

Intelligent Vehicle Introduction of TensorFlow

Yeqiang Qian





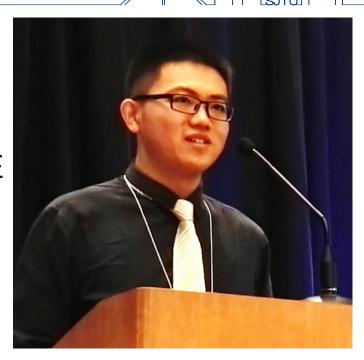


Today's agenda

- Introduction of TensorFlow
- Introduction of Deep Neural Network (DNN)
- Introduction of logistic classifier
- Practice: create your own logistic classifier using TensorFlow



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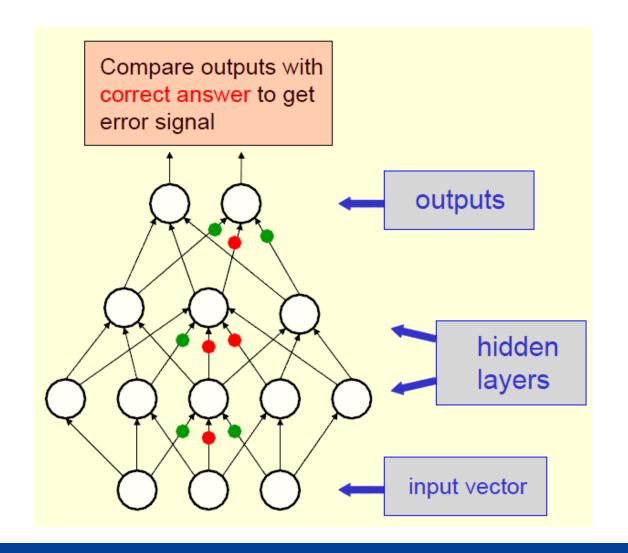




About deep learning

Back Propagation in 1985

- Drawbacks
 - Low error signal
 - Hard to tune
 - Low training speed





About deep learning



Three things happen

- The big dataset
- The faster GPU
- The new training method

A fast learning algorithm for deep belief nets *

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ImageNet Dataset



Russakovsky, O., Deng, J., Su, H., Krause, J., Satheesh, S., Ma, S., ... & Fei-Fei, L. (2015). <u>Imagenet large scale visual recognition challenge</u>. arXiv preprint arXiv:1409.0575. <u>[web]</u>





About deep learning





What is TensorFlow?

- vviiat is Telisoff low:
- Google.
- A framework for deep learning.
- Deep neural networks can be easily configured and trained.
- Running on many machines at the same time.





Installing TensorFlow

Normal installation:

sudo pip install tensorflow-gpu # for Python 2 and gpu version

• For TX2:

https://github.com/jetsonhacks/installTensorFlowJetsonTX sudo pip install XXX

• Check the version of TensorFlow

python # for Python 2
import tensorflow as tf
print(tf.__version___)



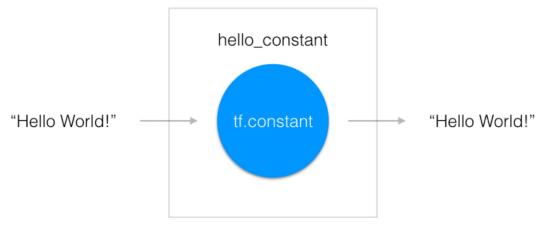
Hello, Tensor World!

```
import tensorflow as tf

# Create TensorFlow object called hello_constant
hello_constant = tf.constant('Hello SJTU!')

with tf.Session() as sess:
    # Run the tf.constant operation in the session
    output = sess.run(hello_constant)
    print(output)
```

TensorFlow Session





TensorFlow Input

```
import tensorflow as tf
def run():
    output = None
    x = tf.placeholder(tf.int32)

with tf.Session() as sess:
    # TODO: Feed the x tensor 123
    output = sess.run(x, feed_dict={x: 1314})
    return output
```



