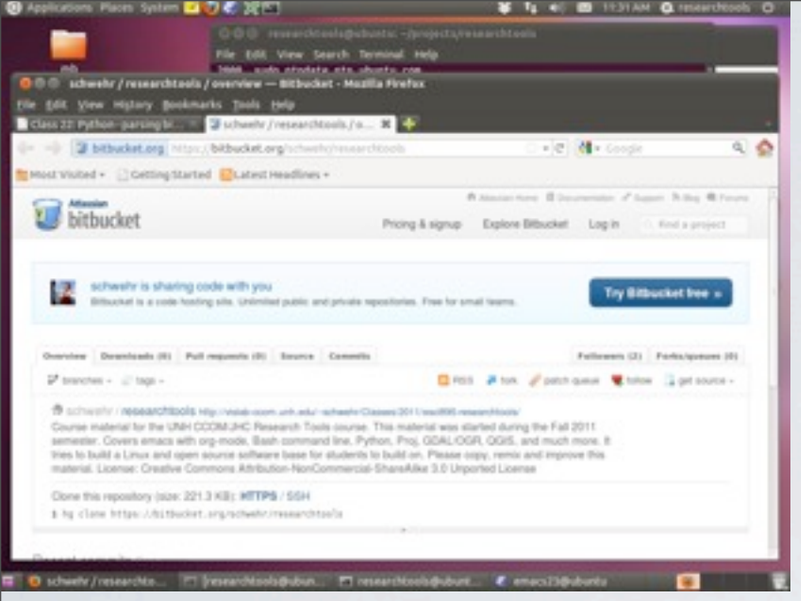
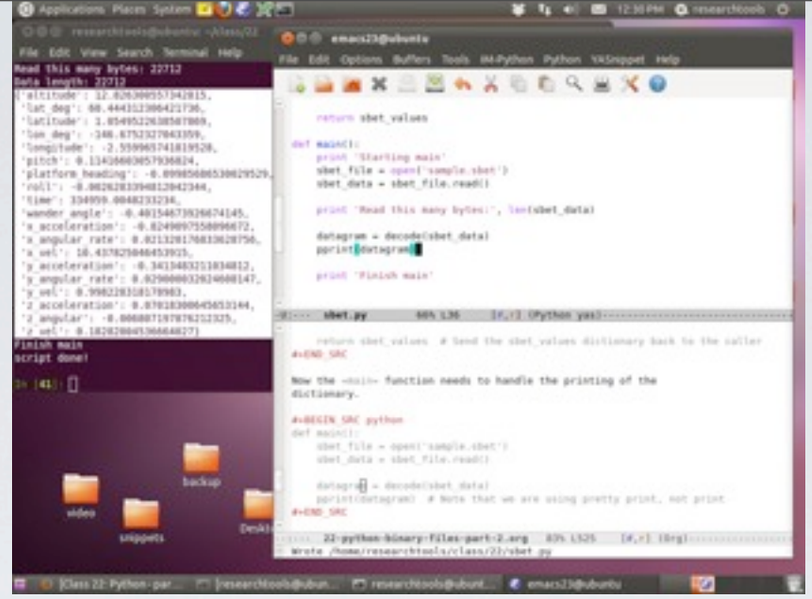
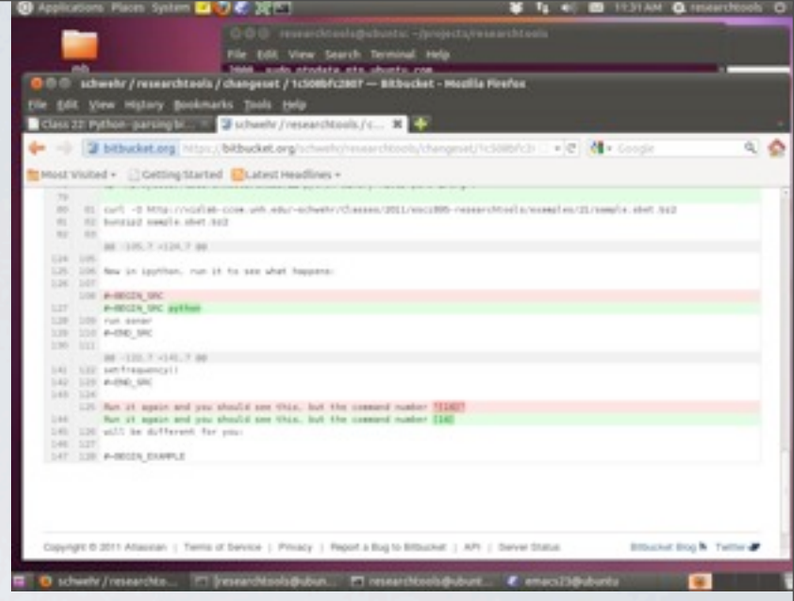

# RESEARCH TOOLS 2011
# LECTURE 22

2011-Nov-16

Kurt Schwehr
http://schwehr.org

UNH CCOM/JHC

Part2 - Parsing binary in Python: SBET IMU navigation files





http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/

Applications Places System 9:56 AM researchtools

Class 22: Python - parsing binary data 2 - SBET IMU data - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Class 22: Python - parsing bina...

vislab-ccom.unh.edu/~schwehr/rt/22-python-binary-files-part-2.html

Google

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# Class 22: Python - parsing binary data 2 - SBET IMU data

## Table of Contents



## See Also

- http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/python-binary-files.org

class Dropbox hw old

Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:05 AM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools ERC Help

kurtvm on #unhresearchtools (+,lag:0)

```
[Tue Nov 15 2011]
*** You have joined channel #unhresearchtools                    [09:56]
*** Users on #unhresearchtools: kurtvm ahyde prasadh sthein ygh2 kjerram
    gmitchell schwehr bwelton berrya
*** #unhresearchtools modes: +
<sthein> Hi !                                                    [09:57]
*** nhassan (~chatzill@192.168.8.244) has joined channel #unhresearchtools
<berrya> Hi
<nhassan> hi
*** mohammad (~chatzill@lab7.ccom.nh) has joined channel #unhresearchtools
<mohammad> hi
<bwelton> hello hello                                            [09:58]
<ygh2> hi
<kjerram> Good morning...                                        [09:59]

[Tue Nov 15 2011]
*** You have joined channel #unhresearchtools                    [11:03]
*** Users on #unhresearchtools: kurtvm mohammad nhassan ahyde prasadh sthein
    ygh2 kjerram gmitchell schwehr bwelton berrya
*** #unhresearchtools modes: +
<gmitchell> Hi                                                   [11:04]
<kurtvm> do not worry about downloading the org file
*** hminami (~chatzill@192.168.8.245) has joined channel #unhresearchtools
<kurtvm> we will be getting the org file a different way today
<kurtvm> we will use mercurial (aka hg)
<hminami> Good morning
ERC>
```

-U:**-  #unhresearchtools@Unknown    All L30    (ERC)----------

Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Wednesday, November 16, 11

Applications Places System 11:05 AM researchtools

Class 22: Python - parsing bina...

File Edit View History Bookmarks

Class 22: Python - parsing bina...

vislab-ccom.unh.edu/~schw

Most Visited Getting Started

Class 22: Python -

researchtools@ubuntu: ~

File Edit View Search Terminal Help

```
researchtools@ubuntu:~$ sudo ntpdate ntp.ubuntu.com
[sudo] password for researchtools:
15 Nov 11:03:56 ntpdate[2889]: step time server 91.189.94.4 offset 3846.744067 s
ec
researchtools@ubuntu:~$ date
Tue Nov 15 11:03:58 EST 2011
researchtools@ubuntu:~$
```

emacs23@ubuntu

File Edit Options Buffers Tools ERC Help

kurtvm on #unhresearchtools (+,lag:0)

```
[Tue Nov 15 2011]
*** You have joined channel #unhresearchtools                    [09:56]
*** Users on #unhresearchtools: kurtvm ahyde prasadh sthein ygh2 kjerram
    gmitchell schwehr bwelton berrya
*** #unhresearchtools modes: +
                                                                 [09:57]
                                  has joined channel #unhresearchtools

                                  has joined channel #unhresearchtools
                                                                 [09:58]
                                                                 [09:59]

                                  chtools                        [11:03]
                                   mohammad nhassan ahyde prasadh sthein
                                  lton berrya
                                                                 [11:04]
                                  g the org file
                                  has joined channel #unhresearchtools
                                  le a different way today
                                  )
                                  as joined channel #unhresearchtools
                                                                 [11:05]
L32    (ERC)----------------------------------
```

Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Wednesday, November 16, 11

Applications Places System 11:08 AM researchtools

researchtools@ubuntu: ~

File Edit View Search Terminal Help

emacs23@ubuntu

File Edit Options Buffers Tools ERC Help

Class 22: Python - parsing binary data 2 - SBET IMU data - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Class 22: Python - parsing bina...

vislab-ccom.unh.edu/~schwehr/rt/22-python-binary-files-part-2.html#se

Google

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# Announcements

## Google Oceans

I will be at CCOM/JHC through the end of the year.

## NSF Sample and Data Policy

National Science Foundation's Division of Ocean Sciences Sample and Data Policy:

http://www.nsf.gov/pubs/2011/nsf11060/nsf11060.pdf

## RVTEC

- http://www.unols.org/committees/rvtec/index.html
- http://www.unols.org/committees/rvtec/Videos/video_library.html
- http://www.unols.org/committees/rvtec/doc_depot/doc_depot.html

## FOSS4G videos

- http://www.fossle.org/drupal/search/node/foss4g2011

[09:59]
[11:03]
[11:04]
[11:05]
[11:06]
[11:08]

-U:**- #unhresearchtools@Unknown Bot L38 (ERC)----------

Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Wednesday, November 16, 11

Applications Places System 11:14 AM researchtools

researchtools@ubuntu: ~

File Edit View Search Terminal Help

emacs23@ubuntu

File Edit Options Buffers Tools ERC Help

Class 22: Python - parsing binary data 2 - SBET IMU data - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Class 22: Python - parsing bina...

vislab-ccom.unh.edu/~schwehr/rt/22-python-binary-files-part-2.html#se

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# See Also

- http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/python-binary-files.org
- YouTube Videos on Bits, Bytes and binary
  - 3 - Decimal, Binary, Octal, & Hexadecimal
  - Binary (full understanding in 10 min)
  - Computer Architecture Lesson 1: Bits and Bytes
- Wikipedia
  - http://en.wikipedia.org/wiki/Integer_%28computer_science%29
  - http://en.wikipedia.org/wiki/Floating_point
  - http://en.wikipedia.org/wiki/Binary_numeral_system

# Public Mercurial (hg) repository hg vc dvcs

https://bitbucket.org/schwehr/researchtools

```
mkdir projects
cd projects
sudo apt-get install mercurial # hg
hg clone https://bitbucket.org/schwehr/researchtools
tree researchtools
```

-U:**- #unhresearchtools@Unknown Bot L46 (ERC)----------

Logging in as 'kurtvm'... done

[09:59] [11:03] [11:04] [11:05] [11:06] [11:08] [11:12]

Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Wednesday, November 16, 11

Applications Places System 11:21 AM researchtools

mb

Class 22: Python - parsing binary data 2 - SBET IN

File Edit View History Bookmarks Tools Help

Class 22: Python - parsing bina...

vislab-ccom.unh.edu/~schwehr/rt/22-python-bi

Most Visited Getting Started Latest Headlines

# Public Mercurial (hg) repository hg vc

https://bitbucket.org/schwehr/researchtools

```
mkdir projects
cd projects
sudo apt-get install mercurial # hg
hg clone https://bitbucket.org/schwehr/resear
tree researchtools
```

## Announcements

### Google Oceans

I will be at CCOM/JHC through the end of the year.

### NSF Sample and Data Policy

National Science Foundation's Division of Ocean Sciences Samp

em

File Edit C

researchtools@ubuntu: ~/projects

File Edit View Search Terminal Help

```
researchtools@ubuntu:~$ mkdir projects
researchtools@ubuntu:~$ cd projects/
researchtools@ubuntu:~/projects$ sudo apt-get install mercurial
[sudo] password for researchtools:
Reading package lists... Done
Building dependency tree
Reading state information... Done
mercurial is already the newest version.
mercurial set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 3 not upgraded.
researchtools@ubuntu:~/projects$ hg clone https://bitbucket.org/schwehr/re
tools
warning: bitbucket.org certificate with fingerprint 81:2b:08:90:dc:d3:71:e
c:b4:75:ce:9b:6c:48:94:56:a1:fe not verified (check hostfingerprints or we
rts config setting)
destination directory: researchtools
warning: bitbucket.org certificate with fingerprint 81:2b:08:90:dc:d3:71:e
c:b4:75:ce:9b:6c:48:94:56:a1:fe not verified (check hostfingerprints or we
rts config setting)
requesting all changes
warning: bitbucket.org certificate with fingerprint 81:2b:08:90:dc:d3:71:e
c:b4:75:ce:9b:6c:48:94:56:a1:fe not verified (check hostfingerprints or we
rts config setting)
adding changesets
adding manifests
adding file changes
added 6 changesets with 62 changes to 58 files
updating to branch default
58 files updated, 0 files merged, 0 files removed, 0 files unresolved
researchtools@ubuntu:~/projects$ ls -la
total 12
drwxr-xr-x  3 researchtools researchtools 4096 2011-11-15 11:21 .
drwxr-xr-x 38 researchtools researchtools 4096 2011-11-15 11:20 ..
drwxr-xr-x  6 researchtools researchtools 4096 2011-11-15 11:21 researchto
researchtools@ubuntu:~/projects$
```

snippets

Deskt

-U:**- #unhresearchtools@Unknown Bot L47 (ERC)----------

Logging in as 'kurtvm'... done

Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:22 AM researchtools

mb

Class 22: Python - parsing binary c

File Edit View History Bookmarks Tool

Class 22: Python - parsing bina...

vislab-ccom.unh.edu/~schwehr

Most Visited Getting Started Late

# Public Mercurial (hg) reposit

https://bitbucket.org/schwehr/researchtools

```
mkdir projects
cd projects
sudo apt-get install mercurial #
hg clone https://bitbucket.org/sc
tree researchtools
```

## Announcements

### Google Oceans

I will be at CCOM/JHC through the end of the y

### NSF Sample and Data Policy

National Science Foundation's Division of Ocea

snippets

Deskt

researchtools@ubuntu: ~/projects

File Edit View Search Terminal Help

```
researchtools@ubuntu:~/projects$ ls -la
total 12
drwxr-xr-x  3 researchtools researchtools 4096 2011-11-15 11:21 .
drwxr-xr-x 38 researchtools researchtools 4096 2011-11-15 11:20 ..
drwxr-xr-x  6 researchtools researchtools 4096 2011-11-15 11:21 researchtools
researchtools@ubuntu:~/projects$ tree researchtools/
researchtools/
├── class
│   ├── 01-introduction.org
│   ├── 02-irc-wiki-basic-shell.org
│   ├── 03-basic-command-line.org
│   ├── 04-ubuntu-virtual-machine.org
│   ├── 05-filetypes-emacs.org
│   ├── 06-keypassx-dropbox.org
│   ├── 07-emacs-and-org-mode.org
│   ├── 08-more-emacs-and-script-files.org
│   ├── 09-bash-scripting.org
│   ├── 10-qgis-bash-python.org
│   ├── 11-ipython.org
│   ├── 12-python.org
│   ├── 13-python.org
│   ├── 14-python-gps-data.org
│   ├── 15-matplotlib.org
│   ├── 16-matplotlib-2.org
│   ├── 17-qgis-gdal.org
│   ├── 18-bag-hdf-xml.org
│   ├── 19-bag-2-xml-metadata.org
│   ├── 20-bags-3-xml-kml-gshhs.org
│   ├── 21-python-binary-files.org
│   └── 22-python-binary-files-part-2.org
├── general
│   ├── backup-cloud.org
│   ├── choosing-a-programming-language.org
│   ├── choosing-a-text-editor.org
│   ├── command-line.org
```

-U:**- #unhresearchtools@Unknown Bot L47 (ERC)----------

Logging in as 'kurtvm'... done

Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:22 AM researchtools

mb

Class 22: Python - parsing binary c

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Class 22: Python - parsing bina...

