

training_executer

May 24, 2024

```
[ ]: station_name = "Vienna"
      iterations = 300000
      mask_years = [2019]
      measurements_folder = f"./measurements/{station_name.capitalize()}"

[ ]: # these imports are used indirectly and are not used in this script, just
      ↳ listed here for reference

      import os
      import numpy as np
      import pandas as pd
      import xarray as xr
      import tempfile
      import matplotlib.pyplot as plt
      import cartopy.crs as ccrs
      from utils.utils import pretty_lat, pretty_lon, ProgressStatus,
      ↳ plot_n_steps_of_area_from_nc_file

[ ]: from station.data_submission import DataSubmission

      from train_station_twin.training_executer import TrainingExecuter
      %matplotlib inline
      from utils.utils import plot_measurements_df

[ ]: station_submission = DataSubmission(name=station_name, mask_years=mask_years)
      station_submission.measurement_dir_path = measurements_folder

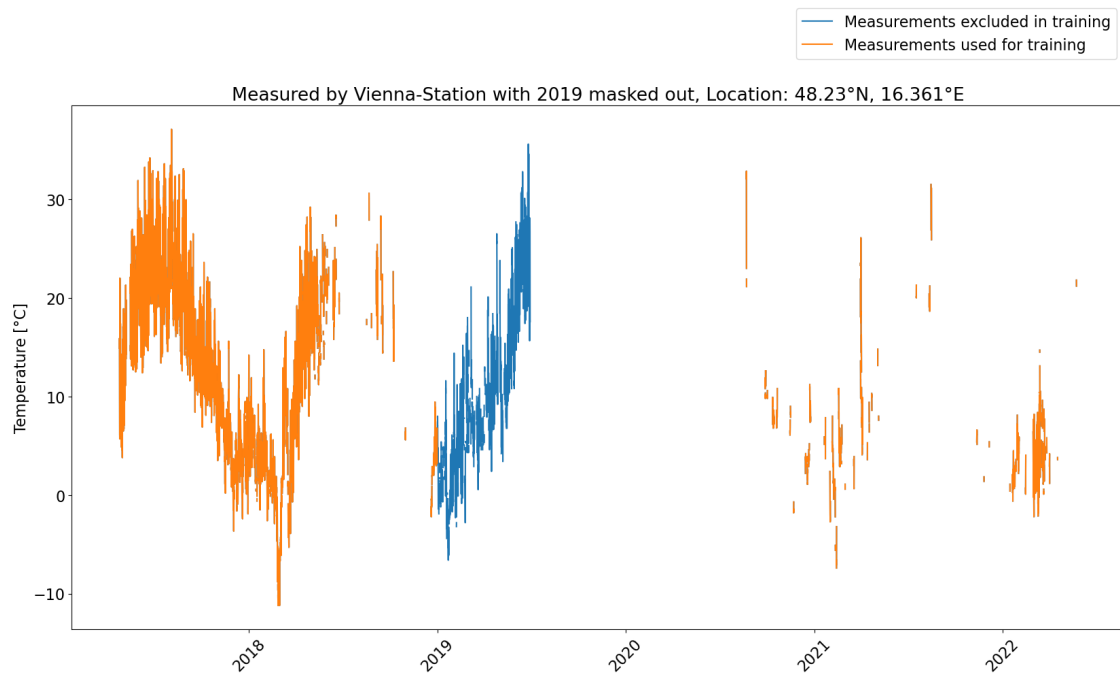
      station_submission.initialixze_station()
```

Extracting Vienna...

```
100%|      | 1857/1857 [03:13<00:00, 9.57it/s]
/Users/timo.wacke/VsCodeProjects/digital-twin-for-weather-
station/station/station.py:25: FutureWarning: 'H' is deprecated and will be
removed in a future version, please use 'h' instead.
    plot_df = plot_df.reindex(pd.date_range(start=plot_df.index.min(),
/Users/timo.wacke/VsCodeProjects/digital-twin-for-weather-
station/station/station.py:37: FutureWarning: 'H' is deprecated and will be
```

removed in a future version, please use 'h' instead.

```
plot_df = plot_df.reindex(pd.date_range(start=plot_df.index.min(),
```



```
[ ]: training = TrainingExecuter(  
    station = station_submission.station,  
    progress = station_submission.progress,  
    iterations = iterations,  
    local = True,  
)  
job_id = training.execute_with_sbatch()
```

(9593,)

