

# Overview – Extract Retrieval Data

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# Agenda

1. What is the goal of this "extraction"?
2. What happens during the filter process?
3. Where is the novelty?
4. How to access this data?
5. Background knowledge for software tools like this
6. How to use this tool
7. ~~What calibrationDays are & the complication with them~~
8. ~~How the automation works~~

# 1. What is the goal of this "extraction"?

<https://retrieval.esm.ei.tum.de/hamburg/2021-08-31>



```
32  ## SENSOR LOCATIONS:
33  ##      me17: GE0
34  ##      mb86: HAW
35  ##      mc15: JOR
36  ##      md16: ROS
37  ## LOCATION COORDINATES:
38  ##          lng,      lat,      alt
39  ##      GE0:   9.974,  53.568,  25.000
40  ##      HAW:  10.200,  53.495,  41.000
41  ##      JOR:   9.677,  53.536,   8.000
42  ##      ROS:   9.892,  53.421,  98.000
43  #####
44  year_day_hour,      mc15_xco2_ppm_sc,  md16_xco2_ppm_sc, mc15_xch4_ppm_sc,  md16_xch4_ppm_sc
45  2021-08-1206:00:59,  412.02071425886874, NaN,          1.9041824076792346, NaN
46  2021-08-1206:02:59,  412.0075591602994, NaN,          1.9042058983160552, NaN
47  2021-08-1206:04:59,  411.99274749780085, NaN,          1.9040060240929118, NaN
48  2021-08-1206:06:59,  411.9823147582188, NaN,          1.9038608421148986, NaN
49  2021-08-1206:08:59,  411.95438482122177, NaN,          1.9035472063243717, NaN
50  2021-08-1206:10:59,  411.930338382756, NaN,          1.9031644223403748, NaN
51  2021-08-1206:12:59,  411.9066550616497, NaN,          1.903019380189071, NaN
```

<https://github.com/tum-esm/extract-retrieval-data/blob/main/docs/example-out.csv>



## 2. What happens during the filter process?

1. **Calibrate** the raw measurement data
2. Filter out data where **GFIT flagged** some anomaly
3. Filter out any data according to specific **filter cases**
4. Compute a **rolling mean** over the remaining data
5. **Resample** the smooth curves at a given rate

## Tweakable filter settings:

- `cases`
- `movingWindowSizeMinutes`
- `outputStepSizeMinutes`

An explanation of the filter cases can be found in the master thesis of Nico Nachtigall (NAS: `/tuei/esm/Thesis/Masterarbeiten/2020 MA Nico Nachtigall/Nachtigall_MasterThesis_final.pdf` )

### 3. Where is the novelty?



**How it used to be:** <https://gitlab.lrz.de/esm/columnmeasurementautomation>

*(You should probably not try to understand this code)*

**Problem:** One big pile of code that does everything: Triggering GFIT, loading data into the database, generating plots, generating CSV files, uploading data to the website.



**Goal:** Split this pipeline into two independent processes!

1. Fill the database with retrieval data
2. Use that database to generate certain output files

**This project** should implement a convenient way for you to **generate output files** from that database.

## 4. How to access this data?

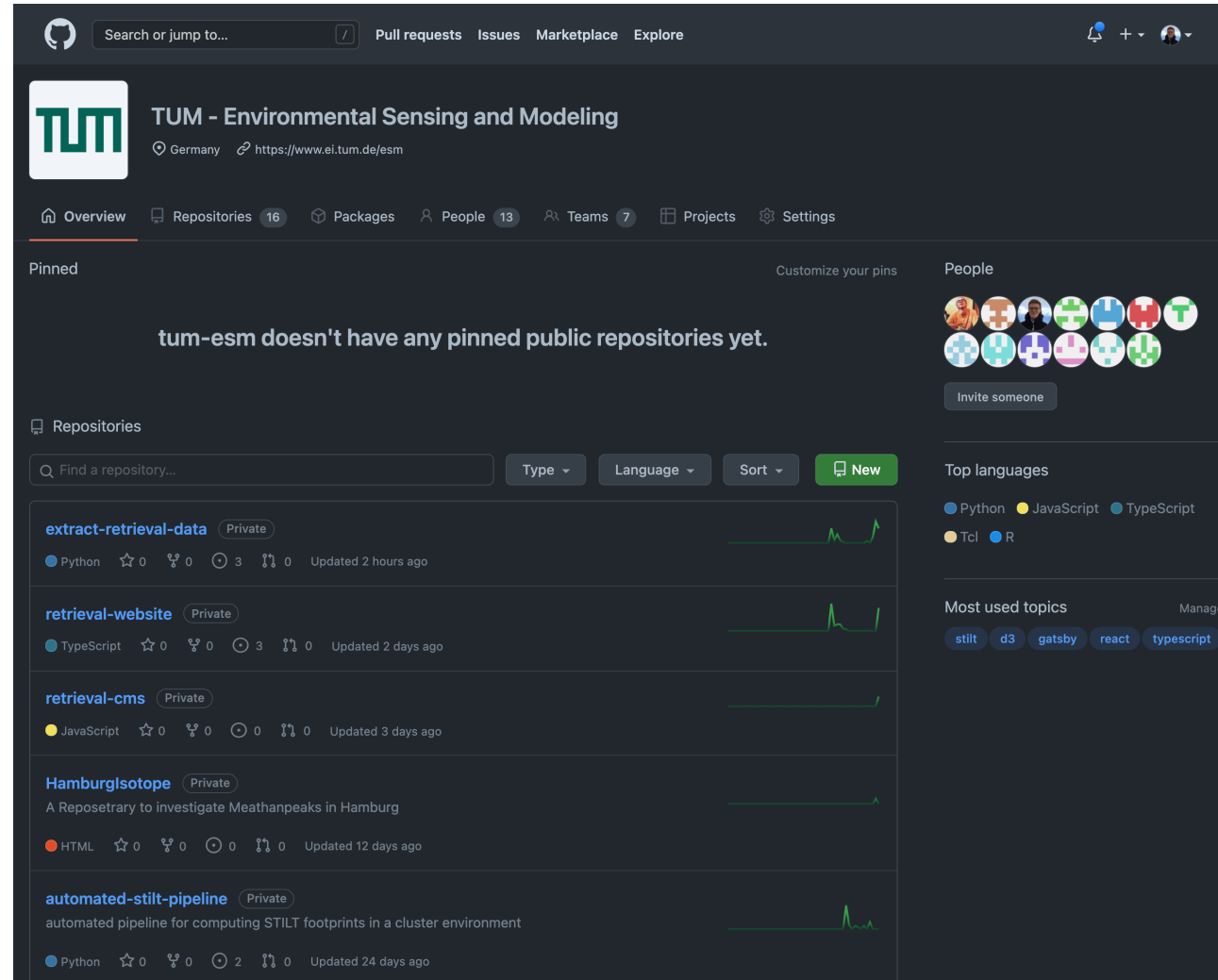
<https://wiki.tum.de/display/esm/EM27+Retrievals>

