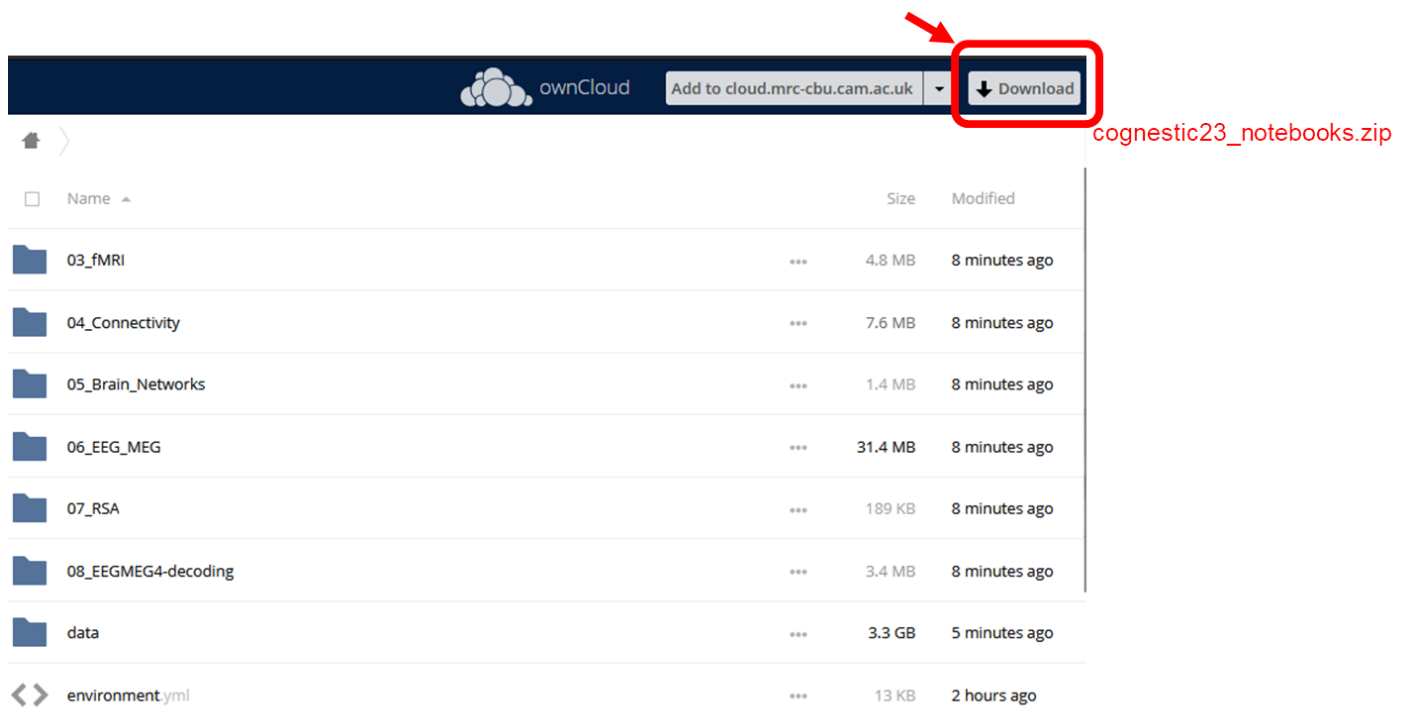


Accessing COGNESTIC-23 hands-on materials

Full hands-on access to the COGNESTIC-23 materials is available via *Virtual Machine* (VM). You will need at least **70GB of free space** on your local hard drive, and at least **4GB of RAM**. For instructions on how to install and set up the Cognestic23 VM see **section '1 COGNESTIC Virtual Machine (full hands-on)'**. Data for the Structural MRI and Diffusion MRI are located inside the VM.

If you would rather install all the required software on your system yourself, or if you have the software installed already, you can download the Structural MRI and Diffusion MRI data on the COGNESTIC-23 wiki <https://imaging.mrc-cbu.cam.ac.uk/methods/COGNESTIC2023#structuralmri>.

Many of the COGNESTIC -23 workshops will use *Jupyter Notebooks*. You can download the notebooks and their accompanied data <https://cloud.mrc-cbu.cam.ac.uk/index.php/s/AOuPeUaRJ6IjiHC> (password: *Scarecrow.Extending.Hamlet7*). Download the whole content of the notebooks and data (~8.6GB) by clicking 'Download' at the top right of the ownCloud page:



The screenshot shows the ownCloud interface. At the top right, there is a 'Download' button with a downward arrow icon, which is highlighted with a red box and a red arrow pointing to it. Below the header, there is a table listing files and folders. The table has columns for 'Name', 'Size', and 'Modified'. The files listed are:

Name	Size	Modified
03_fmRI	4.8 MB	8 minutes ago
04_Connectivity	7.6 MB	8 minutes ago
05_Brain_Networks	1.4 MB	8 minutes ago
06_EEG_MEG	31.4 MB	8 minutes ago
07_RSA	189 KB	8 minutes ago
08_EEGMEG4-decoding	3.4 MB	8 minutes ago
data	3.3 GB	5 minutes ago
environment.yml	13 KB	2 hours ago

To the right of the table, the text 'cognestic23_notebooks.zip' is written in red.