Saving to

./executed_trainings/Vienna_20240522-1659/target_9gs0g5n6/train/vienna.nc

Downloading... 2017

Downloading 2017

2024-05-22 16:59:25,468 INFO Welcome to the CDS

2024-05-22 16:59:25,469 INFO Sending request to

<https://cds.climate.copernicus.eu/api/v2/resources/reanalysis-era5-single-levels>

2024-05-22 16:59:25,694 INFO Request is completed

2024-05-22 16:59:25,695 INFO Downloading <https://download-0013-clone.copernicus-climate.eu/cache-compute-0013/cache/data0/adaptor.mars.internal-1716381414.7186203-30638-7-c3dd4d9d-77a1-416b-ada3-fa95a2f6053b.grib> to

/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmps8uvr3g1/2017.grib (2.3M)

2024-05-22 16:59:26,564 INFO Download rate 2.6M/s

2024-05-22 16:59:26,684 INFO Welcome to the CDS
 2024-05-22 16:59:26,685 INFO Sending request to
<https://cds.climate.copernicus.eu/api/v2/resources/reanalysis-era5-single-levels>
 Downloading... 2018
 Downloading 2018

2024-05-22 16:59:26,919 INFO Downloading <https://download-0012-clone.copernicus-climate.eu/cache-compute-0012/cache/data9/adaptor.mars.internal-1716305070.1286237-30432-13-10e0a43f-a6d5-4aec-80bc-db9a7f38c2f1.grib> to
 /var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmps8uvr3g1/2018.grib (2.3M)
 2024-05-22 16:59:27,796 INFO Download rate 2.6M/s
 2024-05-22 16:59:27,915 INFO Welcome to the CDS
 2024-05-22 16:59:27,916 INFO Sending request to
<https://cds.climate.copernicus.eu/api/v2/resources/reanalysis-era5-single-levels>
 Downloading... 2020
 Downloading 2020-8

2024-05-22 16:59:28,080 INFO Downloading <https://download-0016.copernicus-climate.eu/cache-compute-0016/cache/data6/adaptor.mars.internal-1716305564.984818-14246-5-50e2b754-4c1b-4f1c-bda0-bac6cf4ef138.grib> to
 /var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmps8uvr3g1/2020_8.grib
 (196.2K)
 2024-05-22 16:59:28,655 INFO Download rate 342.1K/s
 2024-05-22 16:59:28,805 INFO Welcome to the CDS
 2024-05-22 16:59:28,806 INFO Sending request to
<https://cds.climate.copernicus.eu/api/v2/resources/reanalysis-era5-single-levels>
 2024-05-22 16:59:28,920 INFO Downloading <https://download-0014-clone.copernicus-climate.eu/cache-compute-0014/cache/data2/adaptor.mars.internal-1716305598.2699645-24790-17-cc180cb0-90a4-4b42-8477-6625d09c4224.grib> to
 /var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmps8uvr3g1/2020_9.grib
 (189.8K)
 Downloading 2020-9

2024-05-22 16:59:29,428 INFO Download rate 374.3K/s
 2024-05-22 16:59:29,553 INFO Welcome to the CDS
 2024-05-22 16:59:29,554 INFO Sending request to
<https://cds.climate.copernicus.eu/api/v2/resources/reanalysis-era5-single-levels>
 Downloading 2020-10

2024-05-22 16:59:29,999 INFO Downloading <https://download-0003-clone.copernicus-climate.eu/cache-compute-0003/cache/data2/adaptor.mars.internal-1716305620.2811038-13436-3-b3c67966-183e-48c2-8a96-0b2488dd2cd7.grib> to
 /var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmps8uvr3g1/2020_10.grib
 (196.2K)
 2024-05-22 16:59:30,486 INFO Download rate 403.8K/s
 2024-05-22 16:59:30,606 INFO Welcome to the CDS
 2024-05-22 16:59:30,607 INFO Sending request to
<https://cds.climate.copernicus.eu/api/v2/resources/reanalysis-era5-single-levels>

Downloading 2020-11

2024-05-22 16:59:30,833 INFO Downloading <https://download-0019.copernicus-climate.eu/cache-compute-0019/cache/data3/adaptor.mars.internal-1716305671.1256313-8892-2-52e526dc-9250-422e-b4dd-8583e72b1b8b.grib> to /var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmps8uvr3g1/2020_11.grib (189.8K)

2024-05-22 16:59:31,389 INFO Download rate 342.7K/s

2024-05-22 16:59:31,509 INFO Welcome to the CDS

2024-05-22 16:59:31,509 INFO Sending request to <https://cds.climate.copernicus.eu/api/v2/resources/reanalysis-era5-single-levels>

