Getting started

Installing ethoscopy as a docker container with ethoscope-lab (recommended).

The ethoscope-lab docker container is the recommended way to use ethoscopy. A docker container is a pre-made image that will run inside any computer, independent of the operating system you use. The docker container is isolated from the rest of the machine and will not interfere with your other Python or R installations. It comes with its own dependencies and will just work. The docker comes with its own multi-user jupyterhub notebook so lab members can login into it directly from their browser and run all the analyses remotely from any computer, at home or at work. In the Gilestro laboratory we use a common workstation with the following hardware configuration.

```
CPU: 12x Intel(R) Xeon(R) CPU E5-1650 v3 @ 3.50GHz
GPU: Intel(R) Xeon(R) CPU E5-1650 v3 @ 3.50GHz
Hard drive: 1TB SSD for OS, 1TB SSD for homes and cache, 7.3 TB for ethoscope data
Memory: 64GB
```

The workstation is accessible via the internet (behind VPN) so that any lab member can login into the service and run their analyses remotely. All the computational power is in the workstation itself so one can analyse ethoscope data from a tablet, if needs be.

What's in the latest image (`ggilestro/ethoscope-lab:1.2`)

- JupyterHub 5.4.0 · Python 3.10 kernel · R kernel with rethomics (behavr, ggetho, damr, sleepr, zeitgebr, scopr)
- `ethoscopy 2.0.5` pre-installed; tutorial datasets (`overview_data.pkl`, `circadian_data.pkl`, etc.) already baked into the package directory, so `get_tutorial('overview')` works out of the box without a separate download step
- Flexible authentication: shared-password (dummy), GitHub, Google, GitLab or Keycloak/OIDC — selected via a `.env` file at run time (see Authentication below)

Follow the instructions below to install the ethoscope-lab docker container on your machine.

Quick start with docker compose (recommended)

The ethoscopy repo ships a `docker-compose.yml` plus `.env.*.example` templates. On a machine that has Docker Engine with the `compose` plugin installed:

```
# Grab just the Docker/ directory (sparse-checkout keeps the rest of the repo off disk)
git clone --depth=1 --filter=blob:none --sparse https://github.com/gilestrolab/ethoscopy.git
cd ethoscopy
git sparse-checkout set Docker
cd Docker
```

```
# Pick an authentication method and write its settings to .env
cp .env.dummy.example .env       # shared password — simplest
#  or
cp .env.keycloak.example .env    # Keycloak / generic OIDC
#  or  .env.github.example / .env.google.example / .env.gitlab.example

# Edit .env — at minimum set DUMMY_PASSWORD, ALLOWED_USERS, ADMIN_USERS
#            (for OAuth, set OAUTH_CLIENT_ID / _SECRET / _CALLBACK_URL instead)

# Optional overrides at the top of .env:
#   JUPYTER_HUB_TAG=5.4.0
#   ETHOSCOPE_LAB_TAG=1.2
#   UID=1000   GID=1000           # must match ownership of /mnt/homes and /mnt/cache

# Adjust docker-compose.yml's volumes: section so the three host paths point at
# places that actually exist on your box:
#   - /mnt/ethoscope_data/results         → /mnt/ethoscope_results  (ro, your .db files)
#   - /mnt/ethoscope_data/ethoscope_metadata → /opt/ethoscope_metadata
#   - /mnt/homes                          → /home                   (per-user homes)
#   - /mnt/cache                          → /home/cache             (shared scratch)

docker compose up -d
```

The service is then exposed on **port 8082** of the host (the `docker-compose.yml` maps `8082:8000` by default — change that line if you need a different host port). Point a browser at `http://your-host:8082/`.

Manual `docker run` (when you don't have compose)

The image can also be started directly. The simplest invocation, for a single-user trial on Linux, looks like this:

```
# Optional. Update the system to the latest version. You may want to restart after this.
sudo pamac update
# install docker
sudo pacman -S docker
# start the docker service
sudo systemctl enable --now docker

# download and run the ethoscope-lab docker container
# the :ro flag means you are mounting that destination in read-only
sudo docker run -d -p 8000:8000 \
```

```
      --name ethoscope-lab \
      --volume /ethoscope_data/results:/mnt/ethoscope_results:ro \
      --restart=unless-stopped \
      ggilestro/ethoscope-lab:1.2
```

> Installation on Windows or MacOS makes sense if you have actual ethoscope data on those machines, which is normally not the case. If you go for those OSs, I won't provide detailed instruction or support as I assume you know what you're doing.

