad client base and making it an attractive choice for clients who need better quality outputs but at a reasonable cost.

ResNet Model: With the highest quality output but also the longest processing time, the ResNet model could be marketed as a premium product. This model should be priced higher than the ANN, targeting clients who require the highest level of detail and accuracy, such as high-end wedding photographers or specialized agencies that demand top-notch quality.

Business Perspective

R1

WHAT CAN WE USE TO ACHIEVE THIS

Use of Various Different ML Algorithms

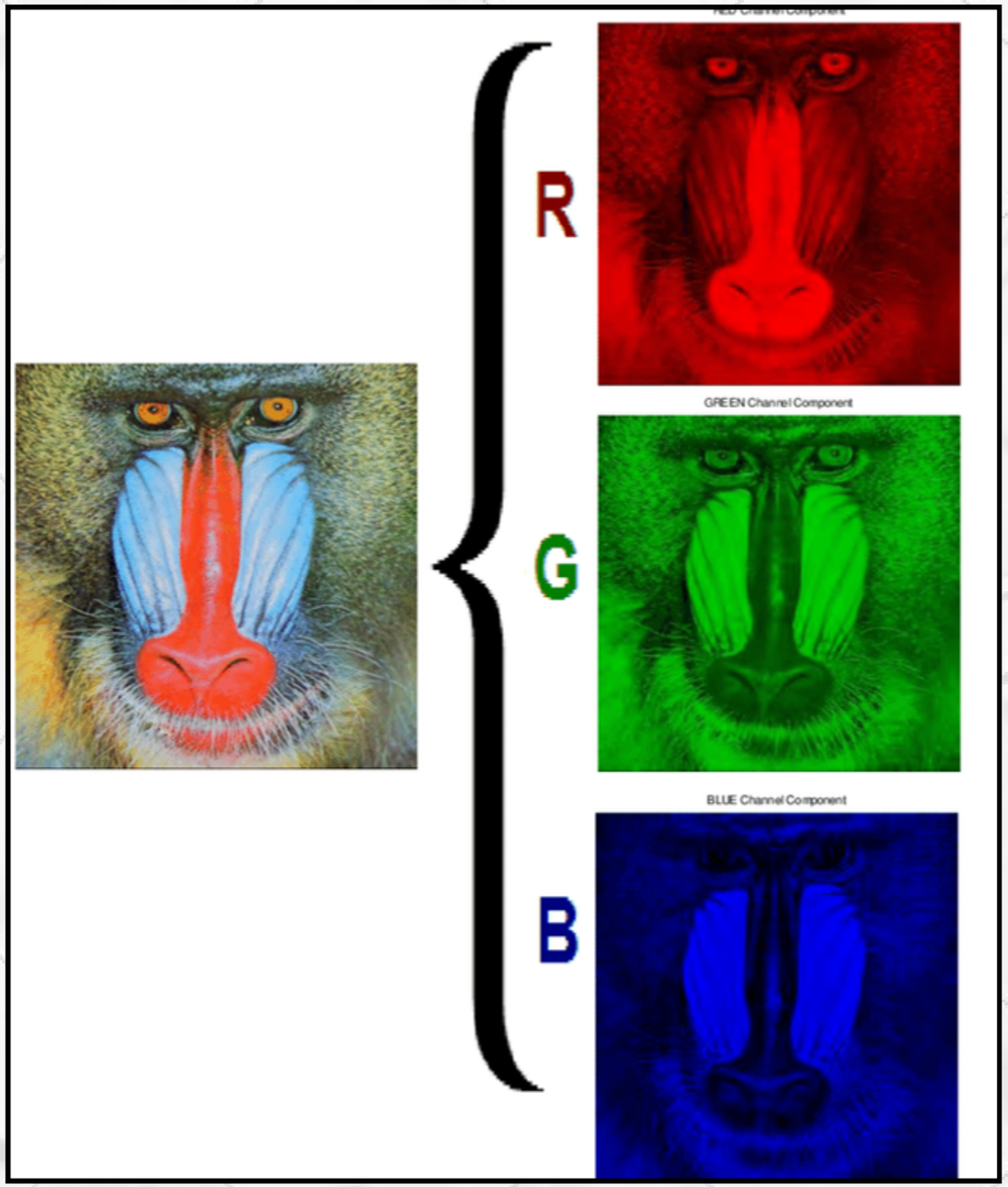
- Trained and tested various models to find which one gives the best results
- Resnets, Pix2pix, GAN's,Linear Regression, ANN's, Binning, Threshold etc,

Using OpenCV to understand Filters

- Used this python Library to Understand how the image changes, feature detection etc.

