北京大学

ROOT的安装

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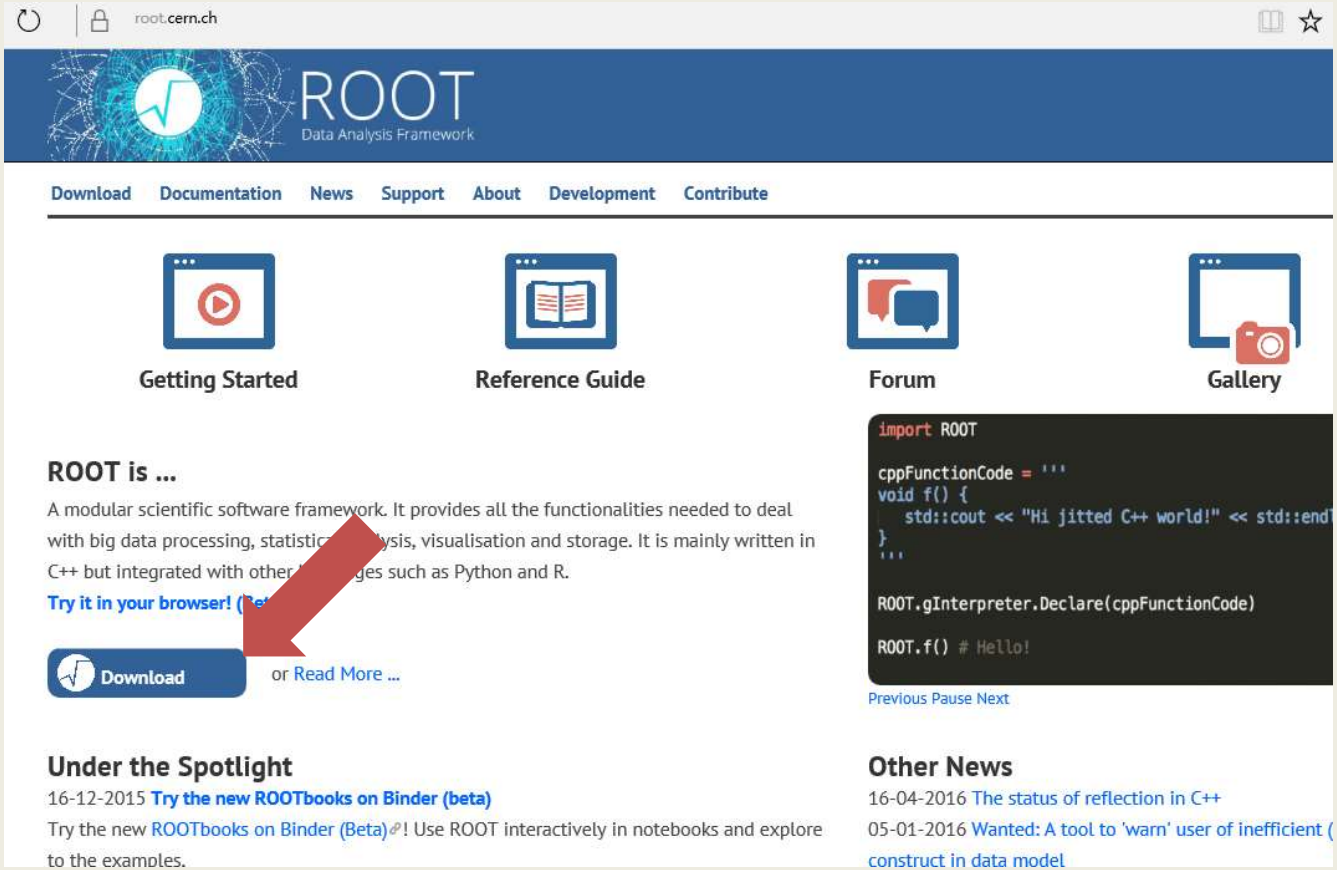
报告内容