On MacOS

Install the docker software from here. Open the terminal and run the same command as above, e.g.:

```
sudo docker run -d -p 8000:8000 \
      --name ethoscope-lab \
      --volume /path/to/ethoscope_data/:/mnt/ethoscope_results:ro \
      --restart=unless-stopped \
      ggilestro/ethoscope-lab:1.2
```

On Windows

Install the docker software from here. After installation, open the window terminal and issue the same command as above, only replacing the folder syntax as appropriate. For instance, if your ethoscope data are on `z:\ethoscope_data` and the user data are on `c:\Users\folder` use the following:

```
sudo docker run -d -p 8000:8000 \
      --name ethoscope-lab \
      --volume /z/ethoscope_data:/mnt/ethoscope_results:ro \
      --restart=unless-stopped \
      ggilestro/ethoscope-lab:1.2
```

Storing user data on the machine, not on the container (recommended)

ethoscope-lab runs on top of a JupyterHub environment, meaning that it supports organised and simultaneous access by multiple users. Users have their own credentials and their own home folder. With the default `.env.dummy.example` settings, the demo user is `ethoscopelab` with password `ethoscope`, and each user's work lives in `/home/<username>`. In the minimal examples above, `/home/<username>` is stored **inside** the container, which is not ideal — you lose everything on a container recreate. A better solution is to mount the host's home folders at `/home` inside the container. In the example below, we use `/mnt/my_user_homes`:

```
sudo docker run -d -p 8000:8000 \
      --name ethoscope-lab \
```

```
    --volume /ethoscope_data/results:/mnt/ethoscope_results:ro \
    --volume /home:/mnt/my_user_homes \
    --restart=unless-stopped \
    ggilestro/ethoscope-lab:1.2
```

> Make sure your local home location contains a folder for each user (e.g. `/mnt/my_user_homes/ethoscopelab`) with correct ownership — by default the container expects UID/GID `1000:1000`.

Any folder in `/mnt/my_user_homes` is then accessible to the corresponding user inside ethoscope-lab. In our lab we sync those using owncloud (an open-source Dropbox clone) so that every user has their files automatically synced across all their machines.

Authentication

The image supports five authentication methods, selected at startup via environment variables (typically a `.env` file consumed by `docker compose`):

Method	When to use	`.env` template
Dummy	Small teams on a trusted network	`.env.dummy.example`
Keycloak / OIDC	Institutional SSO (production)	`.env.keycloak.example`
GitHub OAuth	Team gated by a GitHub organisation	`.env.github.example`
Google OAuth	Gated by a Google Workspace domain	`.env.google.example`
GitLab OAuth	Team on a GitLab instance	`.env.gitlab.example`

Full instructions — including adding users, promoting admins, switching methods without data loss, and troubleshooting tokens — live in `Docker/README_AUTH.md` in the ethoscopy repo.

For the shared-password case, the relevant knobs in `.env` are:

```
AUTHENTICATOR_CLASS=dummy
DUMMY_PASSWORD=pick-a-strong-password
ALLOWED_USERS=alice,bob,charlie,ethoscopelab
ADMIN_USERS=alice
```

Adding users without OAuth (rare)

If you're running the minimal `docker run` setup without an `.env` file and need to add a local user, you can drop into the container and create one the traditional way — this matches what `ALLOWED_USERS` already does automatically for compose deployments:

```
#enter a bash shell of the container
sudo docker exec -it ethoscope-lab /bin/bash
```

```
#create the username and home folder
useradd myusername -m

#set the password for the newly created user
passwd myusername
```

The user will then be able to login into Jupyter and work out of `/home/myusername`.

Persistent user credentials (legacy)

