

Getting started

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

The [ethoscope-lab docker container](#) is the recommended way to use ethoscipy. 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 jupyter hub 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. Follow the instruction below to install the ethoscope-lab docker container on your machine.

On linux (recommended)

The best solution is to install this on the same computer that collects the ethoscope data so ethoscipy can have access to the `db` files directly stored in the machine. For most small installations, this computer could be [the node](#).

To install the docker you will have to find out the following information:

- what is the internet name or address of the computer you want to access? This can be the IP or an actual name.
- Where are your ethoscope data stored? On a regular node they would be in `/ethoscope_data/results`

Once these info are clear, you can proceed.

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

```
# and finally 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
```

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.:

```
# 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 /path/to/ethoscope_data:/mnt/ethoscope_results:ro \
  --restart=unless-stopped \
  ggilestro/ethoscope-lab
```

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 8080:8080 \
  --name ethoscope-lab \
  --volume /z/ethoscope_data:/mnt/ethoscope_results:ro \
  --restart=unless-stopped \
  ggilestro/ethoscope-lab
```

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

ethoscopelab runs on top of a jupyterhub environment, meaning that it supports organised and simultaneous access by multiple users. Users will need to have their own credentials and their own home folder. The default user is `ethoscopelab`, with password `ethoscopelab` and this user will save all of their work in the folder called `/home/ethoscopelab`. In the examples above, the users' folders are stored inside the container itself which is not

ideal. A better solution is to mount the home folders to a local point in your machine. In the example below, we would use the folder `/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
```

Make sure that your local home location contains an `ethoscopelab` folder that can be accessed by the `ethoscopelab` user! In the example below, you would need to create a folder called `/mnt/my_user_homes/ethoscopelab`.

Any folder in `/mnt/my_user_homes` will become accessible to `ethoscopelab`. In our lab, we sync those using [owncloud](#) (an opensource Dropbox clone) so that every user has their files automatically synced across all their machines.

Creating new users

If you want to add new users, you will have to do it from the command line. On the linux computer running `ethoscopelab` (normally the node) use the following commands:

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

#create the username
useradd myusername -m

#set the password for the username you just created
passwd myusername
```

You will now be able to login into jupyter with these new credentials. The data will be stored in the newly created folder.

Persistent user credentials

In linux, user credentials are saved inside three files: `/etc/passwd`, `/etc/shadow`, `/etc/group`. It is possible to store those on the host computer (e.g. the node) and then mount them to the container. This is called a *persistent volume* because the data will remain on the host computer even if the container is deleted. An example of a container running in this way is the following:

```
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.gilest.ro:latest
```

Lines 12-14 indicate the location of the user credentials. This configuration allows to maintain user information even when upgrading ethoscopelab to newer versions.

Troubleshooting

If your Jupyter starts but hangs on the following image

Your server is starting up.
You will be redirected automatically when it's ready for you.

```
Spawn failed: Server at http://127.0.0.1:50861/user/ethoscopelab/ didn't respond in 30 seconds  
Event log  
Server requested  
Spawning server...  
Spawn failed: Server at http://127.0.0.1:50861/user/ethoscopelab/ didn't respond in 30 seconds
```

It means that the ethoscopelab user does not have access to its own folder. This most likely indicates that you are running the container mounting the folder onto your local machine but the ethoscope home folder is either not present or does not have reading and writing access.

Install ethoscipy in your Python space

Ethoscipy is on [github](#) and on [PyPi](#). You can install the latest stable version with pip3.

```
pip install ethoscipy
```

As of version 1.2.25, the required dependencies are:

```
Python >= 3.8
Pandas ^ 1.4.2
Numpy ^ 1.22.3
Scipy ^ 1.8
Hmmlearn ^ 0.3.0
Color ^ 0.1.5
Astropy ^ 5.1.1
PyWavelets ^ 1.4.1
plotly ^ 5.7.0
kaleido ^ 0.2.1
```

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