BARTPy: Exposing the BART Library to Python

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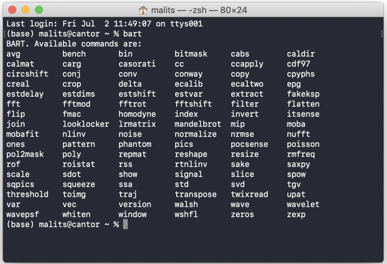
Introduction

- BART: High-Performance CLI Tools for Computational MRI
  - Command-Line Tools
  - Low-Level Libraries
- Extensive network of scientific Python libraries
- Exposed to Python, through a command-line wrapper



```
Last login: Fri Jul  2 11:49:07 on ttys001
(base) malits@cantor ~ % bart
BART. Available commands are:
avg         bench       bin         bitmask     cabs        caldir
calmat      carg        casorati    cc          ccapply     cdf97
circshift   conj        conv        conway      copy        cpyphs
creal       crop        delta       ecalib      ecaltwo     epg
estdelay    estdims     estshift    estvar      extract     fakeksp
fft         fftmod      fftrot      fftshift    filter      flatten
flip        fmac        homodyne    index       invert      itsense
join        looklocker  lrmatrix    mandelbrot  mip         moba
mobafit     nlinv       noise       normalize   nrmse       nufft
ones        pattern     phantom     pics        pocsense    poisson
pol2mask    poly        repmat      reshape     resize      rmfreq
rof         roistat     rss         rtnlinv     sake        saxpy
scale       sdot        show        signal      slice       spow
sqpics      squeeze     ssa         std         svd         tgv
threshold   toimg       traj        transpose   twixread    upat
var         vec         version     walsh       wave        wavelet
wavepsf     whiten      window      wshfl       zeros       zexp
(base) malits@cantor ~ %
```

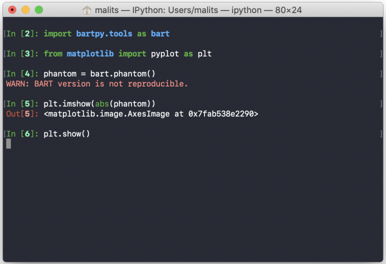
Figure 1: CLI Tools

Goals

- New Python interface, more intuitive
- Easily interoperable with Numpy, Scipy, etc.
- Minimal overhead (automated)
- Expose low-level libraries for developing tools in Python

Current Release

- Automated generation of functions for CLI tools
- For writing high-level recon pipelines in Python
- Low-level bindings in experimental phase

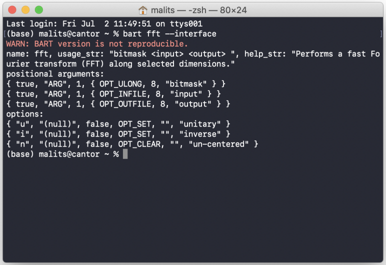


```
In [2]: import bartpy.tools as bart

In [3]: from matplotlib import pyplot as plt

In [4]: phantom = bart.phantom()
WARN: BART version is not reproducible.

In [5]: plt.imshow(abs(phantom))
Out[5]: <matplotlib.image.AxesImage at 0x7fab538e2290>

In [6]: plt.show()
```

Figure 2: Python Code Example

Requirements

- Latest release of BART from Github



```
Last login: Fri Jul  2 11:49:51 on ttys001
(base) malits@cantor ~ % bart fft --interface
WARN: BART version is not reproducible.
name: fft, usage_str: "bitmask <input> <output> ", help_str: "Performs a fast Fo
urier transform (FFT) along selected dimensions."
positional arguments:
{ true, "ARG", 1, { OPT_ULONG, 8, "bitmask" } }
{ true, "ARG", 1, { OPT_INFILE, 8, "input" } }
{ true, "ARG", 1, { OPT_OUTFILE, 8, "output" } }
options:
{ "u", "(null)", false, OPT_SET, "", "unitary" }
{ "i", "(null)", false, OPT_SET, "", "inverse" }
{ "n", "(null)", false, OPT_CLEAR, "", "un-centered" }
(base) malits@cantor ~ %
```

Figure 3: Interface feature

Looking to get Involved?

Seeking developers to help develop internal bindings and test existing code. Github repo (linked) has example code and a Developer guide for open-source developers looking to contribute.

- Testing
- Coverage
- Automation Tools (SWIG Typemaps)