```
Last login: Tue Apr  7 09:14:27 on ttys000
Run-Mac:~ mac$ cd ~/.ssh
Run-Mac:.ssh mac$ ssh -i "Runzhe_Song_0110.pem" ubuntu@ec2-34-226-234-219.compute-1.amazonaws.com
ssh: connect to host ec2-34-226-234-219.compute-1.amazonaws.com port 22: Connection refused
Run-Mac:.ssh mac$ ssh -i "Runzhe_Song_0110.pem" ubuntu@ec2-34-226-234-219.compute-1.amazonaws.com
ssh: connect to host ec2-34-226-234-219.compute-1.amazonaws.com port 22: Connection refused
Run-Mac:.ssh mac$ ssh -i "Runzhe_Song_0110.pem" ubuntu@ec2-34-226-234-219.compute-1.amazonaws.com
ssh: connect to host ec2-34-226-234-219.compute-1.amazonaws.com port 22: Connection refused
Run-Mac:.ssh mac$ ssh -i "Runzhe_Song_0110.pem" ubuntu@ec2-34-226-234-219.compute-1.amazonaws.com
The authenticity of host 'ec2-34-226-234-219.compute-1.amazonaws.com (34.226.234.219)' can't be established.
ECDSA key fingerprint is SHA256:AYjXipUunRK/NUxPWManenxsJs1+U/+PUygngLodFeM.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'ec2-34-226-234-219.compute-1.amazonaws.com,34.226.234.219' (ECDSA) to the list of known hosts.
Welcome to Ubuntu 18.04.3 LTS (GNU/Linux 4.15.0-1063-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

  System information as of Tue Apr  7 14:29:03 UTC 2020

  System load:  0.8                Processes:            794
  Usage of /:   57.0% of 15.45GB   Users logged in:      0
  Memory usage: 0%                 IP address for ens5:  172.31.76.241
  Swap usage:   0%

 * Kubernetes 1.18 GA is now available! See https://microk8s.io for docs or
   install it with:

     sudo snap install microk8s --channel=1.18 --classic

 * Multipass 1.1 adds proxy support for developers behind enterprise
   firewalls. Rapid prototyping for cloud operations just got easier.

     https://multipass.run/

 * Canonical Livepatch is available for installation.
   - Reduce system reboots and improve kernel security. Activate at:
     https://ubuntu.com/livepatch

53 packages can be updated.
0 updates are security updates.


Last login: Wed Apr  1 20:30:39 2020 from 107.13.161.147
ubuntu@ip-172-31-76-241:~$ export openblas_num_threads=1; export OMP_NUM_THREADS=1; python EC2.py
^CTraceback (most recent call last):
  File "EC2.py", line 2, in <module>
    from _utility import *
  File "/home/ubuntu/_utility.py", line 6, in <module>
    from _uti_basic import *
  File "/home/ubuntu/_uti_basic.py", line 3, in <module>
    import scipy as sp
  File "/home/ubuntu/anaconda3/lib/python3.7/site-packages/scipy/__init__.py", line 63, in <module>
    from numpy import show_config as show_numpy_config
  File "/home/ubuntu/anaconda3/lib/python3.7/site-packages/numpy/__init__.py", line 142, in <module>
    from . import core
  File "/home/ubuntu/anaconda3/lib/python3.7/site-packages/numpy/core/__init__.py", line 40, in <module>
    from . import multiarray
  File "/home/ubuntu/anaconda3/lib/python3.7/site-packages/numpy/core/multiarray.py", line 12, in <module>
    from . import overrides
  File "/home/ubuntu/anaconda3/lib/python3.7/site-packages/numpy/core/overrides.py", line 8, in <module>
    from numpy.compat._inspect import getargspec
  File "<frozen importlib._bootstrap>", line 983, in _find_and_load