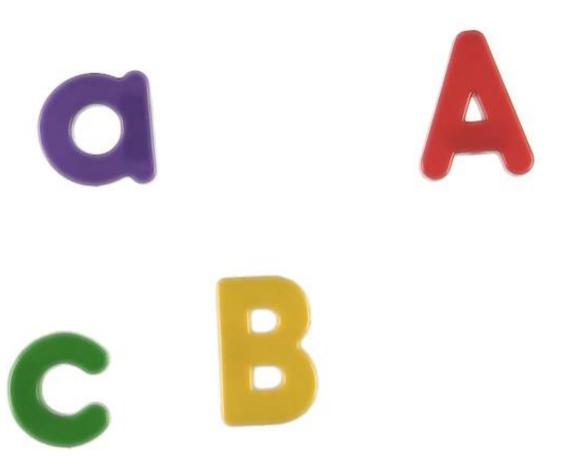
TensorFlow Math

```
x = tf.add(5, 2) # 7
x = tf.subtract(10, 4) # 6
y = tf.multiply(2, 5) # 10
y = tf.divide(10, 2) # 5
tf.cast(tf.constant(2.0), tf.int32)

Test: calculating "10 - 2.0 + 4.0/2" using TensorFlow
```

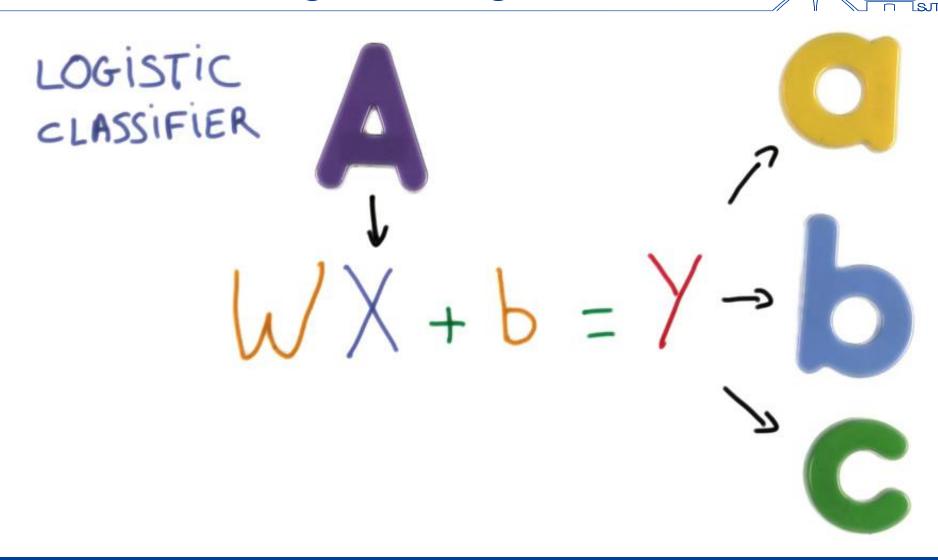


Supervised Classification



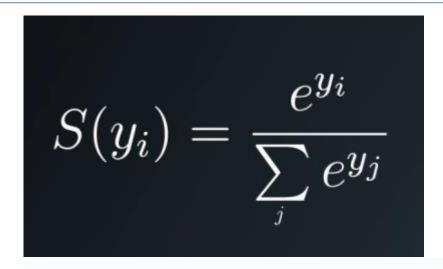


Training Your Logistic Classifier





Softmax

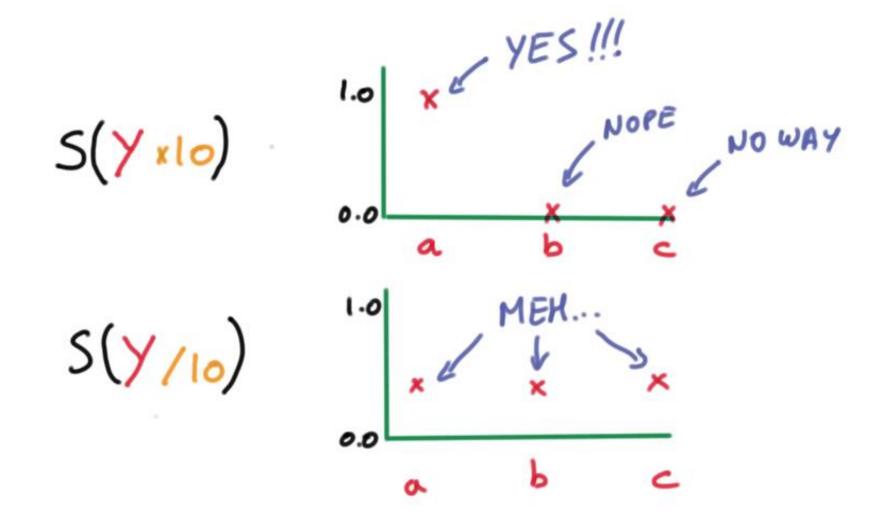


Test:

```
x = tf.nn.softmax([2.0, 1.0, 0.2])
y = tf.nn.softmax(
    [[1, 2, 3, 6],
        [2, 4, 5, 6],
        [3, 8, 7, 6]])
```