Save and unzip the *cognestic23_notebooks.zip* file on your local drive.

! Please note that for some workshops there might be some last-minute updates. In that case, a tutor will ask you to obtain the latest version of their notebooks before the start of the session via the [COGNESTIC-23 Wiki page](#).

You can view and interact with the notebooks via the Cognestic23 VM (instructions in the next section).

Alternatively, **if you cannot install and set up the VM for some reason**, you can install the required environment for the notebooks yourself on your system. See **section '2 Accessing COGNESTIC-23 Jupyter Notebooks only without setting up VM'** for instructions. **This is only if the VM option does not work for you!**

1 COGNESTIC Virtual Machine (full hands-on)

1.1 Intro, download and set up

The software for the COGNESTIC-23 workshops runs on a *Virtual Machine* (VM). A virtual machine can be thought of as an encapsulated instance of a computer (the guest) that runs on another computer (the host, in this case, your desktop or laptop). The guest uses a software application known as a hypervisor to communicate with the host and manage access to host resources such as CPU and memory.

The hypervisor used for Cognestic VM is Oracle VirtualBox. If you don't already have a copy of VirtualBox installed on your host machine, you will need to download and install a copy first. VirtualBox is available free of charge here:

<https://www.virtualbox.org/wiki/Downloads>

If you are installing it on Windows, you might get an error of missing Visual Studio 2019. In that case, you need to download and install the missing package from here <https://learn.microsoft.com/en-us/cpp/windows/latest-supported-vc-redist?view=msvc-170>, reboot your PC and try installing the Virtual Box again. If you get a warning about Python and win32api, you can ignore it and carry on the Virtual Box installation.

The Cognestic VM was built using Virtual Box 7.0.10. If you already have an older version of VirtualBox installed on your machine, you may need to update this before running the Cognestic VM. The VirtualBox software supports some backwards compatibility (up to a point, newer versions of VirtualBox will support VMs created using older versions of the software) but running newer VMs on older versions of the software generally isn't recommended (although in some circumstances it may work).

Once you have installed or updated VirtualBox, you can download the Cognestic VM <https://www.mrc-cbu.cam.ac.uk/cognestic23vm/> (password: *Mystical.Owl.Wholesaler-1753*). (The VM image is 23GB, so you will need a good internet connection and it will take a while to download.)

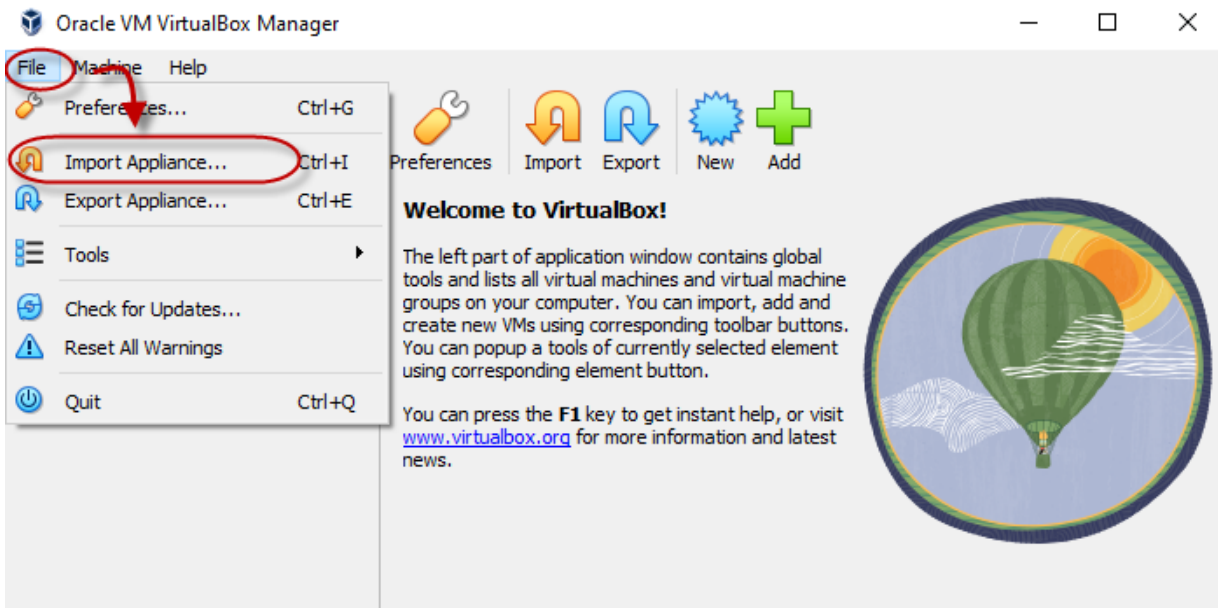
By downloading the Cognestic VM image you agree that you have read and agree to abide by all of the following terms and conditions:

- Ubuntu - <https://ubuntu.com/legal>
- Anaconda - <https://legal.anaconda.com/policies/en/?name=anaconda-org-terms-and-conditions>
- FSL - <https://fsl.fmrib.ox.ac.uk/fsl/fslwiki/Licence>
- Freesurfer - <https://surfer.nmr.mgh.harvard.edu/registration.html>
- The VM image also includes data collected as part of the [Cam-CAN project](#), and you agree to abide by the [terms and conditions](#) governing use of this data.
- You also agree that you will not share any download links or passwords with anyone else.

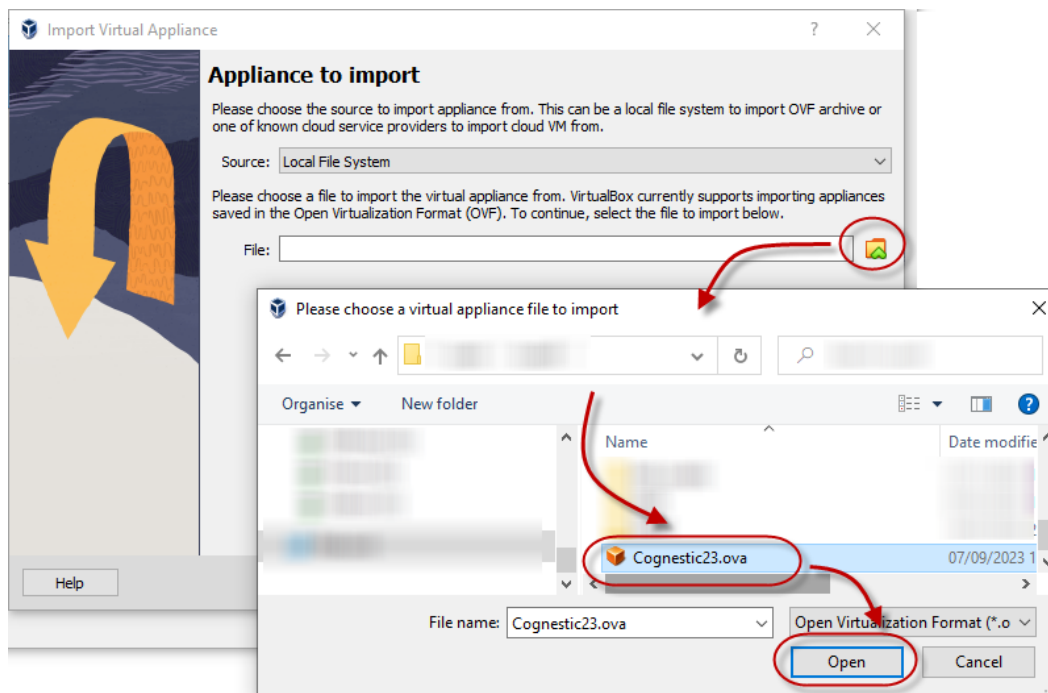
The VM image is 23GB in size, and once unpacked will require **50GB of space**, so you will need at least this amount of free space on your local hard drive, plus any space required by data generated during the workshop exercises.

The image runs the Ubuntu operating system and includes several third-party software tools including Anaconda, FSL and Freesurfer.

Once you have downloaded the *Cognestic23.ova* file, open the Oracle VirtualBox software, click on the File menu, and select "Import Appliance"