- ROOT介绍
- ROOT安装
- 安装后的运行测试

ROOT自由软件网页

https://root.cern.ch/



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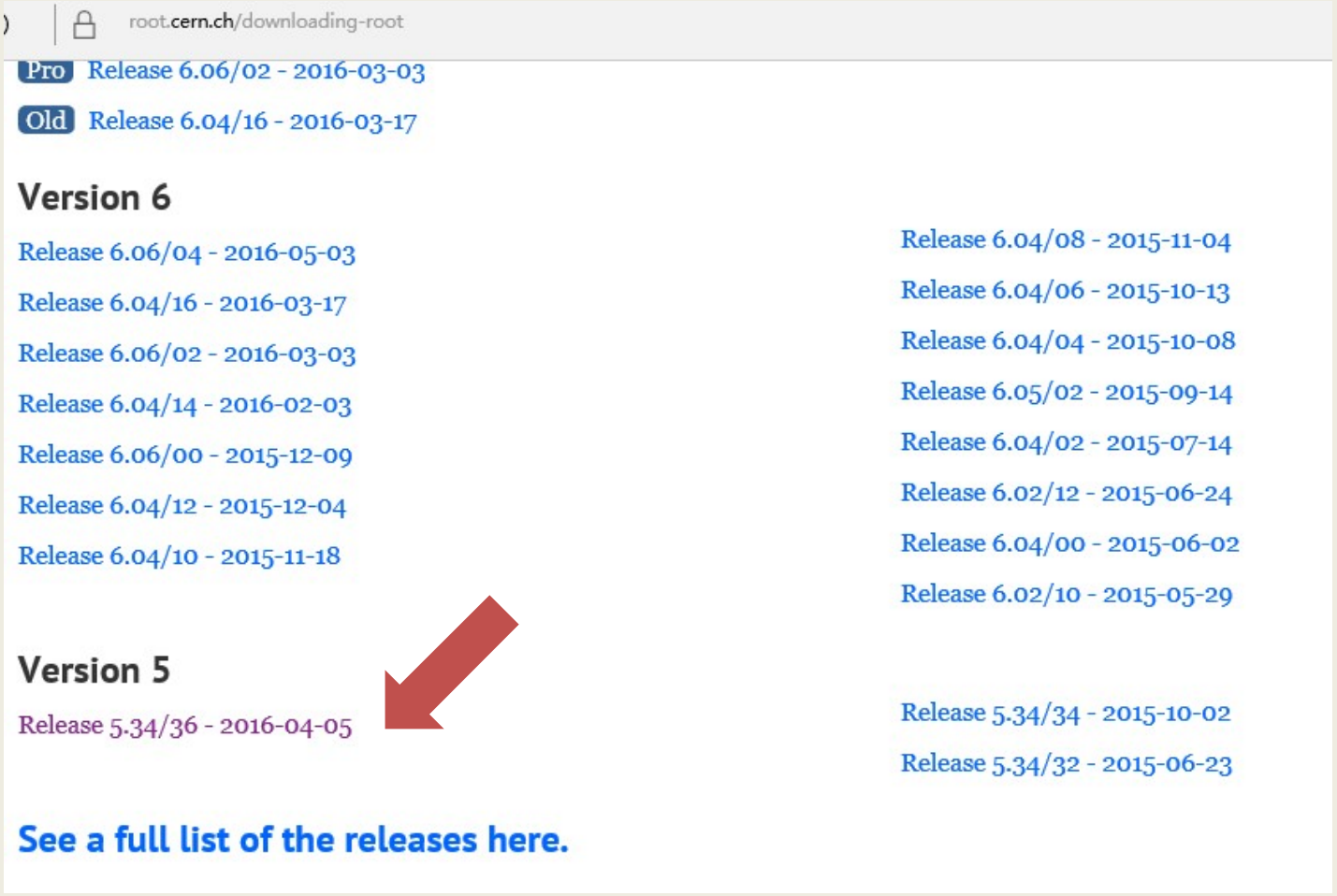
ROOT V5


