PROBLEM

time interval $[t_0, t_f]$ and spatial domain Ω

reaction term R and control term S

system coefficients a, b, c and cost coefficients α, β, γ

target Y

number of discretization points n

`problem_config.txt` and `problem.pickle`

DATA GENERATION

initial condition domain $\mathbb{X}_0$

initialization of BVP solver
(sequence for time-marching,
model for NN warm start)

data set sizes
$|D^0_{\text{train}}|, |D_{\text{val}}|, |D_{\text{test}}|$

sample size selection rule
(esp. upper bound M)

adaptive sampling
(esp. number of candidate
initial conditions K_{init})

`train_data.txt`
`val_data.npz`
`test_data.npz`

MODEL

value function approximator V^{NN}

neural network architecture F^{NN}

depth L and width d

activation function σ

`model_config.txt` and `model.pth`

TRAINING

optimizer incl. hyperparameters
(learning rate, momentum, weight decay, etc.)

gradient regularization weight λ

batch size

early stopping criterion
(performance measure E, threshold T, etc.)

convergence criterion
(esp. tolerance C)

`training_config.txt` and `training.pickle`

EVALUATION

training and test statistics
(evolution of errors along with data set size and runtime during optimization,
empirical validation of final model accuracy)

simulations for specific initial conditions
(comparison of NN, BVP, LQR controllers and unctrl. system,
effect of Gaussian and shock noise)

BVP initialization tests
(comparison of basic initialization, time-marching and NN warm start)

`statistics.txt` and `training_phase.png`
simulation outputs (`control.png`, `state.png`, `costs.txt`, etc.)