How To Install and Run Modified ∂a∂i v1.6.3 (Tine *et al.* 2014)

This file describes how I installed Tine *et al.*'s modified version of ∂a∂i software on the BYU FSL supercomputing cluster marylou, and got it working, on April 15, 2017. Tine *et al.*'s modification of ∂a∂i permits models of heterogeneous migration between lineages, consistent with introgression of specific regions of the genome.

STEP #1. Download ∂a∂i mod distribution.

Tine *et al.*'s modification of ∂a∂i v1.6.3 is distributed in a "dadi-1.6.3_modif" folder containing the distro, which is available as part of a blog post (https://popgensealab.wordpress.com/dadi-inference/) at this SEA Lab website.
Go to the bottom of the blog post and then download the modified ∂a∂i archive from this link (https://drive.google.com/file/d/0B98ym7NN3PauMnUzcnpBa0E5OE0/view?usp=sharing).

STEP #2. Python virtual environment setup on supercomputer.

2a. Uninstall the modules if they're present, then reinstall `virtualenv` with conda and install `virtualenvwrapper` with `pip`:

```
$ pip uninstall virtualenv; # (y)
$ conda uninstall virtualenv; # (y)
$ pip uninstall virtualenvwrapper; # (y)
#
$ conda install virtualenv; # (y)
$ pip install virtualenvwrapper; # (y)
$ source ~/miniconda2/bin/virtualenvwrapper.sh
```

2b. Add the following lines to your `~/.bashrc` or `~/.bash_profile` script, source the script you just edited, then exit/close session and open a new session:

```
##--Added after installing Python package virtualenvwrapper (and virtualenv
dependency), per instructions at
##--URL: http://docs.python-guide.org/en/latest/dev/virtualenvs/
export WORKON_HOME=$HOME/.virtualenvs
export PROJECT_HOME=$HOME/Devel
source ~/miniconda2/bin/virtualenvwrapper.sh
```

Some other code from the developers/online, which I do not use and don't recommend, unless it exactly fits your needs, desires, and system. The following doesn't work for me because I don't want to use an "Envs" folder for my virtual environments, and I don't have admin privileges, so I don't have access to `/usr/local` or `/usr/local/bin` on BYU supercomputer.

```
WORKON_HOME="${WORKON_HOME}:~/Envs"
export WORKON_HOME
source /usr/local/bin/virtualenvwrapper.sh
```

NOTE: You may need to manually edit the final source line. So, before or after editing your bash file(s) as per above, first run a check to locate the corresponding shell script, e.g. by doing `$ find . -name "*virtualenvwrapper.sh" -type f` from within your working dir, or $HOME dir (preferred).

Check the virtual environment setup by attempting a virtualenv named "temp", as follows:

```
$ cd ~
$ mkvirtualenv temp
New python executable in /zhome/bagle004/.virtualenvs/temp/bin/python
copying /fslhome/bagle004/miniconda2/bin/python =>
/zhome/bagle004/.virtualenvs/temp/bin/python
copying /fslhome/bagle004/miniconda2/bin/../lib/libpython2.7.so.1.0 =>
/zhome/bagle004/.virtualenvs/temp/lib/libpython2.7.so.1.0
Installing setuptools, pip, wheel...done.
virtualenvwrapper.user_scripts creating
/fslhome/bagle004/.virtualenvs/temp/bin/predeactivate
virtualenvwrapper.user_scripts creating
/fslhome/bagle004/.virtualenvs/temp/bin/postdeactivate
virtualenvwrapper.user_scripts creating
/fslhome/bagle004/.virtualenvs/temp/bin/preactivate
virtualenvwrapper.user_scripts creating
/fslhome/bagle004/.virtualenvs/temp/bin/postactivate
virtualenvwrapper.user_scripts creating
/fslhome/bagle004/.virtualenvs/temp/bin/get_env_details
Error: deactivate must be sourced. Run 'source deactivate'
instead of 'deactivate'.

(temp) -bash-4.1$ source deactivate
(temp) -bash-4.1$ deactivate
```

STEP #3. Make dadi-mod virtual environment, and then check it.

