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## AIC/RL — Part IV — Function Approximation

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### PyBrain

Throughout the rest of this course, we will be using the PyBrain library. Please download and install it on your computer: <http://pybrain.org/pages/download>

There is a tutorial on how to do reinforcement learning in PyBrain: <http://pybrain.org/docs/tutorial/reinforcement-learning.html>. The corresponding file, which you can run, can be found in the installation here: `pybrain/docs/tutorials/rl.py`

Most of the code that is relevant to you can be found in the directory `pybrain/rl/`. It contains the following directories:

`environments/` Contains the definition of environments, as before.

`agents/` Contains the definition of agents, as before. Although we implemented the rules for learning and exploration directly in an agent before, in PyBrain these are separated out as separate classes called `Learner` and `Explorer`. These are contained in separate directories, see below.

`explorers/` This directory contains different classes for performing exploration for an agent, for instance in the class `EpsilonGreedyExplorer` in the module `egreedy.py`.

`learners/` This directory contains different classes for learning, for instance, values. For instance,  $Q$ -learning is implemented in the class `Q` in the module `q.py`.

`experiments/` Contains code for running experiments. Before, this code was put in the file `experiment_episodic.py`. Here, you will find the function `doEpisodes`, as before.

### Test your agents!

To test the agents you have coded on different environments, replace the agent in the tutorial with your own agent. See if it works.

## Linear Function Approximation

The next step is to apply an agent that uses linear function approximation to estimate the  $Q$ -values on a continuous problem. Luckily, such an agent already exists in PuBrain. Please see the following modules and classes:

```
agents/linearfa.py
    class LinearFA_Agent(LoggingAgent)
learners/valuebased.py
    class ValueBasedLearner(ExploringLearner, DataSetLearner, EpisodicLearner)
learners/linearfa.py
    class LinearFALearner(ValueBasedLearner)
    class Q_LinFA(LinearFALearner)
```

Copy the file `tutorial/rl.py`, select a continuous problem (for instance `BalanceTask` in `environments/cartpole/balancetask.py` or `MountainCar` in `environments/classic/mountaincar.py`), and solve it with the linear FA agent.