

Script: daa_optimize.py

Purpose:

1. Find model parameters that produce the best objective function value.

Parameters:

1. main_dir: Directory where all inputs and outputs are/will be saved.
2. hbv_inps_ts_dir: Directory where time series of input data for a given time period are kept.
3. cats_areas_path: Path to the file that has the catchment areas in it.
4. cat_labels: IDs of the catchment. We have 3421 (River Enz), 420 (River upper Neckar), 3465 (River Kocher) and 3470 (River Jagst). All these are sub-catchments of the Neckar River.
5. secs_per_step: Number of seconds per time step. As it is daily, we have 86400. Do not change this.
6. warmup_steps: Number of time series in the beginning of the simulation period that are not used while evaluating model performance.
7. pop_size: Size of the population in Differential Evolution in scipy. Google it to find what it means.
8. prms_buds_dict: For each parameter lower and upper bounds are required, these are specified in this variable. Do not change.
9. eff_ns_flag: Whether to use Nash-Sutcliffe as a performance criteria while optimizing.
10. eff_ins_flag: Whether to use Log Nash-Sutcliffe as a performance criteria while optimizing.
11. eff_kg_flag: Whether to use Kling-Gupta as a performance criteria while optimizing.
12. eff_pc_flag: Whether to use Pearson correlation as a performance criteria while optimizing.
13. eff_sc_flag: Whether to use Spearman correlation as a performance criteria while optimizing.
14. ot_dir: Name of the directory where all the results of this script are saved. Name it in such a manner that results can be differentiated based on the time period and objective functions used. Names of catchments are used in output files so they are never mixed.

Outputs:

1. sim_[CAT]_otps_df.csv: All the outputs of the HBV model as time series. [CAT] is the catchment ID.
2. dis_sim_[CAT]_df.csv: Observed and simulated discharge (including warmup) time series.
3. prms_[CAT]_sr.csv: Model parameters that produce the best performance.
4. prf_[CAT]_sr.csv: All model efficiencies and the objective function value.

Script: dab_validate.py

Purpose:

1. Use given model inputs and parameters to simulate discharge time series.

Parameters:

1. cat_label: Catchment ID.
2. hbv_inps_ts_path: Path to the input data time series.
3. cats_areas_path: Path to catchment areas.
4. prms_path: Path to the model parameters.
5. The rest is same as daa_optimize.py

Outputs:

1. sim_[CAT]_otps_df.csv: All the outputs of the HBV model as time series.
2. dis_sim_[CAT]_df.csv: Observed and simulated discharge (including warmup) time series.
3. prms_[CAT]_sr.csv: Model parameters that produce the best performance.
4. prf_[CAT]_sr.csv: All model efficiencies and the objective function value.

Script: dba_cmpr_ref_sim_dis.py

Purpose:

1. Plot observed and simulated discharge time series against each other.

Parameters:

1. path_to_ref_sim_dis: Path to the file that has observed and simulated discharge. It is the output of either daa_optimize.py or dab_validate.py.
2. beg_time: Time stamp of the beginning of the comparison.
3. end_time: Time stamp of the end of comparison.

Output:

1. A plot that could be zoomed into, panned or saved as an image.

Script: `dca_cmpr_prms.py`

Purpose:

1. To compare the model parameters of different optimizations.

Parameters:

1. `prms_bounds_dict`: Bounds on each model parameter. Parameters listed here are plotted only.
2. `paths_to_prms`: Paths to model parameter files. These are optimized model parameters from various optimizations.
3. `prms_labels`: Labels assigned to the lines on the comparison plot.

Output:

1. A plot that could be zoomed into, panned or saved as an image.