root.cern.ch/downloading-root
Pro Release 6.06/02 - 2016-03-03
Old Release 6.04/16 - 2016-03-17
Version 6
Release 6.06/04 - 2016-05-03
Release 6.04/16 - 2016-03-17
Release 6.06/02 - 2016-03-03
Release 6.04/14 - 2016-02-03
Release 6.06/00 - 2015-12-09
Release 6.04/12 - 2015-12-04
Release 6.04/10 - 2015-11-18
Release 6.04/08 - 2015-11-04
Release 6.04/06 - 2015-10-13
Release 6.04/04 - 2015-10-08
Release 6.05/02 - 2015-09-14
Release 6.04/02 - 2015-07-14
Release 6.02/12 - 2015-06-24
Release 6.04/00 - 2015-06-02
Release 6.02/10 - 2015-05-29
Version 5
Release 5.34/36 - 2016-04-05
Release 5.34/34 - 2015-10-02
Release 5.34/32 - 2015-06-23
See a full list of the releases here.

ROOT V5

Source distribution

Platform	Files	Size
source	root_v5.34.36.source.tar.gz	72M

Binary distributions

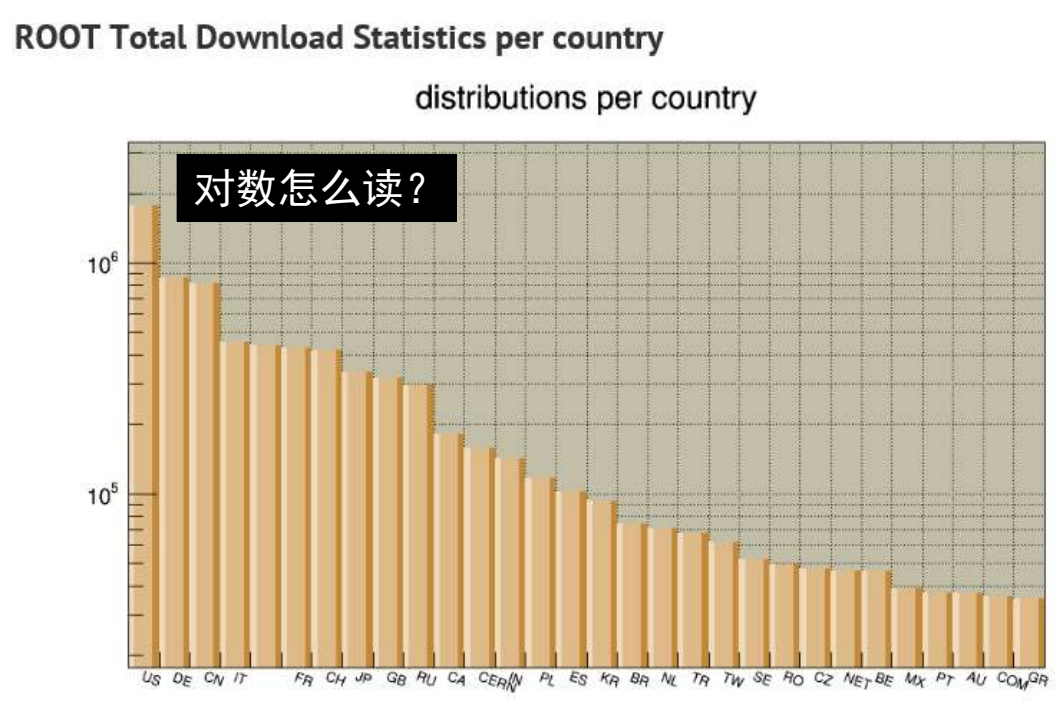
Platform	Files	Size
CentOS Cern 7 gcc4.8	root_v5.34.36.Linux-centos7-x86_64-gcc4.8.tar.gz	72M
CentOS Cern 7 gcc4.9	root_v5.34.36.Linux-centos7-x86_64-gcc4.9.tar.gz	73M
Linux fedora20 gcc4.8	root_v5.34.36.Linux-fedora20-x86_64-gcc4.8.tar.gz	58M
Scientific Linux Cern 6 gcc4.4	root_v5.34.36.Linux-slc6-x86_64-gcc4.4.tar.gz	70M
Scientific Linux Cern 6 gcc4.7	root_v5.34.36.Linux-slc6-x86_64-gcc4.7.tar.gz	71M
Scientific Linux Cern 6 gcc4.8	root_v5.34.36.Linux-slc6-x86_64-gcc4.8.tar.gz	71M
Scientific Linux Cern 6 gcc4.9	root_v5.34.36.Linux-slc6-x86_64-gcc4.9.tar.gz	73M
Scientific Linux Cern 6 gcc5.1	root_v5.34.36.Linux-slc6-x86_64-gcc5.1.tar.gz	73M
Ubuntu 12 gcc4.6	root_v5.34.36.Linux-ubuntu12-x86_64-gcc4.6.tar.gz	58M
Ubuntu 14 gcc4.8	root_v5.34.36.Linux-ubuntu14-x86_64-gcc4.8.tar.gz	62M
OsX 10.9 clang60	root_v5.34.36.macosx64-10.9-clang60.dmg	56M
OsX 10.9 clang60	root_v5.34.36.macosx64-10.9-clang60.tar.gz	56M

