

Evolutionary Computation Competition 2019

OpenMDAO & WISDEM Installation Manual

[Revision Date 1: 2019/09/05 English Version]

Recommended Environment

- OS
 - Linux (Ubuntu, etc.) is recommended for easy installation of required packages.
 - For Windows 10, WSL (Windows subsystem for Linux) that can run Linux (such as Ubuntu) in Windows is convenient.

Initial Installation

1. Preparing the environment

- a. Make Python 2.7 available
- b. Install virtualenv (requires --user)

```
pip install virtualenv --user
```

- c. Create a directory for this competition, and move there ($\{\text{root}\}$ and below)
- d. Create virtual environment

```
virtualenv -p python2.7 jpnsecCompetition2019
```

- e. Enable virtual environment

```
source jpnsecCompetition2019/bin/activate
```

- f. Install required packages (--user is not necessary)

```
pip install numpy scipy==0.17.1 algopy matplotlib pandas
```

- g. (The following packages must be installed on the system (for Ubuntu 16.04 (requires administrator privileges)).)

```
apt install gfortran gcc python-dev python-tk git swig liblapack-dev
```

2. Installation of OpenMDAO (version 0.10.3.2)

- a. Move to $\{\text{root}\}$
- b. Download the installation script from the OpenMDAO site

```
http://openmdao.org/downloads/archive/
```

- File: go-openmdao-0.10.3.2.py
- c. Run the installation script to install
- python go-openmdao-0.10.3.2.py
- d. (The following manual may also be helpful)
- http://openmdao.org/releases/misc/OpenMDAO_Linux_Install_Without_Admin_v3.pdf

3. Various installations of WISDEM

- a. Create a working directory under $\{\text{root}\}$ and move to that directory (assuming $\{\text{root}\}/\{\text{wisdom}\}$)
- b. Download and compile the necessary files
 - i. akima

```
git clone https://github.com/WISDEM/akima.git
cd akima
git checkout 65c7c9be2b09170befe769bc26c0de2792139ad8
python setup.py develop
cd ../
```

- ii. AirfoilPreppy

```
git clone https://github.com/WISDEM/AirfoilPreppy.git
cd AirfoilPreppy
git checkout 875093ed28ff418f22e1daba952472c932f9eb0d
python setup.py develop
cd ../
```

- iii. CCBlade

```
git clone https://github.com/WISDEM/CCBlade.git
cd CCBlade
git checkout 9654caa9c256dffa1984c09c8c67e6d0849123c3
python setup.py develop
cd ../
```

- iv. CommonSE

```
git clone https://github.com/WISDEM/CommonSE.git
cd CommonSE
git checkout bb573cdc1be7a064c03ac446eb409ca683967657
python setup.py develop
cd ../
```

- v. DriveSE

```
git clone https://github.com/WISDEM/DriveSE.git
cd DriveSE
git checkout f4f69c2fdb035e11f297e57ba9ac21556c5b11ec
python setup.py develop
cd ../
```

- vi. FloatingSE

```
git clone https://github.com/WISDEM/FloatingSE.git
cd FloatingSE
git checkout f13e0f38a7742ea00a8f446a9ebf505dcf7acd42
python setup.py develop
cd ../
```

- vii. OffshoreBOS

```
git clone https://github.com/WISDEM/OffshoreBOS.git
cd OffshoreBOS
git checkout 8a5068fcee5e79785c50265d4dbb6d8c1fe801bf
python setup.py develop
cd ../
```

viii. Plant_FinanceSE

```
git clone https://github.com/WISDEM/Plant_FinanceSE.git
cd Plant_FinanceSE
git checkout 8832c7b391e10fe9fc6a9139ea7e5fa17bb0d41f
python setup.py develop
cd ../
```

ix. RotorSE

```
git clone https://github.com/WISDEM/RotorSE.git
cd RotorSE
git checkout f044cc78f07cc5a8bafa8e5eadbf43faa70d9293
python setup.py build_ext --inplace
python setup.py develop
cd ../
```

x. TowerSE

```
git clone https://github.com/WISDEM/TowerSE.git
cd TowerSE
git checkout b12faec307a3e08b9a3ef251a93ca4e43036f4b4
python setup.py develop
cd ../
```

