Installing common programs/applications on a research computer

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If on  first install the command line tools

From finder, open /Applications/Utilities/Terminal.app

Enter: xcode-select --install
and follow the graphical prompts

Then install XQuartz windowing system via .dmg from web

If on  then you should be good to go.

Check your distro for whether you should use
yum, apt-get, rpm, or something new to me

If on  look into Matlab or Python as cross-platform working environments. You may need to dual-boot with Linux or install cyg-win

Your computer needs a “path” variable.
This is a list of directories, separated by : which the operating system searches for executable files

On the macs I set it by editing a file called:
~/.profile
and add lines in bash syntax such as:
export PATH=~/bin/:${PATH}
Alternatively you could use ~/.bashrc

If using a tcsh shell, you’d edit your
~/.tcshrc
with lines like:
setenv PATH ~/bin:${PATH}

monte_pi.c

monte_pi.c 〉 No Selection

```c
/* Program to compute Pi using Monte Carlo methods */

/* http://www.dartmouth.edu/~rc/classes/soft_dev/C_simple_ex.html */

#include <stdlib.h>
#include <stdio.h>
#include <math.h>
#include <string.h>
#include <time.h>
#define SEED 35791246

int main(int argc, char *argv[])
{
   int niter=0;
   double x,y;
   int i,count=0; /* # of points in the 1st quadrant of unit circle */
   double z;
   double pi;
   time_t t;

   printf("Enter the number of iterations used to estimate pi: ");
   scanf("%d",&niter);

   /* initialize random numbers */
//   srand(SEED);
   srand((unsigned) time(&t));
   count=0;
   for ( i=0; i<niter; i++) {
      x = (double)rand()/RAND_MAX;
      y = (double)rand()/RAND_MAX;
      z = x*x+y*y;
      if (z<=1) count++;
      }
   pi=(double)count/niter*4;
   printf("# of trials= %d, estimate of pi is %g \n",niter,pi);
   return 0;
}
```

c compiler input flags output

InstallingExample — -bash — 95×24

```
Roberts-MacBook-Pro-7:InstallingExample porritt$ ls
monte_pi.c
Roberts-MacBook-Pro-7:InstallingExample porritt$ clang monte_pi.c -lm -Wall -O3 -o monte_pi
Roberts-MacBook-Pro-7:InstallingExample porritt$ ls
monte_pi        monte_pi.c
Roberts-MacBook-Pro-7:InstallingExample porritt$ ./monte_pi
Enter the number of iterations used to estimate pi: 30000
# of trials= 30000, estimate of pi is 3.13053
Roberts-MacBook-Pro-7:InstallingExample porritt$
```

monte_pi2.c

monte_pi2.c 〉 No Selection

```c
/* Edit of monte_pi to use a subroutine */

#include <stdlib.h>
#include <stdio.h>
#include <math.h>
#include <string.h>
#include <time.h>

int count_it(int count);

int main(int argc, char *argv[])
{
    int niter=0;
    int i,count=0; /* # of points in the 1st quadrant of unit circle */
    double pi;
    time_t t;

    printf("Enter the number of iterations used to estimate pi: ");
    scanf("%d",&niter);

    /* initialize random numbers */
    //   srand(SEED);
    srand((unsigned) time(&t));
    count=0;
    for ( i=0; i<niter; i++) {
        count=count_it(count);
    }
    pi=(double)count/niter*4;
    printf("# of trials= %d, estimate of pi is %g \n",niter,pi);
    return 0;
}
```

Contents of subroutine

monte_sub.c

monte_sub.c 〉 count_it()

```c
#include <stdlib.h>
#include <stdio.h>
#include <math.h>

int count_it(int count) {
    double x, y, z;
    x = (double)rand()/RAND_MAX;
    y = (double)rand()/RAND_MAX;
    z = x*x+y*y;
    if (z<=1) count++;
    return count;
}
```

Separately compile the subroutine with -c and .o extension. Then compile together