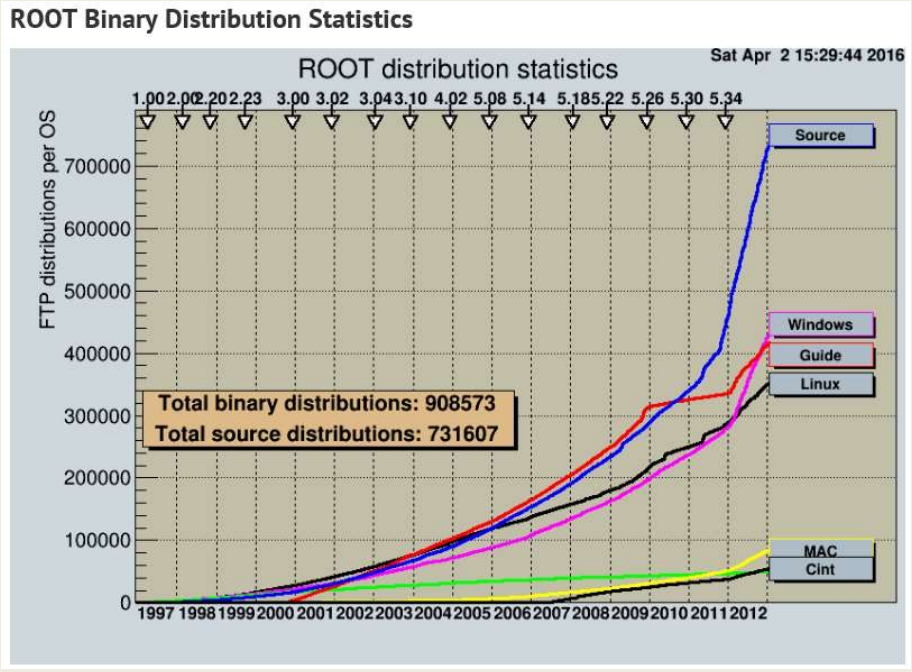
Project Statistics

http://root.cern.ch/drupal/content/project-statistics

2014年统计的，后来就没找到类似网页

各国下载量





2016.5.28有效

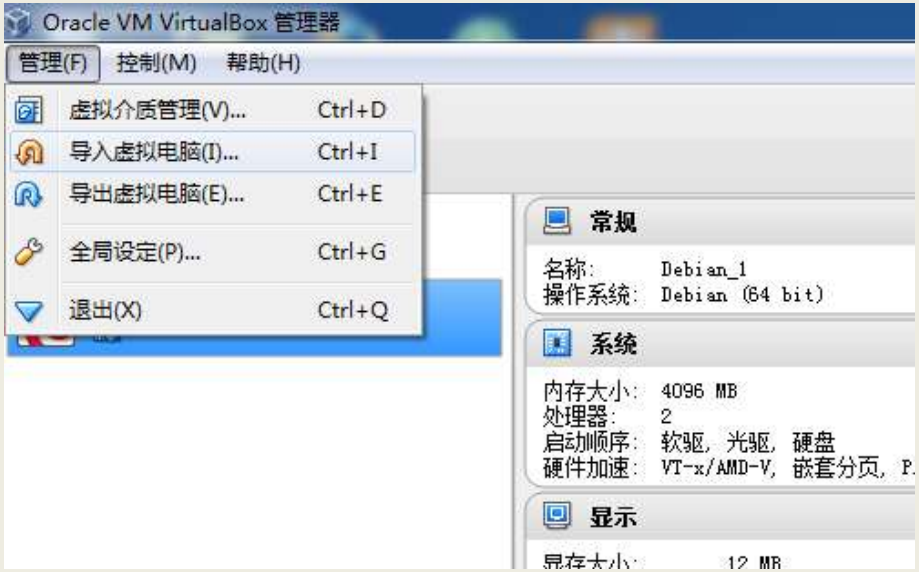
https://root.cern.ch/drupal/content/download-statistics

