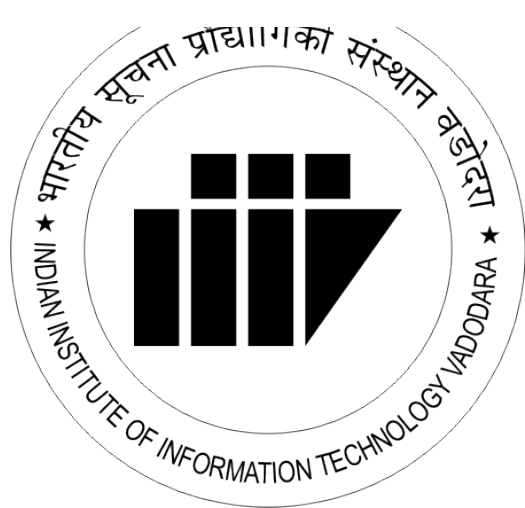


# COLORIZATION OF GRAYSCALE IMAGES USING DEEP LEARNING

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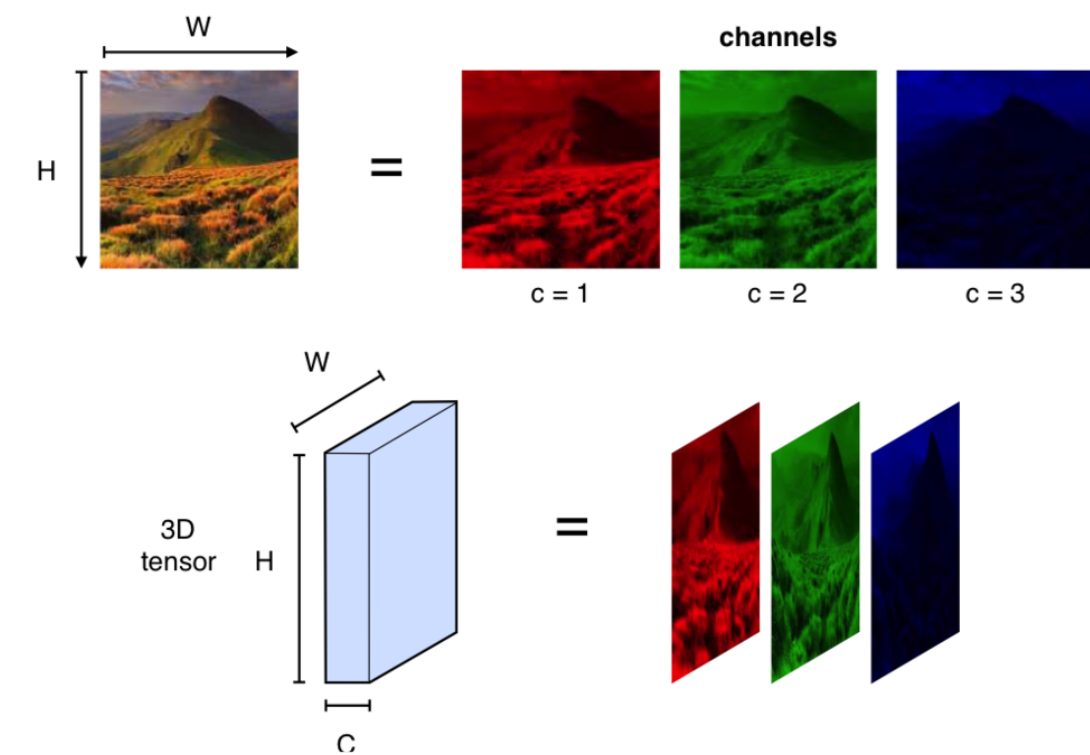


## Problem Statement

- Given: A gray-scale image.
- Objective: To colorize the image so it can be as close to the original coloured image.

## Proposed Approach

Consider an image  $X$  in RGB color space. Firstly, it is converted into CIE



$L^*a^*b^*$  color space.

