

Code instructions for “Bayesian Probabilistic Numerical Methods for Industrial Process Monitoring”

This document describes how to install and run code for the paper *Bayesian Probabilistic Numerical Methods for Industrial Process Monitoring*.

Dependencies:

- eigen \geq 3.3
- cmake \geq 3.7
- gcc \geq 6.3
- python == 2.7.10
- Python libraries:
 - pip
 - numpy
 - scipy
 - sympy
 - matplotlib
 - cython
 - pandas
 - autograd
 - jupyter
 - eigency

Installation instructions:

1. Ensure the correct versions of gcc are in the CC and CXX environment variables:

```
export CC=gcc-6
export CXX=g++-6
```
2. Install bayesian_eit:

```

cd bayesian_eit/cpp
mkdir build
cd build
cmake ..
make
cd ../../python
python setup.py install

```

NB on any errors the `build` directory may need to be removed and re-added.

3. Install `bayesian_pdes`

```

cd bayesian_pdes
python setup.py install

```

4. Install `mcmc`

```

cd mcmc
python setup.py install

```

Bash commands

The following commands should install all the required dependencies and all of the required custom packages on a linux system. This was tested on Ubuntu 17.04.

```

apt install libeigen3-dev cmake gcc-6 python python-pip
export CC=gcc-6
export CXX=g++-6
sudo pip install virtualenv virtualenvwrapper
source /usr/local/bin/virtualenvwrapper.sh
mkvirtualenv hydrocyclone
pip install numpy scipy sympy matplotlib cython pandas autograd jupyter eigency
./build.sh

```

Running

Start a `jupyter notebook` session from `hydrocyclone_code/notebooks`:

```

cd hydrocyclone_code/notebooks
jupyter notebook

```

A browser page should open containing the list of notebooks; if not open a browser and navigate to `localhost:8888`.

There are two principal notebooks which contain code to run the experiments:

- `Hydrocyclone_Static_EIT` (Section 3.2.1)

- Hydrocyclone_Temporal_Recovery (Section 3.2.2)

The other notebooks generate the figures displayed in the paper. In each notebook the cell which contains parameters which must be modified in order to produce output is near the top of the notebook, headed with the command `%%capture_cell params`. To run a notebook, modify the parameters in this cell and then click `Cell > Run All`.

Note that there is a parameter in `Hydrocyclone_Temporal_Recovery` called `n_threads` which you should set according to your machine. If set to be higher than the number of cores on your machine this can cause considerable instability.