What parameters of the image are to be used?

- RGB vs HSV



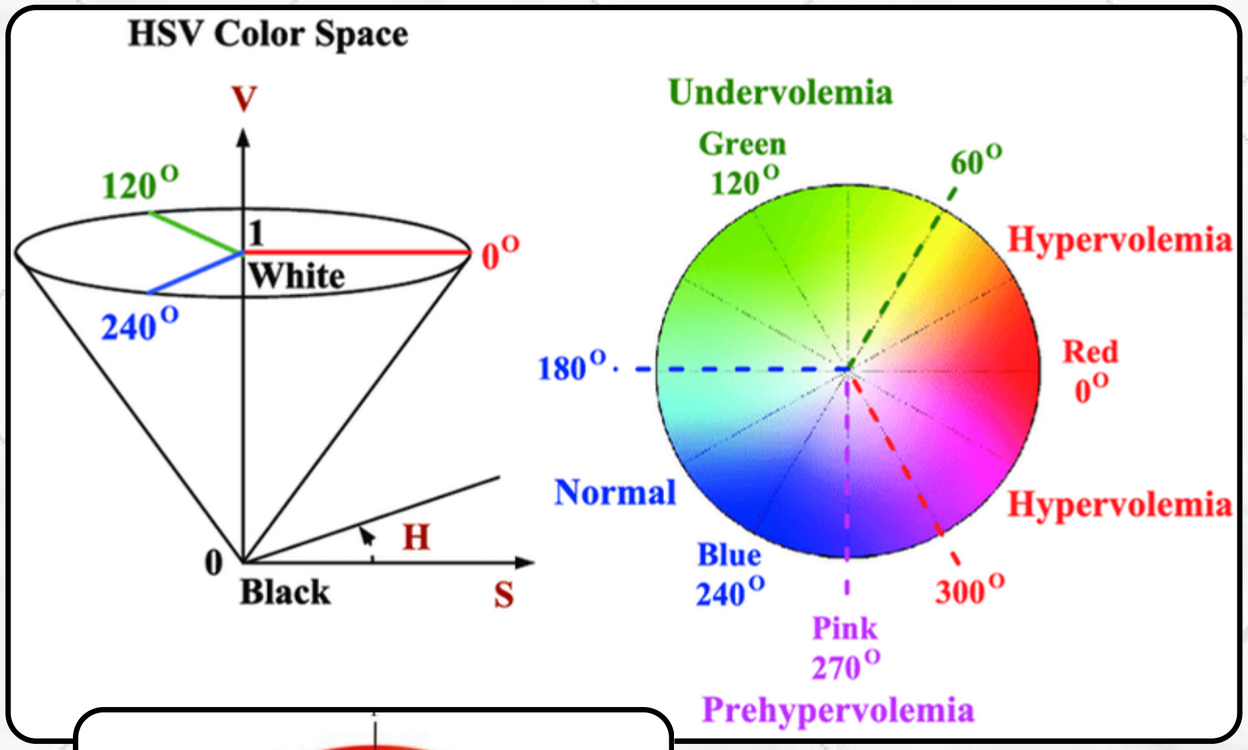
RGB Color Space

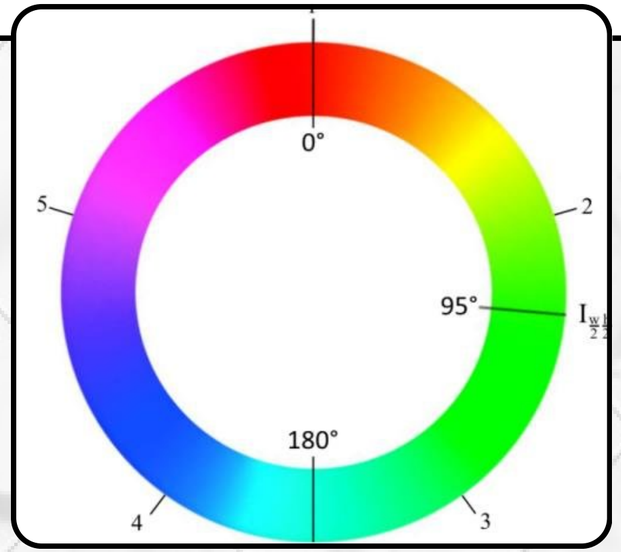
- RGB(Red,Green,Blue) is the most popular color space that is widely used in image processing and storage.

- It basically divides the image into three matrices-red,green and blue for which the entries range from 0-255.

R1

HSV Color Space





- HSV(Hue,Saturation,Value/Brightness) is a popular color space that closely resemble how humans percieve color.

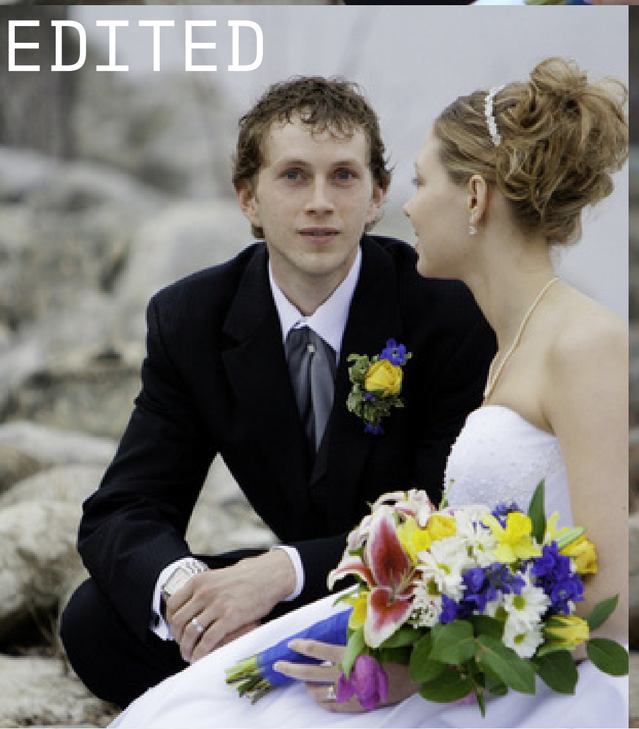
- It allows easy modification of parameters such as color,exposure,saturation,etc. and is suitable for applying color correction.

R1

OpenCV

- OpenCV is a cross platform library using which we can develop real time computer vision applications
- OpenCV mainly focuses on image processing,video capturing and analysis including features like face detection and object detection.
- We found that features of OpenCV like image processing(applying filters to images,transforming images),feature detection(extracting image features) are useful for our project

R1



ResNets

- ResNets are variations of CNNs(Convolution Neural Networks) that are optimized for computer vision tasks.

- We tested ResNet18 on Adobe 5K dataset and found that results were somewhat satisfactory to the project's requirements.

R1

Multi-Layer Perceptron(MLP)

- We then added additional fully connected layers(MLP layers) to ResNet18 to extract non-linear relationships between the parameters.

- The results were better than a simple ResNet18 model.

Issues with ResNet model

- Predicted images sometimes are green due to intense natural and artificial lighting.