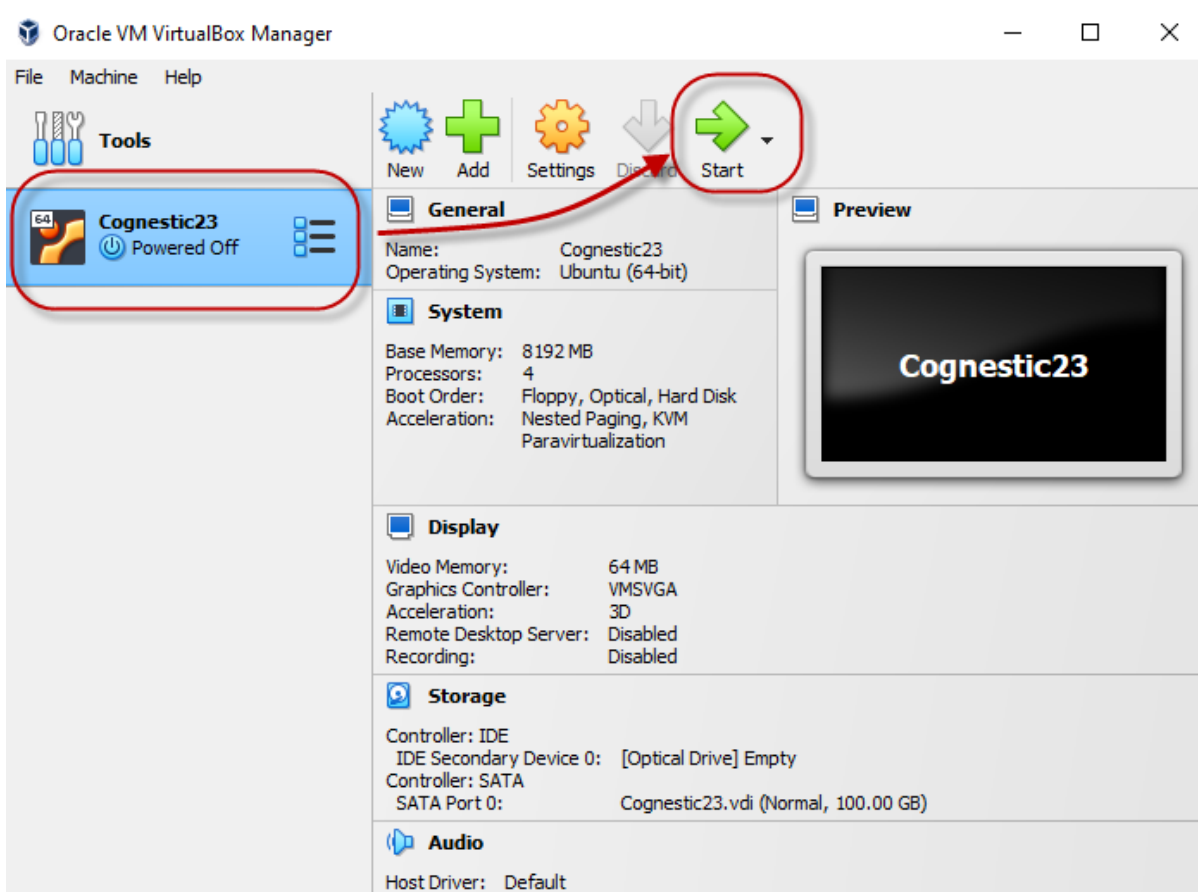
Browse to the location of the *Cognestic23.ova* file and select the file:



Click Next, then click Finish.

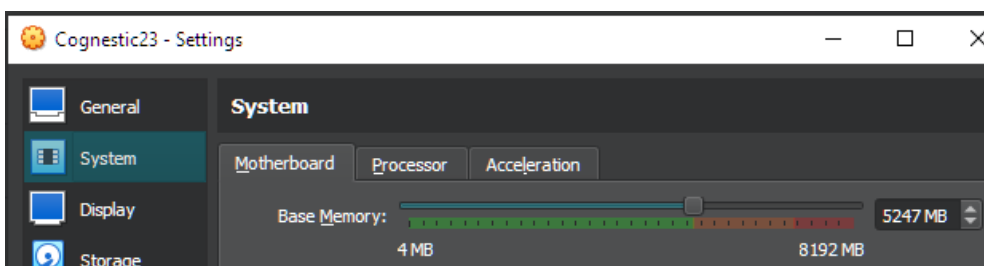
Once the import process has finished, you will see a new VM called Cognestic23 in the menu on the left-hand side of the VirtualBox window. At this point, the *Cognestic23.ova* file can be deleted if you want to recover some disk space.

Select the Cognestic23 VM and click "Start" to boot the VM:



Alternatively, before booting the VM, you can also click on the “Settings” button to edit various features of the VM. The VM has been built with 8GB RAM, 4 virtual CPU cores, and 64MB video memory. The host machine running the VM will need at least this amount of memory / CPU resources. **If the host machine doesn’t have enough memory or CPU, you can reduce the amount available to the VM via the settings interface.**

The RAM you can change in *Settings-System-Motherboard-Base Memory*.



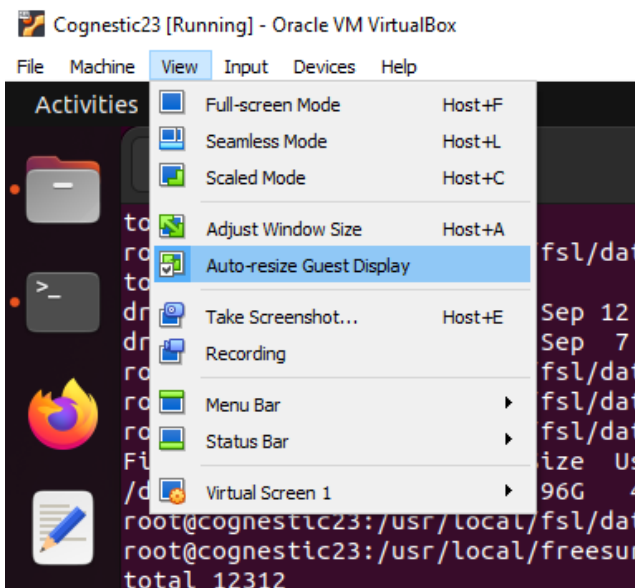
CPU cores you can change in *Settings-System-Processor-Processors*.