Downloading 2020-12

2024-05-22 16:59:31,723 INFO Downloading <https://download-0014-clone.copernicus-climate.eu/cache-compute-0014/cache/data5/adaptor.mars.internal-1716305722.8409395-29470-17-b5d6167f-1e12-486c-8ae3-2b2acdd5e970.grib> to /var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmps8uvr3g1/2020_12.grib (196.2K)

2024-05-22 16:59:31,952 INFO Download rate 861.3K/s

2024-05-22 16:59:32,071 INFO Welcome to the CDS

2024-05-22 16:59:32,072 INFO Sending request to <https://cds.climate.copernicus.eu/api/v2/resources/reanalysis-era5-single-levels>

Downloading... 2021

Downloading 2021

2024-05-22 16:59:32,303 INFO Downloading <https://download-0019.copernicus-climate.eu/cache-compute-0019/cache/data4/adaptor.mars.internal-1716322400.0202093-16078-8-070ec67b-f447-45ac-9a56-145061d999cf.grib> to /var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmps8uvr3g1/2021.grib (2.3M)

2024-05-22 16:59:32,773 INFO Download rate 4.8M/s

2024-05-22 16:59:32,893 INFO Welcome to the CDS

2024-05-22 16:59:32,894 INFO Sending request to <https://cds.climate.copernicus.eu/api/v2/resources/reanalysis-era5-single-levels>

Downloading... 2022

Downloading 2022-1

2024-05-22 16:59:33,099 INFO Downloading <https://download-0008-clone.copernicus-climate.eu/cache-compute-0008/cache/data7/adaptor.mars.internal-1716306137.8515413-6996-15-66eda3ed-d8b8-4773-be16-7f4dbbada93e.grib> to /var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmps8uvr3g1/2022_1.grib (196.2K)

2024-05-22 16:59:33,645 INFO Download rate 360K/s

2024-05-22 16:59:33,764 INFO Welcome to the CDS

2024-05-22 16:59:33,765 INFO Sending request to <https://cds.climate.copernicus.eu/api/v2/resources/reanalysis-era5-single-levels>

Downloading 2022-2

2024-05-22 16:59:33,935 INFO Downloading <https://download-0002-clone.copernicus-climate.eu/cache-compute-0002/cache/data1/adaptor.mars.internal-1716306137.8515413-6996-15-66eda3ed-d8b8-4773-be16-7f4dbbada93e.grib>

```

climate.eu/cache-compute-0002/cache/data2/adaptor.mars.internal-
1716306173.2406828-26630-8-f0440fa0-95fb-4c89-a07f-cb4ffa362ca8.grib to
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmps8uvr3g1/2022_2.grib
(177.2K)
2024-05-22 16:59:34,472 INFO Download rate 330.6K/s
2024-05-22 16:59:34,592 INFO Welcome to the CDS
2024-05-22 16:59:34,592 INFO Sending request to
https://cds.climate.copernicus.eu/api/v2/resources/reanalysis-era5-single-levels
Downloading 2022-3
2024-05-22 16:59:35,018 INFO Downloading https://download-0015-clone.copernicus-
climate.eu/cache-compute-0015/cache/data0/adaptor.mars.internal-
1716306208.9195397-13074-17-898aef59-6a3d-4be3-b09d-2f91021c53c1.grib to
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmps8uvr3g1/2022_3.grib
(196.2K)
2024-05-22 16:59:35,504 INFO Download rate 404.8K/s
2024-05-22 16:59:35,628 INFO Welcome to the CDS
2024-05-22 16:59:35,629 INFO Sending request to
https://cds.climate.copernicus.eu/api/v2/resources/reanalysis-era5-single-levels
Downloading 2022-4
2024-05-22 16:59:35,792 INFO Downloading https://download-0010-clone.copernicus-
climate.eu/cache-compute-0010/cache/data9/adaptor.mars.internal-
1716306244.2464733-20514-14-25b35794-d8e3-4051-970f-ca0762abae86.grib to
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmps8uvr3g1/2022_4.grib
(189.8K)
2024-05-22 16:59:36,275 INFO Download rate 394K/s
2024-05-22 16:59:36,395 INFO Welcome to the CDS
2024-05-22 16:59:36,396 INFO Sending request to
https://cds.climate.copernicus.eu/api/v2/resources/reanalysis-era5-single-levels
Downloading 2022-5
2024-05-22 16:59:36,658 INFO Downloading https://download-0008-clone.copernicus-
climate.eu/cache-compute-0008/cache/data4/adaptor.mars.internal-
1716293141.3645952-26489-4-53c71486-5b2a-486e-95ad-5978900f756c.grib to
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmps8uvr3g1/2022_5.grib
(196.2K)
2024-05-22 16:59:36,895 INFO Download rate 832.7K/s
Found 2022_1.grib
Renamed variable var167 to tas in
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmpup28xmi8/2022_1.nc
Found 2020_11.grib
Renamed variable var167 to tas in
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmpup28xmi8/2020_11.nc
Found 2018.grib
Renamed variable var167 to tas in
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmpup28xmi8/2018.nc

