Deep Learning - Thinking

Travelling photo classification; Applied machine learning; Experimental research

Understanding – Deep Learning

1. Good at image recognition.
2. Tons of training data is needed for high accuracy.
3. Computing takes long time. Better on distributed GPU.

Thinking – Life usage

1. Training should not take too long.
2. Computing on normal PC.
3. Lower accuracy can be tolerated, not for security usage.

It would be great to manage and distribute overwhelming travelling photo smartly.

Technology

```
layer_defs.push({type:'input', out_sx:32, out_sy:32, out_depth:3});
layer_defs.push({type:'conv', sx:5, filters:16, stride:1, pad:2, activation:'relu'});
layer_defs.push({type:'pool', sx:2, stride:2});
layer_defs.push({type:'conv', sx:5, filters:20, stride:1, pad:2, activation:'relu'});
layer_defs.push({type:'pool', sx:2, stride:2});
layer_defs.push({type:'conv', sx:5, filters:20, stride:1, pad:2, activation:'relu'});
layer_defs.push({type:'pool', sx:2, stride:2});
layer_defs.push({type:'softmax', num_classes:3});
```

ConvNetJS.js
Convolutional Neural Network for classification

Supervised Training
Prepare labeled training data.

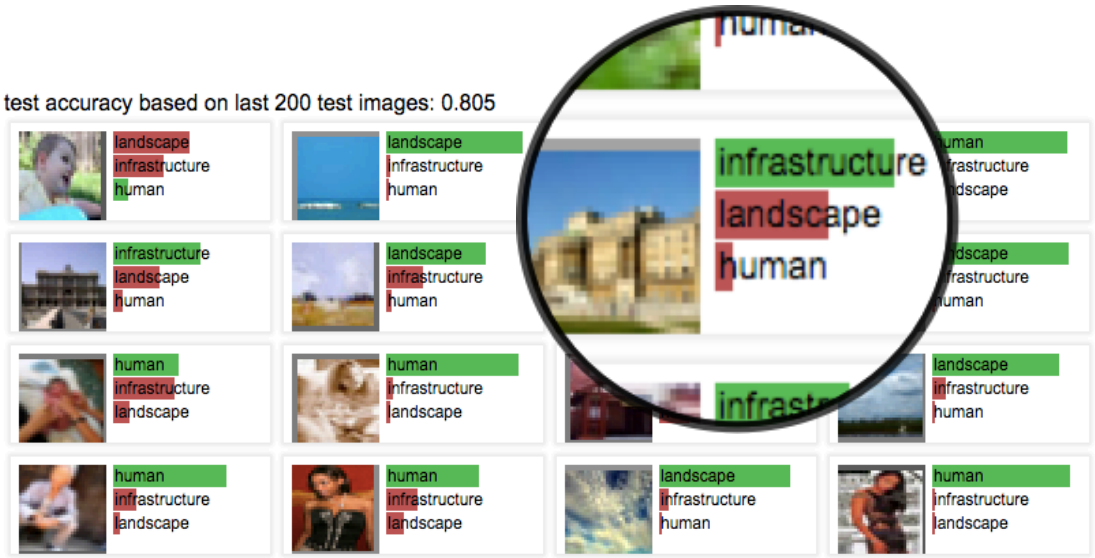
```
for root,dirnames,filenames in os.walk(rootdir):
    for dirname in dirnames:
        dir =os.path.join(rootdir,dirname)
            for imgname in imgnames:
                src = os.path.join(dir,imgname)
                image = Image.open(src)
                image.thumbnail((32,32), Image.ANTIALIAS)
```

Dataset: 32*32 .PNG
1000 photos clustered for quick reading.

Deep Learning - Design

Travelling photo classification; Applied machine learning; Experimental research

- Experiment on three major categories of travelling photos
- After 8000 training pictures, average accuracy: 83.5%



Look Ahead

User could define more precise category, or involve facial recognition to classify photo for individuals, taking use of learning feature of Neural Network.