When changing the System settings, you will see a green-red bar. It will warn if you allocate too much (go into the red zone) of your system’s resources to the VM.

Once started, the VM screen might appear small. You can resize the screen to match your system’s display by enabling ‘Auto-resize Guest Display’.



The same option is also available via the VM window *View* menu:



You can also run the VM in full screen mode (*View menu-> Full screen Mode*).

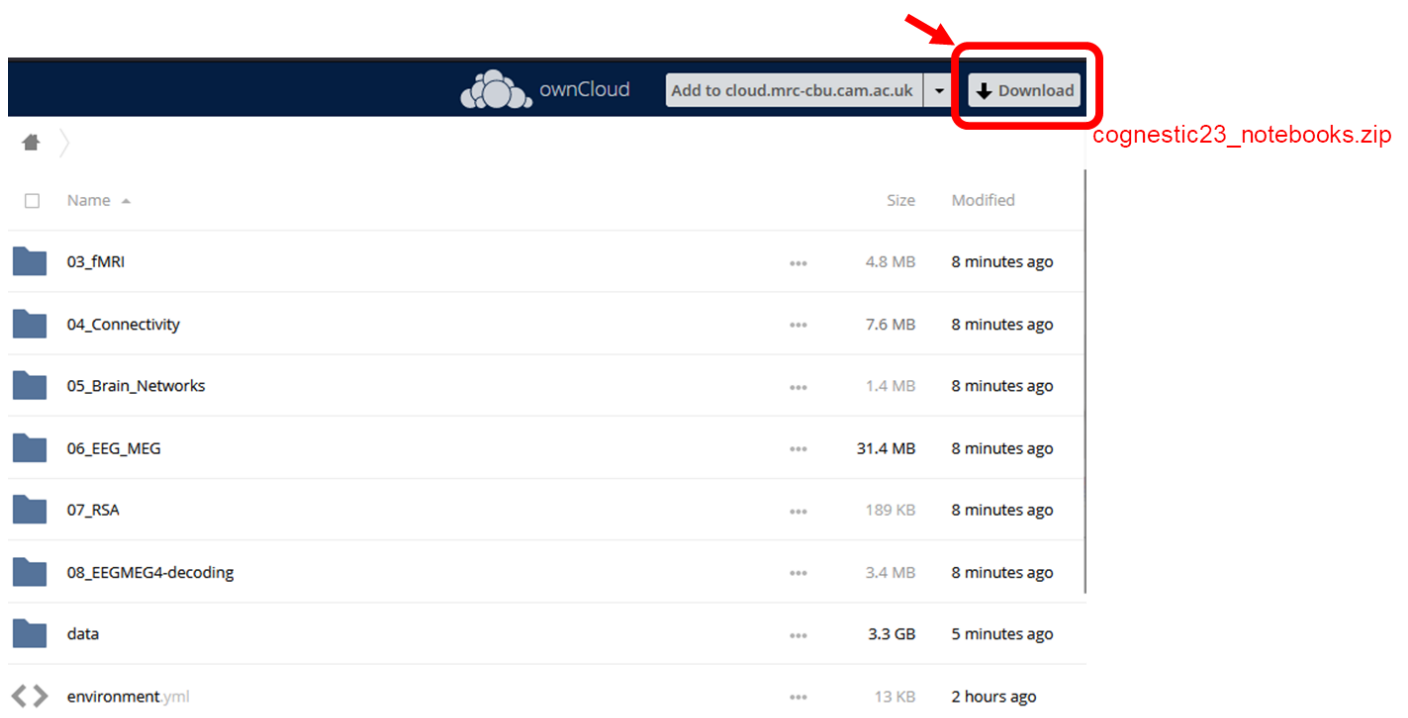
The Cognestic23 VM operating system includes a single user account:

Username: cognestic

Password: Borl.Jubi.Henk-23

1.2 Mapping the data to the Cognestic VM

Many of the COGNESTIC -23 workshops will use *Jupyter Notebooks*. You can download the notebooks and their accompanied data <https://cloud.mrc-cbu.cam.ac.uk/index.php/s/AOuPeUaRJ6IjiHC> (password: *Scarecrow.Extending.Hamlet7*). Download the whole content of the notebooks and data (8.6GB) by clicking 'Download' at the top right of the ownCloud page:

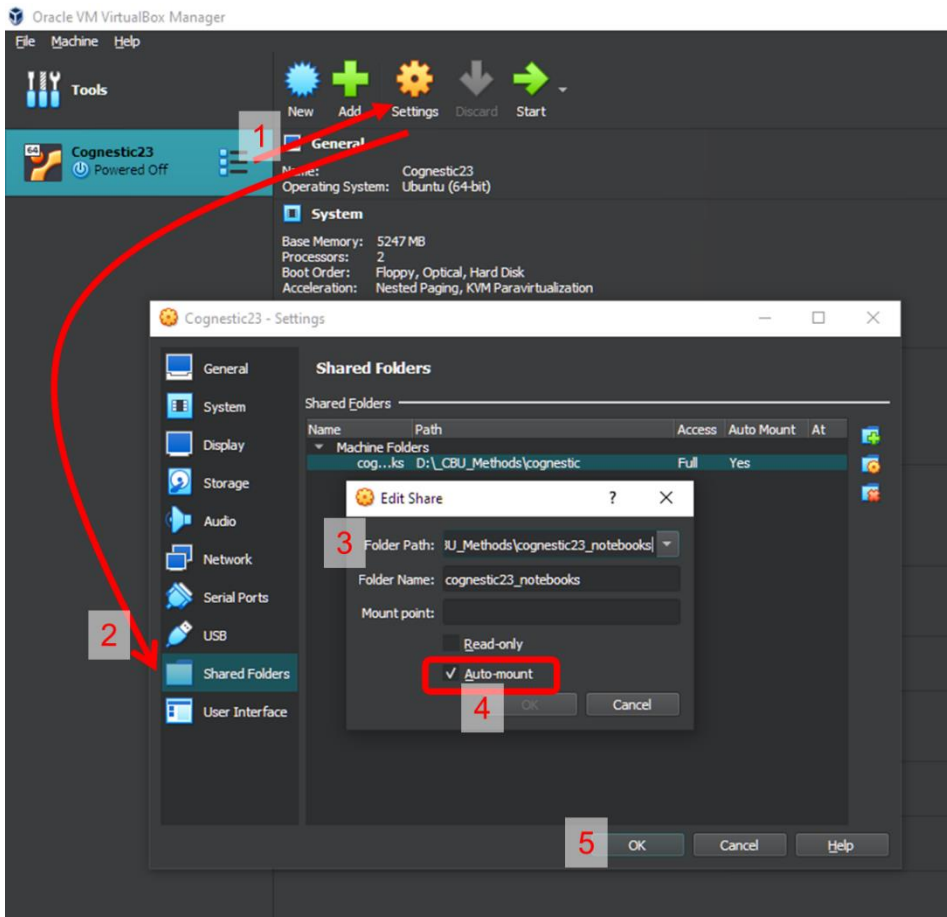


Save and unzip the *cognestic23_notebooks.zip* file on your local drive.

! Please note that for some workshops there might be some last-minute updates. In that case, a tutor will ask you to obtain the latest version of their notebooks before the start of the session via the [Cognestic Wiki page](#).

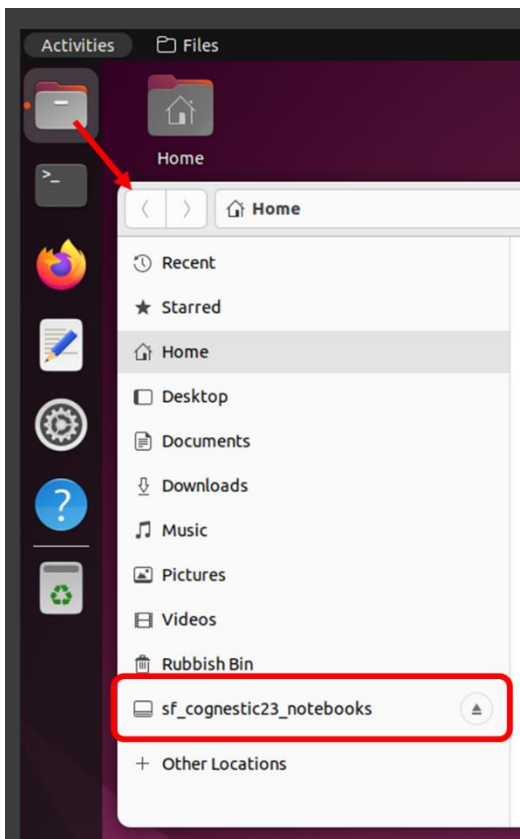
You can use the notebooks through the Cognestic23 VM. To do that, you first need to map the folder with the materials to the VM.

In The Virtual Box, select the *Cognestic23 VM* -> *Settings* -> *Shared Folders* -> In 'Folder Path' select the location where you saved the *Cognestic Notebooks* -> Tick 'Auto-mount' -> OK -> OK.



(You can do this mount also when if have already started the Cognestic VM. Go to *Machine* -> *Settings*.)

