

# SMART-MC (including MSCOR) Reproducibility Instructions

- We describe the reproducibility instructions for generating the tables and figures included in the main paper. Please refer to the following list to see which section describes the reproducibility of the tables and figures of the main paper, detailed as follows.
- Note that, real data is not shared on Github to comply with data sharing policy. To implement SMART-MC on another dataset, see Demo section.

## Figures

- Figure 1: NA (concept diagram).
- Figure 2: NA (concept diagram).
- Figure 3: NA (concept diagram).
- Figure 4, 5, 6: refer to SMART-MC Real Data Analysis.

## Tables

- Table 1: refer to MSCOR benchmark study.
- Table 2: refer to Real data analysis.

## DEMO

- This section demonstrates examples on practical implementations of MSCOR (for Black-box optimization purpose only, unrelated to SMART-MC implementation) and SMART-MC (backed by MSCOR; for synthetic data analysis).

## 1. Benchmark study

1. Go to [MSCOR benchmark](#) folder, run [MSCOR\\_Benchmark\\_comparison.m](#), setting  $(B, M) = (5, 5), (10, 20), (100, 5)$ . The variable  $M$  represents  $n_b$  in the main paper.
2. To summarize the findings run [MSCOR\\_post\\_evaluation.m](#). This yields results reported in [Table 1](#) of the main paper (also [Table S1](#) in the supplementary material).

## 2. Simulation study

1. Go to [Simulation and Real Data Analysis](#) folder, run [SMART\\_MC\\_SIMULATION\\_STUDY\\_v2.m](#) (for proposed method) and [SMART\\_MC\\_SIMULATION\\_STUDY\\_NaiveMethod.m](#) (for naive method to compare). Corresponding outputs are reported in [Table S2](#) of the supplementary material.
2. Go to [Simulation and Real Data Analysis / Simulation\\_Study\\_Non-gaussian](#) folder, run [SMART\\_MC\\_SIMULATION\\_STUDY\\_NonNormal.m](#) (for proposed method) and [SMART\\_MC\\_SIMULATION\\_STUDY\\_NonNormal\\_NaiveMethod.m](#) (for naive method to compare). Corresponding outputs are reported in [Table S3](#) of the supplementary material.
3. Within [Simulation and Real Data Analysis](#) folder, run [SMART\\_MC\\_SIMULATION\\_MAD\\_sequence.m](#) for MAD analysis reported in the paper. Corresponding outputs are reported in [Table S4](#) of the supplementary material.
4. Within [Simulation and Real Data Analysis](#) folder, run [SMART\\_MC\\_SIMULATION\\_parallel\\_v\\_single.m](#). This yields results reported in [Table S5](#) of the supplementary material.

## 3. Real data analysis

Note that the real data is not shared on Github respecting the data sharing policy, but only with journal editors (after de-identification).

1. Go to [Simulation and Real Data Analysis](#) folder, run [SMART\\_MC.m](#). This yields results reported in [Table 2](#), [Figures 4,5](#).
2. Run [SMART\\_MC\\_ODDS\\_ratio\\_calculation.m](#) followed by [SMART\\_MC\\_Odds\\_ratio\\_plot.R](#). This yields [Figure 6](#).

## 4. DEMO

1. Go to [DEMO / MSCOR demo](#) folder. [MSCOR\\_DEMO.m](#) demonstrates a practical example of minimizing a non-convex function (namely, modified Ackley's function; see SMART-MC supplementary information for its exact form) using MSCOR.

2. Go to [DEMO / SMART-MC demo](#) folder. [SMART\\_MC\\_DEMO.m](#) demonstrates a practical example of SMART-MC estimation, backed with MSCOR, based on a dummy dataset.