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# Public Mercurial (hg) reposit

https://bitbucket.org/schwehr/researchtools

```
mkdir projects
cd projects
sudo apt-get install mercurial #
hg clone https://bitbucket.org/sc
tree researchtools
```

## Announcements

### Google Oceans

I will be at CCOM/JHC through the end of the y

### NSF Sample and Data Policy

National Science Foundation's Division of Ocea

snippets

Deskt

researchtools@ubuntu: ~/projects/researchtools/class

File Edit View Search Terminal Help

```
#+STARTUP: showall

#+TITLE:     Class 22: Python - parsing binary data 2 - SBET IMU data
#+AUTHOR:    Kurt Schwehr
#+EMAIL:     schwehr@ccom.unh.edu
#+DATE:      <2011-11-15 Tue>
#+DESCRIPTION: Marine Research Data Manipulation and Practices
#+KEYWORDS: struct numpy sbet imu navigation binary
#+LANGUAGE:  en
#+OPTIONS:   H:3 num:nil toc:t \n:nil @:t ::t |:t ^:t -:t f:t *:t <:t
#+OPTIONS:   TeX:t LaTeX:nil skip:t d:nil todo:t pri:nil tags:not-in-toc
#+INFOJS_OPT: view:nil toc:nil ltoc:t mouse:underline buttons:0 path:http://orgm
ode.org/org-info.js
#+LINK_HOME: http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchto
ols/

* See Also

- http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/python-
binary-files.org
- YouTube Videos on Bits, Bytes and binary
  - [[http://www.youtube.com/user/MyWhyU?v%3D5sS7w-CMHkU][3 - Decimal, Binary, O
ctal, & Hexadecimal]]
  - [[http://www.youtube.com/watch?v%3Dvc-9uASeU7I][Binary (full understanding i
n 10 min)]]
  - [[http://www.youtube.com/watch?v%3DUmSelKbP4sc][Computer Architecture Lesson
 1: Bits and Bytes]]
- Wikipedia
  - http://en.wikipedia.org/wiki/Integer_%28computer_science%29
  - http://en.wikipedia.org/wiki/Floating_point
  - http://en.wikipedia.org/wiki/Binary_numeral_system

* Announcements
```

22-python-binary-files-part-2.org

-U:**-  #unhresearchtools@Unknown    Bot L47    (ERC)----------

Logging in as 'kurtvm'... done

Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Wednesday, November 16, 11

Applications Places System 11:23 AM researchtools

mb

Class 22: Python - parsing binary c

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Class 22: Python - parsing bina...

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# Public Mercurial (hg) reposit

https://bitbucket.org/schwehr/researchtools

```
mkdir projects
cd projects
sudo apt-get install mercurial #
hg clone https://bitbucket.org/sc
tree researchtools
```

## Announcements

### Google Oceans

I will be at CCOM/JHC through the end of the y

### NSF Sample and Data Policy

National Science Foundation's Division of Ocea

snippets

researchtools@ubuntu: ~/projects/researchtools/class

File Edit View Search Terminal Help

```
1982  ls -ltr
1983  sudo shutdown -h now
1984  ping schwehr.org
1985  cd class/
1986  ls
1987  cd test-22/
1988  ls
1989  curl -O http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-research
tools/examples/21/sample.sbet.bz2
1990  bunzip2 sample.sbet.bz2
1991  ipython
1992  type -a hg
1993  dpkg -S /usr/bin/hg
1994  cd ~/
1995  mkdir projects
1996  cd projects/
1997  hg clone https://bitbucket.org/schwehr/researchtools
1998  ls -l
1999  tree researchtools
2000  sudo ntpdate ntp.ubuntu.com
2001  date
2002  mkdir projects
2003  rm -rf projects
2004  clear
2005  mkdir projects
2006  cd projects/
2007  sudo apt-get install mercurial
2008  hg clone https://bitbucket.org/schwehr/researchtools
2009  ls -la
2010  tree researchtools/
2011  cd researchtools/class/
2012  ls -l
2013  less 22-python-binary-files-part-2.org
2014  history
researchtools@ubuntu:~/projects/researchtools/class$
```

-U:**- #unhresearchtools@Unknown Bot L47 (ERC)----------

Logging in as 'kurtvm'... done

Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:29 AM researchtools

mb

Class 22: Python - parsing

File Edit View History Bookmar

Class 22: Python - parsing bina...

vislab-ccom.unh.edu/~

Most Visited Getting Started

Open a terminal and get going:

```
# update your mercurial rep
cd ~/projects/researchtools
hg pull

mkdir -p ~/class/21
cd ~/class/22

pwd
# Make sure you are in the
# ~/class/22

# Rather than downloading t
# or using wget/curl, you c
# mercurial revision contro
cp ~/projects/researchtools

curl -O http://vislab-ccom.
bunzip2 sample.sbet.bz2

md5sum sample.sbet
196c21f16f07ceae180888b12e9
```

researchtools@ubuntu: ~/projects/researchtools

File Edit View Search Terminal Help

```
 1999  tree researchtools
 2000  sudo ntpdate ntp.ubuntu.com
 2001  date
 2002  mkdir projects
 2003  rm -rf projects
 2004  clear
 2005  mkdir projects
 2006  cd projects/
 2007  sudo apt-get install mercurial
 2008  hg clone https://bitbucket.org/schwehr/researchtools
 2009  ls -la
 2010  tree researchtools/
 2011  cd researchtools/class/
 2012  ls -l
 2013  less 22-python-binary-files-part-2.org
 2014  history
researchtools@ubuntu:~/projects/researchtools/class$ cd
researchtools@ubuntu:~$ pwd
/home/researchtools
researchtools@ubuntu:~$ cd projects/
researchtools@ubuntu:~/projects$ cd researchtools/
researchtools@ubuntu:~/projects/researchtools$ pwd
/home/researchtools/projects/researchtools
researchtools@ubuntu:~/projects/researchtools$ hg pull
warning: bitbucket.org certificate with fingerprint 81:2b:08:90:dc:d3:71:ee:e0:7
c:b4:75:ce:9b:6c:48:94:56:a1:fe not verified (check hostfingerprints or web.cace
rts config setting)
pulling from https://bitbucket.org/schwehr/researchtools
warning: bitbucket.org certificate with fingerprint 81:2b:08:90:dc:d3:71:ee:e0:7
c:b4:75:ce:9b:6c:48:94:56:a1:fe not verified (check hostfingerprints or web.cace
rts config setting)
searching for changes
no changes found
researchtools@ubuntu:~/projects/researchtools$
researchtools@ubuntu:~/projects/researchtools$
```

ols [11:06]
ools [11:08]
[11:12]
uyen
l
[11:16]
[11:24]
[11:25]

snippets

-U:**- #unhresearchtools@Unknown Bot L49 (ERC)----------

Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Wednesday, November 16, 11

Sign up for a Bitbucket Acco

https://bitbucket.org/account/signup/

Atlassian Home | Documentation | Support | Blog | Forums

Atlassian bitbucket

Pricing & signup | Explore Bitbucket | Log in | Find a project

# Sign up for a free 5 user account

**Username** *(required)*

**Email address** *(required)*

**Password** *(required)*

**Password (again)** *(required)*

Sign up

Sign up using OpenID

All plans include

- Unlimited repositories
- Unlimited public collaborators
- Unlimited disk space
- Custom domains
- Issue tracking
- Downloads
- Wiki

Applications Places System 11:31 AM researchtools

mb

researchtools@ubuntu: ~/projects/researchtools

File Edit View Search Terminal Help

2000 sudo ntpdate ntp.ubuntu.com

schwehr / researchtools / overview — Bitbucket - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Class 22: Python - parsing bi… | schwehr / researchtools / o…

bitbucket.org https://bitbucket.org/schwehr/researchtools

Google

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Atlassian bitbucket

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schwehr is sharing code with you

Bitbucket is a code hosting site. Unlimited public and private repositories. Free for small teams.

Try Bitbucket free »

Overview Downloads (0) Pull requests (0) Source Commits Followers (2) Forks/queues (0)

branches » tags » RSS fork patch queue follow get source »

schwehr / researchtools http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/

Course material for the UNH CCOM/JHC Research Tools course. This material was started during the Fall 2011 semester. Covers emacs with org-mode, Bash command line, Python, Proj, GDAL/OGR, QGIS, and much more. It tries to build a Linux and open source software base for students to build on. Please copy, remix and improve this material. License: Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License

Clone this repository (size: 221.3 KB): **HTTPS** / SSH

```
$ hg clone https://bitbucket.org/schwehr/researchtools
```

schwehr / researchto… [researchtools@ubun… researchtools@ubunt… emacs23@ubuntu

Applications Places System 11:31 AM researchtools

mb

researchtools@ubuntu: ~/projects/researchtools

File Edit View Search Terminal Help

2000 sudo ntpdate ntp.ubuntu.com

schwehr / researchtools / changeset / 1c508bfc2807 — Bitbucket - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Class 22: Python - parsing bi... | schwehr / researchtools / c...

bitbucket.org https://bitbucket.org/schwehr/researchtools/changeset/1c508bfc2

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```
@@ -29,6 +29,16 @@
29 29
30 30 https://bitbucket.org/schwehr/researchtools
31 31
32    #+BEGIN_SRC sh
33    mkdir projects
34    cd projects
35    sudo apt-get install mercurial # hg
36    hg clone https://bitbucket.org/schwehr/researchtools
37    tree researchtools
38    #+END_SRC
39
40
41
42 32 * FOSS4G videos
43 33
44 34 - http://www.fosslc.org/drupal/search/node/foss4g2011
@@ -51,6 +61,10 @@
61 51 Open a terminal and get going:
62 52
63 53 #+BEGIN_SRC sh
64    # update your mercurial repository of the class notes
65    cd ~/projects/researchtools
66    hg pull
67
68 54 mkdir -p ~/class/21
69 55 cd ~/class/22
70 56
@@ -58,6 +72,11 @@
72 58 # Make sure you are in the right location
```

schwehr / researchto... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:31 AM researchtools

mb

researchtools@ubuntu: ~/projects/researchtools

File Edit View Search Terminal Help

2000 sudo ntpdate ntp.ubuntu.com

schwehr / researchtools / changeset / 1c508bfc2807 — Bitbucket - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Class 22: Python - parsing bi... | schwehr / researchtools / c...

bitbucket.org https://bitbucket.org/schwehr/researchtools/changeset/1c508bfc2

Google

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```
79
80  61  curl -O http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/examples/21/sample.sbet.bz2
81  62  bunzip2 sample.sbet.bz2
82  63
    @@ -105,7 +124,7 @@
124 105
125 106  Now in ipython, run it to see what happens:
126 107
    108  #+BEGIN_SRC
127      #+BEGIN_SRC python
128 109  run sonar
129 110  #+END_SRC
130 111
    @@ -122,7 +141,7 @@
141 122  setfrequency()
142 123  #+END_SRC
143 124
    125  Run it again and you should see this, but the command number "[16]"
144      Run it again and you should see this, but the command number [16]
145 126  will be different for you:
146 127
147 128  #+BEGIN_EXAMPLE
```



schwehr / researchto... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:32 AM researchtools

mb

researchtools@ubuntu: ~/projects/researchtools

File Edit View Search Terminal Help

2000 sudo ntpdate ntp.ubuntu.com

schwehr / researchtools / changeset / 1c508bfc2807 — Bitbucket - Mozilla Firefox

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Class 22: Python - parsing bi... | schwehr / researchtools / c...

bitbucket.org https://bitbucket.org/schwehr/researchtools/changeset/1c508bfc2

Google

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schwehr is sharing code with you

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branches » tags » RSS fork patch queue follow get source »

schwehr / researchtools http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/

Course material for the UNH CCOM/JHC Research Tools course. This material was started during the Fall 2011 semester. Covers emacs with org-mode, Bash command line, Python, Proj, GDAL/OGR, QGIS, and much more. It tries to build a Linux and open source software base for students to build on. Please copy, remix and improve this material. License: Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License

Clone this repository (size: 221.3 KB): **HTTPS** / SSH

```
$ hg clone https://bitbucket.org/schwehr/researchtools
```