Now, when you start the Cognestic23 VM and open *Files*, you will see the mounted data:



When you first try to open it, you might have a permission denied error. In that case, open the Terminal window and type this command:

```
sudo adduser cognestic vboxsf
```

Followed by a password: **Borl.Jubi.Henk-23**

And **reboot**

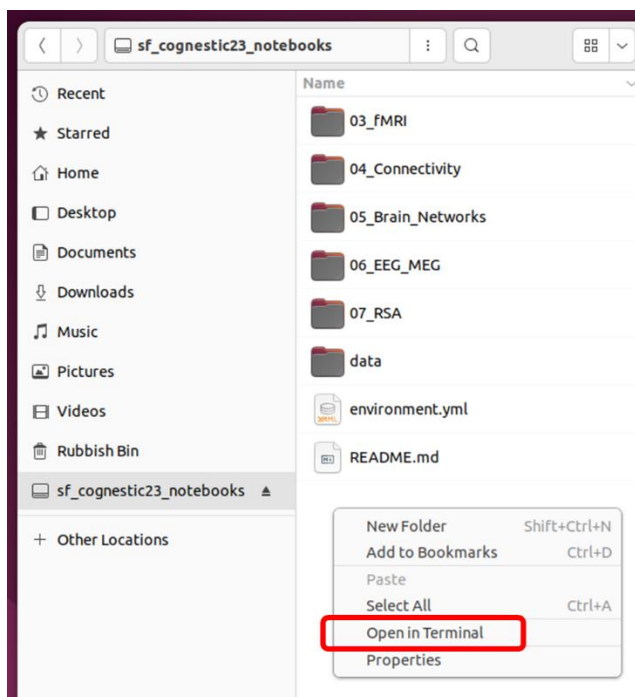
```
cognestic@cognestic23:~$ sudo adduser cognestic vboxsf
[sudo] password for cognestic:
Adding user `cognestic' to group `vboxsf' ...
Adding user cognestic to group vboxsf
Done.
cognestic@cognestic23:~$ reboot
```

After the VM has rebooted, you will be able to access the mapped (shared) folder with your data in the VM.

1.3 Setting up the Conda environment

The workshop notebooks are all Python-based and use many different Python packages. To use the notebooks, you first need to set up an *environment* that contains all the required packages. For that, we use the Conda package manager that is included in the Cognestic23 VM (via Anaconda).

All the required packages are specified in the *environment.yml* file that is included in the *cognestic23_notebooks* folder. To set up this environment, open the *sf_cognestic23_notebooks* shared folder, right-click in it and select *Open in Terminal*:



Then in the Terminal write the following command:

```
conda env create -f environment.yml
```

It will take a while to install the environment, but once it is done, you will see this message:

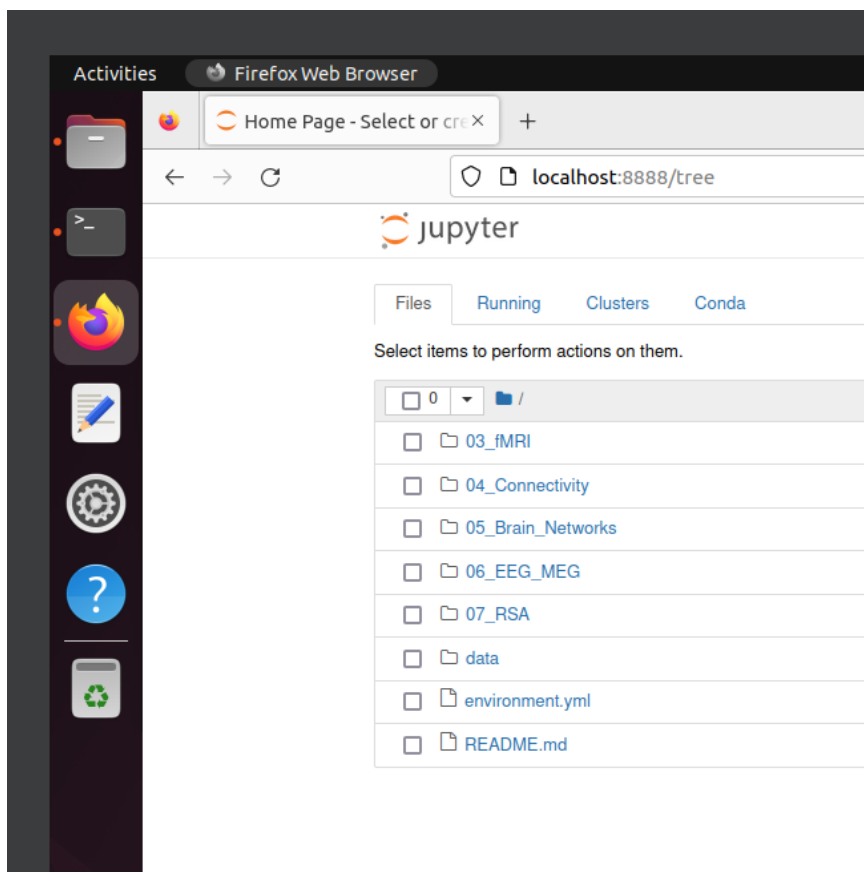
```
done
#
# To activate this environment, use
#
#   $ conda activate cognestic23
#
# To deactivate an active environment, use
#
#   $ conda deactivate
```