  File "<frozen importlib._bootstrap>", line 967, in _find_and_load_unlocked
  File "<frozen importlib._bootstrap>", line 677, in _load_unlocked
  File "<frozen importlib._bootstrap_external>", line 724, in exec_module
  File "<frozen importlib._bootstrap_external>", line 818, in get_code
  File "<frozen importlib._bootstrap_external>", line 917, in get_data
KeyboardInterrupt
ubuntu@ip-172-31-76-241:~$ export openblas_num_threads=1; export OMP_NUM_THREADS=1; python EC2.py
10:32, 04/07; num of cores:96

final sd_R trend for[0, 5] the same

Basic setting:[T, rep_times, sd_O, sd_D, sd_R, sd_u_O, w_O, w_A, [M_in_R, mean_reversion, poisO, u_O_u_D], sd_R_range, t_func] = [None,
96, None, None, None, 30, 0.5, 1, [True, False, True, 10], [0, 5], None]


------------------------------------
[pattern_seed, day, sd_R] = [2, 7, 0]

max(u_O) =  168.8
O_threshold = 80
number of reward locations:  15
O_threshold = 85
number of reward locations:  14
O_threshold = 90
number of reward locations:  12
```

```
        epsilon = epsilon, spatial = spatial, mean_field = mean_field)
    File "/home/ubuntu/weight.py", line 301, in train
        self.policy_ratio2: policy_ratio2
    File "/home/ubuntu/.local/lib/python3.7/site-packages/tensorflow/python/client/session.py", line 950, in run
        run_metadata_ptr)
    File "/home/ubuntu/.local/lib/python3.7/site-packages/tensorflow/python/client/session.py", line 1173, in _run
        feed_dict_tensor, options, run_metadata)
    File "/home/ubuntu/.local/lib/python3.7/site-packages/tensorflow/python/client/session.py", line 1350, in _do_run
        run_metadata)
    File "/home/ubuntu/.local/lib/python3.7/site-packages/tensorflow/python/client/session.py", line 1356, in _do_call
        return fn(*args)
    File "/home/ubuntu/.local/lib/python3.7/site-packages/tensorflow/python/client/session.py", line 1341, in _run_fn
        options, feed_dict, fetch_list, target_list, run_metadata)
    File "/home/ubuntu/.local/lib/python3.7/site-packages/tensorflow/python/client/session.py", line 1429, in _call_tf_sessionrun
        run_metadata)
KeyboardInterrupt
Traceback (most recent call last):
    File "/home/ubuntu/anaconda3/lib/python3.7/multiprocessing/process.py", line 297, in _bootstrap
        self.run()
    File "/home/ubuntu/anaconda3/lib/python3.7/multiprocessing/process.py", line 99, in run
        self._target(*self._args, **self._kwargs)
    File "/home/ubuntu/_uti_basic.py", line 67, in fun
        q_out.put((i, f(x)))
    File "/home/ubuntu/simu_funs.py", line 60, in once
        inner_parallel = inner_parallel)
    File "/home/ubuntu/simu_funs.py", line 212, in simu_once
        inner_parallel = inner_parallel)
    File "/home/ubuntu/main.py", line 149, in V_DR
        r = arr([getOneRegionValue(i) for i in range(N)])
    File "/home/ubuntu/main.py", line 149, in <listcomp>
        r = arr([getOneRegionValue(i) for i in range(N)])
    File "/home/ubuntu/main.py", line 84, in getOneRegionValue
        epsilon = epsilon)
    File "/home/ubuntu/main.py", line 253, in getWeight
        epsilon = epsilon, spatial = spatial, mean_field = mean_field)
    File "/home/ubuntu/weight.py", line 196, in train
        pi0 = den_b_disc(Ta_tl, n_neigh) * 0.5
