

Implementation of Edge Detection using Artificial Neural Networks

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Abstract—Edge detection is a very important task as it extracts the useful objects from the background in an image. Image processing has edge detection as the most fundamental problem and has been tackled in multiple ways over years in the form of sobel filter, prewitt filters etc. Recently, with the advancement in data science, this task of edge detection is performed with machine learning.

Logistic Regression analysis classifies the variable into categories that are defined as a part of output layer. We use this

In this work, we tried to tackle the problem of edge detection using a simple ANN network. We also analyzed solution derived from the learning with the classical filters like sobel and prewitt.

Index Terms — Edge Detection, artificial neural networks, python

I. INTRODUCTION

Edges can be defined as the set of connected pixels that form a distinct boundary between objects. Through the edges, information such as shape and constituency of an object can be found out that helps in differentiating the foreground from the background.

Edges are conventionally defined where there is a drastic change in the intensity values of the pixels. Since gradients can be used to detect changes, the edge detection algorithm usually consist of masks or spatial filters that calculate the gradient to detect edges. In general, the most traditional and commonly used masks include Sobel mask, Prewitt mask, Canny, LoG, etc.

Edge detection can be used to extract the useful properties of any image without changing its structure altogether. Analysing edge detected images can reduce the amount of data to be processed in large use-cases and therefore, simplify the task of feature extraction and interpretation.

A newer way to detect edges is to create a neural network that will detect the edges based on the training data. The model will learn how to detect edges based on the images we train it in. In this research, a multi-layer feedforward neural network is employed for edge detection of gray-scale images.

II. METHOD

The dataset used is "The multi-cue boundary detection dataset". It consisted of 100 images each having resolution of 1280 x 720 pixels. This dataset has variety of images that are rotated, have different illumination, scaled, etc. It is used to train the ANN model

The input layer of the model has $3 \times 100 \times 100$ nodes. There are 4 hidden nodes, having 80×80 , 60×60 , 40×40 and 60×60 nodes respectively. The activation function used for the hidden nodes in ReLu. The output node has the activation function of sigmoid and returns the normalised value of the output.

III. RESULTS

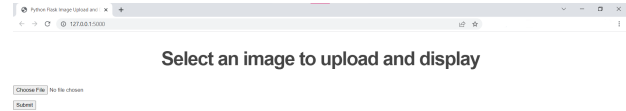


Fig. 1. GUI

IV. DISCUSSIONS

- A dataset was downloaded and used to train the model. The dataset wasn't created using sobel mask because if it was created using Sobel, then the accuracy wouldn't come upto the ideal sobel output
- We can observe from the images that the long edges have been detected by the ANN model

V. CONCLUSION

Implementation of an Artificial Neural Network for edge detection was completed



Fig. 2. Image and its edge-detected output