Sandia National Laboratories

Test Cases for the Plasma System

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Part of the Code Documentation for Neural Networks for Reduced Order Modeling (ROMNet)

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A Plasma System Test Case

Generating Data

Run the Jupyter Notebook:
$WORKSPACE_PATH/ROMNet/romnet/scripts/generating_data/PlasmaSystem/Generate_Data_1.py
for generating simulation data

Run Jupyter Notebook:
$WORKSPACE_PATH/ROMNet/romnet/scripts/generating_data/ PlasmaSystem/Generate_Data_2.ipynb
for producing training and test data

A Plasma System Test Case

Test Case 1
Data-Driven Vanilla DeepONet in the Thermodynamic State Space

A Plasma System Test Case

Test Case 1: Data-driven Vanilla DeepONet

1.1. Copy $WORKSPACE_PATH/ROMNet/romnet/input/PlasmaSystem/DeepONet/PlasmaSystem_TestCase1/ROMNet_Input.py
to $WORKSPACE_PATH/ROMNet/romnet/input/ROMNet_Input.py

1.2. In $WORKSPACE_PATH/ROMNet/romnet/input/ROMNet_Input.py, change:
1.2.1. "self.WORKSPACE_PATH = ..."

1.3. Move to $WORKSPACE_PATH/ROMNet/romnet/app/

1.4. Run: "python3 ROMNet.py ../input/"

1.5. Postprocess results via: $WORKSPACE_PATH/ROMNet/romnet/scripts/postprocessing/PlasmaSystem/DeepONet/Predict_DeepONet.ipynb

A Plasma System Test Case

Test Case 2
Data-Driven DeepONet with Frozen Trunks in the Thermodynamic State Space

A Plasma System Test Case

Generating Data

Run the python scrip:
$WORKSPACE_PATH/ROMNet/romnet/scripts/generating_data/ScenarioAggregated_ROMS/0DReactor/Generate_Data.py
for generating the trunks' modes.

A Plasma System Test Case

Test Case 2: Data-driven DeepONet with Frozen Trunks

Train the Trunks:

2.1. Run $WORKSPACE_PATH/ROMNet/romnet/input/ScenarioAggregated_ROMs/PlasmaSytem/FNN/Trunk/Parallelize_ROMNet.py

2.2 Postprocess with $WORKSPACE_PATH/ROMNet/romnet/scripts/postprocessing/ScenarioAggregated_ROMS/PlasmaSystem/FNN/Predict_FNN_Trunk.ipynb

Train the Rest of the DeepONet

2.1. Copy $WORKSPACE_PATH/ROMNet/romnet/input/PlasmaSystem/DeepONet/PlasmaSystem_TestCase2/ROMNet_Input.py
to $WORKSPACE_PATH/ROMNet/romnet/input/ROMNet_Input.py

2.2. In $WORKSPACE_PATH/ROMNet/romnet/input/ROMNet_Input.py, change:
2.2.1. "self.WORKSPACE_PATH = ..."

2.3. Move to $WORKSPACE_PATH/ROMNet/romnet/app/

2.4. Run: "python3 ROMNet.py ../input/”

2.5. Postprocess results via: $WORKSPACE_PATH/ROMNet/romnet/scripts/postprocessing/Rect/DeepONet/Predict_DeepONet.ipynb

A Plasma System Test Case

Test Case 3
Data-Driven flexDeepONet
in the Thermodynamic State Space

A Plasma System Test Case

Test Case 3: Data-driven FlexDeepONet

3.1. Copy $WORKSPACE_PATH/ROMNet/romnet/input/PlasmaSystem/DeepONet/PlasmaSystem_TestCase3/ROMNet_Input.py
to $WORKSPACE_PATH/ROMNet/romnet/input/ROMNet_Input.py

3.2. In $WORKSPACE_PATH/ROMNet/romnet/input/ROMNet_Input.py, change:
3.2.1. "self.WORKSPACE_PATH = ..."

3.3. Move to $WORKSPACE_PATH/ROMNet/romnet/app/

3.4. Run: "python3 ROMNet.py ../input/"

3.5. Postprocess results via: $WORKSPACE_PATH/ROMNet/romnet/scripts/postprocessing/PlasmaSystem/DeepONet/Predict_DeepONet.ipynb

A Plasma System Test Case

Test Case 4
Data-Driven MIONet
in the Thermodynamic State Space

A Plasma System Test Case

Generating Data

Run the Jupyter Notebook:
$WORKSPACE_PATH/ROMNet/romnet/scripts/generating_data/PlasmaSystem/Generate_Data_1.py
for generating simulation data

Run Jupyter Notebook:
$WORKSPACE_PATH/ROMNet/romnet/scripts/generating_data/ PlasmaSystem/Generate_Data_2.ipynb
for producing training and test data

A Plasma System Test Case

A Plasma System Test Case

Test Case 4: Data-driven MIONet

4.1. Copy $WORKSPACE_PATH/ROMNet/romnet/input/PlasmaSystem/MIONet/PlasmaSystem_TestCase4/ROMNet_Input.py
to $WORKSPACE_PATH/ROMNet/romnet/input/ROMNet_Input.py

4.2. In $WORKSPACE_PATH/ROMNet/romnet/input/ROMNet_Input.py, change:
4.2.1. "self.WORKSPACE_PATH = ..."

4.3. Move to $WORKSPACE_PATH/ROMNet/romnet/app/

4.4. Run: "python3 ROMNet.py ../input/"

4.5. Postprocess results via: $WORKSPACE_PATH/ROMNet/romnet/scripts/postprocessing/PlasmaSystem/ MIONet /Predict_MIONet_Orig_UncertainParams.ipynb

A Plasma System Test Case

Test Case 4: Data-driven DeepONet with Frozen Trunks

4.1. Copy $WORKSPACE_PATH/ROMNet/romnet/input/PlasmaSystem/DeepONet/PlasmaSystem_TestCase4/ROMNet_Input.py
to $WORKSPACE_PATH/ROMNet/romnet/input/ROMNet_Input.py

4.2. In $WORKSPACE_PATH/ROMNet/romnet/input/ROMNet_Input.py, change:
4.2.1. "self.WORKSPACE_PATH = ..."

4.3. Move to $WORKSPACE_PATH/ROMNet/romnet/app/

4.4. Run: "python3 ROMNet.py ../input/"

4.5. Postprocess results via: $WORKSPACE_PATH/ROMNet/romnet/scripts/postprocessing/Rect/DeepONet/Predict_DeepONet.ipynb