## Commit 1c508bfc2807 Raw commit »

minor cleanup

schwehr
15 November 2011

commit: 1c508bfc2807
parent: a2a96a73b11d
branch: default

schwehr / researchto... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:37 AM researchtools

mb

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
researchtools@ubuntu:~$
researchtools@ubuntu:~$
researchtools@ubuntu:~$ mkdir -p ~/class/22
researchtools@ubuntu:~$ cd ~/class/22
researchtools@ubuntu:~/class/22$
researchtools@ubuntu:~/class/22$
researchtools@ubuntu:~/class/22$
researchtools@ubuntu:~/class/22$ pwd
/home/researchtools/class/22
researchtools@ubuntu:~/class/22$ cp ~/projects/researchtools/class/22-python-bin
ary-files-part-2.org .
researchtools@ubuntu:~/class/22$ ls
22-python-binary-files-part-2.org
researchtools@ubuntu:~/class/22$ curl -O http://vislab-ccom.unh.edu/~schwehr/Cla
sses/2011/esci895-researchtools/examples/21/sample.sbet.bz2
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 22473  100 22473    0     0   757k      0 --:--:-- --:--:-- --:--:-- 1688k
researchtools@ubuntu:~/class/22$ bunzip2 sample.sbet.bz2
researchtools@ubuntu:~/class/22$ ls -l
total 44
-rw-r--r-- 1 researchtools researchtools 16722 2011-11-15 11:36 22-python-binary
-files-part-2.org
-rw-r--r-- 1 researchtools researchtools 22712 2011-11-15 11:37 sample.sbet
researchtools@ubuntu:~/class/22$
```

80 x 25

Class 22: Python - par

File Edit View History Book

Class 22: Python - parsing bina

vislab-ccom.unh.e

Most Visited Getting Sta

Open a terminal and get going:

```
# update your mercurial
cd ~/projects/researchto
hg pull

mkdir -p ~/class/21
cd ~/class/22

pwd
# Make sure you are in t
# ~/class/22

# Rather than downloadi
# or using wget/curl, you can now get it from the researchtools
# mercurial revision control repository
cp ~/projects/researchtools/class/22-python-binary-files-part-2.org .

curl -O http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/examples/21/sample.sbet.bz2
bunzip2 sample.sbet.bz2

md5sum sample.sbet
196c21f16f07ceae180888b12e9edc56  sample.sbet
```

Start ipython in the terminal

Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:38 AM researchtools

mb

Class 22: Python - par

File Edit View History Book

Class 22: Python - parsing bina

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Most Visited Getting Sta

Open a terminal and get going:

```
# update your mercurial
cd ~/projects/researchto
hg pull

mkdir -p ~/class/21
cd ~/class/22

pwd
# Make sure you are in t
# ~/class/22

# Rather than downloadi
# or using wget/curl, you can now get it from the researchtools
# mercurial revision control repository
cp ~/projects/researchtools/class/22-python-binary-files-part-2.org .

curl -O http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/examples/21/sample.sbet.bz2
bunzip2 sample.sbet.bz2

md5sum sample.sbet
196c21f16f07ceae180888b12e9edc56  sample.sbet
```

Start ipython in the terminal

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
researchtools@ubuntu:~/class/22$ ls
22-python-binary-files-part-2.org
researchtools@ubuntu:~/class/22$ curl -O http://vislab-ccom.unh.edu/~schwehr/Cla
sses/2011/esci895-researchtools/examples/21/sample.sbet.bz2
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 22473  100 22473    0     0   757k      0 --:--:-- --:--:-- --:--:-- 1688k
researchtools@ubuntu:~/class/22$ bunzip2 sample.sbet.bz2
researchtools@ubuntu:~/class/22$ ls -l
total 44
-rw-r--r-- 1 researchtools researchtools 16722 2011-11-15 11:36 22-python-binary
-files-part-2.org
-rw-r--r-- 1 researchtools researchtools 22712 2011-11-15 11:37 sample.sbet
researchtools@ubuntu:~/class/22$
researchtools@ubuntu:~/class/22$
researchtools@ubuntu:~/class/22$
researchtools@ubuntu:~/class/22$ ls -l
total 44
-rw-r--r-- 1 researchtools researchtools 16722 2011-11-15 11:36 22-python-binary-files-part-2.o
rg
-rw-r--r-- 1 researchtools researchtools 22712 2011-11-15 11:37 sample.sbet
researchtools@ubuntu:~/class/22$ md5sum sample.sbet
196c21f16f07ceae180888b12e9edc56  sample.sbet
researchtools@ubuntu:~/class/22$ emacsclient --no-wait 22-python-binary-files-part-2.org
researchtools@ubuntu:~/class/22$
```

Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

mb

Class 22: Python - par

File Edit View History Book

Class 22: Python - parsing bina

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Most Visited Getting Sta

Open a terminal and get going:

```
# update your mercurial
cd ~/projects/researchto
hg pull

mkdir -p ~/class/21
cd ~/class/22

pwd
# Make sure you are in t
# ~/class/22

# Rather than downloadi
# or using wget/curl, you can now
# mercurial revision control repos
cp ~/projects/researchtools/class/

curl -O http://vislab-ccom.unh.edu
bunzip2 sample.sbet.bz2

md5sum sample.sbet
196c21f16f07ceae180888b12e9edc56
```

Start ipython in the terminal

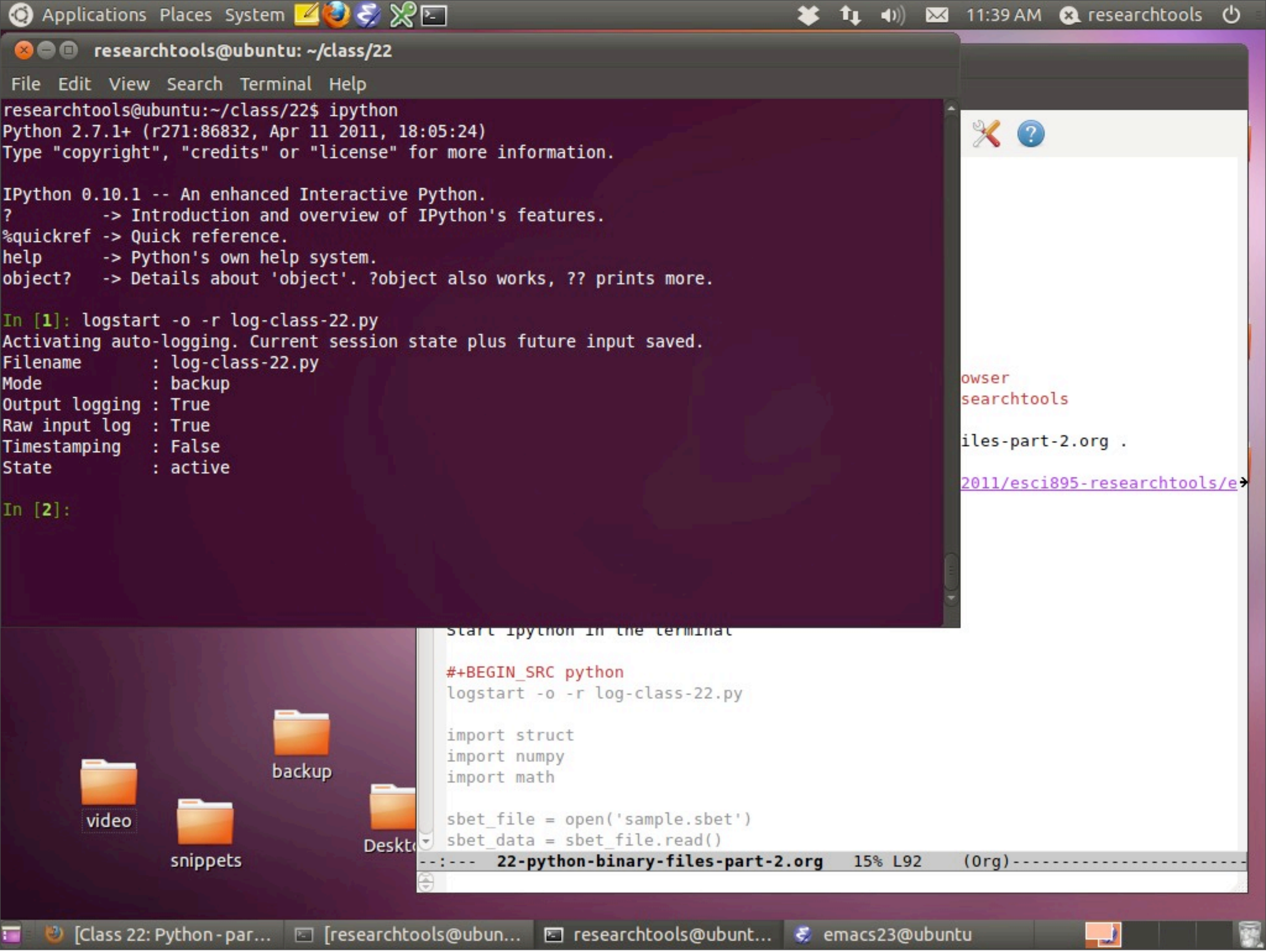
```
re
File Edit V
researchtool
22-python-bi
researchtool
sses/2011/es
  % Total

100 22473  1
researchtool
researchtool
total 44
-rw-r--r-- 1
-files-part-
-rw-r--r-- 1
researchtool
researchtool
researchtool
researchtool
total 44
-rw-r--r-- 1
rg
rg
-rw-r--r-- 1
researchtool
196c21f16f07
researchtool
researchtool
```

emacs23@ubuntu

File Edit Options Buffers Tools Org Tbl Help

```
#+STARTUP: showall

#+TITLE:     Class 22: Python - parsing binary data 2 - SBET I→
#+AUTHOR:    Kurt Schwehr
#+EMAIL:     schwehr@ccom.unh.edu
#+DATE:      <2011-11-15 Tue>
#+DESCRIPTION: Marine Research Data Manipulation and Practices
#+KEYWORDS: struct numpy sbet imu navigation binary
#+LANGUAGE:  en
#+OPTIONS:   H:3 num:nil toc:t \n:nil @:t ::t |:t ^:t -:t f:t *:t <:t
#+OPTIONS:   TeX:t LaTeX:nil skip:t d:nil todo:t pri:nil tags:not-in-toc
#+INFOJS_OPT: view:nil toc:nil ltoc:t mouse:underline buttons:0 path:http://orgm→
#+LINK_HOME: http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchto→

* See Also

- http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/python-→
- YouTube Videos on Bits, Bytes and binary
  - 3 - Decimal, Binary, Octal, & Hexadecimal
  - Binary (full understanding in 10 min)
  - Computer Architecture Lesson 1: Bits and Bytes
- Wikipedia
  - http://en.wikipedia.org/wiki/Integer_%28computer_science%29
  - http://en.wikipedia.org/wiki/Floating_point
  - http://en.wikipedia.org/wiki/Binary_numeral_system

* Announcements

** Google Oceans

I will be at CCOM/JHC through the end of the year.

--:---  22-python-binary-files-part-2.org   Top L1     (Org)----------
```

Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu


Applications Places System
11:39 AM researchtools
researchtools@ubuntu: ~/class/22
File Edit View Search Terminal Help
researchtools@ubuntu:~/class/22$ ipython
Python 2.7.1+ (r271:86832, Apr 11 2011, 18:05:24)
Type "copyright", "credits" or "license" for more information.
IPython 0.10.1 -- An enhanced Interactive Python.
? -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help -> Python's own help system.
object? -> Details about 'object'. ?object also works, ?? prints more.
In [1]: logstart -o -r log-class-22.py
Activating auto-logging. Current session state plus future input saved.
Filename : log-class-22.py
Mode : backup
Output logging : True
Raw input log : True
Timestamping : False
State : active
In [2]:
owser
searchtools
iles-part-2.org .
2011/esci895-researchtools/e
Start ipython in the terminal
#+BEGIN_SRC python
logstart -o -r log-class-22.py
import struct
import numpy
import math
sbet_file = open('sample.sbet')
sbet_data = sbet_file.read()
--:--- 22-python-binary-files-part-2.org 15% L92 (Org)
backup
video
snippets
[Class 22: Python - par...
[researchtools@ubun...
researchtools@ubunt...
emacs23@ubuntu

Applications Places System 11:40 AM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
In [1]: logstart -o -r log-class-22.py
Activating auto-logging. Current session state plus future input saved.
Filename       : log-class-22.py
Mode           : backup
Output logging : True
Raw input log  : True
Timestamping   : False
State          : active

In [2]: ls -l
total 48
-rw-r--r-- 1 researchtools researchtools 16722 2011-11-15 11:36 22-python-binary-files-part-2.o
rg
-rw-r--r-- 1 researchtools researchtools   333 2011-11-15 11:39 log-class-22.py
-rw-r--r-- 1 researchtools researchtools 22712 2011-11-15 11:37 sample.sbet

In [3]: import struct

In [4]: import numpy

In [5]: import math

In [6]: sbet_file = open('sample.sbet')

In [7]: sbet_data = sbet_file.read()
```

owser
searchtools

iles-part-2.org .

2011/esci895-researchtools/e

Start ipython in the terminal

```
#+BEGIN_SRC python
logstart -o -r log-class-22.py

import struct
import numpy
import math

sbet_file = open('sample.sbet')
sbet_data = sbet_file.read()
```

--:---  22-python-binary-files-part-2.org  15% L107  (Org)----------

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[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:45 AM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
In [6]: sbet_file = open('sample.sbet')

In [7]: sbet_data = sbet_file.read()

In [8]: history
1: _ip.magic("logstart -o -r log-class-22.
2: _ip.system("ls -F -l")
3: import struct
4: import numpy
5: import math
6: sbet_file = open('sample.sbet')
7: sbet_data = sbet_file.read()
8: _ip.magic("history ")

In [9]: whos
Variable    Type      Data/Info
-----------------------------
math        module    <module 'math' (buil
numpy       module    <module 'numpy' from
sbet_data   str       ?g??q??H???G??C
sbet_file   file      <open file 'sample.s
struct      module    <module 'struct' fro

In [10]:
```

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emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
def setfrequency():
    print 'Setting frequency'
    # Write code here to set the frequency
```

-U:--- sonar.py All L4 [#,r] (Python yas)----------

- Python Programming Tutorial - 27 - Building Functions on YouTube

Since functions are a bit tricky, we should go over them again. You start a function with "def" followed by the name of a function, "()" and a ":" to finish the function.

Open the file ~/class/22/sonar.py and put this in it:

```
#+BEGIN_SRC python
def setfrequency():
    print 'Setting frequency'
    # Write code here to set the frequency
#+END_SRC
```

***Be sure to save the file***. That means that the bottom left of your emacs window should have a status of "-U:---" with ***no*** "**"

--:--- 22-python-binary-files-part-2.org 20% L131 [#,r] (Org)----------

Wrote /home/researchtools/class/22/sonar.py

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:46 AM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
In [8]: history
1: _ip.magic("logstart -o -r log-class-22.py")
2: _ip.system("ls -F -l")
3: import struct
4: import numpy
5: import math
6: sbet_file = open('sample.sbet')
7: sbet_data = sbet_file.read()
8: _ip.magic("history ")

In [9]: whos
Variable    Type      Data/Info
-----------------------------
math        module    <module 'math' (built-in)>
numpy       module    <module 'numpy' from '/us<...>n2.7/numpy/__init__.pyc'>
sbet_data   str       ...
sbet_file   file      <open file 'sample.sbet', mode 'r' at 0xa44c860>
struct      module    <module 'struct' from '/u<...>ib/python2.7/struct.pyc'>

In [10]: ls
22-python-binary-files-part-2.org  log-class-22.py  sample.sbet  sonar.py

In [11]: run sonar

In [12]:
```

ippet Help



backup

video

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Deskt

*Be sure to save the file*. That means that the bottom left of your emacs window should have a status of "-U:---" with *no* "**"

Now in ipython, run it to see what happens:

```
#+BEGIN_SRC python
run sonar
#+END_SRC
```

You get nothing, because we have not called the function. So add a

--:--- 22-python-binary-files-part-2.org 23% L138 [#,r] (Org)

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:47 AM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
In [8]: history
1: _ip.magic("logstart -o -r log-class-22.
2: _ip.system("ls -F -l")
3: import struct
4: import numpy
5: import math
6: sbet_file = open('sample.sbet')
7: sbet_data = sbet_file.read()
8: _ip.magic("history ")

In [9]: whos
Variable    Type      Data/Info
-----------------------------
math        module    <module 'math' (buil
numpy       module    <module 'numpy' from
sbet_data   str       ?g??q??H???G??C
sbet_file   file      <open file 'sample.s
struct      module    <module 'struct' fro

In [10]: ls
22-python-binary-files-part-2.org  log-cla

In [11]: run sonar

In [12]:
```

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emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
# "Define" or create the fuction
def setfrequency():
    print 'Setting frequency'
    # Write code here to set the frequency

setfrequency()
```

-U:--- **sonar.py** All L8 [#,r] (Python yas)----------

```
function call to your code that uses setfrequency:

#+BEGIN_SRC python
# "Define" or create the function
def setfrequency():
    print 'Setting frequency'
    # Write code here to set the frequency

# Use the function
setfrequency()
#+END_SRC

Run it again and you should see this, but the command number [16]
will be different for you:

#+BEGIN_EXAMPLE
```

--:--- **22-python-binary-files-part-2.org** 25% L151 [#,r] (Org)----------

Wrote /home/researchtools/class/22/sonar.py

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:47 AM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
3: import struct
4: import numpy
5: import math
6: sbet_file = open('sample.sbet')
7: sbet_data = sbet_file.read()
8: _ip.magic("history ")

In [9]: whos
Variable    Type      Data/Info
-----------------------------
math        module    <module 'math' (buil
numpy       module    <module 'numpy' from
sbet_data   str       ??g??q??H????G??C
sbet_file   file      <open file 'sample.s
struct      module    <module 'struct' fro

In [10]: ls
22-python-binary-files-part-2.org  log-cla

In [11]: run sonar

In [12]: run sonar
Setting frequency

In [13]:
```

emacs23@ubuntu

File Edit Options Buffers Tools Org Tbl Help

```
# "Define" or create the fuction
def setfrequency():
    print 'Setting frequency'
    # Write code here to set the frequency

setfrequency()
```

-U:--- sonar.py All L3 [#,r] (Python yas)

```
function call to your code that uses setfrequency:

#+BEGIN_SRC python
# "Define" or create the function
def setfrequency():
    print 'Setting frequency'
    # Write code here to set the frequency

# Use the function
setfrequency()
#+END_SRC

Run it again and you should see this, but the command number [16]
will be different for you:

#+BEGIN_EXAMPLE
```

--:--- 22-python-binary-files-part-2.org 25% L153 [#,r] (Org)

backup

video

snippets

Deskt

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:49 AM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
3: import struct
4: import numpy
5: import math
6: sbet_file = open('sample.sbet')
7: sbet_data = sbet_file.read()
8: _ip.magic("history ")

In [9]: whos
Variable    Type      Data/Info
-----------------------------
math        module    <module 'math' (buil
numpy       module    <module 'numpy' from
sbet_data   str       ?g??q?A?H???G??C
sbet_file   file      <open file 'sample.s
struct      module    <module 'struct' fro

In [10]: ls
22-python-binary-files-part-2.org  log-cla

In [11]: run sonar

In [12]: run sonar
Setting frequency

In [13]:
```

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
# "Define" or create the fuction
def setfrequency(freq):
    print 'Setting frequency', freq
    # Write code here to set the frequency

setfrequency()
```

-U:--- sonar.py All L4 [#,r] (Python yas)

```
outside of the function.

Change the "def" line and the print right after it to have a parameter
called "freq"

#+BEGIN_SRC python
# "Define" or create the function
def setfrequency(freq):
    print 'Setting frequency to', freq
    # Write code here to set the frequency

# Use the function
setfrequency()
#+END_SRC

Now if we run the code, we get an error!
```

--:--- 22-python-binary-files-part-2.org 29% L175 [#,r] (Org)

Wrote /home/researchtools/class/22/sonar.py

backup

video

snippets

Deskt

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:49 AM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
In [10]: ls
22-python-binary-files-part-2.org  log-class-22.py  sample.sbet  sonar.py

In [11]: run sonar

In [12]: run sonar
Setting frequency

In [13]: run sonar
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)

/home/researchtools/class/22/sonar.py in <module>()
      5     # Write code here to set the frequency
      6
----> 7 setfrequency()
      8
      9

TypeError: setfrequency() takes exactly 1 argument (0 given)
WARNING: Failure executing file: <sonar.py>

In [14]:
```

ippet Help

o have a parameter

```
#+BEGIN_SRC python
# "Define" or create the function
def setfrequency(freq):
    print 'Setting frequency to', freq
    # Write code here to set the frequency

# Use the function
setfrequency()
#+END_SRC

Now if we run the code, we get an error!
--:---  22-python-binary-files-part-2.org   29% L175    [#,r] (Org)----------
Wrote /home/researchtools/class/22/sonar.py
```

backup

video

snippets

Deskt

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:50 AM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
In [11]: run sonar

In [12]: run sonar
Setting frequency

In [13]: run sonar
---------------------------------------
TypeError

/home/researchtools/class/22/sonar.py in <
      5     # Write code here to set the f
      6
----> 7 setfrequency()
      8
      9

TypeError: setfrequency() takes exactly 1
WARNING: Failure executing file: <sonar.py

In [14]: run sonar
Setting frequency 12000

In [15]:
```

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
# "Define" or create the fuction
def setfrequency(freq = 12000):
    print 'Setting frequency', freq, 'Hz'
    # Write code here to set the frequency

setfrequency()
```

-U:--- sonar.py All L4 [#,r] (Python yas)----------

```
#+END_EXAMPLE

By calling "setfrequency()", we did not pass in a value for freq.
Oops!

For arguments, we can assign a "default" value that will be used if
nothing is passed in when calling (aka using) the function.  You don't
have to do this, but it is often a smart thing to do.  Why don't we
make the default frequency be 12kHz (12000 cycles per second).
Change the def line to look like this:

#+BEGIN_SRC python
def setfrequency(freq = 12000):
#+END_SRC

Now when you run the function, you will see this:
```

--:--- 22-python-binary-files-part-2.org 34% L210 [#,r] (Org)----------

Wrote /home/researchtools/class/22/sonar.py

backup

video

snippets

Deskt

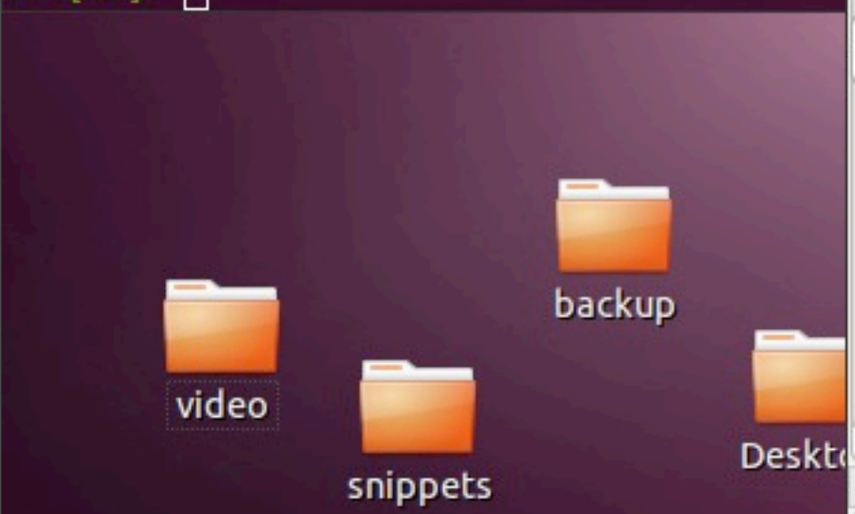
[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:51 AM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
In [12]: run sonar
Setting frequency

In [13]: run sonar
---------------------------------------
TypeError

/home/researchtools/class/22/sonar.py in <
      5     # Write code here to set the f
      6
----> 7 setfrequency()
      8
      9

TypeError: setfrequency() takes exactly 1
WARNING: Failure executing file: <sonar.py

In [14]: run sonar
Setting frequency 12000

In [15]: run sonar
Setting frequency 24000 Hz

In [16]:
```




emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
# "Define" or create the fuction
def setfrequency(freq = 12000):
    print 'Setting frequency', freq, 'Hz'
    # Write code here to set the frequency

setfrequency(24000)
```

-U:--- sonar.py All L7 [#,r] (Python yas)----------

```
#+BEGIN_EXAMPLE
In [18]: run sonar
Setting frequency to 12000
#+END_EXAMPLE

So what do we do now if we want to change it to a different frequency?
We need to call =setfrequency= with a different number.  Let's double
the frequency to 24kHz.  Change the call to look like this:

#+BEGIN_SRC python
setfrequency(24000)
#+END_SRC

Running the sonar.py code in ipython looks like this:
```

--:--- 22-python-binary-files-part-2.org 37% L226 [#,r] (Org)----------

Wrote /home/researchtools/class/22/sonar.py

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:52 AM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
In [13]: run sonar
---------------------------------------
TypeError

/home/researchtools/class/22/sonar.py in <
      5     # Write code here to set the f
      6
----> 7 setfrequency()
      8
      9

TypeError: setfrequency() takes exactly 1
WARNING: Failure executing file: <sonar.py

In [14]: run sonar
Setting frequency 12000

In [15]: run sonar
Setting frequency 24000 Hz

In [16]: run sonar
Setting frequency 15000 Hz

In [17]:
```

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File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
# "Define" or create the fuction
def setfrequency(freq = 12000):
    print 'Setting frequency', freq, 'Hz'
    # Write code here to set the frequency

my_sonar_freq = 15000

setfrequency( my_sonar_freq )
```

-U:--- sonar.py All L3 [#,r] (Python yas)----------

```
#+BEGIN_SRC python
# "Define" or create the function
def setfrequency(freq = 12000):
    print 'Setting frequency to', freq
    # Write code here to set the frequency

my_sonar_freq = 15000

# Use the function
setfrequency( my_sonar_freq )
#+END_SRC

Now run it:

#+BEGIN_EXAMPLE
run sonar
```

--:--- 22-python-binary-files-part-2.org 40% L247 [#,r] (Org)----------

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:54 AM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
/home/researchtools/class/22/sonar.py in <
      5     # Write code here to set the f

      6
----> 7 setfrequency()
      8
      9

TypeError: setfrequency() takes exactly 1
WARNING: Failure executing file: <sonar.py

In [14]: run sonar
Setting frequency 12000

In [15]: run sonar
Setting frequency 24000 Hz

In [16]: run sonar
Setting frequency 15000 Hz

In [17]: run sonar
Setting frequency 3500 Hz

In [18]:
```

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Deskt

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File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
# "Define" or create the fuction
def setfrequency(freq = 12000):
    print 'Setting frequency', freq, 'Hz'
    # Write code here to set the frequency

sonar_freq_table = {
    'em122': 12000,
    'knudsen': 3500,
    }

setfrequency( sonar_freq_table['knudsen'] )
```

-U:---  **sonar.py**  All L11  [#,r] (Python yas)----------

```
    print 'Setting frequency to', freq
    # Write code here to set the frequency

sonar_freq_table = {
    'em122': 12000,
    'knudsen': 3500,
    }

setfrequency( sonar_freq_table['knudsen'] )
#+END_SRC

#+BEGIN_EXAMPLE
In [21]: run sonar
Setting frequency to 3500
#+END_EXAMPLE
```

--:---  **22-python-binary-files-part-2.org**  43% L269  [#,r] (Org)----------

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 11:56 AM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
      6
----> 7 setfrequency()
      8
      9

TypeError: setfrequency() takes exactly 1
WARNING: Failure executing file: <sonar.py

In [14]: run sonar
Setting frequency 12000

In [15]: run sonar
Setting frequency 24000 Hz

In [16]: run sonar
Setting frequency 15000 Hz

In [17]: run sonar
Setting frequency 3500 Hz

In [18]: run sonar
Setting frequency 3500 Hz name is R/V Supe

In [19]:
```


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File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
# "Define" or create the fuction
def setfrequency(freq = 12000, name='unknown'):
    print 'Setting frequency', freq, 'Hz', 'name is', name
    # Write code here to set the frequency

sonar_freq_table = {
    'em122': 12000,
    'knudsen': 3500,
    }

setfrequency( sonar_freq_table['knudsen'], 'R/V Super Slow' )
```

-U:--- **sonar.py** All L12 [#,r] (Python yas)

```
    'knudsen': 3500,
    }

setfrequency( sonar_freq_table['knudsen'] )
#+END_SRC

#+BEGIN_EXAMPLE
In [21]: run sonar
Setting frequency to 3500
#+END_EXAMPLE

Hopefully that gives you a better field for functions!  Now we will
get back to creating our sbet.py module with functions to handle
reading IMU navigation data.

* Last time, where were we?
```

--:--- **22-python-binary-files-part-2.org** 44% L276 [#,r] (Org)

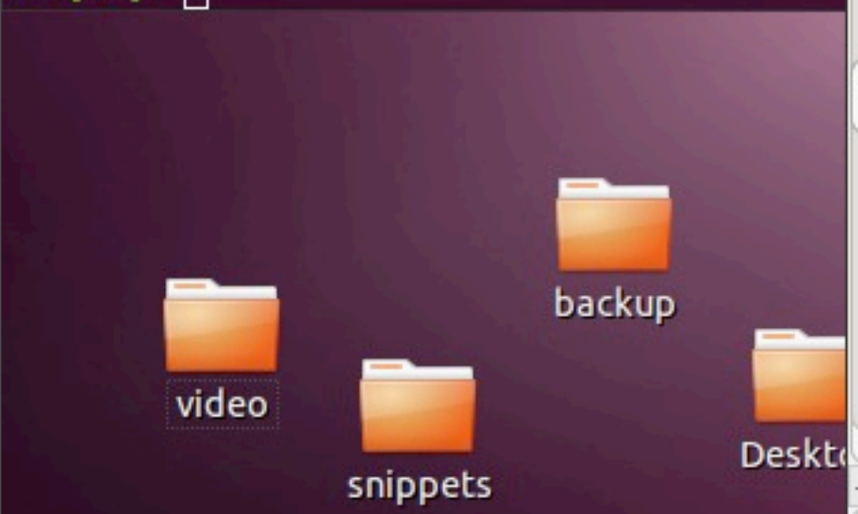
[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:00 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
      6
----> 7 setfrequency()
      8
      9

TypeError: setfrequency() takes exactly 1
WARNING: Failure executing file: <sonar.py

In [14]: run sonar
Setting frequency 12000

In [15]: run sonar
Setting frequency 24000 Hz

In [16]: run sonar
Setting frequency 15000 Hz

In [17]: run sonar
Setting frequency 3500 Hz

In [18]: run sonar
Setting frequency 3500 Hz name is R/V Supe

In [19]:
```

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File Edit Options Buffers Tools IM-Python Python YASnippet Help

-U:--- **sbet.py** All L1 [#,r] (Python yas)----------

Last time we were editing ~/class/22/sbet.py. Here is a cleaned up version of where we left off. I have removed the extra print statements.

