Optical Character Recognition using Neural Network

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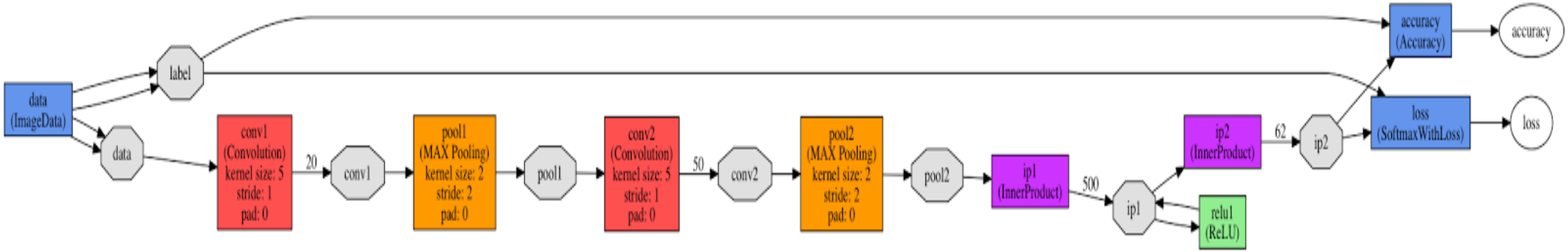
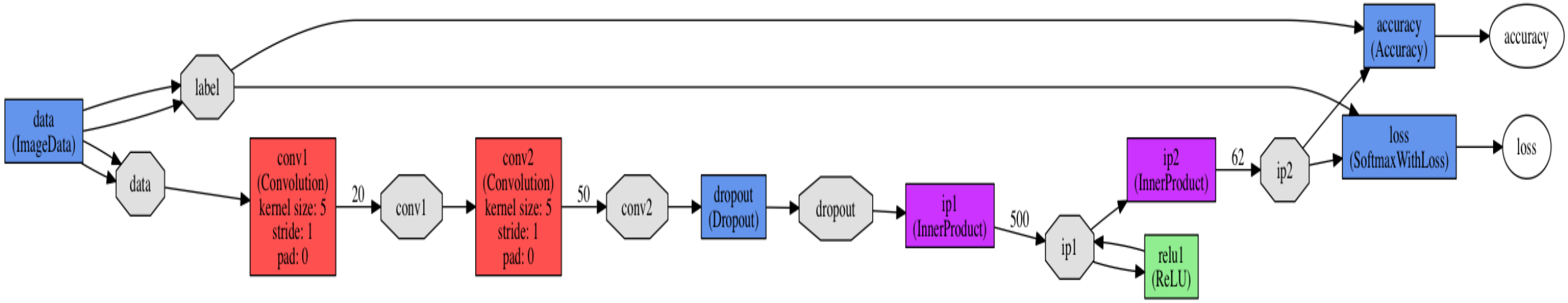
Goal

- Implement an optical character recognition application for images using neural networks.
- Experiment and report results in the process of building the application.
  - Layer architecture
  - Training set size
  - Shuffled/unshuffled train set
  - Iteration count

Neural Network Architecture: Model 1



Neural Network Architecture: Model 2



Training/Testing Data and Methodology

- Split Training data in a 90 – 10 fashion.
- Training set 1:
  - Generated using python on common fonts
  - Train set size : 558 images
  - Test set size : 62 images
- Training set 2:
  - The Chars74k dataset : taken 10%images
  - Train set size : 5580 images
  - Test set size : 620 images
- Testing:
  - Measure accuracy on test data

Experiment 1: Learning Rate

- Parameters :
  - Learning Rate : 0.01
  - Learning Rate : 0.001
  - Learning Rate : 0.0001

  - No Convergence in the first two cases
  - Converges in the last case, and has been used for all the experiments

Experiment 2 : Shuffled/unshuffled train set

- Parameters
  - Test set size : 62 images
  - Train set size : 558 images
  - Number of iterations : 3000

Train set	Accuracy
Shuffled train set	65.17%
Unshuffled train set	19.62%

Experiment 3 : Training set size

- Config1
  - Train set size : 558 images
  - Test set size : 62 images
  - Number of iterations : 3000
- Config2
  - Train set size : 5580 images
  - Test set size : 620 images
  - Number of iterations : 3000

Config	accuracy
Config1	65.17%
Config2	78.15%

Experiment 4 : Number of iterations

- Parameters :
  - Train set size : 5580 images
  - Test set size : 620 images
  - Neural Network Architecture : LeNet

Iteration count	Accuracy
1000	60.75%
2000	62.50%
3000	78.15%

Experiment 5 : Neural Network Architecture

- Parameters :
  - Train set size : 5580 images
  - Test set size : 620 images
  - Number of iterations : 3000

Model	Accuracy
LeNet	78.15%
Modified LeNet	86%

Demo

- Segmentation
- Optical Character Recognition

Major Challenges Faced

- Caffe Installation
- Understanding Caffe
- Understanding Neural Networks and Various layers offered in Caffe
- Understanding OpenCV
- Segmentation and character extraction
- Thinking about modifying LeNet
- Getting everything to work together

Future Work

- Generate train set using segmentation and train the neural network
- Install and use Caffe in GPU mode and train neural network with larger train set.
- Extend this application to work on videos.
- Implement an application for indexing video files based on the text content that appears in videos.