Root的安装

- 含ROOT的虚拟电脑安装方法
- Configure安装ROOT的方法
- cmake安装ROOT的方法
- **安装操作系统源自带的root**

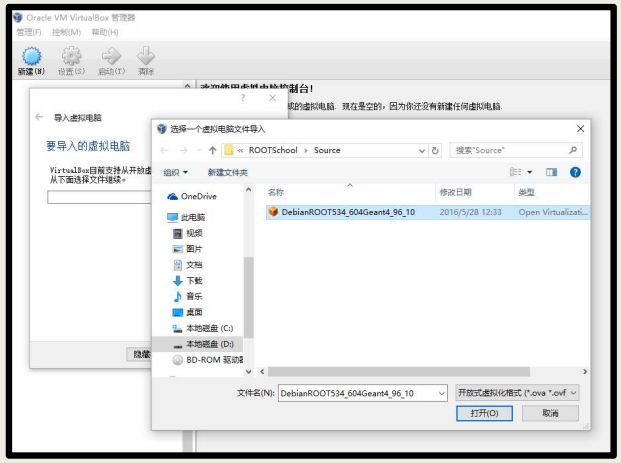
在Windows下安装虚拟机

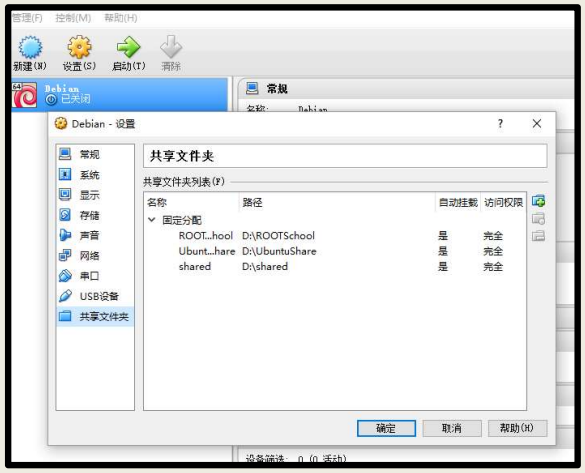
1. 先安装VirtualBox
   https://virtualbox.org/
2. 导入安装好ROOT的虚拟电脑

