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Bilinear Interpolation for Deep Image Classification

Abstract

1. Introduction
   1. Image processing is widely used in the modern world
      1. Computer Vision: Extract meaning from Images
      2. Types of Vision: Classification, Detection, Segmentation
         1. We will be performing classification of images
      3. Use Cases: Facial recognition, Handwriting parsing
   2. Image Formats and Sizes
      1. Images are 2D or 3D Objects
      2. Typical Image formats: PNG, PJEG, RAW
      3. Hundreds of thousands of bytes to store a single image in Disk or RAM
      4. Stores as bytes, but upscaled to single/double precision floats
   3. Power of Automation
      1. Modern computers can read/write hundreds to thousands of images/sec
      2. Must be trained to map images to
   4. Limits of Human Vision
      1. Humans have eyesight “resolution” limited by biology
2. Related Works
3. Dataset
   1. Case Study 1 – MNIST 784 Dataset
      1. 70,000 Images of single digits 0 through 9
      2. 28 x 28 pixels (single gray-scale channel)
      3. Down-Sample to 7 x 7 (avg of 2 x 2 blocks) to simulate smaller sizes
      4. Allows images to be stored at 1/16 the size in DISK
4. Interpolation Technique
5. Deep Neural Network Architecture
   1. Convolutional Neural Network
      1. Groups of Layers Conv2D + Conv2D + MaxPool2D
      2. Flatten out activations
   2. Model Configuration
      1. Optimizer – Adaptive Momentum (ADAM)
         1. Expansion of SGD
         2. Description of method
         3. Hyperparameters selection
      2. Loss Function – Categorical Crossentropy
         1. Indirect optimization
         2. Minimize to is learning
      3. Metrics – Precision, Recall, Accuracy
      4. Regularization?
         1. Motivation
         2. Other considerations
   3. Outputs
      1. Softmax activation function
         1. Exponential of each output activation
         2. L1-Norm of 1
      2. Treat outputs as probability distribution
      3. Compare to expected outputs,
6. Methodology
   1. For all Images in the full dataset
      1. Sample from (m,n,k) down to (p,q,k)
      2. Scale each pixel to unit variance and zero mean
      3. This simulates the “compacted dataset” (1/16 the size)
7. Results
8. Conclusions