```
#+BEGIN_SRC python
# Decode Applanix POSPac SBET IMU binary files

def decode(data):
    'Decipher a SBET datagram from binary'
    print 'Data length:', len(data)

def main():
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()
```

--:--- **22-python-binary-files-part-2.org** 46% L296 [#,r] (Org)----------

Using the CPython shell

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:02 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
      6
----> 7 setfrequency()
      8
      9

TypeError: setfrequency() takes exactly 1
WARNING: Failure executing file: <sonar.py

In [14]: run sonar
Setting frequency 12000

In [15]: run sonar
Setting frequency 24000 Hz

In [16]: run sonar
Setting frequency 15000 Hz

In [17]: run sonar
Setting frequency 3500 Hz

In [18]: run sonar
Setting frequency 3500 Hz name is R/V Supe

In [19]:
```

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File Edit Options Buffers Tools IM-Python Python YASnippet Help

*Rescan*

```
# Decode Applanix POSPac SBET IMU binary files

def decode(data):
    'Decipher a SBET datagram from binary'
    print 'Data length:', len(data)

def main():
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()
```

-U:**- sbet.py All L10 [#,r] (Python yas)

```
#+BEGIN_SRC python
# Decode Applanix POSPac SBET IMU binary files

def decode(data):
    'Decipher a SBET datagram from binary'
    print 'Data length:', len(data)

def main():
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()

    print 'Read this many bytes:',len(sbet_data)

    decode(sbet_data)
```

--:--- 22-python-binary-files-part-2.org 47% L296 [#,r] (Org)

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[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu



By running “IM-Python” Rescan, it will know about our functions. Not quite completion, but helpful.

Applications Places System 12:02 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
      6
----> 7 setfrequency()
      8
      9

TypeError: setfrequency() takes exactly 1
WARNING: Failure executing file: <sonar.py

In [14]: run sonar
Setting frequency 12000

In [15]: run sonar
Setting frequency 24000 Hz

In [16]: run sonar
Setting frequency 15000 Hz

In [17]: run sonar
Setting frequency 3500 Hz

In [18]: run sonar
Setting frequency 3500 Hz name is R/V Supe

In [19]:
```

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File Edit Options Buffers Tools IM-Python Python YASnippet Help

*Rescan*
decode
main

```
# Decode Applanix POSPac SBET                les

def decode(data):
    'Decipher a SBET datagram from binary'
    print 'Data length:', len(data)

def main():
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()
```

-U:**- sbet.py All L10 [#,r] (Python yas)

```
#+BEGIN_SRC python
# Decode Applanix POSPac SBET IMU binary files

def decode(data):
    'Decipher a SBET datagram from binary'
    print 'Data length:', len(data)

def main():
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()

    print 'Read this many bytes:',len(sbet_data)

    decode(sbet_data)
```

--:--- 22-python-binary-files-part-2.org 47% L296 [#,r] (Org)

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[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:03 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
      6
----> 7 setfrequency()
      8
      9

TypeError: setfrequency() takes exactly 1
WARNING: Failure executing file: <sonar.py

In [14]: run sonar
Setting frequency 12000

In [15]: run sonar
Setting frequency 24000 Hz

In [16]: run sonar
Setting frequency 15000 Hz

In [17]: run sonar
Setting frequency 3500 Hz

In [18]: run sonar
Setting frequency 3500 Hz name is R/V Supe

In [19]:
```

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File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
# Decode Applanix POSPac SBET IMU binary files

def decode(data):
    'Decipher a SBET datagram from binary'
    print 'Data length:', len(data)

def main():
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()

    print 'Read this many bytes:', len(sbet_data)

    decode(sbet_data)

    print 'Fin
```

-U:**- sbet.py Top L16 [#,r] (Python yas)

```
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()

    print 'Read this many bytes:',len(sbet_data)

    decode(sbet_data)

    print 'Finishing main'
#+END_SRC

Open ~/class/22/sbet.py and put the above code into the file.

* Writing a decode method for an sbet data record

Get started on working with your sbet file in ipython
```

--:--- 22-python-binary-files-part-2.org 48% L304 [#,r] (Org)

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[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:03 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
      6
----> 7 setfrequency()
      8
      9

TypeError: setfrequency() takes exactly 1
WARNING: Failure executing file: <sonar.py

In [14]: run sonar
Setting frequency 12000

In [15]: run sonar
Setting frequency 24000 Hz

In [16]: run sonar
Setting frequency 15000 Hz

In [17]: run sonar
Setting frequency 3500 Hz

In [18]: run sonar
Setting frequency 3500 Hz name is R/V Supe

In [19]:
```

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File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
sbet_file = open('sample.sbet')
sbet_data = sbet_file.read()

print 'Read this many bytes:', len(sbet_data)

decode(sbet_data)

print 'Finish main'
```

-U:**- sbet.py Bot L9 [#,r] (Python yas)

```
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()

    print 'Read this many bytes:',len(sbet_data)

    decode(sbet_data)

    print 'Finishing main'
#+END_SRC

Open ~/class/22/sbet.py and put the above code into the file.

* Writing a decode method for an sbet data record

Get started on working with your sbet file in ipython
```

--:--- 22-python-binary-files-part-2.org 48% L304 [#,r] (Org)

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[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:04 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
In [15]: run sonar
Setting frequency 24000 Hz

In [16]: run sonar
Setting frequency 15000 Hz

In [17]: run sonar
Setting frequency 3500 Hz

In [18]: run sonar
Setting frequency 3500 Hz name is R/V Super Slow

In [19]: import sbet

In [20]: sbet.
sbet.__builtins__       sbet.__getattribute__   sbet.__reduce_ex__      sbet.main
sbet.__class__          sbet.__hash__           sbet.__repr__           sbet.py
sbet.__delattr__        sbet.__init__           sbet.__setattr__        sbet.pyc
sbet.__dict__           sbet.__name__           sbet.__sizeof__         sbet.py~
sbet.__doc__            sbet.__new__            sbet.__str__
sbet.__file__           sbet.__package__        sbet.__subclasshook__
sbet.__format__         sbet.__reduce__         sbet.decode

In [20]: sbet.
```

the file.

```
* Writing a decode method for an sbet data record

Get started on working with your sbet file in ipython

#+BEGIN_SRC python
import sbet
sbet.decode()

# remember that after you have done an import, you must use this to
# get updates
reload sbet
```

--:---  22-python-binary-files-part-2.org  49% L315  [#,r] (Org)----------

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[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:05 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
sbet.__format__         sbet.__reduce__         sbet.decode

In [20]: del sbet

In [21]: whos
Variable           Type        Data/Info
-------------------------------------
math               module      <module 'math' (built-in)>
my_sonar_freq      int         15000
numpy              module      <module 'numpy' from '/us<...>n2.7/numpy/__init__.pyc'>
sbet_data          str         [illegible]
sbet_file          file        <open file 'sample.sbet', mode 'r' at 0xa44c860>
setfrequency       function    <function setfrequency at 0xa463f0c>
sonar_freq_table   dict        {'knudsen': 3500, 'em122': 12000}
struct             module      <module 'struct' from '/u<...>ib/python2.7/struct.pyc'>

In [22]: sbet
sbet.py    sbet.pyc   sbet.py~   sbet_data  sbet_file

In [22]: sbet.
sbet.py    sbet.pyc   sbet.py~

In [22]: import sbet

In [23]: sbet.
```

the file.

```
* Writing a decode method for an sbet data record

Get started on working with your sbet file in ipython

#+BEGIN_SRC python
import sbet
sbet.decode()

# remember that after you have done an import, you must use this to
# get updates
reload sbet
```

--:---  22-python-binary-files-part-2.org  49% L315  [#,r] (Org)

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[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:05 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
In [22]: import sbet

In [23]: sbet.
sbet.__builtins__       sbet.__getattribute__   sbet.__reduce_ex__      sbet.main
sbet.__class__          sbet.__hash__           sbet.__repr__           sbet.py
sbet.__delattr__        sbet.__init__           sbet.__setattr__        sbet.pyc
sbet.__dict__           sbet.__name__           sbet.__sizeof__         sbet.py~
sbet.__doc__            sbet.__new__            sbet.__str__
sbet.__file__           sbet.__package__        sbet.__subclasshook__
sbet.__format__         sbet.__reduce__         sbet.decode

In [23]: sbet.decode()
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)

/home/researchtools/class/22/sonar.py in <module>()
----> 1
      2
      3
      4
      5

TypeError: decode() takes exactly 1 argument (0 given)

In [24]: sbet.decode(sbet_data)
```

the file.

```
* Writing a decode method for an sbet data record

Get started on working with your sbet file in ipython

#+BEGIN_SRC python
import sbet
sbet.decode()

# remember that after you have done an import, you must use this to
# get updates
reload sbet
```

--:---  22-python-binary-files-part-2.org  49% L315  [#,r] (Org)

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[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:06 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
TypeError

/home/researchtools/class/22/sonar.py in <
----> 1
      2
      3
      4
      5

TypeError: decode() takes exactly 1 argume

In [24]: sbet.decode(sbet_data)
Data length: 22712

In [25]: reload sbet
-------> reload(sbet)
Out[25]: <module 'sbet' from 'sbet.pyc'>

In [26]: sbet.main()
Starting main
Read this many bytes: 22712
Data length: 22712
Finish main

In [27]:
```

emacs23@ubuntu

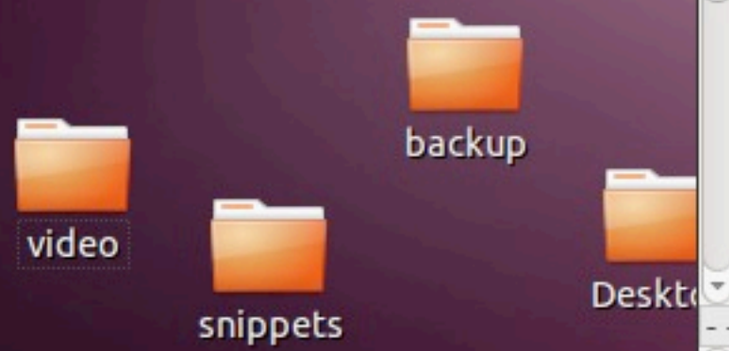
File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
def decode(data):
    'Decipher a SBET datagram from binary'
    print 'Data length:', len(data)

def main():
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()

    print 'Read this many bytes:', len(sbet_data)

    decode(sbet_data)

    print 'Finish main'
```

-U:**- sbet.py 13% L14 [#,r] (Python yas)

```
#+END_SRC

Try out the decode function.  If you run =whos=, you will see we have
an sbet_data variable in our workspace.

#+BEGIN_SRC python
sbet.decode(sbet_data)
# Data length: 22712
#+END_SRC

We can also call our main function:

#+BEGIN_SRC python
sbet.main()
# Starting main
# Read this many bytes: 22712
```

--:--- 22-python-binary-files-part-2.org 51% L334 [#,r] (Org)

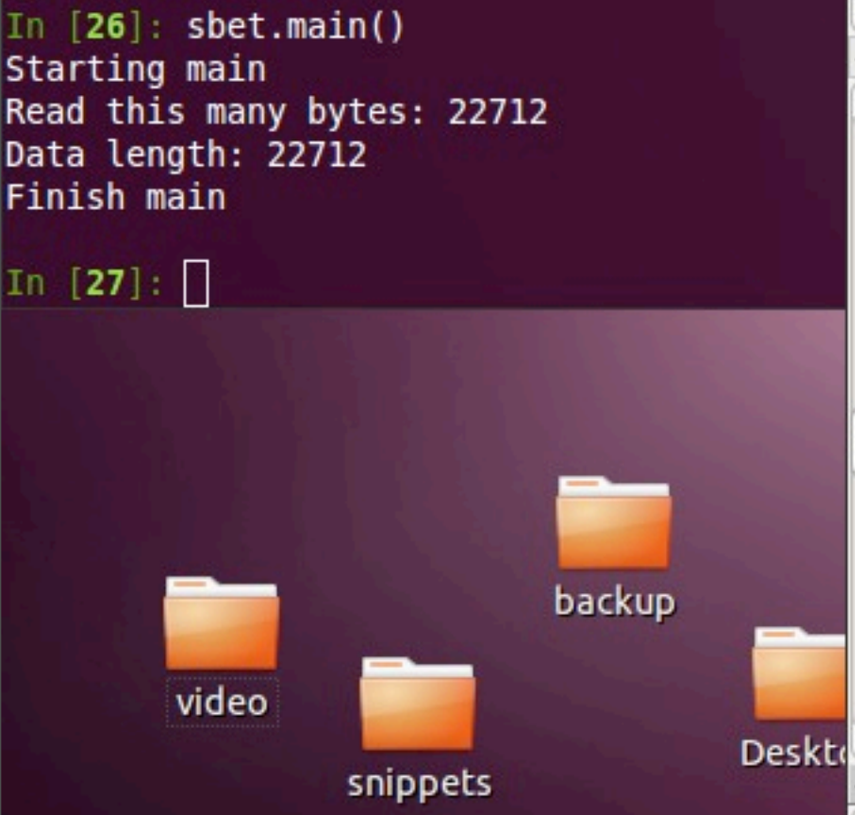



[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
TypeError

/home/researchtools/class/22/sonar.py in <
----> 1
      2
      3
      4
      5