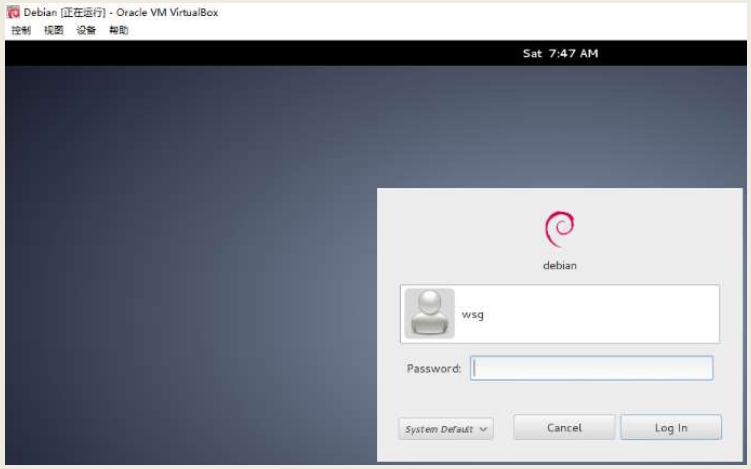


王思广所提供的含ROOT的虚拟电脑

所提供的虚拟机为Debian，安装在64位VirtualBox版本：
第一步：下载地址：http://www.phy.pku.edu.cn/~wangsg/ROOTSchool/VMVirtualBox_Debian_ROOT_G4.rar
下载压缩文件并解压,找到VirtualBox-4.3.12-93733-Win.exe并安装;
第二步：在“管理”下拉菜单“导入虚拟电脑”弹出的选择框内选择“DebianROOT534_604Geant4_96_10.ova”
第三步：按“设置”后进行“共享文件夹”设置，Window与虚拟机之间可以通过共享文件夹进行数据交换
第四步：“启动”，对于wsg用户和超级root用户，密码都是testroot







该虚拟机包含：
ROOT5.34 ROOT6.04
Geant4.96 Geant4.10

ROOT 需要的包

不同操作系统所需要的包见该网页

根据
https://root.cern.ch/drupal/content/build-prerequisites
需要如下的包：
sudo apt-get install git dpkg-dev make g++ gcc binutils libx11-dev libxpm-dev libxft-dev libxext-dev
Optional packages:
sudo apt-get install gfortran libssl-dev libpcre3-dev xlibmesa-glu-dev libglew1.5-dev libftgl-dev libmysqlclient-dev libfftw3-dev cfitsio-dev graphviz-dev libavahi-compat-libdnssd-dev libldap2-dev python-dev libxml2-dev libkrb5-dev libgsl0-dev libqt4-dev
如果有ROOT权限，执行以上命令即可

Configure安装ROOT方法：含fftw Pythia6 及Pythia8等扩展包

```
#!/bin/bash
export PYTHIA6=/home/wsg/work/pythia6/pythia6428
export PYTHIA8=/home/wsg/work/pythia8/8186
export PYTHIA8DATA=/home/wsg/work/pythia8/8186/xmldoc
export PYTHONDIR=/usr
export PATH=$PYTHONDIR/bin:$PATH
export
LD_LIBRARY_PATH=$PYTHONDIR/lib:$PYTHIA6:$PYTHIA8/lib:$LD_LIBRARY_PATH
export PYTHONPATH=$PYTHONDIR/lib:$PYTHONPATH

./configure --prefix=/home/wsg/work/root/534 --fail-on-missing --enable-pythia8  --with-pythia8-
incdir=$PYTHIA8/include  --with-pythia8-libdir=$PYTHIA8/lib --enable-pythia6 --with-pythia6-
libdir=$PYTHIA6  --enable-fftw3 --with-fftw3-incdir=/usr/include --with-fftw3-libdir=/usr/lib --
enable-python  --with-python-incdir=/usr/include/python2.7 --with-python-libdir=/usr/lib  --
enable-tmva --enable-qt --enable-unuran --enable-qtgsi  --enable-minuit2 --enable-roofit  --
enable-gdml  --enable-reflex  --enable-cxx11 --enable-cocoa

make -j2
make install
```

