在NVIDIA Jetson TX2上安装TensorFlow

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本文内容安排如下：

- 刷机
- 刷机完成后的操作
- 安装TensorFlow1.0.1
- install TensorFlow v1.2.1

刷机

刷机的目的是把Ubuntu操作系统和JetPack SDK安装到Jetson TX2上。刷机的操作按照官方教程即可，比较容易。这个过程中有一点需要注意：Jetson TX2和宿主机Host必须连接在同一个路由器之下。Host会先把操作系统刷到TX2上，这一步是通过数据线连接的方式完成，然后使用SSH的方式安装Host上的SDK到TX2，所以Host和TX2需要连接在同一个路由器下，方便Host找到TX2的ip地址。

刷机开始的时候需要将TX2设置到RECOVRY MODE，设置方法在安装过程中会给出提示，请仔细阅读该提示即可完成操作。

另外一个问题是关于从网络下载安装文件到Host上过程中，因为我们公司网络为内网环境，无法连接到网络下载源，从而导致下载失败。如果遇到这种情况，更换网络环境就可以了。

刷机完成后的操作

这一部分主要是卸载Ubuntu里面一些不必要的软件，腾出更多磁盘空间。具体请参照jetsonHacks的postFlashTX1。我只是卸载了Libre Office，因为在以后的开发过程中不会用到这些。

另外，上面的教程也提供了添加swap file的脚本。添加swap file是为了在硬盘上创建虚拟内存，给编译像TensorFlow这种大型的项目提供足够的内存。例如TX2的真实内存只有8G，编译TF也需要至少8G的内存，所以有必要创建虚拟内存空间。

添加虚拟内存空间的操作，我直接参考了“How to install TensorFlow on the NVIDIA Jetson TX2? (https://link.jianshu.com?t=https://syed-ahmed.gitbooks.io/nvidia-jetson-tx2-recipes/content/first-question.html)”中的Step 4：Create a Swap File，在磁盘上创建了8G的虚拟空间。
1. 创建8G大小的swapfile

```
fallocate -l 8G swapfile
```

2. 更改swapfile的权限

```
chmod 600 swapfile
```

3. 创建swap区

```
mkswap swapfile
```

4. 激活swap区

```
sudo swapon swapfile
```

5. 确认swap区在用

```
swapon -s
```

执行第五步，输出中会有新建立的虚拟空间，否则确认是否正确执行了上面的命令。

```
nvidia@tegra-ubuntu:~$ swapon -s
Filename                                Type            Size    Used    Priority
/home/nvidia/swapfile                   file            8388604 0       -1
nvidia@tegra-ubuntu:~$
```

创建虚拟内存空间成功

如果你没有建立虚拟内存空间，可能在build TF的时候会遇到如下类似的错误，在报错之前INFO的提示'Killed'，正是由于内存不够用导致的。

```
nvidia@tegra-ubuntu: ~/installTensorFlowTX2
tensorflow/core/common_runtime/function.cc:923:14: note: 'data.tensorflow::Endpoint::node
' was declared here
    Endpoint data;  // Data input for the ret node.
             ^
INFO: From Compiling tensorflow/core/debug/debug_io_utils.cc:
tensorflow/core/debug/debug_io_utils.cc:212:15: warning: 'tensorflow::Status tensorflow::
CloseDebugURL(const string&)' defined but not used [-Wunused-function]
 static Status CloseDebugURL(const string& debug_url) { return Status::OK(); }
               ^
INFO: From Compiling tensorflow/core/common_runtime/gpu/gpu_tracer.cc:
tensorflow/core/common_runtime/gpu/gpu_tracer.cc:82:13: warning: 'const char* {anonymous}
::getActivityOverheadKindString(CUpti_ActivityOverheadKind)' defined but not used [-Wunus
ed-function]
 const char *getActivityOverheadKindString(CUpti_ActivityOverheadKind kind) {
             ^
INFO: From Compiling tensorflow/core/distributed_runtime/rpc/grpc_worker_service_impl.cc:
tensorflow/core/distributed_runtime/rpc/grpc_worker_service_impl.cc: In function 'const c
har* tensorflow::GrpcWorkerMethodName(tensorflow::GrpcWorkerMethod)':
tensorflow/core/distributed_runtime/rpc/grpc_worker_service_impl.cc:50:1: warning: contro
l reaches end of non-void function [-Wreturn-type]
 }
 ^
INFO: From Compiling tensorflow/core/kernels/tensor_array_ops.cc:
tensorflow/core/kernels/tensor_array_ops.cc: In member function 'virtual tensorflow::Stat
us tensorflow::TensorArrayGradOp::CreateTensorArray(tensorflow::OpKernelContext*, tensorf
low::ResourceMgr*, tensorflow::Tensor*, tensorflow::TensorArray**)':
tensorflow/core/kernels/tensor_array_ops.cc:312:5: warning: 'marked_size' may be used uni
nitialized in this function [-Wmaybe-uninitialized]
    };
    ^
INFO: From Compiling tensorflow/core/kernels/tile_ops_gpu.cu.cc:
Killed
ERROR: /home/nvidia/tensorflow/tensorflow/core/kernels/BUILD:685:1: output 'tensorflow/co
re/kernels/_objs/tile_ops_gpu/tensorflow/core/kernels/tile_ops_gpu.cu.pic.o' was not crea
ted.
ERROR: /home/nvidia/tensorflow/tensorflow/core/kernels/BUILD:685:1: not all outputs were
created or valid.
Target //tensorflow/tools/pip_package:build_pip_package failed to build
INFO: Elapsed time: 1526.147s, Critical Path: 1438.79s
nvidia@tegra-ubuntu:~/installTensorFlowTX2$
```