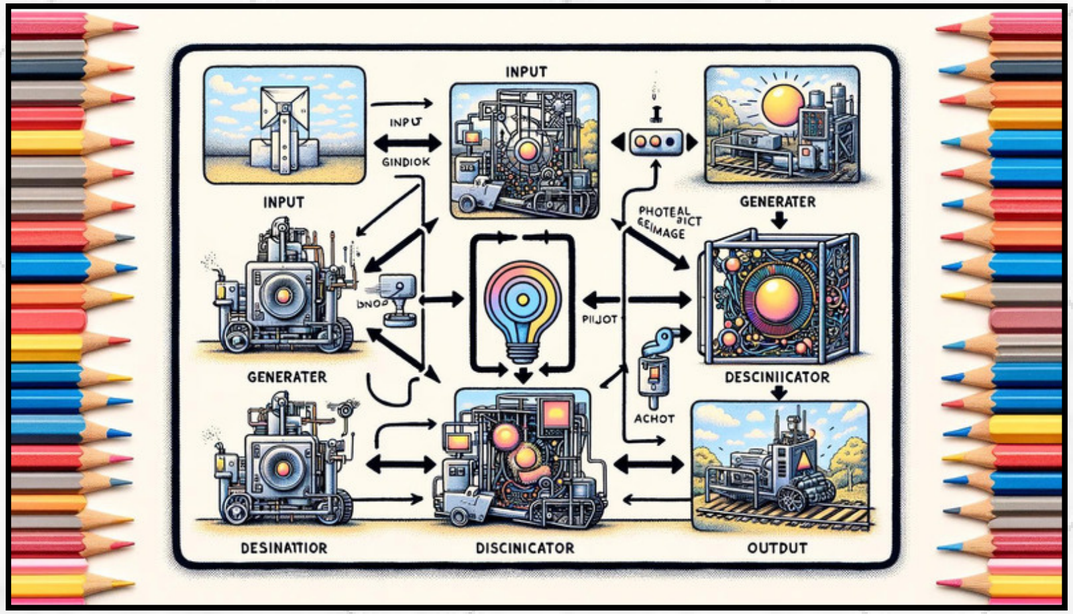
- Training takes time,large dataset and thus may not be suitable for learning editor's style in real-time.

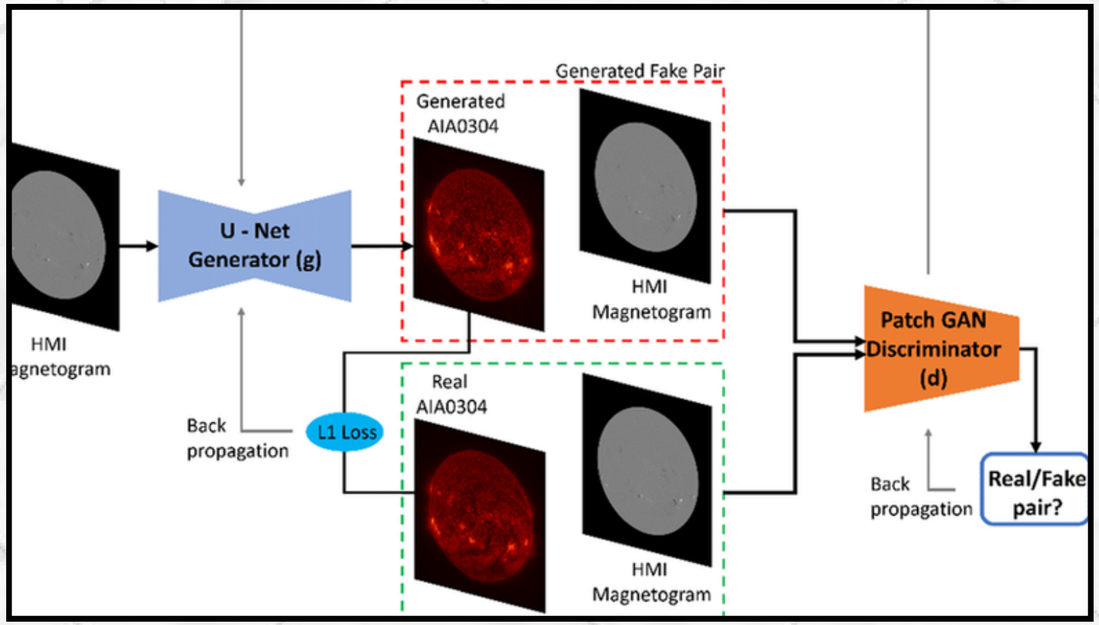
R1

Pix2Pix GAN

R1

- The Pix2Pix architecture is a type conditional GAN(cGAN), where the generation of the output image is conditional on one more input(which is an image in Pix2Pix)
- In pix2Pix in training, we give input-edited image pairs so the model learns the art of retoucher
- Pix2Pix GAN consists of a Generator that creates an image and a Discriminator that evaluates how close the generated image is to the Edited image. The generator and discriminator are trained together competitively.
- We have used Unet as Generator and PatchGen as Discriminator





