CaffeOnACL

Accuracy Report

2018-01-23

Revision Record

Date	Rev	Change Description	Author
2017-9-20	0.1.0	Initial	Huifang
2017-10-11	0.2.0	Validation Arm Compute Library v17.09	Huifang
2017-11-28	0.3.0	Validation Arm Compute Library v17.10	Huifang
2018-01-23	0.4.0	Validation Arm Compute Library v17.12	Huifang

Catalog

1 Purpose

This Report is tested on RK3399 platform and the Arm Compute Library is version 17.12. We tested the accuracy data on AlexNet, GoogLeNet, SqueezeNet and MobileNet.
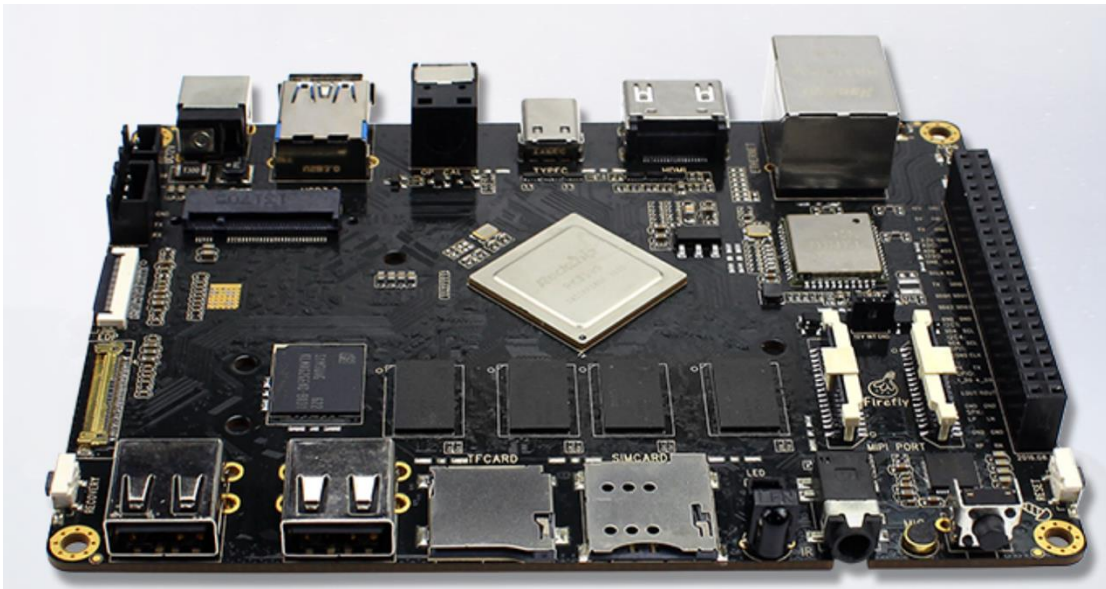
2 Test Environment

Hardware SoC: firefly

http://www.t-firefly.com/product/rk3399.html

> GPU: Mali T864 (800MHz)
> RAM: 4G
> CPU: Dual-core Cortex-A72 up to 2.0GHz (real frequency is 1.8GHz); Quad-core Cortex-A53 up to 1.5GHz (real frequency is 1.4GHz)

Operating System: Ubuntu 16.04

Test Dataset: 10000 images from ImageNet ILSVRC 2012 validation set (ImageNet is the world's largest open source database for image recognition)

3 Test Approach
3.1 Prepare Dataset

The first thing that needs to be prepared is the test dataset. ImageNet dataset is strongly recommended because it provides the same category labels as the labels used to train the 4 models. You can download it from below path:

wget ftp://ftp.openailab.net/tools/CaffeOnACL_test_model/models.tar.gz

3.2 Configure the Prototxt

AlexNet, GoogleNet and SqueezeNet have already provided train_val.prototxt and require no change in the prototxt file (except for setting the right path to the test data). MobileNet only provide deploy.prototxt and requires some changes for testing.

Firstly, you can duplicate the deploy.prototxt of MobileNet and rename it. Then in the prototxt, change the input of the model from

```
input: "data"
input_dim: 1
input_dim: 3
input_dim: 224
input_dim: 224
```

to

```
layer {
  name: "data"
  type: "Data"
  top: "data"
  top: "label"
  include {
    phase: TEST
  }
  transform_param {
    scale: 0.017
    mirror: false
    crop_size: 224
    mean_value: [103.94,116.78,123.68]
  }
  data_param {
    source: "your_path_of_lmdb"
    batch_size: 50
    backend: LMDB
  }
}
```

Then at the end please add the following:

```
layer {
  name: "accuracy/top1"
  type: "Accuracy"
  bottom: "fc7"
  bottom: "label"
  top: "accuracy/top1"
  include {
    phase: TEST
  }
}
layer {
  name: "accuracy/top5"
  type: "Accuracy"
  bottom: "fc7"
```

```
  bottom: "label"
  top: "accuracy/top5"
  include {
    phase: TEST
  }
  accuracy_param {
      top_k: 5
  }
}
```