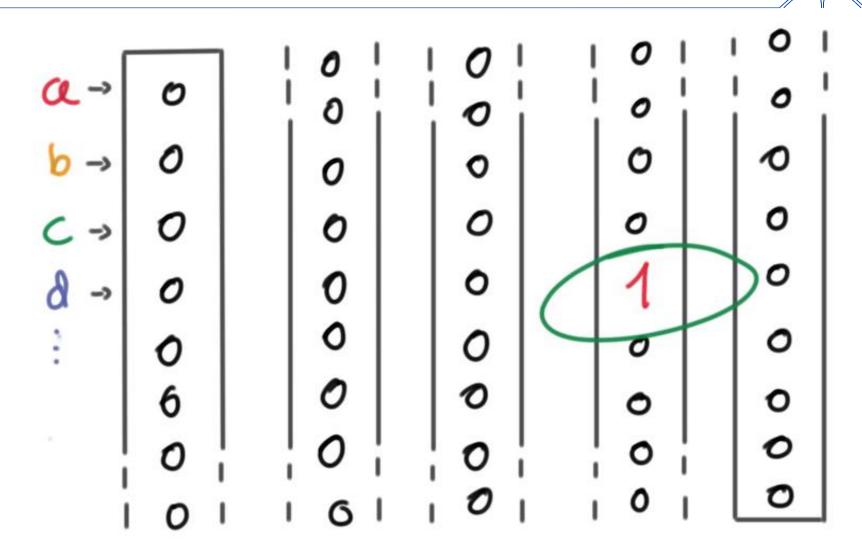


One-Hot Encoding



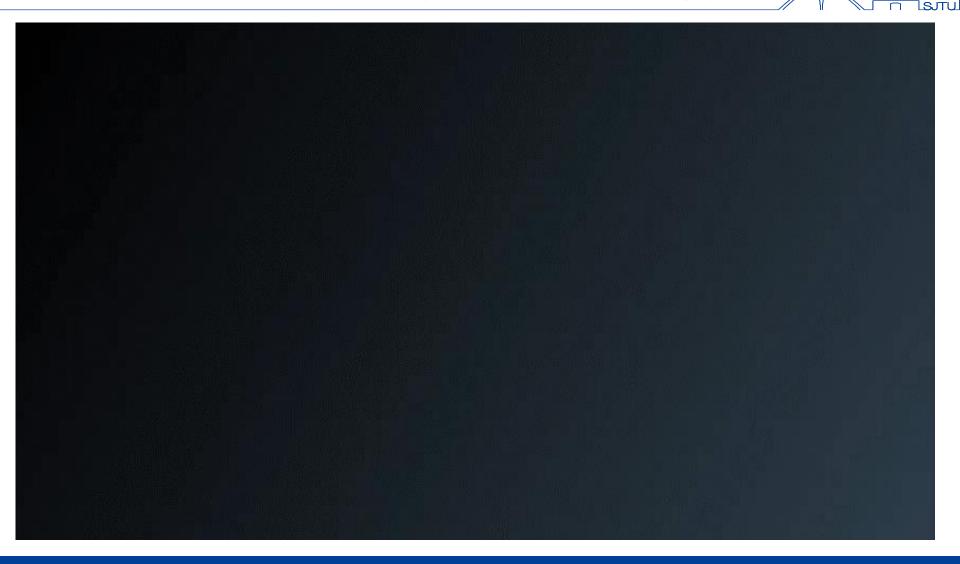


Cross Entropy



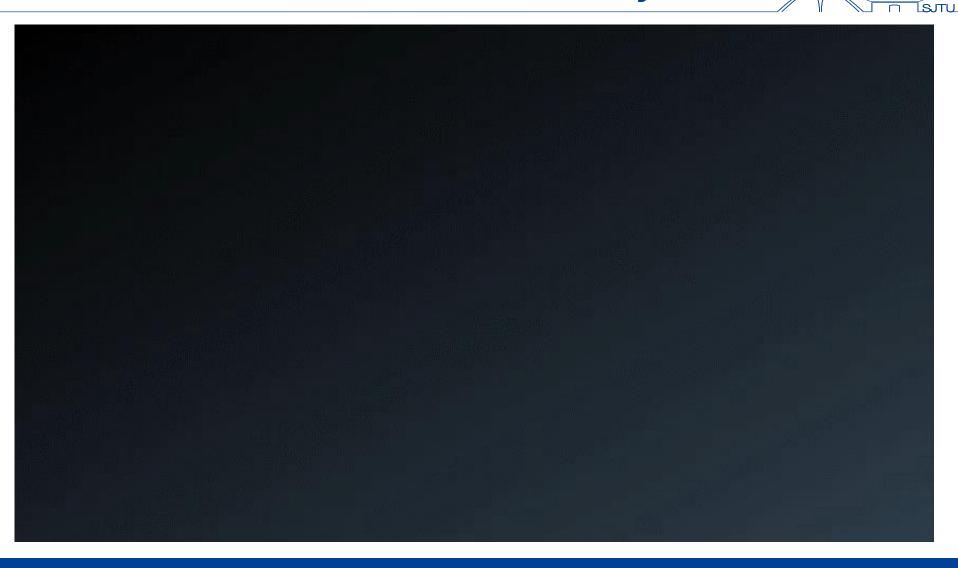


