Image Classification with Neural Networks

Bruce Liu, Computer Engineering, Pasadena City College
Fangqiu Han, Dr Xifeng Yan, UC Santa Barbara Computer Science

Introduction

Digital images contain many contextual objects in them. Similar objects of different images show statistical data similar to each other despite the setting of any given image. We propose the use of Artificial Neural Networks (ANN) to classify images based on the object in the image.

Goals

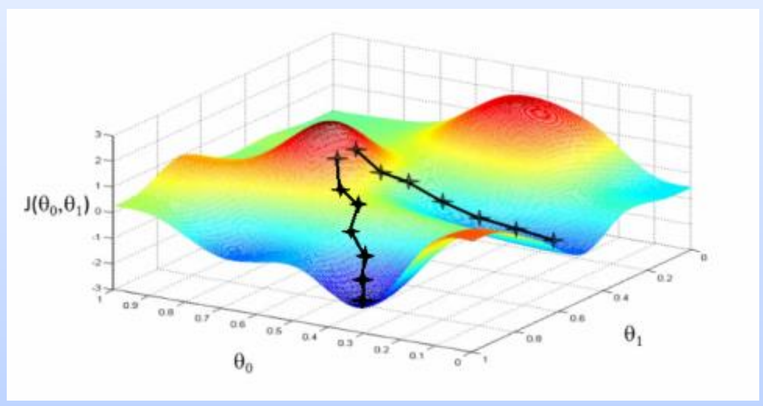
This project goal is to employ the use of MATLAB to develop ANNs. These ANNs will use input data of images to generate a decision based on statistical probability.

Method

Using the Logistic Regression Cost Function:

$$J(\theta) = -\frac{1}{m}[\sum_{i=1}^{m} y^{(i)} \log h_\theta(x^{(i)}) + (1 - y^{(i)}) \log (1 - h_\theta(x^{(i)}))]$$

We will use the method, gradient descent to find optimum boundary parameter for our data set. The algorithm will be repeated until the value of $J(\theta)$ has been minimized and θ_j has converged.

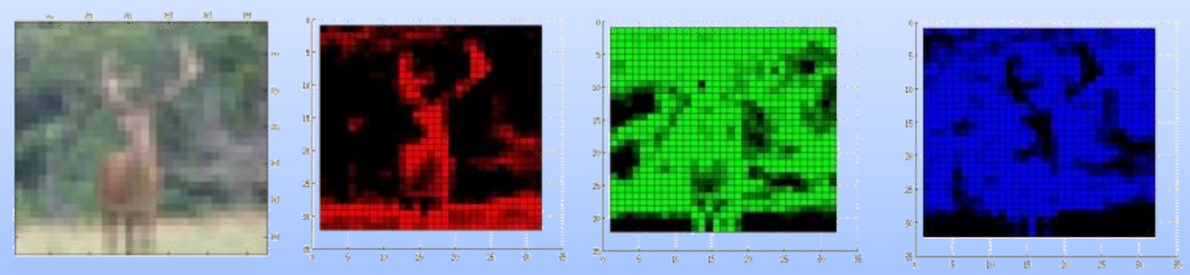


Gradient Descent Algorithm

$$\theta_j := \theta_j - \alpha \frac{\partial}{\partial \theta_j} J(\theta)$$

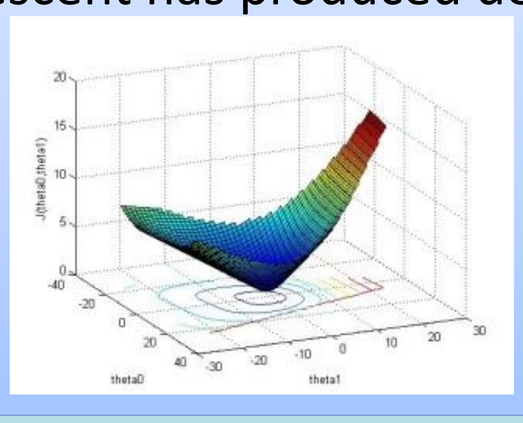
Data

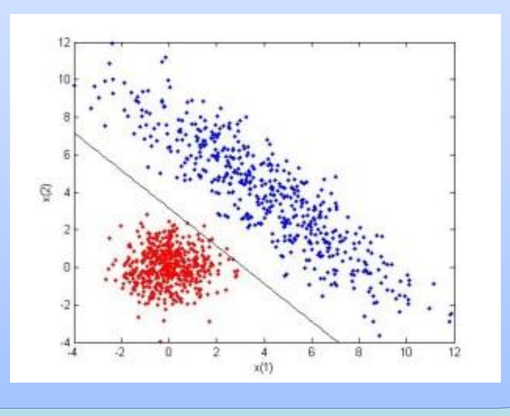
We will be using 32x32 labeled sample data images. This data will be rearranged to fit into an array for input. Our θ will be randomly generated.



Results

The MATLAB code for Cost Function and gradient descent has produced desirable results





Conclusion

While there is still much to be done, the preliminary programs to build the final neural network has worked successfully. The number of iterations has been tested to be optimized. Other types of neural networks still need to be tested and developed.