    File "/home/ubuntu/_utility.py", line 56, in den_b_disc
        den += binom.pmf(i, N_neigh, 0.5)
    File "/home/ubuntu/anaconda3/lib/python3.7/site-packages/scipy/stats/_distn_infrastructure.py", line 3003, in pmf
        place(output, cond, np.clip(self._pmf(*goodargs), 0, 1))
    File "/home/ubuntu/anaconda3/lib/python3.7/site-packages/scipy/stats/_discrete_distns.py", line 58, in _pmf
        return exp(self._logpmf(x, n, p))
    File "/home/ubuntu/anaconda3/lib/python3.7/site-packages/scipy/stats/_discrete_distns.py", line 53, in _logpmf
        combiln = (gamln(n+1) - (gamln(k+1) + gamln(n-k+1)))
KeyboardInterrupt
Traceback (most recent call last):
    File "/home/ubuntu/anaconda3/lib/python3.7/multiprocessing/process.py", line 297, in _bootstrap
        self.run()
    File "/home/ubuntu/anaconda3/lib/python3.7/multiprocessing/process.py", line 99, in run
        self._target(*self._args, **self._kwargs)
    File "/home/ubuntu/_uti_basic.py", line 67, in fun
        q_out.put((i, f(x)))
    File "/home/ubuntu/simu_funs.py", line 60, in once
        inner_parallel = inner_parallel)
    File "/home/ubuntu/simu_funs.py", line 212, in simu_once
        inner_parallel = inner_parallel)
    File "/home/ubuntu/main.py", line 149, in V_DR
        r = arr([getOneRegionValue(i) for i in range(N)])
    File "/home/ubuntu/main.py", line 149, in <listcomp>
        r = arr([getOneRegionValue(i) for i in range(N)])
    File "/home/ubuntu/main.py", line 78, in getOneRegionValue
        CV_QV = CV_QV, penalty_range = penalty, spatial = True)
    File "/home/ubuntu/main.py", line 294, in computeQV
        validation_set = valid_tuples)
    File "/home/ubuntu/main.py", line 417, in computeQV_basic
        right = ECKQ1.T.dot(Kg.dot(solve(E_right_bef_inverse, R))) # Right part of (\hat{\alpha}, \hat{\eta})
    File "/home/ubuntu/anaconda3/lib/python3.7/site-packages/numpy/linalg/linalg.py", line 403, in solve
        r = gufunc(a, b, signature=signature, extobj=extobj)
KeyboardInterrupt
ubuntu@ip-172-31-76-241:~$ export openblas_num_threads=1; export OMP_NUM_THREADS=1; python EC2.py
10:36, 04/07; num of cores:96

final sd_R trend for[0, 5] the same

Basic setting:[T, rep_times, sd_O, sd_D, sd_R, sd_u_O, w_O, w_A, [M_in_R, mean_reversion, pois0, u_O_u_D], sd_R_range, t_func] = [None,
96, None, None, None, 30, 0.5, 1, [True, False, True, 10], [0, 5], None]


------------------------------------
[pattern_seed, day, sd_R] = [2, 7, 0]

max(u_O) =  168.8
O_threshold = 75
number of reward locations:  16
O_threshold = 80
number of reward locations:  15
O_threshold = 85
number of reward locations:  14
```

O_threshold = 90
number of reward locations: 12
O_threshold = 100
number of reward locations: 9
O_threshold = 105
number of reward locations: 7
O_threshold = 110
number of reward locations: 6
O_threshold = 120
number of reward locations: 3
target 1 in 8 DONE!
target 2 in 8 DONE!
target 3 in 8 DONE!
target 4 in 8 DONE!
target 5 in 8 DONE!
target 6 in 8 DONE!
target 7 in 8 DONE!
target 8 in 8 DONE!

Value of Behaviour policy:57.724
O_threshold = 75
MC for this TARGET:[66.856, 0.064]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[0.51, 0.31, -0.46]][[2.48, -66.86, -9.13]]