Minimizing Cross-Entropy



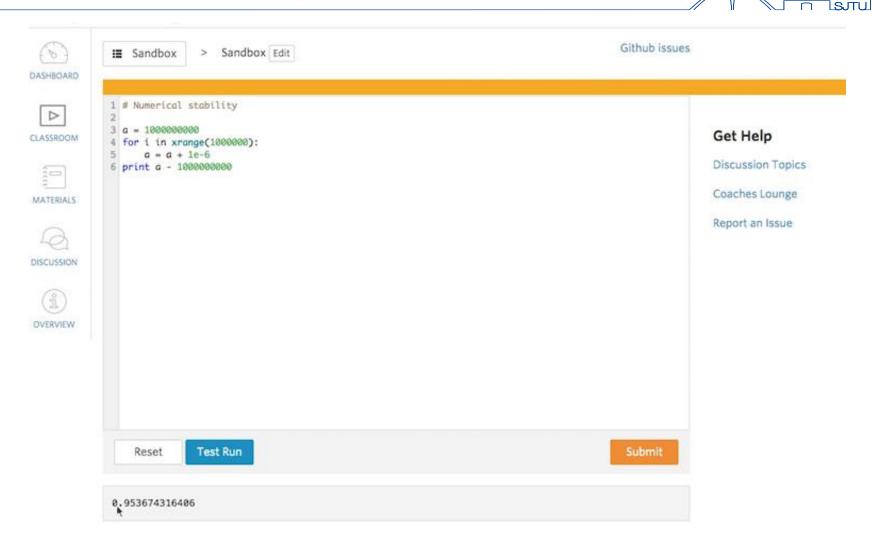


Numerical Stability



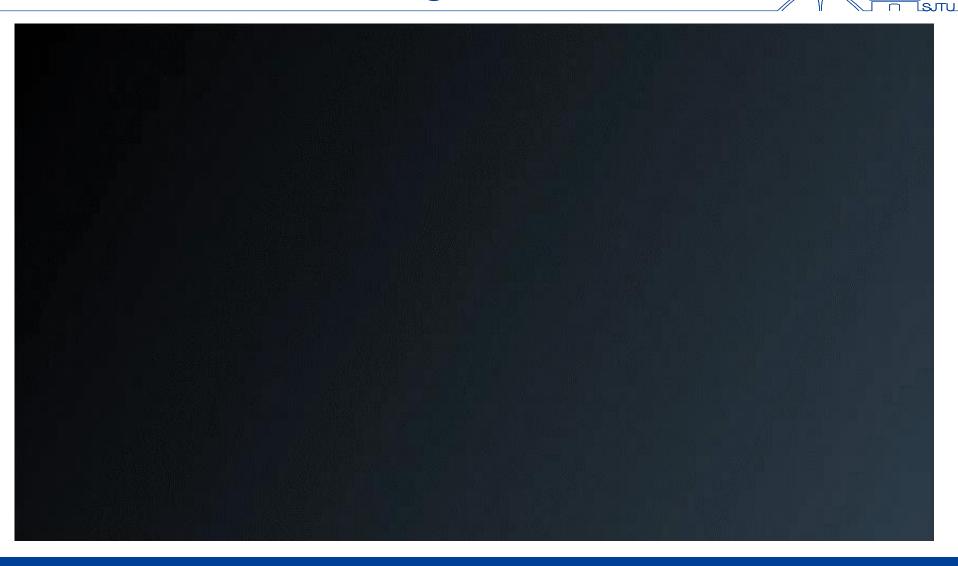


Normalized Inputs and Initial Weights