InstallingExample — -bash — 125×24

```
Roberts-MacBook-Pro-7:InstallingExample porritt$ ls
monte_pi        monte_pi.c      monte_pi2.c     monte_sub.c
Roberts-MacBook-Pro-7:InstallingExample porritt$ clang monte_sub.c -c -o monte_sub.o
Roberts-MacBook-Pro-7:InstallingExample porritt$ ls
monte_pi        monte_pi.c      monte_pi2.c     monte_sub.c     monte_sub.o
Roberts-MacBook-Pro-7:InstallingExample porritt$ clang monte_pi2.c monte_sub.o -lm -Wall -O3 -o monte_pi2
Roberts-MacBook-Pro-7:InstallingExample porritt$ ls
monte_pi        monte_pi.c      monte_pi2       monte_pi2.c     monte_sub.c     monte_sub.o
Roberts-MacBook-Pro-7:InstallingExample porritt$ ./monte_pi2
Enter the number of iterations used to estimate pi: 3000
# of trials= 3000, estimate of pi is 3.15467
Roberts-MacBook-Pro-7:InstallingExample porritt$
```

Makefile

```
CC = clang
FLAGS = -lm -Wall -O3
INSTALL_DIR = ~/bin/
BIN = monte_pi
SUBS = monte_sub.c
SRC = monte_pi2.c

all :: $(BIN)

monte_pi ::
	$(CC) $(SUBS) -c $(FLAGS) -o subs.o
	$(CC) $(SRC) subs.o $(FLAGS) -o $(BIN)

install ::
	install -s $(BIN) $(INSTALL_DIR)

clean ::
	rm subs.o $(BIN)
```

InstallingExample — -bash — 125×24

```
Roberts-MacBook-Pro-7:InstallingExample porritt$ ls
Makefile        monte_pi.c      monte_pi2.c     monte_sub.c
Roberts-MacBook-Pro-7:InstallingExample porritt$ make
clang monte_sub.c -c -lm -Wall -O3 -o subs.o
clang: warning: -lm: 'linker' input unused
clang monte_pi2.c subs.o -lm -Wall -O3 -o monte_pi
Roberts-MacBook-Pro-7:InstallingExample porritt$ ls
Makefile        monte_pi        monte_pi.c      monte_pi2.c     monte_sub.c     subs.o
Roberts-MacBook-Pro-7:InstallingExample porritt$ ./monte_pi
Enter the number of iterations used to estimate pi: 3000
# of trials= 3000, estimate of pi is 3.12933
Roberts-MacBook-Pro-7:InstallingExample porritt$ make install
install -s monte_pi ~/bin/
Roberts-MacBook-Pro-7:InstallingExample porritt$ monte_pi
Enter the number of iterations used to estimate pi: 3000
# of trials= 3000, estimate of pi is 3.184
Roberts-MacBook-Pro-7:InstallingExample porritt$ make clean
rm subs.o monte_pi
Roberts-MacBook-Pro-7:InstallingExample porritt$ ./monte_pi
-bash: ./monte_pi: No such file or directory
Roberts-MacBook-Pro-7:InstallingExample porritt$ monte_pi
Enter the number of iterations used to estimate pi: 3000
# of trials= 3000, estimate of pi is 3.15067
Roberts-MacBook-Pro-7:InstallingExample porritt$
```

TIME_DOMAIN_VS_FREQUENCY_DOMAIN_CONVOLUTION — vi Makefile — 125×24

```
BIN = convolutionTests
CC = gcc
OBJ = convolutionTests.c
LIBS = -L/usr/local/lib -lfftw3 -lm
FLAGS = -Wall -O2 -I/usr/local/include
INSTALL_DIR = ~/bin


all ::
        $(CC) $(OBJ) $(LIBS) $(FLAGS) -o $(BIN)

install ::
        install -s $(BIN) $(INSTALL_DIR)

clean ::
        rm $(BIN)

~
~
~
~
~
~
"Makefile" 17L, 271C
```

fftw.org

FFTW

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Introduction

FFTW is a C subroutine library for computing the discrete Fourier transform (DFT) in one or more dimensions, of arbitrary input size, and of both real and complex data (as well as of even/odd data, i.e. the discrete cosine/sine transforms or DCT/DST). We believe that FFTW, which is free software, should become the FFT library of choice for most applications.