```

```

Found 2020_10.grib
Renamed variable var167 to tas in
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmpup28xmi8/2020_10.nc
Found 2020_8.grib
Renamed variable var167 to tas in
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmpup28xmi8/2020_8.nc
Found 2021.grib
Renamed variable var167 to tas in
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmpup28xmi8/2021.nc
Found 2022_5.grib
Renamed variable var167 to tas in
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmpup28xmi8/2022_5.nc
Found 2017.grib
Renamed variable var167 to tas in
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmpup28xmi8/2017.nc
Found 2022_4.grib
Renamed variable var167 to tas in
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmpup28xmi8/2022_4.nc
Found 2020_12.grib
Renamed variable var167 to tas in
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmpup28xmi8/2020_12.nc
Found 2020_9.grib
Renamed variable var167 to tas in
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmpup28xmi8/2020_9.nc
Found 2022_3.grib
Renamed variable var167 to tas in
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmpup28xmi8/2022_3.nc
Found 2022_2.grib
Renamed variable var167 to tas in
/var/folders/yj/k7pg73d56rl366r8bvlbncgm0000gn/T/tmpup28xmi8/2022_2.nc
Found 2022_2.nc
Found 2020_12.nc
Found 2022_3.nc
Found 2021.nc
Found 2020_8.nc
Found 2017.nc
Found 2020_9.nc
Found 2022_4.nc
Found 2020_10.nc
Found 2022_1.nc
Found 2020_11.nc
Found 2018.nc
Found 2022_5.nc
Merged era5 file saved into
./executed_trainings/Vienna_20240522-1659/temp_v8p85rkb/era5_merged.nc
Lat: 48.2303
Lon: 16.3609
nearest_lat_idx: 5 [49.231      48.980875 48.73075  48.480625 48.2305   47.980375

```

```

47.73025
  47.480125 47.23    ]
nearest_lon_idx: 5 [15.36 15.61 15.86 16.11 16.36 16.61 16.86 17.11 17.36]
nearest_lat: 47.980375
nearest_lon: 16.61
nearest lon is bigger
nearest lat is smaller
crop_lon_idx_min: 1
crop_lon_idx_max: 8
crop_lat_idx_min: 1
crop_lat_idx_max: 8
Lon values after cropping: [15.61 15.86 16.11 16.36 16.61 16.86 17.11 17.36]
Lat values after cropping: [48.980875 48.73075  48.480625 48.2305   47.980375
47.73025  47.480125
  47.23    ]
Era5 for station cropped and exported to:
./executed_trainings/Vienna_20240522-1659/target_9gs0g5n6/train/era5_merged.nc
train args: --data-root-dir
./executed_trainings/Vienna_20240522-1659/target_9gs0g5n6
            --data-names era5_merged.nc,cleaned.nc
            --data-types tas,tas
            --n-target-data 1
            --encoding-layers 3
            --pooling-layers 0
            --device cpu
            --n-filters 18
            --out-channels 1
            --snapshot-dir
./executed_trainings/Vienna_20240522-1659/model_k_rzjhrj
            --n-threads 0
            --max-iter 300000
            --log-interval 3000
            --eval-timesteps 0,1
            --loss-criterion 3
            --log-dir ./executed_trainings/Vienna_20240522-1659/log_j2yewysi
            --normalize-data

```

```

-----
FileNotFoundError                                Traceback (most recent call last)
/Users/timo.wacke/VsCodeProjects/digital-twin-for-weather-station/
↳ training_executer.ipynb Cell 5 line 7
      <a href='vscode-notebook-cell:/Users/timo.wacke/VsCodeProjects/
↳ digital-twin-for-weather-station/training_executer.ipynb#W4sZmlsZQ%3D%3D?
↳ line=0'>1</a> training = TrainingExecuter(
      <a href='vscode-notebook-cell:/Users/timo.wacke/VsCodeProjects/
↳ digital-twin-for-weather-station/training_executer.ipynb#W4sZmlsZQ%3D%3D?
↳ line=1'>2</a>         station = station_submission.station,