out of memory导致的错误

伴随着这个错误的出现，系统还会有一些软件崩溃的症状，例如浏览器打开的网页全部崩溃。如果出现这种症状，你一定是忘记分配虚拟空间了。

安装TensorFlow

对于普通的Ubuntu、Windows等系统，TensorFlow提供了简单的pip方式，分为有GPU和无GPU版本，但是pip安装方式存在一个问题，TensorFlow执行CPU计算的效率低，没有优化，所以最好的安装方式是重新编译源码。另外，TX2的CPU是ARM架构，混合NVIDIA自家的CPU，所以目前只能重新编译、再安装TensorFlow。安装步骤直接按照TensorFlow on NVIDIA Jetson TX2 Development Kit (https://link.jianshu.com?t=http://www.jetsonhacks.com/2017/04/02/tensorflow-on-nvidia-jetson-tx2-development-kit/)即可。

如果你参考了How to install TensorFlow on the NVIDIA Jetson TX2? (https://link.jianshu.com?t=https://syed-ahmed.gitbooks.io/nvidia-jetson-tx2-recipes/content/first-question.html)”中修改TF源码关于NUMA的部分。可能在你修改的时候，你会发现有所不同，文件 `tensorflow/stream_executor/cuda/cuda_gpu_executor.cc` 中的 `TryToReadNumaNode()` 函数源码中已经添加了对 `aarch64` 架构的识别和处理，

```
static int TryToReadNumaNode(const string &pci_bus_id, int device_ordinal){
#ifdef __aarch64__
    LOG(INFO) << "ARM64 does not support NUMA - returning NUMA node zero";
    return 0;
...
}
```

如果是这样，就不必修改源码。
否则，请阅读下面内容，完成类似修改

由于TX2的ARM架构不支持NUMA，所以在build TensorFlow之前需要修改一下clone到本地的源码，具体中添加如下两行内容，避免后面使用TF的时候出现错误

```
LOG(INFO) << "ARM has no NUMA node, hardcoding to return zero";
return 0;
```

如图：

```
// Attempts to read the NUMA node corresponding to the GPU device's PCI bus out
// of SysFS. Returns -1 if it cannot.
//
// For anything more complicated/prod-focused than this, you'll likely want to
// turn to gsys' topology modeling.
static int TryToReadNumaNode(const string &pci_bus_id, int device_ordinal) {
LOG(INFO) << "ARM has no NUMA node, hardcoding to return zero";
return 0;
#if defined(__APPLE__)
  LOG(INFO) << "OS X does not support NUMA - returning NUMA node zero";
  return 0;
#elif defined(PLATFORM_WINDOWS)
  // Windows support for NUMA is not currently implemented. Return node 0.
  return 0;
#else
  VLOG(2) << "trying to read NUMA node for device ordinal: " << device_ordinal;
  static const int kUnknownNumaNode = -1;

  if (pci_bus_id.empty()) {
    LOG(INFO) << "no PCI bus ID for device ordinal: " << device_ordinal;
    return kUnknownNumaNode;
  }
```

ARM不支持NUMA，添加硬编码，返回0

install TensorFlow v1.2.1 on TX2

To use mobilenet on TX2 for object detection task, I have to use a newer TensorFlow than version 1.0.1. TF 1.2.1 is good for me, while JetsonHacks does not give guide to install TF 1.2.1 or some other versions but 1.0.1. After searching the Internet and read many talks on nvidia jetson forum, I get TF 1.2.1 working on TX2. Here is the steps:

1. install Bazel 0.5.2 from official website

```
nvidia@tegra-ubuntu:~$ bazel version
Build label: 0.5.2- (@non-git)
Build target: bazel-out/local-  opt/bin/src/main/java/com/google/devtools/build/lib/b
Build time: Fri Aug 4 08:22:07 2017 (1501834927)
Build timestamp: 1501834927
Build timestamp as int: 1501834927
```

2. clone and checkout v1.2.1 for tensorflow

```
# from $HOME/
git clone https://github.com/tensorflow/tensorflow
cd ./tensorflow
git checkout v1.2.1
```


3. ./configure

```
./configure
```

All setting is default (just type ENTER) except for CUDA set to 'y'