Labeled Dataset

- 8000 training dataset and 1000 testing dataset, separated by random.
- Mixture photo sources (from Internet and myself collection), closer to real application.

Technology Choice

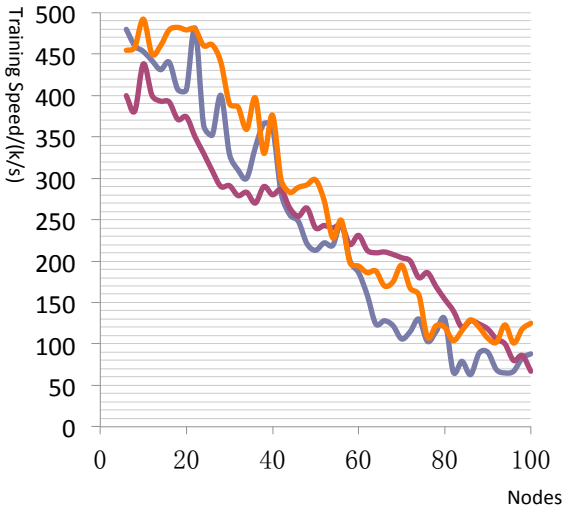
- Softmax Regression, continuously increase the predict possibility for correct label.
- Adaelts, performed best in Loss trend compared with Adagad, sgd and momentum.

Deep Learning – Results

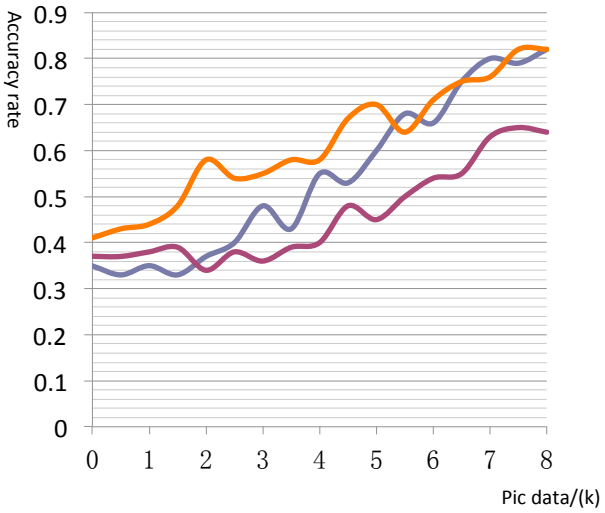
Travelling photo classification; Applied machine learning; Experimental research

Dimension

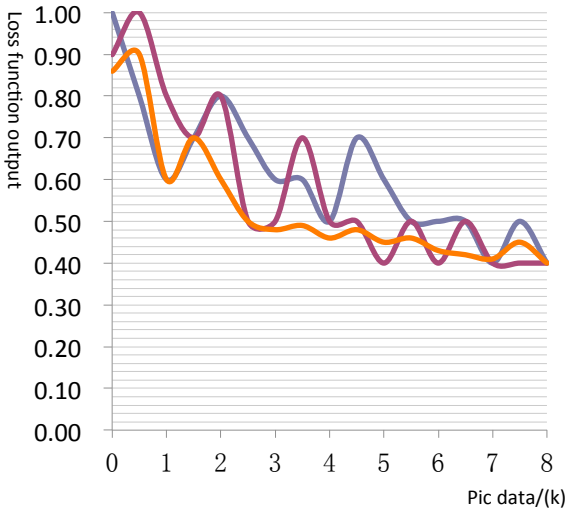
1. Speed



2. Accuracy



3. Trend of cost function output



Experiment Result

- Using Pad:2 avoids pic edge blur
- Activation function: ReLU(Rectifier Linear Units) f(x) = max(0,x)
- Learning rate 0.001~0.005 performed best, affecting the rate of regression adjustment
- 6K~8K training data is efficient, which takes few time and nearly most accurate prediction.