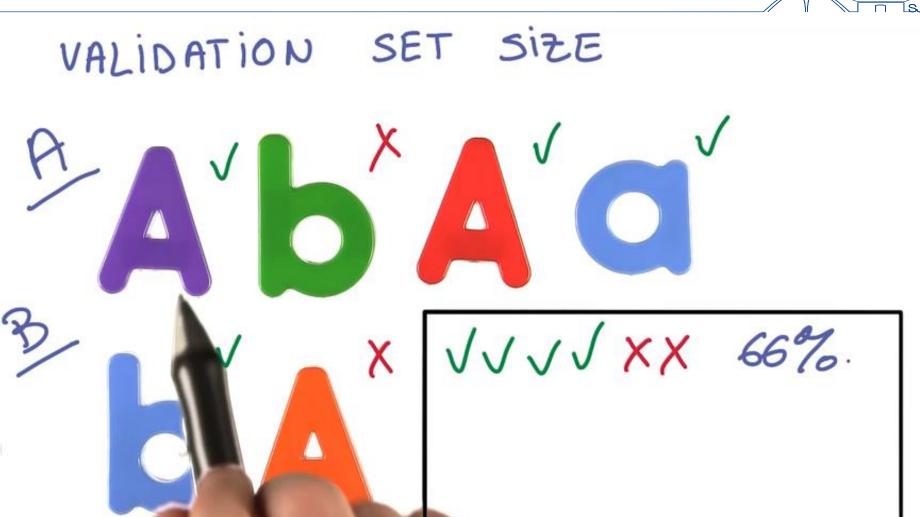


Measuring Performance





Validation and Test Set Size



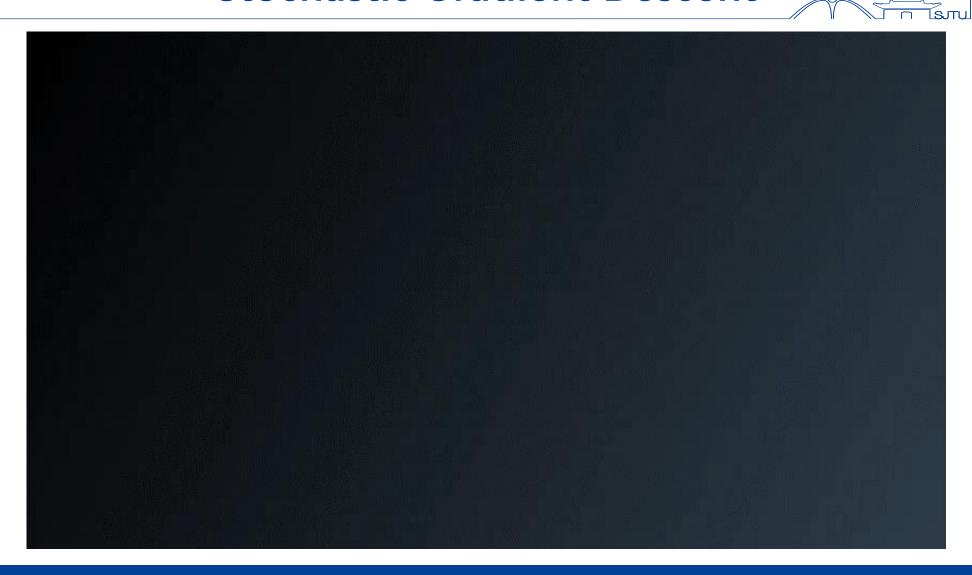


Validation Set Size

RULE OF '30'