安装前要进行fftw等外挂包的安装，fftw的安装方法见下一页

FFTW的安装（如果需要RooFit的快速傅里叶卷积拟合，需要在编译安装root前安装FFTW）

方法1：

Debian, Ubuntu等系统源自带的安装方法（发现这种方法更安全稳定，推荐！）：

apt-get install libfftw3-dev

方法2：

下载FFTW源代码(网站见下页)，解压后查看安装说明

emacs INSTALL　　查看安装方法

mkdir fftw　　建立安装目录，建立后的完整目录：　/home/wsg/work/fftw

./configure - -prefix=/home/wsg/work/fftw

【prefix前是两个减号】

make –j2

make install

Linux下通过cmake编译源代码安装root5

安装脚本：

Root534下只能安装pythia8.1*
Root6下可以安装pythia8.2*
设置pythia8*环境的时候：
./configure --enable-shared --enable-64bit --prefix=……

```
#!/bin/bash

#pre install FFTW with apt-get install libfftw3-dev

#more: https://root.cern.ch/installing-root-source

export PYTHIA6=/home/wsg/work/pythia6/pythia6428

export PYTHIA8=/home/wsg/work/pythia8/8186

export PYTHIA8DATA=/home/wsg/work/pythia8/8186/xmldoc

export PYTHONDIR=/usr

export PYTHONPATH=$PYTHONDIR/lib

export PATH=$PYTHONDIR/bin:$PATH

export
LD_LIBRARY_PATH=$PYTHONDIR/lib:$PYTHIA6:$PYTHIA8/lib:$PYTHONDIR/lib:$LD_LIBRARY_PATH


mkdir -p tmpRootCompile

cd tmpRootCompile
```

cmake 安装细节

cmake -DCMAKE_INSTALL_PREFIX=/home/wsg/work/root/534 是要安装 后的目录

../root 是源代码解压后的目录

-DPYTHIA6_LIBRARY=/home/wsg/work/pythia6/pythia6428/libPythia6.so -Dpythia6=ON

-DPYTHIA8_DIR=/home/wsg/work/pythia8/8186

-DPYTHIA8_INCLUDE_DIR=/home/wsg/work/pythia8/8186/include

-DPYTHIA8_LIBRARY=/home/wsg/work/pythia8/8186/lib/libpythia8.so -Dpythia8=on

-DPYTHON_EXECUTABLE=/usr/bin

-DPYTHON_INCLUDE_DIR=/usr/include/python2.7

-DPYTHON_INCLUDE_DIR2=/usr/include/python2.7

-DPYTHON_LIBRARY=/usr/lib/python2.7/config/libpython2.7.so

实际脚本1）去掉中文 2）写cmake后面的命令写成一行

-Dall=on -Droofit=on -Dfftw3=on -Dpython=on -Droottest=on -Druby=on -Dtmva=on -Dtestring=on -Dxml=on -Dx11=on -Dqt=on -Dmt=on -Dxrootd=on -Dtcmalloc=on -Dfail-on-missing=OFF

make –j2

make install

-Dall=on 打开所有选项
-Dfail-on-missing=OFF 如果没有找到需要的外挂库,继续执行其余安装
详细见：https://root.cern.ch/installing-root-source

设置环境

检查运行环境： echo $0

如果返回bash

```
wsg@debian:~$ cd
wsg@debian:~$ emacs .bashrc &
在文件中加入：
export ROOTSYS=/home/wsg/work/root/534
export PATH=$ROOTSYS/bin:$PATH
export LD_LIBRARY_PATH=$ROOTSYS/lib:$LD_LIBRARY_PATH
```

如果返回-tcsh

```
wsg@debian:~$ cd
wsg@debian:~$ emacs .tcshrc &
在文件中加入：
setenv ROOTSYS   /home/wsg/work/root/534
setenv PATH   $ROOTSYS/bin:$PATH
setenv LD_LIBRARY_PATH   $ROOTSYS/lib:$LD_LIBRARY_PATH
```