4. fix `workspace.bzl` to get the right Eigen version for out ARMv8 on TX2

   `worksapce.bzl` is in `./tensorflow/tensorflow/` , feel free to open it use some text editor or vim, find lines as follows:

```
 native.new_http_archive(
     name = "eigen_archive",
     urls = [
         # "http://mirror.bazel.build/bitbucket.org/eigen/eigen/get/f3a22f35b044.tar
         # "https://bitbucket.org/eigen/eigen/get/f3a22f35b044.tar.gz",
         "http://mirror.bazel.build/bitbucket.org/eigen/eigen/get/d781c1de9834.tar.g
         "https://bitbucket.org/eigen/eigen/get/d781c1de9834.tar.gz",
     ],
     # sha256 = "ca7beac153d4059c02c8fc59816c82d54ea47fe58365e8aded4082ded0b820c4",
     # strip_prefix = "eigen-eigen-f3a22f35b044",
     sha256 = "a34b208da6ec18fa8da963369e166e4a368612c14d956dd2f9d7072904675d9b",
     strip_prefix = "eigen-eigen-d781c1de9834",
     build_file = str(Label("//third_party:eigen.BUILD")),
 )
```

the lines above those starting with `#` are the source text, and I just use `#` to commet these lines and new urls, sha256 and strip_prefix are added.

5. bazel build

   If you do not `swapon swapfile` , do it before build TF and then `bazel build` as

following.

```
bazel build -c opt --local_resources 3072,4.0,1.0 --cxxopt="-D_GLIBCXX_USE_CXX11_ABI=
```

then

```
bazel-bin/tensorflow/tools/pip_package/build_pip_package /tmp/tensorflow_pkg
```

now you get tensorflow 1.2.1 on `/tem/tensorflow_pkg/` , use

```
sudo pip install tensorflow-1.2.1-cp27-cp27mu-linux_aarch64.whl
```

参考

- TensorFlow on NVIDIA Jetson TX2 Development Kit (https://link.jianshu.com?t=http://www.jetsonhacks.com/2017/04/02/tensorflow-on-nvidia-jetson-tx2-development-kit/)
- Jetson TX1 Swap File and Development Preparation (https://link.jianshu.com?t=http://www.jetsonhacks.com/2016/12/21/jetson-tx1-swap-file-and-development-preparation/)
- installTensorFlowTX2 (https://link.jianshu.com?t=https://github.com/jetsonhacks/installTensorFlowTX2)
- How to install TensorFlow on the NVIDIA Jetson TX2? (https://link.jianshu.com?t=https://syed-ahmed.gitbooks.io/nvidia-jetson-tx2-recipes/content/first-question.html)
- TensorFlow on Jetson TX2 (https://link.jianshu.com?t=https://devtalk.nvidia.com/default/topic/1000717/tensorflow-on-jetson-tx2/)

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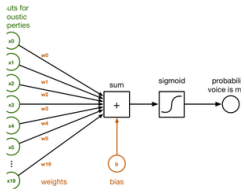

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深度学习指南：在iOS平台上使用TensorFlow (/p/abc4e084bdbd?utm_ca…

在利用深度学习网络进行预测性分析之前，我们首先需要对其加以训练。目前市面上存在着大量能够用于神经网络训练的工具，但TensorFlow无疑是其中极为重要的首选方案之一。 这就是Tensor的全部含义。在卷…


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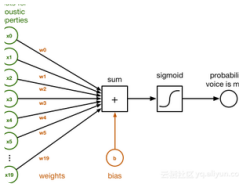

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TensorFlow介绍与安装 (/p/4c0c66a07c1f?utm_campaign=maleskine&u…

1. 介绍 首先让我们来看看TensorFlow！ 但是在我们开始之前，我们先来看看Python API中的TensorFlow代码，这样你就可以感受到我们怎么做的。 这段很短的 Python 程序生成了一些三维数据, 然后用一个平面拟…

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CentOS 7上安装Tensorflow (/p/10542140e2e3?utm_campaign=maleski…

美团的知识库上已经有在CentOS 7上安装TF的详细教程，但是有很多坑还是不踩不知道，现在记录一下安装过程遇到的各种问题。 安装方法： 知识库参考链接：https://www.mtyun.com/library/45/how-to-install-…

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想让你为了我睡不着觉，一晚抽掉两包烟。 ——不读笑忘书 我记得我在一个街头碰到过一位老人家，断臂，伤口触目惊心。 我蹲在马路边跟她聊了很久，我问她，这样生活起来会不会很麻烦。 老人家的那只残疾的…

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初入职场的人，未来职业发展的前景很大程度上在最初的几年内（通常是3-5年）就已经决定了。最初的这几年是至关重要的时间，这段时间也可称为：混沌期。 混沌期起始于第一份工作，但结束却没有明确的时间…

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恋爱，说起来是挺美好的事，有人说恋爱是一种修行，修炼好了两个人会甜蜜幸福，修炼不好的话两个人没准就分道扬镳啦！ 恋爱里其实有很多禁忌，千万不能触碰对方的底线，除非你想和他say Goodbye！ 之前…


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“这个洗衣机能用吗？” “你看那个时间，应该是不能用。用第二个吧。” 早上洗衣服的时候，有人问我。第三个洗衣机我用过，吞过我的硬币。 来了大学，很少手洗衣服了。 1.《机器人总动员》中人类变得全无行动…


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