std:[[0.48, 0.49, 0.25]][[0.26, 0.0, 0.2]]
MSE:[[0.7, 0.58, 0.52]][[2.49, 66.86, 9.13]]
MSE(-DR):[[0.0, -0.12, -0.18]][[1.79, 66.16, 8.43]]
**
==============
O_threshold = 80
MC for this TARGET:[68.355, 0.062]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[-0.08, -0.3, -1.09]][[1.16, -68.36, -10.63]]
std:[[0.47, 0.48, 0.25]][[0.26, 0.0, 0.2]]
MSE:[[0.48, 0.57, 1.12]][[1.19, 68.36, 10.63]]
MSE(-DR):[[0.0, 0.09, 0.64]][[0.71, 67.88, 10.15]]
***
==============
O_threshold = 85
MC for this TARGET:[68.37, 0.064]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[0.01, -0.21, -1.32]][[0.11, -68.37, -10.65]]
std:[[0.35, 0.35, 0.23]][[0.27, 0.0, 0.2]]
MSE:[[0.35, 0.41, 1.34]][[0.29, 68.37, 10.65]]
MSE(-DR):[[0.0, 0.06, 0.99]][[-0.06, 68.02, 10.3]]
==============
O_threshold = 90
MC for this TARGET:[66.714, 0.067]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[-0.01, -0.18, -0.78]][[-0.44, -66.71, -8.99]]
std:[[0.37, 0.38, 0.23]][[0.26, 0.0, 0.2]]
MSE:[[0.37, 0.42, 0.81]][[0.51, 66.71, 8.99]]
MSE(-DR):[[0.0, 0.05, 0.44]][[0.14, 66.34, 8.62]]
***
==============
O_threshold = 100
MC for this TARGET:[66.948, 0.071]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[-2.77, -2.9, -3.14]][[-4.16, -66.95, -9.22]]
std:[[0.4, 0.4, 0.25]][[0.27, 0.0, 0.2]]
MSE:[[2.8, 2.93, 3.15]][[4.17, 66.95, 9.22]]
MSE(-DR):[[0.0, 0.13, 0.35]][[1.37, 64.15, 6.42]]
***
==============
O_threshold = 105
MC for this TARGET:[67.294, 0.07]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[-5.31, -5.4, -5.67]][[-7.0, -67.29, -9.57]]
std:[[0.47, 0.47, 0.31]][[0.27, 0.0, 0.2]]
MSE:[[5.33, 5.42, 5.68]][[7.01, 67.29, 9.57]]
MSE(-DR):[[0.0, 0.09, 0.35]][[1.68, 61.96, 4.24]]
***
==============
O_threshold = 110
MC for this TARGET:[65.968, 0.07]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[-5.09, -5.16, -5.4]][[-7.34, -65.97, -8.24]]
std:[[0.49, 0.5, 0.34]][[0.28, 0.0, 0.2]]
MSE:[[5.11, 5.18, 5.41]][[7.35, 65.97, 8.24]]
MSE(-DR):[[0.0, 0.07, 0.3]][[2.24, 60.86, 3.13]]
***
==============
O_threshold = 120
MC for this TARGET:[65.336, 0.059]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[-7.06, -7.08, -6.95]][[-11.42, -65.34, -7.61]]
std:[[0.62, 0.64, 0.4]][[0.26, 0.0, 0.2]]
MSE:[[7.09, 7.11, 6.96]][[11.42, 65.34, 7.61]]

MSE(-DR):[[0.0, 0.02, -0.13]][[4.33, 58.25, 0.52]]
**
==============
[[0.7   0.58 0.52 2.49 66.86 9.13]
 [0.48 0.57 1.12 1.19 68.36 10.63]
 [0.35 0.41 1.34 0.29 68.37 10.65]
 [0.37 0.42 0.81 0.51 66.71 8.99]
 [2.8   2.93 3.15 4.17 66.95 9.22]
 [5.33 5.42 5.68 7.01 67.29 9.57]
 [5.11 5.18 5.41 7.35 65.97 8.24]
 [7.09 7.11 6.96 11.42 65.34 7.61]]

time spent until now: 127.4 mins

[pattern_seed, day, sd_R] = [2, 7, 5]

max(u_0) = 168.8
O_threshold = 75
number of reward locations: 16
O_threshold = 80
number of reward locations: 15
O_threshold = 85
number of reward locations: 14
O_threshold = 90
number of reward locations: 12
O_threshold = 100
number of reward locations: 9
O_threshold = 105
number of reward locations: 7
O_threshold = 110
number of reward locations: 6
O_threshold = 120
number of reward locations: 3
target 1 in 8 DONE!
target 2 in 8 DONE!
target 3 in 8 DONE!
target 4 in 8 DONE!
target 5 in 8 DONE!
target 6 in 8 DONE!
target 7 in 8 DONE!
target 8 in 8 DONE!