<https://github.com/tum-esm/extract-retrieval-data>

## **5. Background knowledge for software tools like this**

- Git (<https://wiki.tum.de/display/esm/Version+Control+with+Git>)

- GitHub/GitLab (<https://wiki.tum.de/display/esm/GitHub+and+GitLab>)



The screenshot shows the GitHub profile page for 'TUM - Environmental Sensing and Modeling'. The profile includes a bio, location (Germany), and website (https://www.ei.tum.de/esm). The navigation bar shows 'Overview', 'Repositories (16)', 'Packages', 'People (13)', 'Teams (7)', 'Projects', and 'Settings'. The 'Pinned' section states 'tum-esm doesn't have any pinned public repositories yet.' The 'Repositories' section lists five private repositories:

- extract-retrieval-data** (Private): Python, 0 stars, 0 forks, 3 commits, updated 2 hours ago.
- retrieval-website** (Private): TypeScript, 0 stars, 0 forks, 3 commits, updated 2 days ago.
- retrieval-cms** (Private): JavaScript, 0 stars, 0 forks, 0 commits, updated 3 days ago.
- HamburgIsotope** (Private): HTML, 0 stars, 0 forks, 0 commits, updated 12 days ago. Description: A Repository to investigate Methanpeaks in Hamburg.
- automated-stilt-pipeline** (Private): Python, 0 stars, 0 forks, 2 commits, updated 24 days ago. Description: automated pipeline for computing STILT footprints in a cluster environment.

The right sidebar shows 'People' (a grid of avatars), 'Top languages' (Python, JavaScript, TypeScript, Tcl, R), and 'Most used topics' (stilt, d3, gatsby, react, typescript).



- Python Interpreter & Dependencies

(<https://wiki.tum.de/display/esm/Python+Development>)

```
7  [tool.poetry.dependencies]
8  python = ">=3.9,<3.10"
9  pandas = "^1.1.4"
10 tqdm = "^4.53.0"
11 rich = "^10.6.0"
12 scipy = "^1.7.1"
13 colorcet = "^2.0.6"
14 geographiclib = "^1.52"
15 sklearn = "^0.0"
16 matplotlib = "^3.4.2"
17 seaborn = "^0.11.1"
18 bokeh = "^2.3.3"
19 pyproj = "^3.1.0"
20 mysql-connector-python = "^8.0.26"
21 httpx = "^0.19.0"
22
23 [tool.poetry.dev-dependencies]
24 autopep8 = "^1.5.4"
25 pytest = "^6.2.4"
26 importlib-metadata = "^4.0.1"
27 typing-extensions = "^3.10.0"
28 black = "^21.6b0"
```

- Virtual Environments (<https://wiki.tum.de/display/esm/Python+Development>)

```
which python
```

```
# output: /usr/bin/python
```

```
source /Users/moritz/Documents/research/extract-retrieval-data/.venv/bin/activate
```

```
which python
```

```
# output: /Users/moritz/Documents/research/extract-retrieval-data/.venv/bin/python
```

```
deactivate
```

```
which python
```

```
# output: /usr/bin/python
```

\* UNIX commands\_

## 6. How to use this tool

👉 Why this is not a workshop.

See setup instructions in the `README.md` at <https://github.com/tum-esm/extract-retrieval-data>.

**config.example.json** : <https://github.com/tum-esm/extract-retrieval-data/blob/main/config.example.json>

**example-out.csv** : <https://github.com/tum-esm/extract-retrieval-data/blob/main/docs/example-out.csv>



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**8. How the automation works**