mtspec

Multitaper Spectral Estimation

mtspec is a Python wrapper for the Multitaper Spectrum Estimation Library by Germán Prieto. The relevant publication is

```
Prieto, G. A., R. L. Parker, F. L. Vernon. (2009),
A Fortran 90 library for multitaper spectrum analysis,
Computers and Geosciences, 35, pp. 1701-1710.
doi:10.1016/j.cageo.2008.06.007
```

It enables you to calculate Slepian windows, perform multitaper spectral estimations with various options, calculate Wigner-Ville time-frequency distributions, and construct coherence spectra with multitapers.

It currently wraps version 3.1 of the library. This is mainly due to later versions using FFTW which would introduce an additional dependency.

If you use the Python wrapper please consider citing it as (http://doi.org/10.5281/zenodo.321789)

```
Lion Krischer. (2016). mtspec Python wrappers 0.3.2 [Data set].
Zenodo.
doi:10.5281/zenodo.321789
```

Getting Started and Documentation

To get started, please have a look at the tutorial.

- Tutorial

Installation

Easy Way

The simplest way to install `mtspec` is to download (Ana)conda, install it, and run:

```
$ conda config --add channels conda-forge
$ conda install mtspec
```

This will take care of everything and you can stop reading here. The rest of the installation instructions are for custom installations.

Requirements

mtspec currently runs on Linux and Mac OS X. Adding support for Windows is mainly a question of compiling the shared Fortran libraries - pull requests are welcome.

- `gfortran >= 4.7`
- `Python 2.7, 3.3, 3.4, or 3.5`
- `NumPy >= 1.7`

Fortran Compiler

If you don't have `gfortran`, please install it (on Linux) with

```
$ sudo apt-get install gfortran
```

or the equivalent of your distribution. On OSX we recommend to install Homebrew and then use it to install `gfortran`:

```
$ brew install gcc
```

On Windows, you'll have download and install TDM-GCC after you've installed Anaconda and before you install mtspec. Don't forget to mark the *fortran* option in the "gcc" part of the installation.

Python and Dependencies

If you know what you are doing, just make sure the aforementioned dependencies are installed. Otherwise do yourself a favor and download the Anaconda Python distribution. It is a free scientific Python distribution bundling almost all necessary modules with a convenient installer (does not require root access!). Once installed assert that `pip` and `conda` point to the Anaconda installation folder (you may need to open a new terminal after installing Anaconda). Then install **mtspec**'s dependencies with

```
$ conda install numpy pip
```

Installing mtspec

For normal usage just install **mtspec** with

User Installation

```
$ pip install mtspec
```

Developer Installation

If you want the bleeding edge version or intend to edit **mtspec**'s code, clone the git repository and install in an editable fashion:

```
$ git clone https://github.com/krischer/mtspec.git
$ cd mtspec
$ pip install -v -e .
```

Testing

To assert that your installation is working properly, execute

```
$ python -m mtspec.tests
```

and make sure all tests pass. Otherwise please contact the developers.

If you intend to develop for `mtspec`, please also install `flake8>=3` - the tests will then also include code formatting checks.

Build the Documentation

The documentation requires `sphinx` and the Alabaster theme. Install both with

```
$ pip install sphinx alabaster
```

Build the doc with

```
$ cd doc
$ make html
```

Finally open the `doc/html_doc/index.html` file with the browser of your choice.

Additional Notes

In case you get the error message `"Internal Error: printf is broken"`, you can use the following workaround:

```
export LC_ALL=C
python script.py
```

This is a known `gfortran` bug, see here for an explanation.

API Doc

- mtspec.dpss
- mtspec.mtspec
- mtspec.sine_psd
- mtspec.mt_coherence
- mtspec.mt_deconvolve
- mtspec.wigner_ville_spectrum
- mtspec.util