建议

如果：
configure method失败，
试用cmake安装方法。因为cmake方法会自动扫描系统，寻找ROOT需要的库。

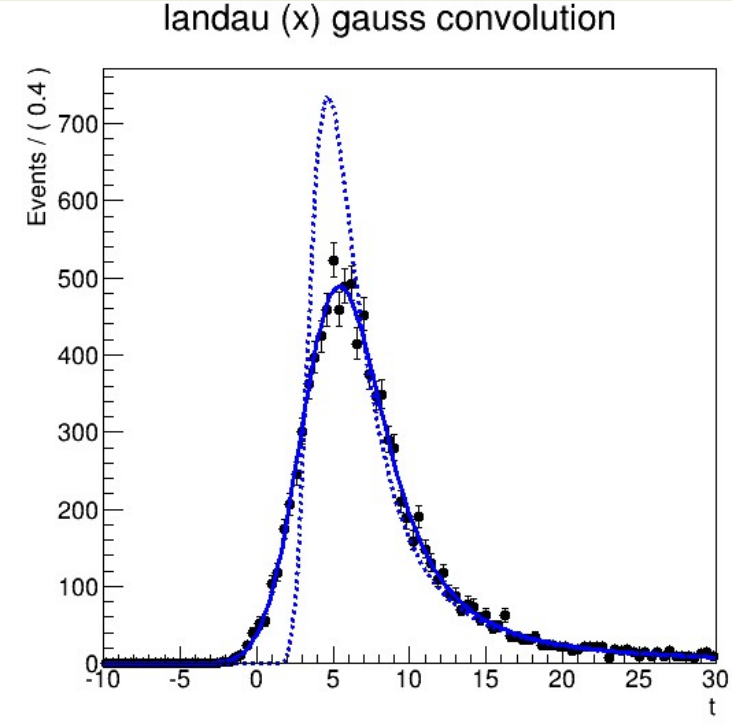
安装操作系统源自带的root

快速安装：在联网的状态下，在Ubuntu、Debian操作系统下执行
apt-get install root-system
即可
tutorials、test目录会被安装在：
/usr/share/doc/root/tutorials
和
/usr/share/doc/root/test

安装后的运行测试

安装后的运行测试： $ROOTSYS/tutorials/

在$ROOTSYS/tutorials/下有很多例子程序，运行方法为：
$cd $ROOTSYS/tutorials/roofit
$root rf208_convolution.C



看能否出现左图。
如果能，说明你的root、roofit软件包、fftw软件安装成功。

编译运行方法

红色为您输入的文字

```
wsg@debian:~/work/root/534/tutorials/roofit$ root
root [0] .L rf208_convolution.C++
Info in <TUnixSystem::ACLiC>: creating shared library
/home/wsg/work/root/534/tutorials/roofit/./rf208_convolution_C.so

RooFit v3.60 -- Developed by Wouter Verkerke and David Kirkby
                Copyright (C) 2000-2013 NIKHEF, University of California & Stanford
University
                All rights reserved, please read http://roofit.sourceforge.net/license.txt

root [1] rf208_convolution()
```

运行一个例子

求答案？

一筐鸡蛋：1个1个拿，正好拿完。2个2个拿，还剩1个。3个3个拿，正好拿完。4个4个拿，还剩1个。5个5个拿，还差1个。6个6个拿，还剩3个。7个7个拿，正好拿完。8个8个拿，还剩1个。9个9个拿，正好拿完。问筐里有多少鸡蛋？

写如下代码存储为egg.C 文件

```
void takeEgg(Int_t N){
  Int_t Nok=0;
  if((N%2)==1) Nok++;
  if((N%3)==0) Nok++;
  if((N%4)==1) Nok++;
  if((N%5)==4) Nok++;
  if((N%6)==3) Nok++;
  if((N%7)==0) Nok++;
  if((N%8)==1) Nok++;
  if((N%9)==0) Nok++;
  if(Nok==8) printf("N=%d\n",N);
  return;
}

void egg(){
  Int_t N=1;
  for(Int_t i=1; i<20000; i++){
    N=i*9;
    takeEgg(N);
  }
}
```

```
$ root egg.C
root [0]
Processing egg.C...
N=1449
N=3969
N=6489
N=9009
N=11529
N=14049
N=16569
N=19089
N=21609
……
```