TypeError: decode() takes exactly 1 argume

In [24]: sbet.decode(sbet_data)
Data length: 22712

In [25]: reload sbet
-------> reload(sbet)
Out[25]: <module 'sbet' from 'sbet.pyc'>

In [26]: sbet.main()
Starting main
Read this many bytes: 22712
Data length: 22712
Finish main

In [27]:
```




emacs23@ubuntu

File Edit Options Buffers Tools Org Tbl Help

```
# Decode Applanix POSPac SBET IMU binary files

import struct
import math

def decode(data):
    'Decipher a SBET datagram from binary'
    print 'Data length:', len(data)

def main():
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()

    print 'Read this many bytes:', len(sbet_data)
```

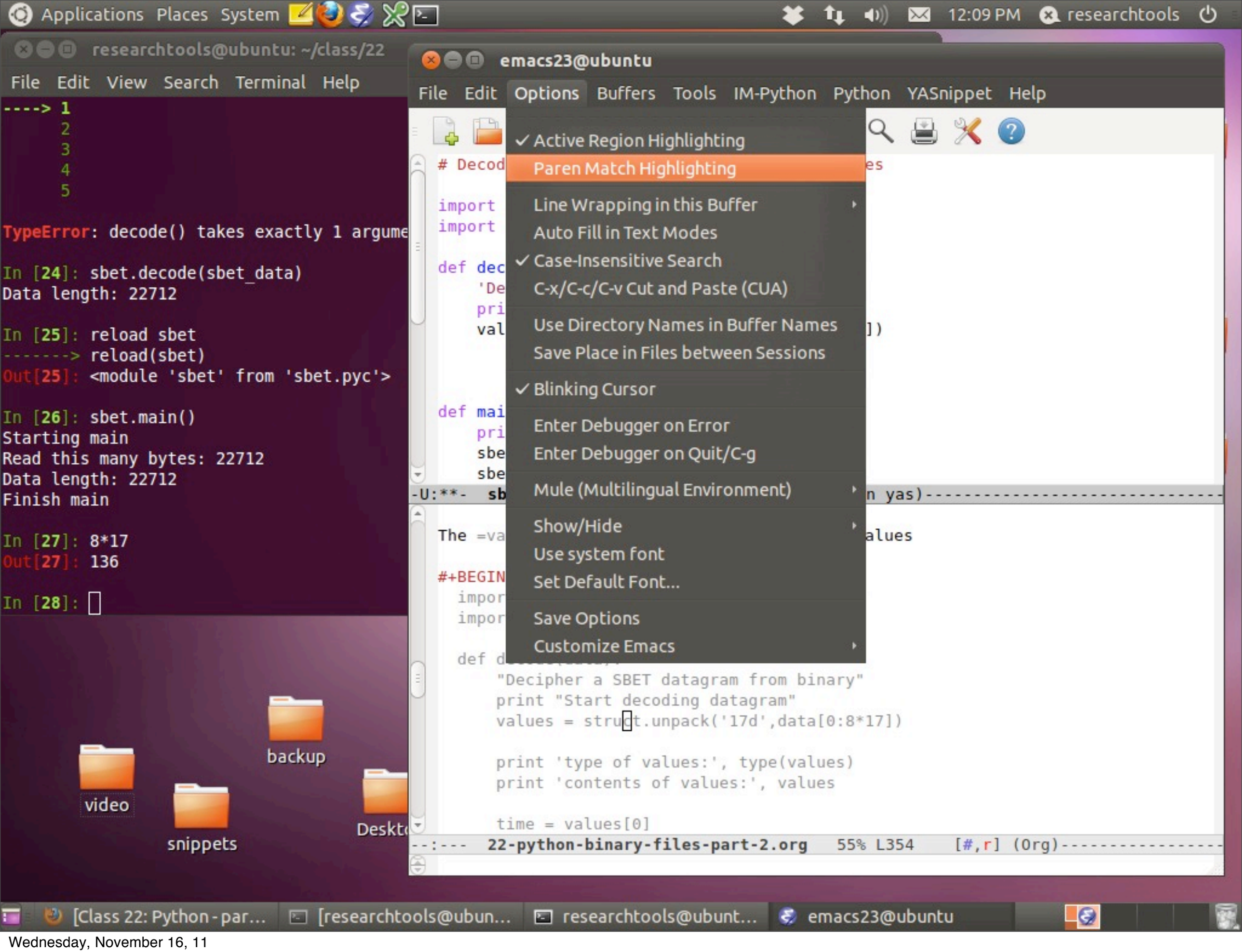
-U:--- sbet.py Top L5 [#,r] (Python yas)

The =values= variable will be a list of 17 values

```
#+BEGIN_SRC python
  import math
  import struct

  def decode(data):
      "Decipher a SBET datagram from binary"
      print "Start decoding datagram"
      values = struct.unpack('17d',data[0:8*17])

      print 'type of values:', type(values)
      print 'contents of values:', values

      time = values[0]
```

--:--- 22-python-binary-files-part-2.org 55% L354 [#,r] (Org)

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu






By default, “Paren Match Highlighting” was off. Here I turned it on.

Applications Places System 12:09 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
----> 1
      2
      3
      4
      5

TypeError: decode() takes exactly 1 argume

In [24]: sbet.decode(sbet_data)
Data length: 22712

In [25]: reload sbet
-------> reload(sbet)
Out[25]: <module 'sbet' from 'sbet.pyc'>

In [26]: sbet.main()
Starting main
Read this many bytes: 22712
Data length: 22712
Finish main

In [27]: 8*17
Out[27]: 136

In [28]:
```

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
# Decode Applanix POSPac SBET IMU binary files

import struct
import math

def decode(data):
    'Decipher a SBET datagram from binary'
    print 'Data length:', len(data)
    values = struct.unpack('17d',data[0:8*17])

    print 'type of values:', type(values)

def main():
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()
-U:**-  sbet.py        Top L11     [#,r] (Python yas)----------
```

The =values= variable will be a list of 17 values

```
#+BEGIN_SRC python
  import math
  import struct

  def decode(data):
      "Decipher a SBET datagram from binary"
      print "Start decoding datagram"
      values = struct.unpack('17d',data[0:8*17])

      print 'type of values:', type(values)
      print 'contents of values:', values

      time = values[0]
--:---  22-python-binary-files-part-2.org   55% L354    [#,r] (Org)----------
```

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[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:11 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
----> 1
      2
      3
      4
      5

TypeError: decode() takes exactly 1 argume

In [24]: sbet.decode(sbet_data)
Data length: 22712

In [25]: reload sbet
-------> reload(sbet)
Out[25]: <module 'sbet' from 'sbet.pyc'>

In [26]: sbet.main()
Starting main
Read this many bytes: 22712
Data length: 22712
Finish main

In [27]: 8*17
Out[27]: 136

In [28]:
```

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File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
# Decode Applanix POSPac SBET IMU binary files

import struct
import math

def decode(data):
    'Decipher a SBET datagram from binary'
    print 'Data length:', len(data)
    values = struct.unpack('17d',data[0:8*17])

    print 'type of values:', type(values)
    print 'contents of value:', values

    time = values[0]
    latitude = values[1]
    lat_deg = math.degrees(latitude
```

-U:**- sbet.py Top L16 [#,r] (Python yas)----------

```
def decode(data):
    "Decipher a SBET datagram from binary"
    print "Start decoding datagram"
    values = struct.unpack('17d',data[0:8*17])

    print 'type of values:', type(values)
    print 'contents of values:', values

    time = values[0]

    latitude = values[1]
    lat_deg = math.degrees(latitude)

    longitude = values[2]
    lon_deg = math.degrees(longitude)
```

--:--- 22-python-binary-files-part-2.org 55% L358 [#,r] (Org)----------

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Deskt

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

researchtools@ubuntu: ~/class/22

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```
Starting main
Read this many bytes: 22712
Data length: 22712
Finish main

In [27]: 8*17
Out[27]: 136

In [28]: reload sbet
-------> reload(sbet)
Out[28]: <module 'sbet' from 'sbet.py'>

In [29]: sbet.main()
Starting main
Read this many bytes: 22712
Data length: 22712
type of values: <type 'tuple'>
contents of value: (334959.0048233234, 1.6
15, 10.437825046453915, 0.998228318178983,
603057936824, -0.09985686530029529, -0.401
812, 0.07018300645653144, 0.021320176833622
results: 334959.004823 60.4443123064 -146.
Finish main

In [30]:
```

emacs23@ubuntu

File Edit Options Buffers Tools Org Tbl Help

```
    values = struct.unpack('17d',data[0:8*17])

    print 'type of values:', type(values)
    print 'contents of value:', values

    time = values[0]
    latitude = values[1]
    lat_deg = math.degrees(latitude)

    longitude = values[2]
    lon_deg = math.degrees(longitude)

    print 'results:', time, lat_deg, lon_deg

def main():
    print 'Starting main'
```

-U:--- sbet.py 24% L21 [#,r] (Python yas)

```
     longitude = values[2]
     lon_deg = math.degrees(longitude)

     print 'results:', time, lat_deg, lon_deg
#+END_SRC

We also would like to make this a run-able script from within ipython,
so add this to the end of sbet.py:

#+BEGIN_SRC python
if __name__=='__main__':
    print 'starting to run script...'
    main()
    print 'script done!'
#+END_SRC
```

--:--- 22-python-binary-files-part-2.org 57% L374 [#,r] (Org)

backup

video

snippets

Deskt

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:14 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
Starting main
Read this many bytes: 22712
Data length: 22712
Finish main

In [27]: 8*17
Out[27]: 136

In [28]: reload sbet
-------> reload(sbet)
Out[28]: <module 'sbet' from 'sbet.py'>

In [29]: sbet.main()
Starting main
Read this many bytes: 22712
Data length: 22712
type of values: <type 'tuple'>
contents of value: (334959.0048233234, 1.6
15, 10.437825046453915, 0.998228318178983,
603057936824, -0.09985686530029529, -0.401
812, 0.07018300645653144, 0.021320176833623
results: 334959.004823 60.4443123064 -146.
Finish main

In [30]:
```


emacs23@ubuntu

File Edit Options Buffers Tools Org Tbl Help

```
def main():
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()

    print 'Read this many bytes:', len(sbet_data)

    decode(sbet_data)

    print 'Finish main'
```

-U:--- sbet.py Bot L35 [#,r] (Python yas)

```
      longitude = values[2]
      lon_deg = math.degrees(longitude)

      print 'results:', time, lat_deg, lon_deg
#+END_SRC

We also would like to make this a run-able script from within ipython,
so add this to the end of sbet.py:

#+BEGIN_SRC python
if __name__=='__main__':
    print 'starting to run script...'
    main()
    print 'script done!'
#+END_SRC
```

--:--- 22-python-binary-files-part-2.org 57% L378 [#,r] (Org)

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:15 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

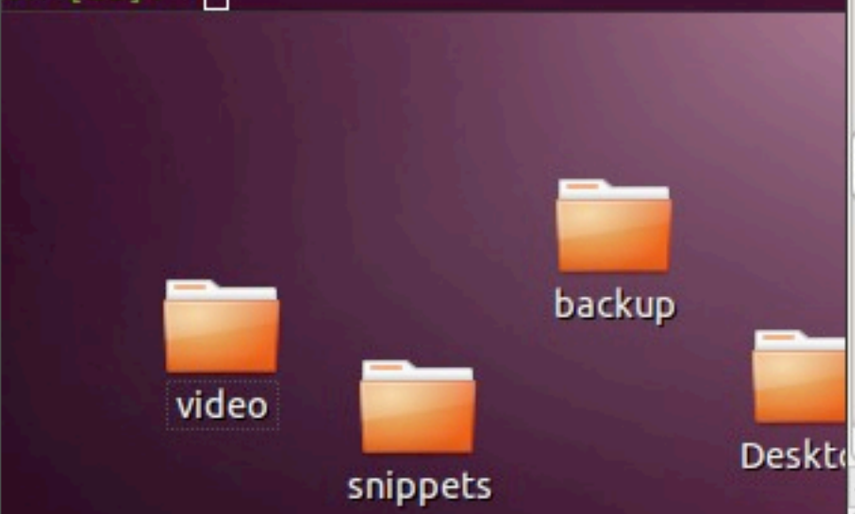
```
Starting main
Read this many bytes: 22712
Data length: 22712
Finish main

In [27]: 8*17
Out[27]: 136

In [28]: reload sbet
-------> reload(sbet)
Out[28]: <module 'sbet' from 'sbet.py'>

In [29]: sbet.main()
Starting main
Read this many bytes: 22712
Data length: 22712
type of values: <type 'tuple'>
contents of value: (334959.0048233234, 1.6
15, 10.437825046453915, 0.998228318178983,
603057936824, -0.09985686530029529, -0.401
812, 0.07018300645653144, 0.02132017683362
results: 334959.004823 60.4443123064 -146.
Finish main

In [30]: !
```




emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
    decode(sbet_data)

    print 'Finish main'


if __name__ == '__main__':
    print 'starting to run script...'
    main()
    print 'script done!'
```

-U:--- **sbet.py** Bot L40 [#,r] (Python yas)----------

```
so add this to the end of sbet.py:

#+BEGIN_SRC python
if __name__=='__main__':
    print 'starting to run script...'
    main()
    print 'script done!'
#+END_SRC

And add this as the very first line of sbet.py to make it run-able
from the bash shell:

#+BEGIN_SRC python
#!/usr/bin/env python
#+END_SRC
```

--:--- **22-python-binary-files-part-2.org** 58% L384 [#,r] (Org)----------

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
Starting main
Read this many bytes: 22712
Data length: 22712
Finish main

In [27]: 8*17
Out[27]: 136

In [28]: reload sbet
-------> reload(sbet)
Out[28]: <module 'sbet' from 'sbet.py'>