The latest official release of FFTW is version **3.3.4**, available from our download page. Version 3.3 introduced support for the AVX x86 extensions, a distributed-memory implementation on top of MPI, and a Fortran 2003 API. Version 3.3.1 introduced support for the ARM Neon extensions. See the release notes for more information.

The FFTW package was developed at MIT by Matteo Frigo and Steven G. Johnson.

Our benchmarks, performed on on a variety of platforms, show that FFTW's performance is typically superior to that of other publicly available FFT software, and is even competitive with vendor-tuned codes. In contrast to vendor-tuned codes, however, FFTW's performance is *portable*: the same program will perform well on most architectures without modification. Hence the name, "FFTW," which stands for the somewhat whimsical title of "**Fastest Fourier Transform in the West**."

Subscribe to the fftw-announce mailing list to receive release announcements (or use the web feed).

Features

FFTW 3.3.4 is the latest official version of FFTW (refer to the release notes to find out what is new). Here is a list of some of FFTW's more interesting features:

FFTW — -bash — 125×24

```
Roberts-MacBook-Pro-7:FFTW porritt$ ls
fftw-3.3.4.tar
Roberts-MacBook-Pro-7:FFTW porritt$ tar -xvf fftw-3.3.4.tar
x fftw-3.3.4/
x fftw-3.3.4/mpi/
x fftw-3.3.4/mpi/f03api.sh
x fftw-3.3.4/mpi/Makefile.am
x fftw-3.3.4/mpi/genf03-wrap.pl
x fftw-3.3.4/mpi/transpose-alltoall.c
x fftw-3.3.4/mpi/rdft2-rank-geq2.c
x fftw-3.3.4/mpi/mpi-dft.h
x fftw-3.3.4/mpi/fftw3-mpi.h
x fftw-3.3.4/mpi/fftw3-mpi.f03.in
x fftw-3.3.4/mpi/rdft2-problem.c
x fftw-3.3.4/mpi/dft-rank1.c
x fftw-3.3.4/mpi/block.c
x fftw-3.3.4/mpi/rdft2-serial.c
x fftw-3.3.4/mpi/rdft-problem.c
x fftw-3.3.4/mpi/mpi-rdft2.h
x fftw-3.3.4/mpi/testsched.c
x fftw-3.3.4/mpi/rdft2-solve.c
x fftw-3.3.4/mpi/any-true.c
```

```
Roberts-MacBook-Pro-7:FFTW porritt$ ls
fftw-3.3.4      fftw-3.3.4.tar
Roberts-MacBook-Pro-7:FFTW porritt$ cd fftw-3.3.4
Roberts-MacBook-Pro-7:fftw-3.3.4 porritt$ ls
AUTHORS         Makefile.am     api             configure       genfft          missing         tests
CONVENTIONS     Makefile.in     bootstrap.sh    configure.ac    install-sh      mpi             threads
COPYING         NEWS            compile         depcomp         kernel          rdft            tools
COPYRIGHT       README          config.guess    dft             libbench2       reodft
ChangeLog       TODO            config.h.in     doc             ltmain.sh       simd-support
INSTALL         aclocal.m4      config.sub      fftw.pc.in      m4              support
Roberts-MacBook-Pro-7:fftw-3.3.4 porr
```

General install from source:

1. tar -xvf software.tar.gz
2. cd {software directory}
3. ./configure
4. make
5. make install

Voila!

```
config.status: creatin
config.status: creatin
config.status: creatin
config.status: creatin
config.status: creatin
config.status: creatin
config.status: creatin
config.status: creatin
config.status: creatin
config.status: creatin
config.status: creatin
config.status: creatin
config.status: creating tests/Makefile
config.status: creating doc/Makefile
config.status: creating doc/FAQ/Makefile
config.status: creating tools/Makefile
config.status: creating tools/fftw_wisdom.1
config.status: creating tools/fftw-wisdom-to-conf
config.status: creating m4/Makefile
config.status: creating fftw.pc
config.status: creating config.h
config.status: executing depfiles commands
config.status: executing libtool commands
Roberts-MacBook-Pro-7:fftw-3.3.4 porritt$
```

Some packages installed this way…

- mseed2sac
- evalresp
- sac (also pre-compiled versions are available)
- seismic unix
- Computer Programs in Seismology (slightly modified)

Package Management

How do you deal with software dependencies?