3.3 Run Tests

Test can be done using command ./distribute/bin/caffe.bin -model -weights -iterations. For example, if you want to test the accuracy of MobileNet you can use the following command:

```
./distribute/bin/caffe.bin test -
model ./models/MobileNet/MobileNet_v1.1/mobilenet_train_val.prototxt -
weights ./models/MobileNet/MobileNet_v1.1/mobilenet.caffemodel -iterations 200
```

4 Accuracy Achievement

All tests below use the same dataset which contains images of 1000 separate categories each with category label. Top 1 and top 5 prediction accuracies are given in the below table.

Top 1 accuracy means the accuracy of most probable prediction category versus category label and top 5 accuracy means accuracy of the top 5 most probable prediction categories versus category label.

All models are tested under 3 different circumstances

- Use ACL in all layers on Arm platform
- Use OpenBLAS in all layers on Arm platform
- Use Mixed Mode (ACL+OpenBLAS) on Arm platform

The test results are given below

Library and Platform		AlexNet(s) (s)	GoogleNet (s)	SqueezeNet (s)	MobileNet (s)
CaffeOnACL(Neon)	Acc-top1	0.5661	0.6918	0.5768	0.6889
	Acc-top5	0.8015	0.8954	0.8093	0.8929
CaffeOnACL(OpenBLAS)	Acc-top1	0.5661	0.6918	0.5768	0.6889
	Acc-top5	0.8015	0.8954	0.8093	0.8929
CaffeOnACL(Neon+OpenBLA	Acc-top1	0.5661	0.6918	0.5768	0.6889

S)	Acc-top5	0.8015	0.8954	0.8093	0.8929
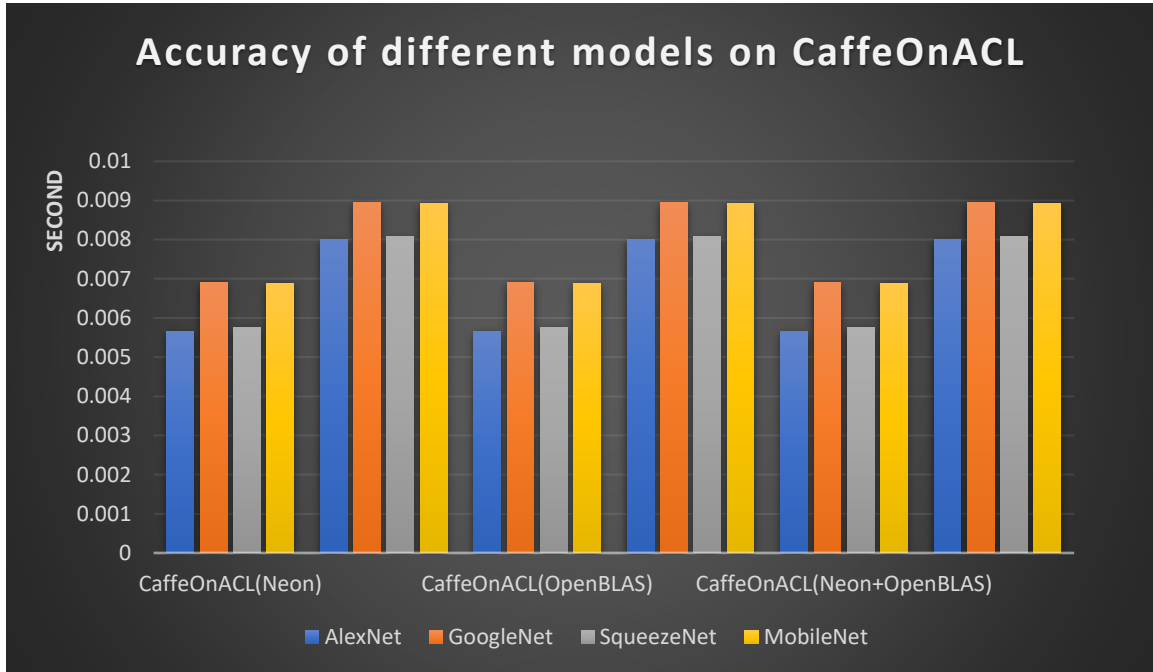
5 Additional Information for Models

Other factors including numbers of Multi-Adds and Parameters should also be considered when choosing appropriate model as some of the models have similar accuracy. The information is given in the table below.

	AlexNet	GoogleNet	SqueezeNet	MobileNet
Parameters (Million)	60	6.8	1.25	4.2
Multi-Adds (Million)	720	1550	1700	569

6 Conclusion

Several conclusions can be drawn from the tests:

- GoogleNet and MobileNet have the best result in top 1 and top 5 accuracy among the 4 models
- Same results are produced using different libraries in one model