In [29]: sbet.main()
Starting main
Read this many bytes: 22712
Data length: 22712
type of values: <type 'tuple'>
contents of value: (334959.0048233234, 1.6
15, 10.437825046453915, 0.998228318178983,
603057936824, -0.09985686530029529, -0.401
812, 0.07018300645653144, 0.021320176833362
results: 334959.004823 60.4443123064 -146.
Finish main

In [30]: !
```

emacs23@ubuntu

File Edit Options Buffers Tools Org Tbl Help

```
#!/usr/bin/env python

# Decode Applanix POSPac SBET IMU binary files

import struct
import math

def decode(data):
    'Decipher a SBET datagram from binary'
    print 'Data length:', len(data)
    values = struct.unpack('17d',data[0:8*17])

    print 'type of values:', type(values)
    print 'contents of value:', values

    time = values[0]
```

-U:--- sbet.py Top L1 [#,r] (Python yas)----------

```
And add this as the very first line of sbet.py to make it run-able
from the bash shell:

#+BEGIN_SRC python
#!/usr/bin/env python
#+END_SRC

To complete making sbet.py work from the bash prompt, you need to set
the file as executable with chmod.  Remember that "!" tells ipython
that we want to run a shell command:

#+BEGIN_SRC python
!chmod +x sbet.py

ls -l sbet.py
```

--:--- 22-python-binary-files-part-2.org 59% L391 [#,r] (Org)----------

Applications Places System 12:16 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
-rw-r--r-- 1 researchtools researchtools 16722 2011-11-15 11:36 22-python-binary-files-part-2.o
rg
-rw-r--r-- 1 researchtools researchtools   754 2011-11-15 12:16 log-class-22.py
-rw-r--r-- 1 researchtools researchtools 22712 2011-11-15 11:37 sample.sbet
-rw-r--r-- 1 researchtools researchtools   869 2011-11-15 12:15 sbet.py
-rw-r--r-- 1 researchtools researchtools    48 2011-11-15 12:00 sbet.py~
-rw-r--r-- 1 researchtools researchtools   989 2011-11-15 12:12 sbet.pyc
-rw-r--r-- 1 researchtools researchtools   317 2011-11-15 11:56 sonar.py
-rw-r--r-- 1 researchtools researchtools    98 2011-11-15 11:46 sonar.py~

In [31]: !chmod +x sbet.py

In [32]: ls -l
total 68
-rw-r--r-- 1 researchtools researchtools 16722 2011-11-15 11:36 22-python-binary-files-part-2.o
rg
-rw-r--r-- 1 researchtools researchtools   778 2011-11-15 12:16 log-class-22.py
-rw-r--r-- 1 researchtools researchtools 22712 2011-11-15 11:37 sample.sbet
-rwxr-xr-x 1 researchtools researchtools   869 2011-11-15 12:15 sbet.py*
-rw-r--r-- 1 researchtools researchtools    48 2011-11-15 12:00 sbet.py~
-rw-r--r-- 1 researchtools researchtools   989 2011-11-15 12:12 sbet.pyc
-rw-r--r-- 1 researchtools researchtools   317 2011-11-15 11:56 sonar.py
-rw-r--r-- 1 researchtools researchtools    98 2011-11-15 11:46 sonar.py~

In [33]:
```

ke it run-able

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#!/usr/bin/env python
#+END_SRC

To complete making sbet.py work from the bash prompt, you need to set
the file as executable with chmod.  Remember that "!" tells ipython
that we want to run a shell command:

#+BEGIN_SRC python
!chmod +x sbet.py

ls -l sbet.py

--:---  22-python-binary-files-part-2.org   59% L391    [#,r] (Org)----------

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:20 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
-rw-r--r-- 1 researchtools researchtools 22712 2011-11-15 11:37 sample.sbet
-rwxr-xr-x 1 researchtools researchtools   869 2011-11-15 12:15 sbet.py*
-rw-r--r-- 1 researchtools researchtools    48 2011-11-15 12:00 sbet.py~
-rw-r--r-- 1 researchtools researchtools   989 2011-11-15 12:12 sbet.pyc
-rw-r--r-- 1 researchtools researchtools   317 2011-11-15 11:56 sonar.py
-rw-r--r-- 1 researchtools researchtools    98 2011-11-15 11:46 sonar.py~

In [33]: !sbet.py
sh: sbet.py: not found

In [34]: !./sbet.py
starting to run script...
Starting main
Read this many bytes: 22712
Data length: 22712
type of values: <type 'tuple'>
contents of value: (334959.0048233234, 1.0549522638507869, -2.559965741819528, 12.826300557342815, 10.437825046453915, 0.998228318178983, 0.18282804536664027, -0.0026283394812042344, 0.11416603057936824, -0.099856866530029529, -0.40154673926674145, -0.8249097558096672, -0.3413483211034812, 0.07018300645653144, 0.021320176833628756, 0.029000032024608147, -0.006807197876212325)
results: 334959.004823 60.4443123064 -146.675232704
Finish main
script done!

In [35]: run sb
```

11-15 08:00 sbet.py*

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Deskt

```
!sbet.py
# sh: sbet.py: not found

# Oops!  We need to tell bash where the program is located
!./sbet.py

# It should print out quite a bit here

# Or you can run it directly from ipython
run sbet
#+END_SRC
```

--:---  22-python-binary-files-part-2.org  62% L409  [#,r] (Org)

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:21 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
Data length: 22712
type of values: <type 'tuple'>
contents of value: (334959.0048233234, 1.0549522638507869, -2.559965741819528, 12.8263005573428
15, 10.437825046453915, 0.998228318178983, 0.18282804536664027, -0.0026283394812042344, 0.11416
603057936824, -0.099856866530029529, -0.40154673926674145, -0.8249097558096672, -0.3413483211034
812, 0.07018300645653144, 0.021320176833628756, 0.029000032024608147, -0.006807197876212325)
results: 334959.004823 60.4443123064 -146.675232704
Finish main
script done!

In [35]: run sbet.py
starting to run script...
Starting main
Read this many bytes: 22712
Data length: 22712
type of values: <type 'tuple'>
contents of value: (334959.0048233234, 1.0549522638507869, -2.559965741819528, 12.8263005573428
15, 10.437825046453915, 0.998228318178983, 0.18282804536664027, -0.0026283394812042344, 0.11416
603057936824, -0.099856866530029529, -0.40154673926674145, -0.8249097558096672, -0.3413483211034
812, 0.07018300645653144, 0.021320176833628756, 0.029000032024608147, -0.006807197876212325)
results: 334959.004823 60.4443123064 -146.675232704
Finish main
script done!

In [36]:
```

11-15 08:00 sbet.py*

backup

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snippets

Deskt

```
!sbet.py
# sh: sbet.py: not found

# Oops!  We need to tell bash where the program is located
!./sbet.py

# It should print out quite a bit here

# Or you can run it directly from ipython
run sbet
#+END_SRC
```

--:---  22-python-binary-files-part-2.org  62% L409  [#,r] (Org)

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:22 PM researchtools

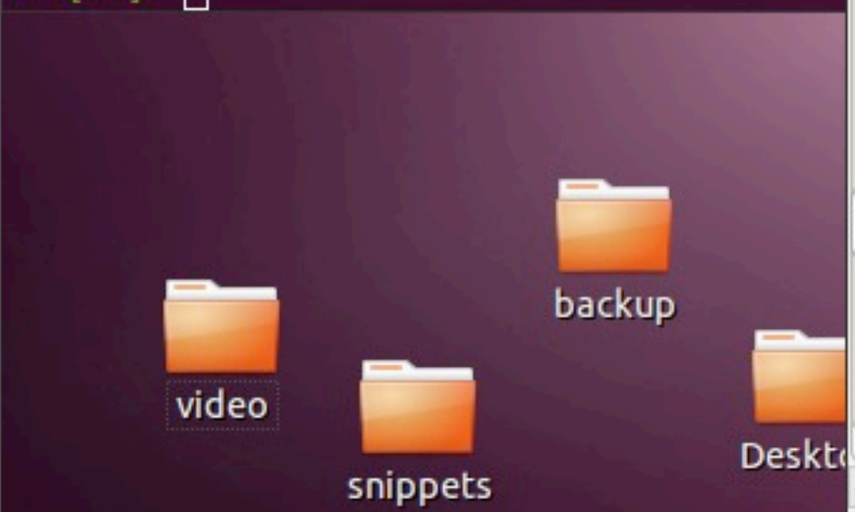
researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
Data length: 22712
type of values: <type 'tuple'>
contents of value: (334959.0048233234, 1.0
15, 10.437825046453915, 0.998228318178983,
603057936824, -0.09985686530029529, -0.401
812, 0.07018300645653144, 0.021320176833362
results: 334959.004823 60.4443123064 -146.
Finish main
script done!

In [35]: run sbet.py
starting to run script...
Starting main
Read this many bytes: 22712
Data length: 22712
type of values: <type 'tuple'>
contents of value: (334959.0048233234, 1.0
15, 10.437825046453915, 0.998228318178983,
603057936824, -0.09985686530029529, -0.401
812, 0.07018300645653144, 0.021320176833362
results: 334959.004823 60.4443123064 -146.
Finish main
script done!

In [36]:
```




emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

# Decode Applanix POSPac SBET IMU binary files

import struct
import math


field_names = ('time', 'latitude', 'longitude', 'altitude', \
          'x_vel', 'y_vel', 'z_vel', \
          'roll', 'pitch', 'platform_heading', 'wander_angle', \
          'x_acceleration', 'y_acceleration', 'z_acceleration', \
          'x_angular_rate', 'y_angular_rate', 'z_angular')

def decode(data):
```

-U:**- sbet.py Top L14 [#,r] (Python yas)

```
=decode= function with this decode

#+BEGIN_SRC python
field_names = ('time', 'latitude', 'longitude', 'altitude', \
          'x_vel', 'y_vel', 'z_vel', \
          'roll', 'pitch', 'platform_heading', 'wander_angle', \
          'x_acceleration', 'y_acceleration', 'z_acceleration', \
          'x_angular_rate', 'y_angular_rate', 'z_angular')

def decode(data):
    "Decipher a SBET datagram from binary"
    values = struct.unpack('17d',data[0:8*17])

    # Create a dictionary for all the values
    sbet_values = dict(zip (field_names, values))
```

--:--- 22-python-binary-files-part-2.org 69% L443 [#,r] (Org)

Mark set

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:23 PM researchtools

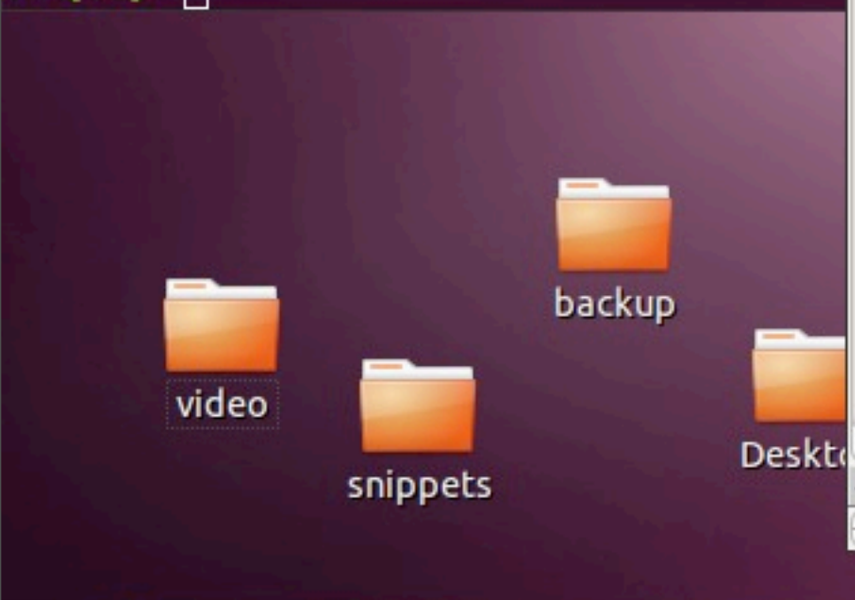
researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
Data length: 22712
type of values: <type 'tuple'>
contents of value: (334959.0048233234, 1.0
15, 10.437825046453915, 0.998228318178983,
603057936824, -0.09985686530029529, -0.401
812, 0.07018300645653144, 0.021320176833362
results: 334959.004823 60.4443123064 -146.
Finish main
script done!

In [35]: run sbet.py
starting to run script...
Starting main
Read this many bytes: 22712
Data length: 22712
type of values: <type 'tuple'>
contents of value: (334959.0048233234, 1.0
15, 10.437825046453915, 0.998228318178983,
603057936824, -0.09985686530029529, -0.401
812, 0.07018300645653144, 0.021320176833362
results: 334959.004823 60.4443123064 -146.
Finish main
script done!

In [36]:
```




emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
def decode(data):
    'Decipher a SBET datagram from binary'
    print 'Data length:', len(data)
    values = struct.unpack('17d',data[0:8*17])

    print 'type of values:', type(values)
    print 'contents of value:', values

    time = values[0]
    latitude = values[1]
    lat_deg = math.degrees(latitude)

    longitude = values[2]
    lon_deg = math.degrees(longitude)

    print 'results:', time, lat_deg, lon_deg

def main():
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()

    print 'Read this many bytes:', len(sbet_data)

    decode(sbet_data)

    print 'Finish main'


if __name__ == '__main__':
    print 'starting to run script...'
    main()
    print 'script done!'
```

-U:**- sbet.py 34% L32 [#,r] (Python yas)----------

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:26 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

```
Data length: 22712
results:
   x_acceleration -0.82490975581
   x_angular_rate 0.0213201768336
   platform_heading -0.0998568653003
   y_angular_rate 0.0290000320246
   pitch 0.114166030579
   altitude 12.8263005573
   z_vel 0.182828045367
   lat_deg 60.4443123064
   longitude -2.55996574182
   roll -0.0026283394812
   y_vel 0.998228318179
   y_acceleration -0.341348321103
   time 334959.004823
   latitude 1.05495226385
   lon_deg -146.675232704
   z_acceleration 0.0701830064565
   z_angular -0.00680719787621
   x_vel 10.4378250465
   wander_angle -0.401546739267
Finish main
script done!

In [37]:
```

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File Edit Options Buffers Tools Org Tbl Help

```
def decode(data):
    'Decipher a SBET datagram from binary'
    print 'Data length:', len(data)
    values = struct.unpack('17d',data[0:8*17])

    sbet_values = dict(zip (field_names, values))

    sbet_values['lat_deg'] = math.degrees(sbet_values['latitude'])
    sbet_values['lon_deg'] = math.degrees(sbet_values['longitude'])

    print 'results:'
    for key in sbet_values:
        print '   ', key, sbet_values[key]

def main():
```

-U:---  sbet.py  34% L29  [#,r] (Python yas)

```
    x_acceleration -0.82490975581
    x_angular_rate 0.0213201768336
    platform_heading -0.0998568653003
    y_angular_rate 0.0290000320246
    pitch 0.114166030579
    altitude 12.8263005573
    z_vel 0.182828045367
    lat_deg 60.4443123064
    longitude -2.55996574182
    roll -0.0026283394812
    y_vel 0.998228318179
    y_acceleration -0.341348321103
    time 334959.004823
    latitude 1.05495226385
    lon_deg -146.675232704
    z_acceleration 0.0701830064565
```

--:---  22-python-binary-files-part-2.org  75% L478  [#,r] (Org)

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Deskt

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:27 PM researchtools

researchtools@ubuntu: ~/class/22

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```
Finish main
script done!

