

Building a Brain: Image Recognition with Deep Learning

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The purpose of this project was to create a Convolutional Neural Network (CNN) on MATLAB that could identify/classify handwritten integers from 0-9 with a 95% testing accuracy rate. Once trained and tested the CNN was uploaded to a microcontroller that was connected to a camera to identify handwritten digits in real time. A CNN is a form of deep learning algorithm, which takes an input image, assigns the importance of the image's features (Feature learning section), and then is able to classify (Classification section) the image. To train and test the CNN, the MNIST numerical data set was used. This data set includes 70,000 categorized handwritten digits. The type of statistical model used to predict the category of the data was a multi-class classification model that is able to model the probability of a discrete outcome given an input variable. A common optimization algorithm called gradient descent was used to optimize the parameters the model used to predict the category of the input data. This algorithm is an iterative first-order optimization algorithm used to find a local minimum of a given function. By using the MNIST data set with these methods the CNN was able to obtain a training accuracy of 99.48% and a testing accuracy of 98.03%, well above the initial accuracy rate the project set out to achieve.

Keywords: Convolutional Neural Network, MATLAB, MNIST, Microcontroller.