xi. Turbine_CostsSE

```
git clone https://github.com/WISDEM/Turbine_CostsSE.git
cd Turbine_CostsSE
git checkout bfb9f46340635cf5bcf38f4852f2f0e05b55153
python setup.py develop
cd ../
```

xii. NREL_CSM

```
git clone https://github.com/WISDEM/NREL_CSM.git
cd NREL_CSM
git checkout 94efc65a18659976f537b2c64ba126c36113ddf9
python setup.py develop
cd ../
```

xiii. pyoptsparse

```
git clone https://github.com/mdolab/pyoptsparse.git
cd pyoptsparse
git checkout c7c1f5af3814bc481303ffed980f4c3ad6be10a1
python setup.py install
cd ../
```

xiv. WISDEM

```
git clone https://github.com/WISDEM/WISDEM.git
cd WISDEM
git checkout aa3d679928aa5a93618cb8a60d5827db47ba6e76
python setup.py develop
cd ../
```

xv. pBeam

```
git clone https://github.com/WISDEM/pBeam.git
cd pBeam
git checkout 6e8d5169699da5c129d6728b0dd5207a53f07d53
python setup.py develop
cd ../
```

xvi. pyFrame3DD

```
git clone https://github.com/WISDEM/pyFrame3DD.git
cd pyFrame3DD
git checkout 680a8ba1b00b45ad6f76a76374f2b83cfb3c56df
python setup.py develop
cd ../
```

xvii. pyMAP

```
git clone https://github.com/WISDEM/pyMAP.git
cd pyMAP
git checkout d63dd3882dcfb3d2d3b89bde56ba19d6fc88cb10
python setup.py develop
cd ../
```

xviii. DriveWPACT

```
git clone https://github.com/WISDEM/DriveWPACT.git
cd DriveWPACT
git checkout d872163b9929ce54d7cec3814c3101809d2201b4
python setup.py develop
cd ../
```

xix. Plant_CostsSE

```
git clone https://github.com/WISDEM/Plant_CostsSE.git
cd Plant_CostsSE
git checkout c93c99fbb23a92c7222f15259bd3e204fb323407
python setup.py develop
cd ../
```

xx. Plant_EnergySE

```
git clone https://github.com/WISDEM/Plant_EnergySE.git
cd Plant_EnergySE
git checkout 5ca898bf65b63fd1a87a40241591866f5f0b185a
python setup.py develop
cd ../
```

4. Installation of Fusedwind

- a. Move to $\{\text{root}\}$
- b. Download and compile the necessary files

```
git clone https://github.com/FUSED-Wind/fusedwind.git
cd fusedwind
python setup.py develop
cd ../
```

5. Installation of dummy packages

- a. Move to $\{\text{root}\}$
- b. Download dummies from Evolution Computing Competition 2019 site, unzip, and place under $\{\text{root}\}$
- c. Installation

```
cd dummies
python setup.py install
cd ../
```

6. Testing the installation

- a. Go to `${root}/wisdem/WISDEM/src/wisdem/Icoe`
- b. Run the sample script with the following command

```
python lcoe se assembly.py
```

- c. Check if the result is as follows. If they match, the installation is successful.

```
Key Turbine Outputs for NREL 5 MW Reference Turbine
mass rotor blades:54674.80 (kg)
mass hub system: 0.00 (kg)
mass nacelle: 230085.68 (kg)
mass tower: 348828.03 (kg)
maximum tip deflection: 10.37 (m)
ground clearance: 28.47 (m)
```

```
Key Plant Outputs for wind plant with NREL 5 MW Turbine
COE: $0.0807 USD/kWh
```

```
AEP per turbine: 15050698.6 kWh/turbine
Turbine Cost: $8491454.51 USD
BOS costs per turbine: $3084430.38 USD/turbine
OPEX per turbine: $192127.10 USD/turbine
```

- d. If the script does not take effect, see the error message, download the necessary package as appropriate, and execute the `python setup.py...` command for the relevant package again. If you are not sure, please contact us at the website of Evolution Computing Symposium Competition 2019.

After Initial Installation

1. Required every time you start your terminal

- a. Go to `${root}`
- b. Enable the virtual environment

```
source jpnsecCompetition2019/bin/activate
```