
pymdptoolbox Documentation

Release stable

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1	Features	3
2	Documentation	5
3	Installation	7
4	Quick Use	9
5	Contribute	11
6	Support	13
7	License	15

The MDP toolbox provides classes and functions for the resolution of discrete-time Markov Decision Processes. The list of algorithms that have been implemented includes backwards induction, linear programming, policy iteration, q-learning and value iteration along with several variations.

The classes and functions were developed based on the [MATLAB MDP toolbox](#) by the [Biometry and Artificial Intelligence Unit](#) of [INRA Toulouse](#) (France). There are editions available for MATLAB, GNU Octave, Scilab and R. The suite of MDP toolboxes are described in Chades I, Chapron G, Cros M-J, Garcia F & Sabbadin R (2014) ‘MDPtoolbox: a multi-platform toolbox to solve stochastic dynamic programming problems’, *Ecography*, vol. 37, no. 9, pp. 916–920, doi [10.1111/ecog.00888](https://doi.org/10.1111/ecog.00888).

Features

- Eight MDP algorithms implemented
- Fast array manipulation using [NumPy](#)
- Full sparse matrix support using [SciPy's sparse package](#)
- Optional linear programming support using [cvxopt](#)

Documentation

Documentation is available as docstrings in the module code.

Installation

NumPy and SciPy must be on your system to use of this toolbox. Please have a look at their documentation to get them installed. If you are installing onto Ubuntu or Debian and using Python 2 then this will pull in all the dependencies:

```
sudo apt-get install python-numpy python-scipy python-cvxopt
```

On the other hand, if you are using Python 3 then cvxopt will have to be compiled (pip will do it automatically). To get NumPy, SciPy and all the dependencies to have a fully featured cvxopt then run:

```
sudo apt-get install python3-numpy python3-scipy liblapack-dev  
libatlas-base-dev libgsl0-dev fftw-dev libglpk-dev libdsdp-dev
```

I recommend using [pip](#) to install the toolbox if you have it available. Just type

```
pip install pymdptoolbox
```

at the console and it should take care of downloading and installing everything for you. If you also want cvxopt to be automatically downloaded and installed so that you can solve MDPs using linear programming then type:

```
pip install "pymdptoolbox[LP]"
```

If you want it to be installed just for you rather than system wide then do

```
pip install --user pymdptoolbox
```

Otherwise, you can download the package manually from the web

1. Download the latest stable release from <https://pypi.python.org/pypi/pymdptoolbox> or clone the Git repository

```
git clone https://github.com/sawcordwell/pymdptoolbox.git
```

2. If you downloaded the *.zip or *.tar.gz archive, then extract it

```
tar -xzf pymdptoolbox-<VERSION>.tar.gz
```

```
unzip pymdptoolbox-<VERSION>
```

3. Change to the PyMDPtoolbox directory

```
cd pymdptoolbox
```

4. Install via Setuptools, either to the root filesystem or to your home directory if you don't have administrative access.

```
python setup.py install
```

```
python setup.py install --user
```

Read the [Setuptools documentation](#) for more advanced information.

Quick Use

Start Python in your favourite way. The following example shows you how to import the module, set up an example Markov decision problem using a discount value of 0.9, solve it using the value iteration algorithm, and then check the optimal policy.

```
import mdptoolbox.example
P, R = mdptoolbox.example.forest()
vi = mdptoolbox.mdp.ValueIteration(P, R, 0.9)
vi.run()
vi.policy # result is (0, 0, 0)
```

Contribute

Issue Tracker: <https://github.com/sawcordwell/pymdptoolbox/issues>

Source Code: <https://github.com/sawcordwell/pymdptoolbox>

Support

Use the issue tracker.

License

The project is licensed under the BSD license. See `LICENSE.txt` for details.