Value of Behaviour policy:57.73
O_threshold = 75
MC for this TARGET:[66.864, 0.082]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[0.54, 0.33, -0.44]][[2.48, -66.86, -9.13]]
std:[[0.59, 0.61, 0.28]][[0.28, 0.0, 0.2]]
MSE:[[0.8, 0.69, 0.52]][[2.5, 66.86, 9.13]]
MSE(-DR):[[0.0, -0.11, -0.28]][[1.7, 66.06, 8.33]]
**
==============
O_threshold = 80
MC for this TARGET:[68.363, 0.083]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[-0.07, -0.29, -1.06]][[1.16, -68.36, -10.63]]
std:[[0.57, 0.57, 0.3]][[0.29, 0.0, 0.2]]
MSE:[[0.57, 0.64, 1.1]][[1.2, 68.36, 10.63]]
MSE(-DR):[[0.0, 0.07, 0.53]][[0.63, 67.79, 10.06]]
***
==============
O_threshold = 85
MC for this TARGET:[68.378, 0.088]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[0.01, -0.21, -1.31]][[0.11, -68.38, -10.65]]
std:[[0.4, 0.4, 0.28]][[0.29, 0.0, 0.2]]
MSE:[[0.4, 0.45, 1.34]][[0.31, 68.38, 10.65]]
MSE(-DR):[[0.0, 0.05, 0.94]][[-0.09, 67.98, 10.25]]
==============
O_threshold = 90
MC for this TARGET:[66.722, 0.092]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[-0.0, -0.18, -0.78]][[-0.45, -66.72, -8.99]]
std:[[0.41, 0.41, 0.28]][[0.28, 0.0, 0.2]]
MSE:[[0.41, 0.45, 0.83]][[0.53, 66.72, 8.99]]
MSE(-DR):[[0.0, 0.04, 0.42]][[0.12, 66.31, 8.58]]
***
==============
O_threshold = 100
MC for this TARGET:[66.956, 0.097]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[-2.78, -2.9, -3.14]][[-4.17, -66.96, -9.23]]
std:[[0.46, 0.46, 0.27]][[0.29, 0.0, 0.2]]
MSE:[[2.82, 2.94, 3.15]][[4.18, 66.96, 9.23]]
MSE(-DR):[[0.0, 0.12, 0.33]][[1.36, 64.14, 6.41]]

```
***
==============
O_threshold = 105
MC for this TARGET:[67.302, 0.098]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[-5.33, -5.43, -5.69]][[-7.01, -67.3, -9.57]]
std:[[0.51, 0.52, 0.36]][[0.29, 0.0, 0.2]]
MSE:[[5.35, 5.45, 5.7]][[7.02, 67.3, 9.57]]
MSE(-DR):[[0.0, 0.1, 0.35]][[1.67, 61.95, 4.22]]
***
==============
O_threshold = 110
MC for this TARGET:[65.976, 0.097]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[-5.1, -5.18, -5.4]][[-7.35, -65.98, -8.25]]
std:[[0.56, 0.57, 0.36]][[0.3, 0.0, 0.2]]
MSE:[[5.13, 5.21, 5.41]][[7.36, 65.98, 8.25]]
MSE(-DR):[[0.0, 0.08, 0.28]][[2.23, 60.85, 3.12]]
***
==============
O_threshold = 120
MC for this TARGET:[65.344, 0.082]
    [DR/QV/IS]; [DR_NO_MARL, DR_NO_MF, V_behav]
bias:[[-7.07, -7.08, -6.95]][[-11.43, -65.34, -7.61]]
std:[[0.74, 0.75, 0.43]][[0.28, 0.0, 0.2]]
MSE:[[7.11, 7.12, 6.96]][[11.43, 65.34, 7.61]]
MSE(-DR):[[0.0, 0.01, -0.15]][[4.32, 58.23, 0.5]]
**
==============
[[ 0.7   0.58  0.52  2.49 66.86  9.13]
 [ 0.48  0.57  1.12  1.19 68.36 10.63]
 [ 0.35  0.41  1.34  0.29 68.37 10.65]
 [ 0.37  0.42  0.81  0.51 66.71  8.99]
 [ 2.8   2.93  3.15  4.17 66.95  9.22]
 [ 5.33  5.42  5.68  7.01 67.29  9.57]
 [ 5.11  5.18  5.41  7.35 65.97  8.24]
 [ 7.09  7.11  6.96 11.42 65.34  7.61]]


[[ 0.8   0.69  0.52  2.5  66.86  9.13]
 [ 0.57  0.64  1.1   1.2  68.36 10.63]
 [ 0.4   0.45  1.34  0.31 68.38 10.65]
 [ 0.41  0.45  0.83  0.53 66.72  8.99]
 [ 2.82  2.94  3.15  4.18 66.96  9.23]
 [ 5.35  5.45  5.7   7.02 67.3   9.57]
 [ 5.13  5.21  5.41  7.36 65.98  8.25]
 [ 7.11  7.12  6.96 11.43 65.34  7.61]]


time spent until now: 253.8 mins

ubuntu@ip-172-31-76-241:~$
```