In [37]: whos
Variable           Type        Data/Info
-------------------------------------
decode             function    <function d
field_names        tuple       ('time', 'l
main               function    <function m
math               module      <module 'ma
my_sonar_freq      int         15000
numpy              module      <module 'nu
sbet               module      <module 'sb
sbet_data          str         ?g??q??H
sbet_file          file        <open file
setfrequency       function    <function s
sonar_freq_table   dict        {'knudsen':
struct             module      <module 'st

In [38]: from pprint import pprint

In [39]: pprint(sonar_freq_table)
{'em122': 12000, 'knudsen': 3500}

In [40]:
```


emacs23@ubuntu

File Edit Options Buffers Tools Org Tbl Help

```
#!/usr/bin/env python

# Decode Applanix POSPac SBET IMU binary files

import struct
import math
from pprint import pprint

field_names = ('time', 'latitude', 'longitude', 'altitude', \
          'x_vel', 'y_vel', 'z_vel', \
          'roll', 'pitch', 'platform_heading', 'wander_angle', \
          'x_acceleration', 'y_acceleration', 'z_acceleration', \
          'x_angular_rate', 'y_angular_rate', 'z_angular')


def decode(data):
```

-U:--- sbet.py Top L7 [#,r] (Python yas)

```
from pprint import pprint
#+END_SRC

Now replace the print and for loop at the end of =decode= so that
decode looks like this with just a =return sbet_values=.

#+BEGIN_SRC python
def decode(data):
    "Decipher a SBET datagram from binary"
    values = struct.unpack('17d',data[0:8*17])

    # Create a dictionary for all the values
    sbet_values = dict(zip (field_names, values))

    sbet_values['lat_deg'] = math.degrees(sbet_values['latitude'])
    sbet_values['lon_deg'] = math.degrees(sbet_values['longitude'])
```

--:--- 22-python-binary-files-part-2.org 80% L499 [#,r] (Org)

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:28 PM researchtools

researchtools@ubuntu: ~/class/22

File Edit View Search Terminal Help

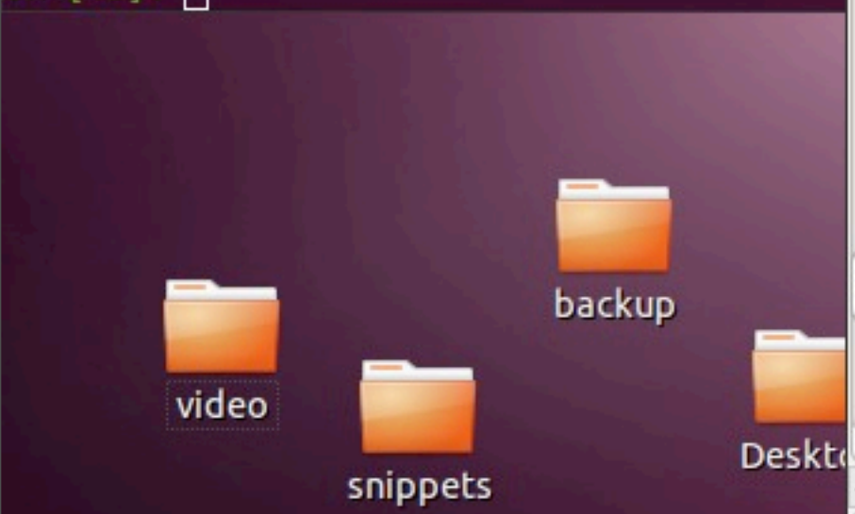
```
Finish main
script done!

In [37]: whos
Variable           Type        Data/Info
-------------------------------------
decode             function    <function d
field_names        tuple       ('time', 'l
main               function    <function m
math               module      <module 'ma
my_sonar_freq      int         15000
numpy              module      <module 'nu
sbet               module      <module 'sb
sbet_data          str         ?g??q??H
sbet_file          file        <open file
setfrequency       function    <function s
sonar_freq_table   dict        {'knudsen':
struct             module      <module 'st

In [38]: from pprint import pprint

In [39]: pprint(sonar_freq_table)
{'em122': 12000, 'knudsen': 3500}

In [40]:
```




emacs23@ubuntu

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```
    'Decipher a SBET datagram from binary'
    print 'Data length:', len(data)
    values = struct.unpack('17d',data[0:8*17])

    sbet_values = dict(zip (field_names, values))

    sbet_values['lat_deg'] = math.degrees(sbet_values['latitude'])
    sbet_values['lon_deg'] = math.degrees(sbet_values['longitude'])

    print 'results:'
    for key in sbet_values:
        print '  ', key, sbet_values[key]

def main():
    print 'Starting main'
    sbet_file = open('sample.sbet')
```

-U:---  **sbet.py**  37% L29  [#,r] (Python yas)

```
    "Decipher a SBET datagram from binary"
    values = struct.unpack('17d',data[0:8*17])

    # Create a dictionary for all the values
    sbet_values = dict(zip (field_names, values))

    sbet_values['lat_deg'] = math.degrees(sbet_values['latitude'])
    sbet_values['lon_deg'] = math.degrees(sbet_values['longitude'])

    return sbet_values  # Send the sbet_values dictionary back to the caller
#+END_SRC

Now the =main= function needs to handle the printing of the
dictionary.

#+BEGIN_SRC python
```

--:---  **22-python-binary-files-part-2.org**  81% L514  [#,r] (Org)

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

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researchtools@ubuntu: ~/class/22

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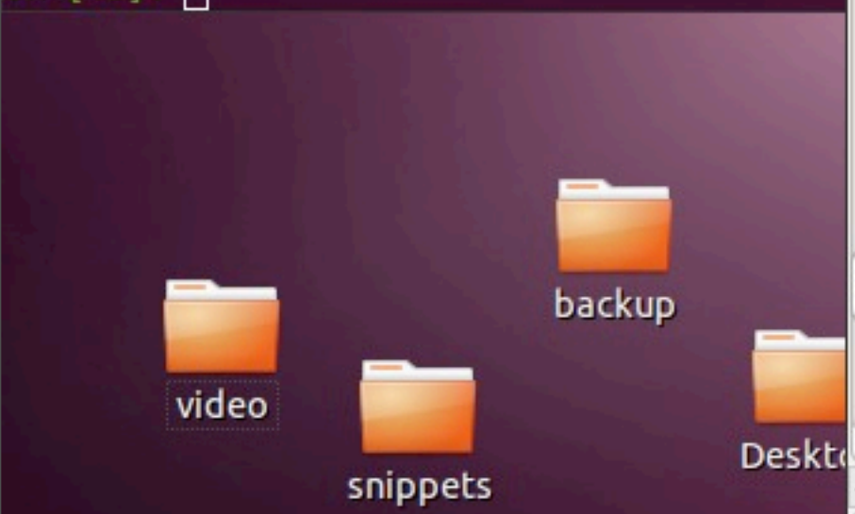
```
Finish main
script done!

In [37]: whos
Variable           Type        Data/Info
-------------------------------------
decode             function    <function d
field_names        tuple       ('time', 'l
main               function    <function m
math               module      <module 'ma
my_sonar_freq      int         15000
numpy              module      <module 'nu
sbet               module      <module 'sb
sbet_data          str         ?g??q?H
sbet_file          file        <open file
setfrequency       function    <function s
sonar_freq_table   dict        {'knudsen':
struct             module      <module 'st

In [38]: from pprint import pprint

In [39]: pprint(sonar_freq_table)
{'em122': 12000, 'knudsen': 3500}

In [40]:
```

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```
    'Decipher a SBET datagram from binary'
    print 'Data length:', len(data)
    values = struct.unpack('17d',data[0:8*17])

    sbet_values = dict(zip (field_names, values))

    sbet_values['lat_deg'] = math.degrees(sbet_values['latitude'])
    sbet_values['lon_deg'] = math.degrees(sbet_values['longitude'])

    return sbet_values

def main():
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()
```

-U:--- **sbet.py** 40% L26 [#,r] (Python yas)

```
    "Decipher a SBET datagram from binary"
    values = struct.unpack('17d',data[0:8*17])

    # Create a dictionary for all the values
    sbet_values = dict(zip (field_names, values))

    sbet_values['lat_deg'] = math.degrees(sbet_values['latitude'])
    sbet_values['lon_deg'] = math.degrees(sbet_values['longitude'])

    return sbet_values  # Send the sbet_values dictionary back to the caller
#+END_SRC

Now the =main= function needs to handle the printing of the
dictionary.

#+BEGIN_SRC python
```

--:--- **22-python-binary-files-part-2.org** 81% L514 [#,r] (Org)

Wrote /home/researchtools/class/22/sbet.py

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researchtools@ubuntu: ~/class/22

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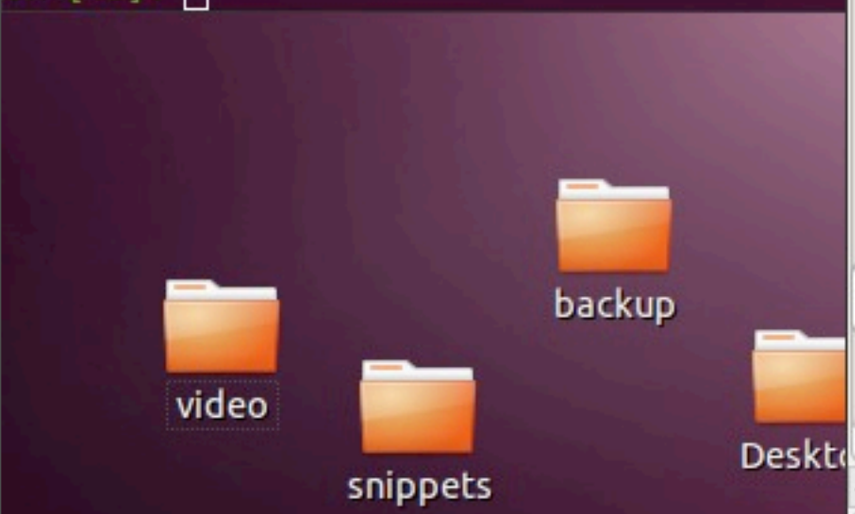
```
Finish main
script done!

In [37]: whos
Variable           Type        Data/Info
-------------------------------------
decode             function    <function d
field_names        tuple       ('time', 'l
main               function    <function m
math               module      <module 'ma
my_sonar_freq      int         15000
numpy              module      <module 'nu
sbet               module      <module 'sb
sbet_data          str         ?g??q?H
sbet_file          file        <open file
setfrequency       function    <function s
sonar_freq_table   dict        {'knudsen':
struct             module      <module 'st

In [38]: from pprint import pprint

In [39]: pprint(sonar_freq_table)
{'em122': 12000, 'knudsen': 3500}

In [40]:
```

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```
    return sbet_values

def main():
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()

    print 'Read this many bytes:', len(sbet_data)

    datagram = decode(sbet_data)
    pprint(datagram)

    print 'Finish main'
```

-U:--- **sbet.py** 66% L36 [#,r] (Python yas)

```
    return sbet_values  # Send the sbet_values dictionary back to the caller
#+END_SRC

Now the =main= function needs to handle the printing of the
dictionary.

#+BEGIN_SRC python
def main():
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()

    datagram = decode(sbet_data)
    pprint(datagram)  # Note that we are using pretty print, not print
#+END_SRC
```

--:--- **22-python-binary-files-part-2.org** 83% L525 [#,r] (Org)

Wrote /home/researchtools/class/22/sbet.py

[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu

Applications Places System 12:30 PM researchtools

researchtools@ubuntu: ~/class/22

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```
Read this many bytes: 22712
Data length: 22712
{'altitude': 12.826300557342815,
 'lat_deg': 60.444312306421736,
 'latitude': 1.0549522638507869,
 'lon_deg': -146.6752327043359,
 'longitude': -2.559965741819528,
 'pitch': 0.11416603057936824,
 'platform_heading': -0.09985686530029529,
 'roll': -0.0026283394812042344,
 'time': 334959.0048233234,
 'wander_angle': -0.40154673926674145,
 'x_acceleration': -0.8249097558096672,
 'x_angular_rate': 0.021320176833628756,
 'x_vel': 10.437825046453915,
 'y_acceleration': -0.3413483211034812,
 'y_angular_rate': 0.029000032024608147,
 'y_vel': 0.998228318178983,
 'z_acceleration': 0.07018300645653144,
 'z_angular': -0.006807197876212325,
 'z_vel': 0.182828045366640 27}
Finish main
script done!

In [41]:
```

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```
    return sbet_values

def main():
    print 'Starting main'
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()

    print 'Read this many bytes:', len(sbet_data)

    datagram = decode(sbet_data)
    pprint(datagram)

    print 'Finish main'
```

-U:--- **sbet.py** 66% L36 [#,r] (Python yas)

```
    return sbet_values  # Send the sbet_values dictionary back to the caller
#+END_SRC

Now the =main= function needs to handle the printing of the
dictionary.

#+BEGIN_SRC python
def main():
    sbet_file = open('sample.sbet')
    sbet_data = sbet_file.read()

    datagram = decode(sbet_data)
    pprint(datagram)  # Note that we are using pretty print, not print
#+END_SRC
```

--:--- **22-python-binary-files-part-2.org** 83% L525 [#,r] (Org)

Wrote /home/researchtools/class/22/sbet.py


[Class 22: Python - par... [researchtools@ubun... researchtools@ubunt... emacs23@ubuntu