```

```

    <a href='vscode-notebook-cell:/Users/timo.wacke/VsCodeProjects/
↪digital-twin-for-weather-station/training_executer.ipynb#W4sZmlsZQ%3D%3D?
↪line=2'>3</a>        progress = station_submission.progress,
    <a href='vscode-notebook-cell:/Users/timo.wacke/VsCodeProjects/
↪digital-twin-for-weather-station/training_executer.ipynb#W4sZmlsZQ%3D%3D?
↪line=3'>4</a>        iterations = iterations,
    <a href='vscode-notebook-cell:/Users/timo.wacke/VsCodeProjects/
↪digital-twin-for-weather-station/training_executer.ipynb#W4sZmlsZQ%3D%3D?
↪line=4'>5</a>        local = True,
    <a href='vscode-notebook-cell:/Users/timo.wacke/VsCodeProjects/
↪digital-twin-for-weather-station/training_executer.ipynb#W4sZmlsZQ%3D%3D?
↪line=5'>6</a> )
----> <a href='vscode-notebook-cell:/Users/timo.wacke/VsCodeProjects/
↪digital-twin-for-weather-station/training_executer.ipynb#W4sZmlsZQ%3D%3D?
↪line=6'>7</a> job_id = training.execute_with_sbatch()

```

```

File ~/VsCodeProjects/digital-twin-for-weather-station/train_station_twin/
↪training_executer.py:111, in TrainingExecuter.execute_with_sbatch(self)
    109 self.transform_station_to_expected_output()
    110 self.copy_train_folder_as_val_folder()
--> 111 result = subprocess.run(['sbatch', self.get_sbatch_script()],
↪stdout=subprocess.PIPE, stderr=subprocess.PIPE, text=True)
    113 # Check if the command executed successfully
    114 if result.returncode == 0:
    115     # Extract the job ID from the output

```

```

File ~/anaconda3/envs/crai/lib/python3.10/subprocess.py:503, in run(input,
↪capture_output, timeout, check, *popenargs, **kwargs)
    500     kwargs['stdout'] = PIPE
    501     kwargs['stderr'] = PIPE
--> 503 with Popen(*popenargs, **kwargs) as process:
    504     try:
    505         stdout, stderr = process.communicate(input, timeout=timeout)

```

```

File ~/anaconda3/envs/crai/lib/python3.10/subprocess.py:971, in Popen.
↪__init__(self, args, bufsize, executable, stdin, stdout, stderr, preexec_fn,
↪close_fds, shell, cwd, env, universal_newlines, startupinfo, creationflags,
↪restore_signals, start_new_session, pass_fds, user, group, extra_groups,
↪encoding, errors, text, umask, pipesize)
    967         if self.text_mode:
    968             self.stderr = io.TextIOWrapper(self.stderr,
    969                 encoding=encoding, errors=errors)
--> 971     self._execute_child(args, executable, preexec_fn, close_fds,
    972                         pass_fds, cwd, env,
    973                         startupinfo, creationflags, shell,
    974                         p2cread, p2cwrite,
    975                         c2pread, c2pwrite,
    976                         errread, errwrite,
    977                         restore_signals,
    978                         gid, gids, uid, umask,

```



```

979                 start_new_session)
980 except:
981     # Cleanup if the child failed starting.
982     for f in filter(None, (self.stdin, self.stdout, self.stderr)):

```

File ~/anaconda3/envs/crai/lib/python3.10/subprocess.py:1863, in Popen.

```

→ _execute_child(self, args, executable, preexec_fn, close_fds, pass_fds, cwd,
→ env, startupinfo, creationflags, shell, p2cread, p2cwrite, c2pread, c2pwrite,
→ errread, errwrite, restore_signals, gid, gids, uid, umask, start_new_session)
1861     if errno_num != 0:
1862         err_msg = os.strerror(errno_num)
-> 1863     raise child_exception_type(errno_num, err_msg, err_filename)
1864 raise child_exception_type(err_msg)

```

FileNotFoundError: [Errno 2] No such file or directory: 'sbatch'

```
[ ]: plot_measurements_df(station_submission.station.df)
```

```
[ ]: print(f"Job ID: {job_id}")
print(f"tail -f {training.temp_dir.name}/slurm_logs/crai_crai-train_{job_id}.
→ log")
```

```
[ ]:
```

```
[ ]: [matplotlib.lines.Line2D at 0x19d3bc8b0>]
```