Make the environment and populate it with relevant stuff.

```
-bash-4.1$ mkvirtualenv dadi-mod
New python executable in /zhome/bagle004/.virtualenvs/dadi-mod/bin/python
copying /fslhome/bagle004/miniconda2/bin/python =>
/zhome/bagle004/.virtualenvs/dadi-mod/bin/python
copying /fslhome/bagle004/miniconda2/bin/../lib/libpython2.7.so.1.0 =>
/zhome/bagle004/.virtualenvs/dadi-mod/lib/libpython2.7.so.1.0
Installing setuptools, pip, wheel...done.
virtualenvwrapper.user_scripts creating /fslhome/bagle004/.virtualenvs/dadi-
mod/bin/predeactivate
virtualenvwrapper.user_scripts creating /fslhome/bagle004/.virtualenvs/dadi-
mod/bin/postdeactivate
virtualenvwrapper.user_scripts creating /fslhome/bagle004/.virtualenvs/dadi-
mod/bin/preactivate
virtualenvwrapper.user_scripts creating /fslhome/bagle004/.virtualenvs/dadi-
mod/bin/postactivate
virtualenvwrapper.user_scripts creating /fslhome/bagle004/.virtualenvs/dadi-
mod/bin/get_env_details
Error: deactivate must be sourced. Run 'source deactivate'
instead of 'deactivate'.

(dadi-mod) -bash-4.1$
```

STEP #4. Install dadi-mod dependencies into dadi-mod virtual environment Python stash.

```
##--Check Python in the dadi-mod env, and you'll see that there's almost
nothing modules-wise:
(dadi-mod) -bash-4.1$ cd ~/.virtualenvs/dadi-mod/lib/python2.7/
(dadi-mod) -bash-4.1$ ls
#
##--Install SciPy and NumPy for the dadi-mod env:
(dadi-mod) -bash-4.1$ conda install scipy --prefix=~/.virtualenvs/dadi-mod/
(dadi-mod) -bash-4.1$ conda install numpy --prefix=~/.virtualenvs/dadi-mod/
```

Tests:

```
##--Check Python in the dadi-mod env again, and you'll see that now there's
LOTS of goodies in there!:
(dadi-mod) -bash-4.1$ cd ~/.virtualenvs/dadi-mod/lib/python2.7/
(dadi-mod) -bash-4.1$ ls
```

STEP #5. Install dadi-1.6.3-mod software from modified archive downloaded under STEP #1 *above*, and check it.

Do install with prefix:

```
(dadi-mod) -bash-4.1$ cd ~/compute/dadi-1.6.3_modif/; python setup.py install -
-user
```

Run tests script within the dadi-mod archive:

```
(dadi-mod) -bash-4.1$ cd ~/compute/dadi-1.6.3_modif/tests
(dadi-mod) -bash-4.1$ ls
admixture_test_manual.py  run_tests.py        test_Admixture.pyc
test_Optimization.py   test_phi1D.pyc    test_Spectrum.py
test_Tridiagonal.pyc
build                     test_2D_frozen1.fs  test_Freezing.py
test_Optimization.pyc  test_Results.py   test_Spectrum.pyc
IM.fs                     test_Admixture.py   test_Freezing.pyc   test_phi1D.py
test_Results.pyc  test_Tridiagonal.py
(dadi-mod) -bash-4.1$ python run_tests.py
```

Open Python and make sure everything imports correctly:

```
(dadi-mod) -bash-4.1$ python
Python 2.7.13 |Continuum Analytics, Inc.| (default, Dec 20 2016, 23:09:15)
[GCC 4.4.7 20120313 (Red Hat 4.4.7-1)] on linux2
Type "help", "copyright", "credits" or "license" for more information.
Anaconda is brought to you by Continuum Analytics.
Please check out: http://continuum.io/thanks and https://anaconda.org
>>> import numpy
>>> import scipy
>>> import dadi
>>> exit()
```

STEP #6. Now you're ready to run heterogeneous migration models in ∂a∂i!