1. **Abstract:**

Image classification is critical and significant research problems in computer vision applications such as facial expression classification, satellite image classification, and plant classification based on images. This project proposes the image classification model applied for identifying the display of daunting pictures on the internet. The proposed model uses Convolutional Neural Network (CNN) to identify these images and filter them through different blocks of the network, so that it can be classified accurately. The model works on TensorFlow a user friendly platform, which provides different high levelled APIs (in Keras) which are used to build any basic model. It also permits us to add our own libraries. The input data for the model are images we collected online through various resources. Our model will work as an extension to the web browser and will work on all websites when activated.

The output of the proposed model is blurring the images and deactivating the links. This means that it will scan the entire web page and find all the daunting images present on that page. Then we will blur those images before they are loaded and the children could see them. Apart from it, we will also disable any clickable links present. This ensures double protection from disturbing images and links, to the children.

1. **Introduction:**

Skin colour detection has been used in numerous computer vision applications like face detection, nudity recognition, hand gesture detection and person identification. Skin colour detection is often used as a preliminary step in these applications. Colour is the most robust and useful clue for skin detection and also allows fast processing of the skin patterns. Other cues like shape and geometry can be used to build accurate face detection systems. Skin colour detection is a challenging task as the skin colour in an image is sensitive to various factors like illumination, camera characteristics, ethnicity, individual characteristics such as age, sex and body parts and other factors like makeup, hairstyle and glasses. All these factors affect appearance of skin colour. Another problem is that there is a significant overlap between the skin and non-skin pixels. Most of the skin detection techniques discussed in literature are used as a preprocessor for face detection and tracking systems. However when these techniques are used in real-time, it is crucial to follow time deadlines and memory constraints. Sometimes, accuracy may need to be sacrificed when the skin detection strategy is used only as a preprocessing step to face detection, particularly in real time applications.

In this study we have focused on the problem of developing an accurate and robust model for the human skin.

1. **Objectives:**

The model will offer child proof surfing on the internet without parent intervention. So that parents do not have to worry about their children coming across nude images at such an early age without knowing the actual meaning of it. That is it will monitor every page and filter all the images, hiding their details from the children and disabling their activation upon any click. Even if the people in the image is not completely nude, may it be just the upper or lower half of the person’s body; the model will still blur that image once it reaches the minimum percentage of human pixel colour set by the classifier, thus ensuring guaranteed protection.

1. **Literature Review:**

The Neural Network (NN) classifies the image regions as a collection of either skin or non-skin regions. Various approaches to skin modelling are used in the literature. Here we give a brief review of the neural network models for skin detection. A Multi-Layer Perception (MLP) based skin colour model for face detection is proposed by Ming-Jung et al. (2003). They have used 41000 skin pixels in RGB space having different illumination for training. Further they have used mask based processing to identify face regions, from the skin pixels identified. Karlekar and Desai (1999) and Phung et al. (2001) used MLP in CbCr space for skin classification. The MLP is trained from 200 images using Levenberg-Marquardt algorithm for faster convergence. Ming-Jung et al. (2003) and Zhu et al. (2004) trained a three layered NN in RGB space not only to extract the skin regions but also to interpolate the skin regions in 3D color cube. The NN interpolated area of the colour cube is considered as skin region and the rest as non- skin region. Two types of skin models are used in the literature (Brown et al., 2001) viz., symmetric and asymmetric. Symmetric model uses a single classifier for both the classes whereas asymmetric model uses two separate classifiers for skin and non-skin pixels that are separately trained using respective features. Advantage of asymmetric skin classifier is that it increases the distances in certain skin related features between a positive (skin) and a negative (non-skin) image, with disadvantage of increased time complexity for training two classifiers.

The neural classifiers used in the literature either uses a symmetric model with single neuron in the output layer or uses two separate neural networks (asymmetric model) for each of the skin and non-skin classes. The novelty of our approach is that it has two output layer neurons; one each for skin and non-skin class, instead of using two separate classifiers. Thus by using a single NN classifier we have improved the separability between these two classes, eliminating additional time complexity that is needed in asymmetric classifier.

1. **Problem Definition:**

Skin colour pixel detection is used as a preliminary step in nudity recognition and person identification. In this study we present a pixel based skin colour classification approach, for detecting skin pixels and non -skin pixels in colour images, using a classifier. The classifier will differentiate the pixel based on the values it collects. Then the classifier will map the percentage of skin colour pixel present in that image. If the image reaches that level it will be classified as a nude image. This classifier makes the work easier, as we don’t have to make two different classifiers for identification and filtering.

1. **Scope:**

This project proposes the image classification model based on skin pixel detection applied for identifying the display of daunting pictures on the internet. In order to differentiate them from images containing humans from other images of any type.

Our scope is to blur all the extreme images and deactivating their links. This means that it will scan the entire web page and find all the extreme images present on that page. Then we will blur those images before they are loaded, so that the children would not be able to see them. This will be done in a 2 step process, first it will try to detect the face of a human and then it will calculate the percentage of human colour pixel in that image. If the pixel percentage exceeds or matches the percentage of our model then the image is completely blurred. Apart from it, we will also disable any clickable links present on or below those images. This ensures double protection of children from the disturbing images and links that are easily available on en-number of websites we visit from day to day. Our model will try to do this in the most minimum amount of time possible.

1. **Technology stack:**

Our technology is built on different API’s which help us detect the nude pictures on the web pages. There is an API for face detection and different API’s for nude body detection.

Apart from this our model also uses Convolutional Neural Network (CNN) for differentiating the images. Images containing humans should be separated from all other images in order to disable them. All this code is written in Colab, a platform which allows importing python libraries and uploading data from our computer or any other source.

We have also used OpenCV-Python which makes use of Numpy, which is a highly optimized library for numerical operations. It is an open source computer vision and machine learning software library built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception.

1. **Benefits for society:**

This project would work as an excellent child proof surfing on the internet without us monitoring their usage 24\*7. Not only the child would not come across extreme pictures and videos at such an early age where their minds are growing and has the most grasping power. But it will also help the parents to not waste their time and worry about their child getting exposed to nudity at such an early age.

Thus benefitting the society as a whole in multiple ways the project mainly ensures protection of the children from a number of things while surfing on the internet.

1. **Applications:**

We will try to put this technology on the web browser itself so that it works on all the websites. Thus being said we will try to provide it in the form of an extension which when activated would work for all the websites you visit while it is activated.

So it has a wide range of applications, though it cannot work on all websites (e.g. porn websites) where there are multiple images and videos or links to them which cannot be blurred and disabled all at once. Our technology will still try to cover the maximum websites possible.

The extension would work in Google Chrome as any other extension you may use or see. You will have to download and add it to the Google Chrome and give it permissions to scan the pages you visit while surfing on the internet.