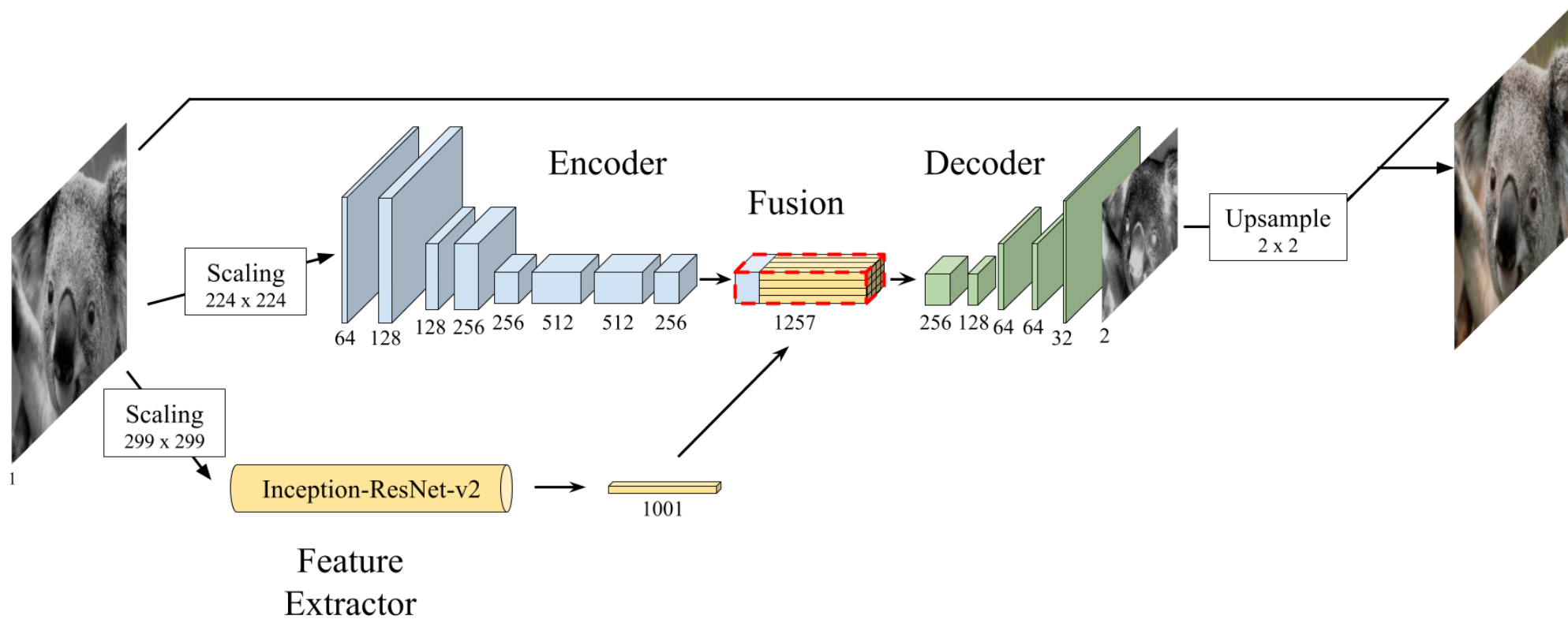


The model takes the  $X_L$  as the input and estimates the  $X_a, X_b$  pair to generate a fully coloured version. We can assume : (let  $f$  be a mapping)

$$f \left( \begin{matrix} L \\ \begin{matrix} 93 & 92 & 83 & 77 & 77 \\ 92 & 77 & 77 & 77 & 92 \\ 92 & 77 & 83 & 77 & 92 \\ 77 & 77 & 77 & 92 & 92 \\ 77 & 77 & 92 & 92 & 92 \end{matrix} \end{matrix} \right) = \begin{matrix} a \\ \begin{matrix} 89 & 99 & 99 & 52 & 52 \\ 99 & 52 & 52 & 34 & 20 \\ 99 & 52 & 52 & 20 & 83 \\ 52 & 52 & 20 & 83 & 83 \\ 83 & 83 & 83 & 83 & 83 \end{matrix} \end{matrix} \quad \begin{matrix} b \\ \begin{matrix} 88 & 88 & 40 & 52 & 71 \\ 88 & 40 & 52 & 52 & 71 \\ 40 & 52 & 52 & 20 & 71 \\ 40 & 52 & 20 & 83 & 83 \\ 52 & 20 & 83 & 83 & 83 \end{matrix} \end{matrix}$$

