

Deep learning in R with MXNet

Qiang Kou

qkou@umail.iu.edu

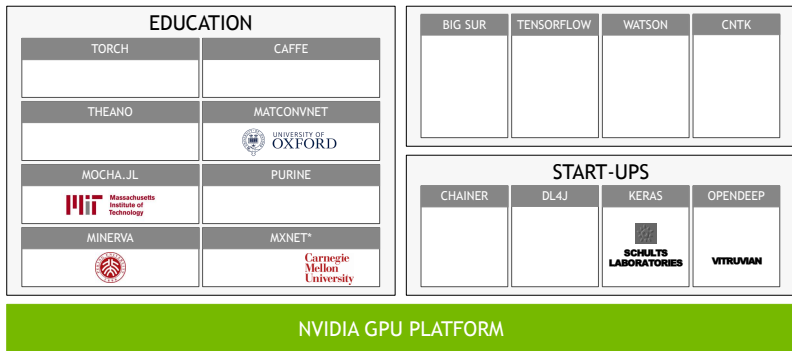


- Qiang Kou, KK, 寇强
- PhD student in mass spectrometry, Indiana University
- R/C++ developer
- **Rcpp** core team member
- DMLC team member

What is MXNet?

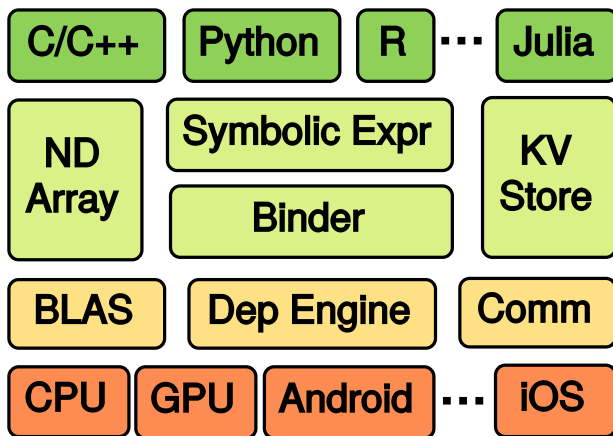
Platforms

THE ENGINE OF MODERN AI



<http://www.slideshare.net/NVIDIA/nvidia-ces-2016-press-conference>

MXNet



MXNet: A Flexible and Efficient Machine Learning Library for Heterogeneous Distributed Systems

Why MXNet?

Why not tensorflow?

More efficient

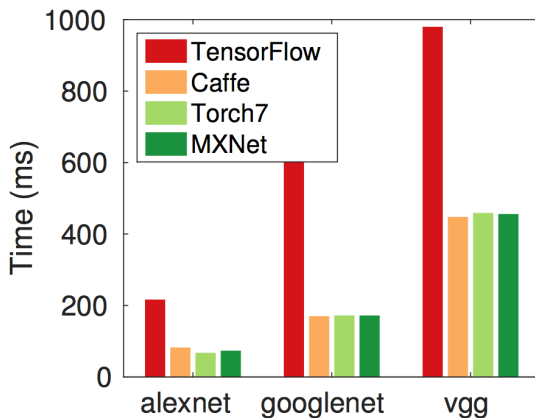


Figure: Compare MXNet to others on a single forward-backward performance.

Windows support

```

RGui (64-bit) - [R Console]
File Edit View Misc Packages Windows Help

> drat::addRepo("dmlc")
> install.packages("mxnet")
--- Please select a CRAN mirror for use in this session ---
trying URL 'http://dmlc.github.io/drat/bin/windows/contrib/3.2/mxnet_0.5.zip'
Content type 'application/zip' length 13372314 bytes (12.8 MB)
downloaded 12.8 MB

package 'mxnet' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
  C:\Users\Administrator\AppData\Local\Temp\2\Btmpc2G04H\downloaded_packages
> require("mxnet")
Loading required package: mxnet
> require("mlbench")
Loading required package: mlbench
> data(Sonar, package="mlbench")
> Sonar[,61] = as.numeric(Sonar[,61])-1
> train.ind = c(1:50, 100:150)
> train.x = data.matrix(Sonar[train.ind, 1:60])
> train.y = Sonar[train.ind, 61]
> test.x = data.matrix(Sonar[-train.ind, 1:60])
> test.y = Sonar[-train.ind, 61]
> mx.set.seed(0)
> model <- mx.mlp(train.x, train.y, hidden_node=10, out_node=2, out_activation="softmax",
+               num.round=20, array.batch.size=15, learning.rate=0.07, momentum=0.9,
+               eval.metric=mx.metric.accuracy)
Auto detect layout of input matrix, use rowmajor..
Start training with 1 devices
[1] Train-accuracy=0.488888888888889
[2] Train-accuracy=0.514285714285714
[3] Train-accuracy=0.514285714285714
[4] Train-accuracy=0.514285714285714

```

Installation

DRAT repo

For Windows and Mac users,

```
install.packages("drat", repos="https://cran.rstudio.com")  
drat::addRepo("dmlc")  
install.packages("mxnet")
```

MNIST demo

The dataset is from

<https://www.kaggle.com/c/digit-recognizer/data>

```
library(mxnet)
train <- read.csv("train.csv", header=TRUE)
test  <- read.csv("test.csv", header=TRUE)
train <- data.matrix(train)
test  <- data.matrix(test)
train.x <- train[,-1]
train.y <- train[,1]
train.x <- t(train.x/255)
test  <- t(test/255)
```

MNIST demo

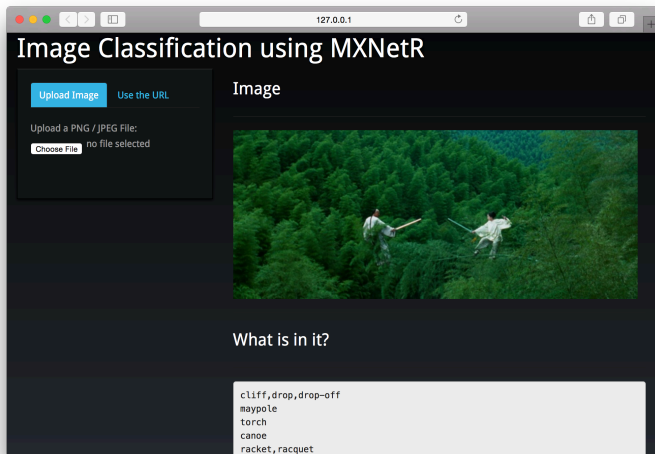
```
data <- mx.symbol.Variable("data")
fc1 <- mx.symbol.FullyConnected(data, name="fc1", num_hidden=128)
act1 <- mx.symbol.Activation(fc1, name="relu1", act_type="relu")
fc2 <- mx.symbol.FullyConnected(act1, name="fc2", num_hidden=64)
act2 <- mx.symbol.Activation(fc2, name="relu2", act_type="relu")
fc3 <- mx.symbol.FullyConnected(act2, name="fc3", num_hidden=10)
softmax <- mx.symbol.SoftmaxOutput(fc3, name="sm")
```

MNIST demo

```
mx.set.seed(0)
model <- mx.model.FeedForward.create(softmax, X=train.x,
                                     y=train.y, ctx=mx.cpu(), num.round=10,
                                     array.batch.size=100,
                                     learning.rate=0.07, momentum=0.9,
                                     eval.metric=mx.metric.accuracy,
                                     initializer=mx.init.uniform(0.07),
                                     batch.end.callback
                                     = mx.callback.log.train.metric(100))
```

A shiny app

A shiny app



Thanks

Thank you for your time!