How do you deal with hardware dependencies?

How do you build new programs with old tools?

Command-line package managers

Homebrew

MacPorts

Debian/Ubuntu: apt-get

Fedora/CentOS: yum

python

pip

anaconda: conda

Install

Desktop — -bash — 79×24

```
Roberts-MacBook-Pro-7:Desktop porritt$ brew install emojify
==> Downloading https://github.com/mrowa44/emojify/archive/v1.0.2.tar.gz
==> Downloading from https://codeload.github.com/mrowa44/emojify/tar.gz/v1.0.2
######################################################################## 100.0%
🍺  /usr/local/Cellar/emojify/1.0.2: 4 files, 43.5K, built in 1 second
Roberts-MacBook-Pro-7:Desktop porritt$
```

Run

Desktop — -bash — 59×19

```
Roberts-MacBook-Pro-7:Desktop porritt$ emojify "To :bee: , or not to :bee: : that is the question... To take :muscle: against a :ocean: of troubles, and by opposing, end them?"
To 🐝, or not to 🐝: that is the question... To take 💪agai
nst a 🌊of troubles, and by opposing, end them? Roberts-Mac
Book-Pro-7:Desktop porritt$
```

Example, installing GMT5

Red Hat, CentOS, Fedora:

```
$ sudo yum install GMT gshhg-gmt-nc4-all dcw-gmt
```

Mac OSX

Download installer and add to path

or

```
$ sudo port install gdal +curl +geos +hdf5 +netcdf
$ sudo port install gmt5
```

