

# minimal\_param\_sweep

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## 1 Minimal model for parameter sweep + Monte Carlo runs

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The shortest model that has parameter sweeping and MC runs at the same time!

```
[1]: import numpy as np
from cadCAD.configuration import Experiment
from cadCAD.configuration.utils import config_sim
from cadCAD.configuration import Configuration
from cadCAD.engine import ExecutionMode, ExecutionContext, Executor
import pandas as pd
import plotly.express as px
import plotly.io as pio
pio.renderers.default = "jupyterlab"
import seaborn as sns
```

```
[2]: MONTE_CARLO_RUNS = 10
SIMULATION_TIMESTEPS = 100

sys_params = {
    'parameter': [0.1, 0.5, 1.0]
}

genesis_states = {
    'something': 0
}

def p_something(params,
                substep,
                state_history,
                prev_state):
    parameter = params['parameter']
    random_value_1 = np.random.randn() + parameter
    random_value_2 = np.random.rand() + parameter
    return {'policy_input_1': random_value_1,
            'policy_input_2': random_value_2}
```

```

def s_something(params,
                substep,
                state_history,
                prev_state,
                policy_input):
    new_value = policy_input['policy_input_1']
    new_value += policy_input['policy_input_2']
    return ('something', new_value)

partial_state_update_blocks = [
    {
        'policies': {
            'something': p_something
        },
        'variables': {
            'something': s_something
        }
    }
]

sim_config = {
    'N': MONTE_CARLO_RUNS,
    'T': range(SIMULATION_TIMESTEPS),
    'M': sys_params
}

```

```

[3]: sim_params = config_sim(sim_config)

exp = Experiment()
exp.append_configs(
    sim_configs=sim_params,
    initial_state=genesis_states,
    partial_state_update_blocks=partial_state_update_blocks
)

from cadCAD import configs

exec_mode = ExecutionMode()
local_mode_ctx = ExecutionContext(context=exec_mode.local_mode)

simulation = Executor(exec_context=local_mode_ctx,
                      configs=configs)
raw_system_events, tensor_field, sessions = simulation.execute()

```

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by cadCAD

```

Execution Mode: local\_proc

Configuration Count: 3

Dimensions of the first simulation: (Timesteps, Params, Runs, Vars) = (100, 1, 10, 1)

Execution Method: local\_simulations

SimIDs : [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2]

SubsetIDs: [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2]

Ns : [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9]

ExpIDs : [0, 0]

Execution Mode: parallelized

Total execution time: 0.30s

```
[4]: df = pd.DataFrame(raw_system_events)
```

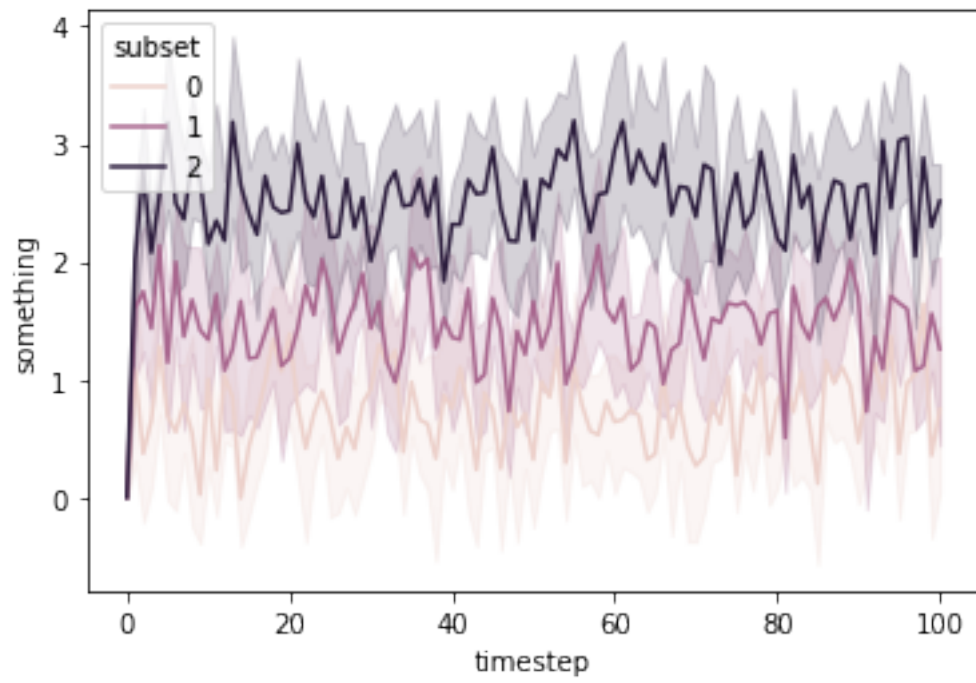
```

px.scatter(df,
            x='timestep',
            y='something',
            color='subset')

```

```
[5]: sns.lineplot(x=df.timestep,
                  y=df.something,
                  hue=df.subset)
```

```
[5]: <AxesSubplot:xlabel='timestep', ylabel='something'>
```



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