Stochastic Gradient Descent



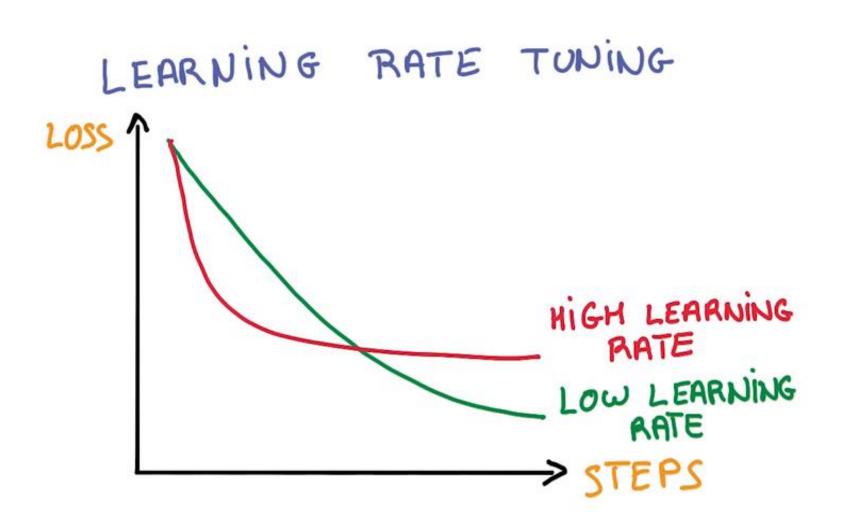


Momentum and Learning Rate Decay

```
HELPING SGD
1- INPUTS
       MEAN = Ø
       EQUAL VARIANCE (SMALL)
2- INITIAL WEIGHTS
        RANDOM!
        MEAN = Ø
        EQUAL VARIANCE (STIALL TOO)
```



Parameter Hyperspace!





Practice

- Aim: Classify the numbers in MNIST and increase the testing_accuracy to 95%
- Link: http://pan.baidu.com/s/1qYl0jSg Password: 7y39





- https://jbox.sjtu.edu.cn/l/H1Nwfz
- dsnp





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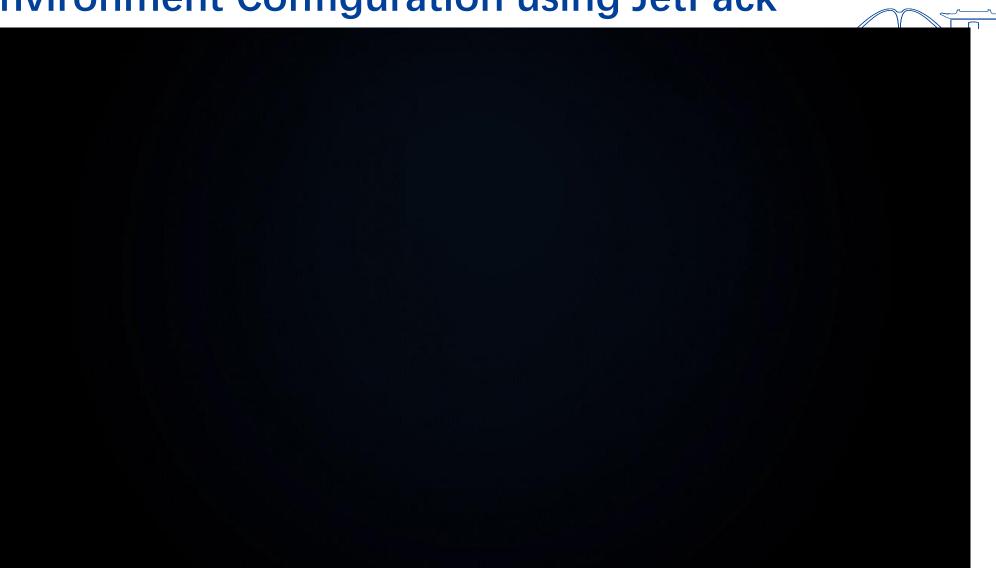
Thank you!

Video link: http://pan.baidu.com/s/1pLR0hsf

Password: d9ja



Environment Configuration using JetPack





Environment Configuration using JetPack

- Environmente Gonnigaration doing Joth dok
- Download JetPack3.0
- Install JetPack3.0 in another PC
- Connect PC with TX2
- Environment Configuration for TX2
- CUDA test:
 - usr/local/cuda/samples
 - sudo make all -j16
 - 1_Utilities/deviceQuery
 - ./deviceQuery