PROBLEMS WITH PIX2PIX

Output Images are blur

Possible Correction - Train on More datasets, More Epochs , More Hypertuning

(a) Raw Image

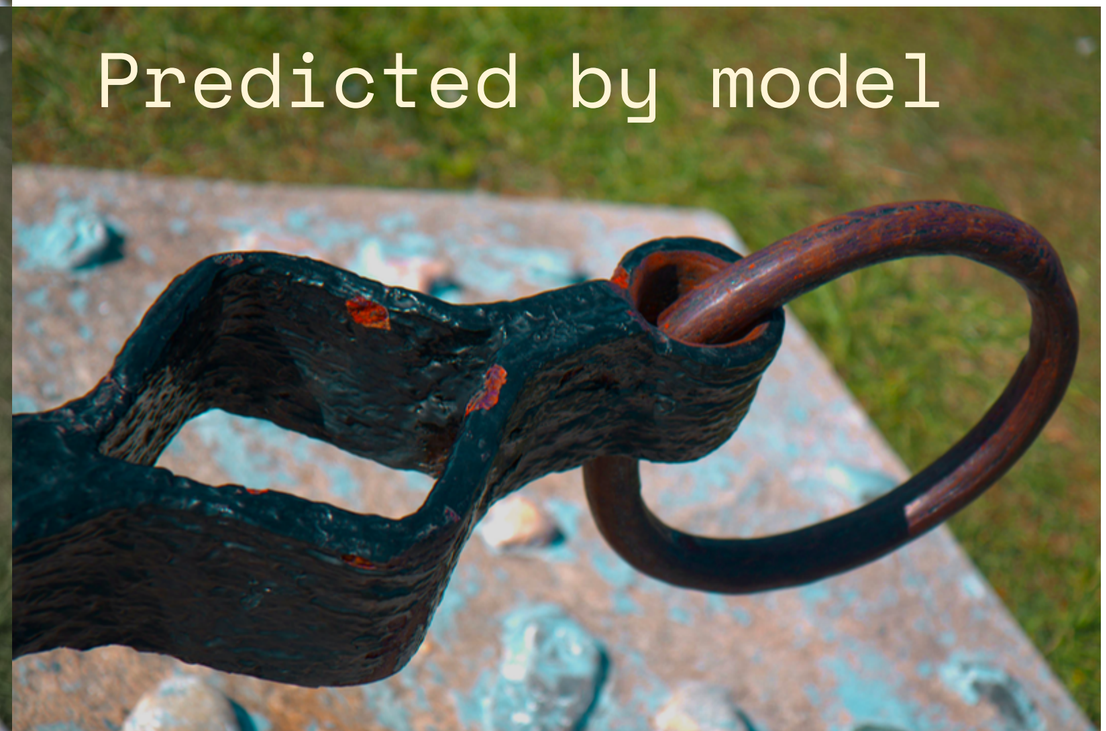
(b) Expected Output

(c) Model Predicted Output

R1

REGRESSION · R1

Linear Regression is a simple & computationally fast technique to map raw images to edited ones (HSV values) and then apply the filters to new images. Trained on **Adobe5k**



Difficulties FACED in Regression

- Highly dependent on the data set.
- Requires huge data set to train as features extracted are less.
- Works well only with **consistent** data.
- eg: Outdoor and indoor photos are edited in different style.