0 to 100      -128 to 128      -128 to 128

## Main Components

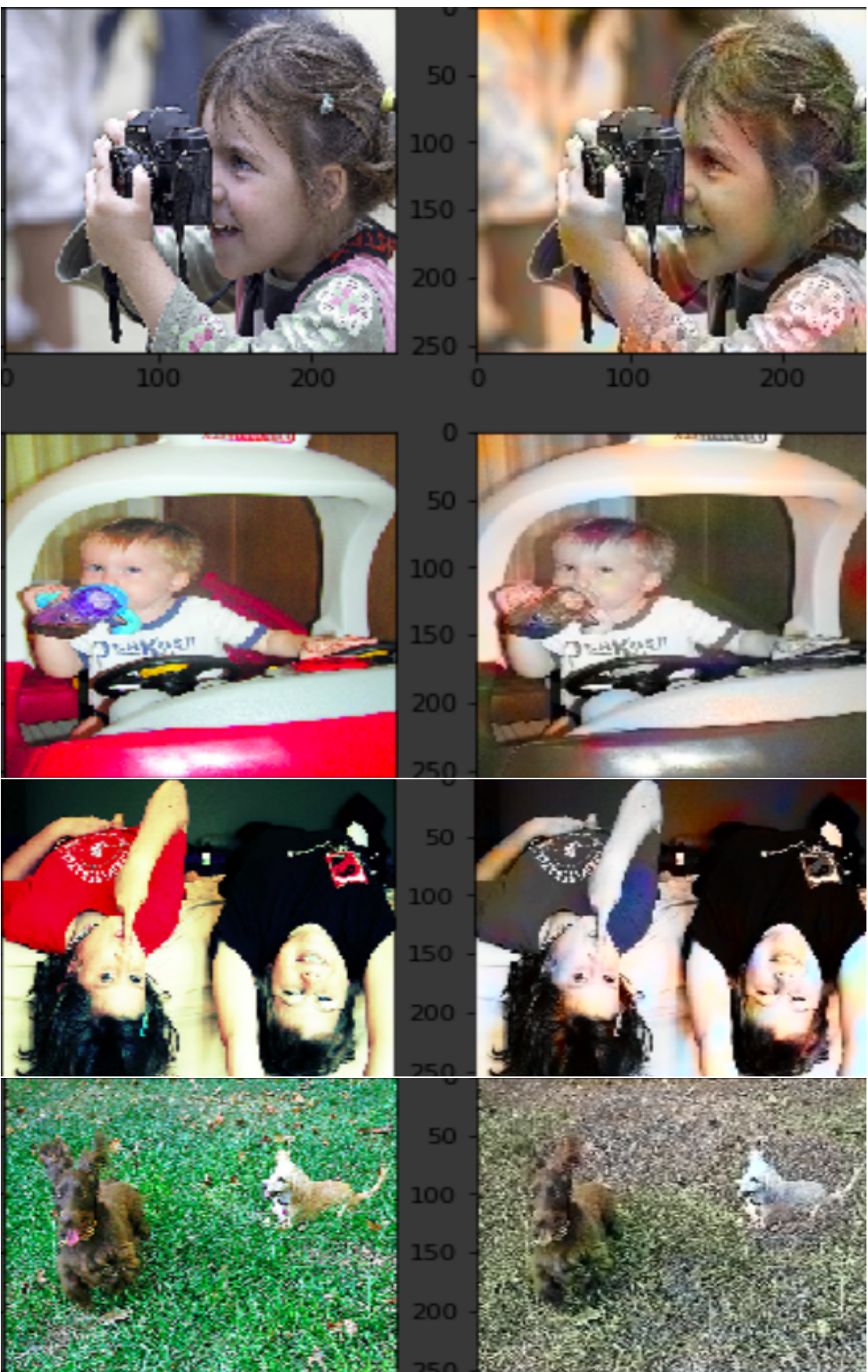


## Training Configuration

In order to quantify the model loss, we employ the Mean Squared Error between the estimated pixel colors in  $a^*b^*$  space and their real value.

Optimizer : ADAM  
Number of epochs : 100  
Image Format : 256x256(JPG)  
Platform : Google Colab and Keras

## Experimental Results



## Conclusion

The approach is able to successfully color high-level image components but they are dull.