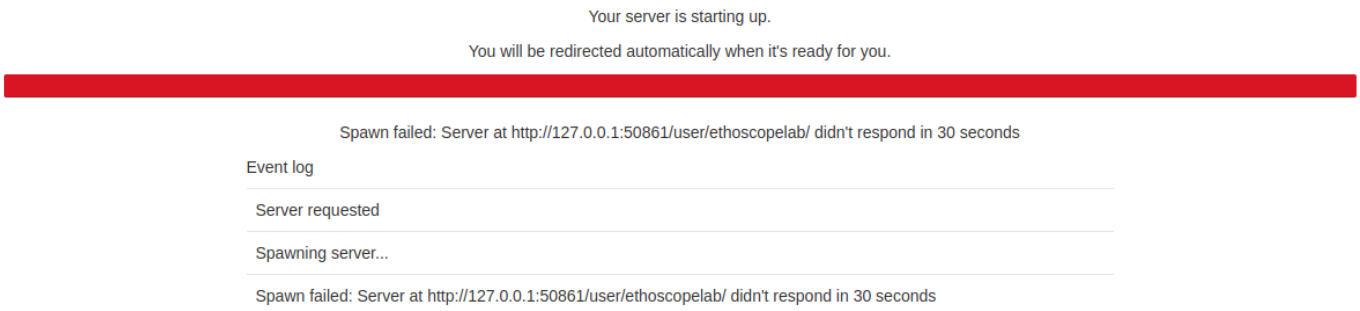
If you prefer to manage Linux-level credentials on the host rather than via `.env` or OAuth (for example, when you've inherited an older ethoscope-lab deployment), you can bind-mount `/etc/passwd`, `/etc/shadow` and `/etc/group` from the host into the container. This is the old approach; OAuth is now the recommended way to persist identities across image upgrades. An example:

```
sudo docker run -d -p 8000:8000 \
      --name ethoscope-lab \
      --volume /mnt/data/results:/mnt/ethoscope_results:ro \
      --volume /mnt/data/ethoscope_metadata:/opt/ethoscope_metadata \
      --volume /mnt/homes:/home \
      --volume /mnt/cache:/home/cache \
      --restart=unless-stopped \
      -e VIRTUAL_HOST="jupyter.lab.gilest.ro" \
      -e VIRTUAL_PORT="8000" \
      -e LETSENCRYPT_HOST="jupyter.lab.gilest.ro" \
      -e LETSENCRYPT_EMAIL="giorgio@gilest.ro" \
      --volume /mnt/secrets/passwd:/etc/passwd:ro \
      --volume /mnt/secrets/group:/etc/group:ro \
      --volume /mnt/secrets/shadow:/etc/shadow:ro \
      --cpus=10 \
      ggilestro/ethoscope-lab:1.2
```

The last three `--volume` lines indicate the location of the user credentials. This configuration allows to maintain user information even when upgrading ethoscope-lab to newer versions.

Troubleshooting

If your Jupyter starts but hangs on the following image



It means that the ethoscopelab user does not have access to its own folder. This most likely indicates that you are running the container with a mounted home directory, but the ethoscope home folder is either not present or does not have read/write access for UID/GID `1000:1000` (the default inside the image — configurable via `UID` / `GID` in `.env`).

Install ethoscopy in your Python space

Ethoscopy is on github and on PyPi. You can install the latest stable version with pip3.

```
pip install ethoscopy
```

As of version 2.0.5, the required dependencies are:

```
Python >= 3.10
numpy >= 2.0
pandas >= 2.2.2
plotly >= 5.22
seaborn >= 0.13
hmmlearn >= 0.3.2
pywavelets >= 1.6
astropy >= 6.1
tabulate >= 0.9
colour >= 0.1.5
nbformat >= 5.10
```

Tutorial data

Starting with **ethoscopy 2.0.5**, the six tutorial pickle files (~36 MB total, dominated by `overview_data.pkl` at ~31 MB) are **no longer bundled with the PyPI wheel** — `pip install ethoscopy` ships code only. The tutorial notebooks fetch the datasets on demand with a single one-time call:

```
import ethoscopy as etho
etho.download_tutorial_data()   # idempotent — skips files already on disk
```

By default this populates `~/.cache/ethoscopy/tutorial_data/`, which is user-writable on every platform (no root or sudo needed). After that, `get_tutorial('overview')`, `get_tutorial('circadian')` and

`get_HMM('M'|'F')` work as shown in the tutorial notebooks.

Lookup order. At load time, ethoscopy checks three locations in this order:

1. `<site-packages>/ethoscopy/misc/tutorial_data/` — dev / editable installs and the `ethoscope-lab` Docker image (which pre-populates it at build time, see below).
2. `$ETHOSCOPY_TUTORIAL_DATA_DIR` if set — useful for shared clusters where one admin-maintained copy serves many users.
3. `~/.cache/ethoscopy/tutorial_data/` — the default for `download_tutorial_data()`.

The canonical URLs live at github.com/gilestrolab/ethoscopy/tree/main/src/ethoscopy/misc/tutorial_data. Place the six `*.pkl` files in any of the three locations above if you prefer to download manually.

> **ethoscope-lab users don't need to do anything.** The Docker image (`ggilestro/ethoscope-lab:1.2` and later) runs `download_tutorial_data(dest_dir=package_tutorial_data_dir())` during build, so the pickles are already present in the image. JupyterHub users can run the tutorials without any download step.

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