or

```
$ sudo fink install gmt5
```

or

```
$ brew install homebrew/science/gmt
```

Windows

Download and run installer

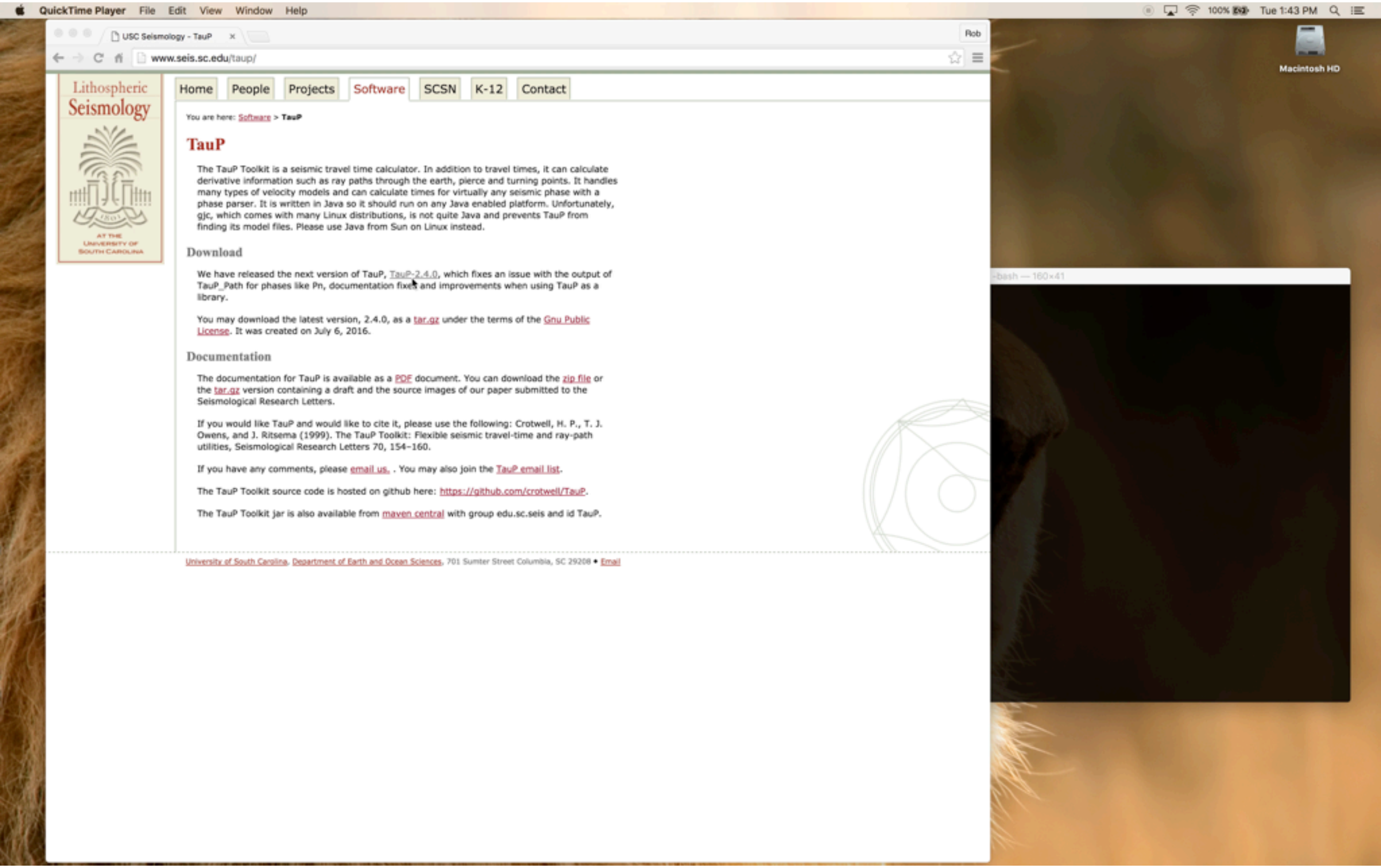
Seems uncomfortable to use package managers?

You already use them everyday…

Some packages installed this way…

- obspy (also installs numpy, matlibplot, etc…)
- gmt
- git

Installing scripts or pre-compiled software (SOD, TauP, Fetch scripts, etc…)



Installing scripts or pre-compiled software (SOD, TauP, Fetch scripts, etc…)

```
guest-wireless-upc-1606-10-120-106-164:~ porritt$ ls -lh FetchData
-rw-r-----@ 1 porritt  staff    72K Jul 14 12:36 FetchData
guest-wireless-upc-1606-10-120-106-164:~ porritt$ head FetchData
#!/usr/bin/perl
#
# FetchData
#
# Find the most current version at http://service.iris.edu/clients/
#
# Fetch data and related metadata from web services.  The default web
# service are from the IRIS DMC, other FDSN web services may be
# specified by setting the following environment variables:
#
guest-wireless-upc-1606-10-120-106-164:~ porritt$ ./FetchData
-bash: ./FetchData: Permission denied
guest-wireless-upc-1606-10-120-106-164:~ porritt$ chmod +x FetchData
guest-wireless-upc-1606-10-120-106-164:~ porritt$ ./FetchData
FetchData: collect time series and related metadata (version 2015.246)
http://service.iris.edu/clients/

Usage: FetchData [options]

 Options:
 -v                 Increase verbosity, may be specified multiple times
 -q                 Be quiet, do not print anything but errors
 -N,--net           Network code, list and wildcards (* and ?) accepted
 -S,--sta           Station code, list and wildcards (* and ?) accepted
```

Tells shell what program to run this under

Adds permission to execute

Installing programs for Matlab

Check the file exchange:
https://www.mathworks.com/matlabcentral/fileexchange/

Hope the authors include an install or setup script

Add executable scripts to matlab path (ie pathtool or addpath)

Add jar files (ie group of java software files) to either the dynamic java path (javaaddpath) or the static class path edit ~/.matlab/{Version}/classpath.txt

Thanks! Any questions?