R1

Difficulties FACED in Regression

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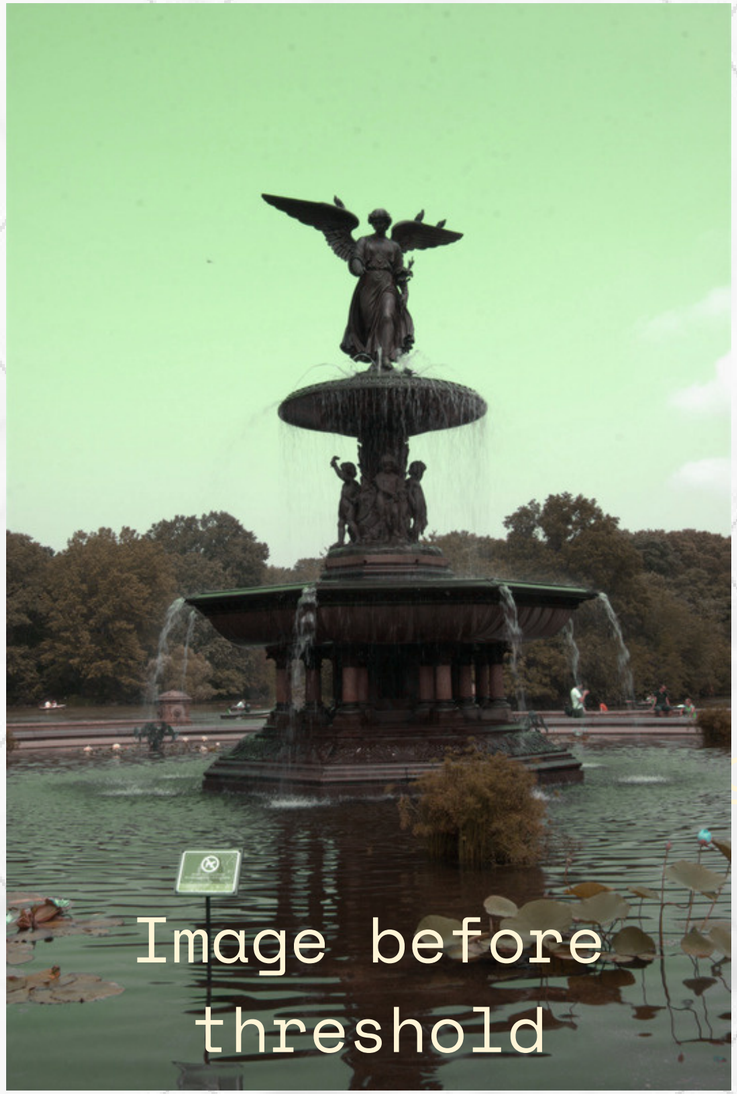
R1

CHALLENGES overcomed in R2

Challenges Faced and Resolved



- Unnatural greenness or redness in predicted images.
- Resolved using a threshold check when applying color correction to maintain dominant color of image.

Challenges Faced and Resolved

- Prediction highly dependent on the edited images in training data
- Resolved using multiple variations of edited photos for training.

OUR TIME LINE

2nd Feb. ’24

Today !!!

Project concept outline

Finalise requirements

Explore viable software tools

Finalise tools to be employed

Market Analysis

Image Analysis

Trying Models

Trying Different Parameters

Rule of Thirds

UI for individual Image Adjustment

Segmentation of Image

Visual Transformers Binning

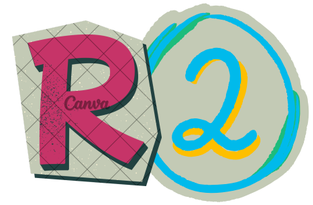
Improving UI

Variational Auto Encoder

Testing

Integration

Final Release



DEMONSTRATION

We built a UI using React and Python

DEMO VIDEO LINK

CONTRIBUTIONS

ABHINAV

Linear Regression
Reverse Engineer existing softwares

DEEKSHITHA

Pix2Pix GAN
openCV
Documentation
Reserach Work

ISHAN

HSV colour space
RES NET 18 model
MLP
Research Work

SUJAL

Market Analysis
GUI (react)
MOM's
Research Work
PPT

HARSH

Pix2Pix
GUI
Linear Regression
Reverse Engineer existing softwares
- Which models should be implemented

THANK YOU