From now on, each time you want to use the Cognestic23 notebooks in the VM, first open the *sf_cognestic23_notebooks* shared folder, right-click in it and select *Open in Terminal* and type these 2 commands:

```
conda activate cognestic23
```

```
jupyter notebook
```

The '*jupyter notebook*' command will launch the notebook folder in a web browser window, and the '*conda activate cognestic23*' ensures that the notebooks are launched in the environment that contains all the necessary toolboxes.

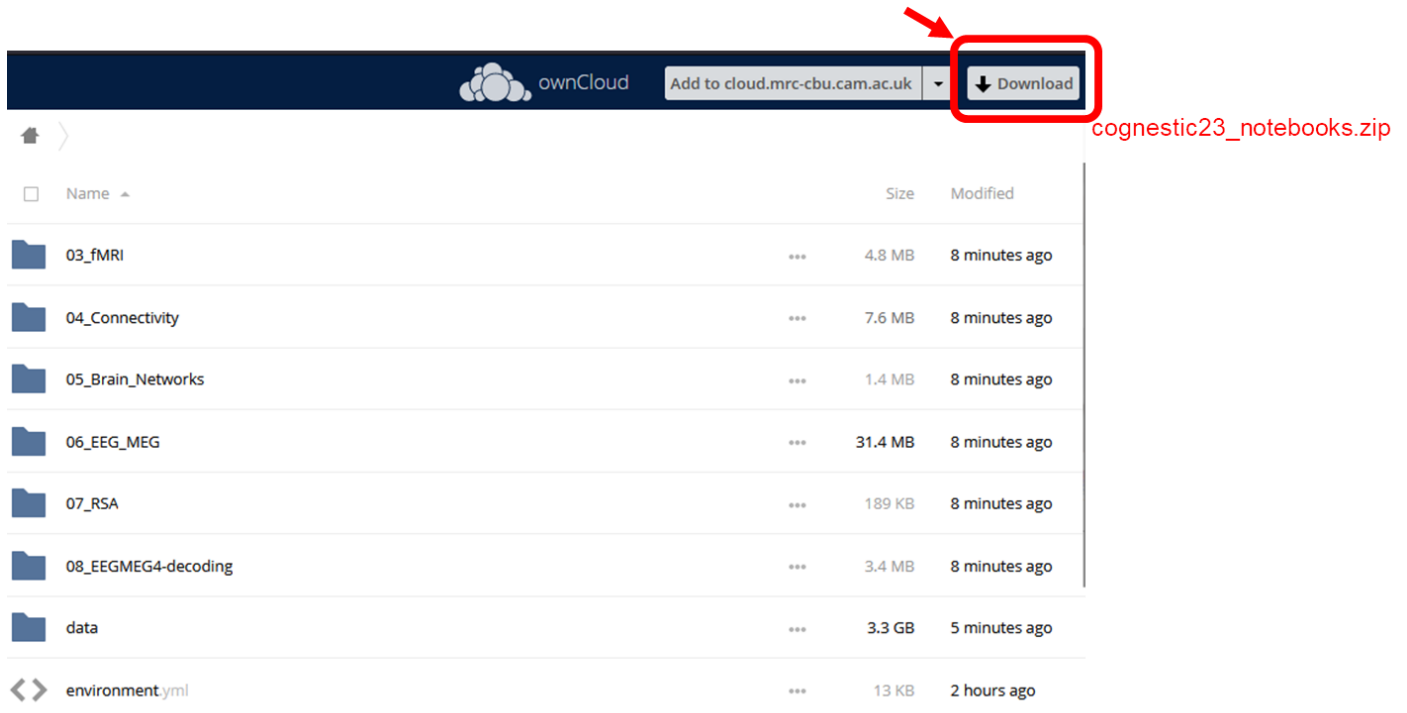


2 Accessing COGNESTIC-23 Jupyter Notebooks only without setting up VM

Follow these instructions **only if the preferred VM option (above) does not work for you!**

If you cannot install and set up the VM for some reason, you can install the required environment for the notebooks only yourself on your system.

download the notebooks and their accompanied data <https://cloud.mrc-cbu.cam.ac.uk/index.php/s/AOuPeUaRJ6ljiHC> (password: *Scarecrow.Extending.Hamlet7*). Download the whole content of the notebooks and data (8.6GB) by clicking 'Download' at the top right of the ownCloud page:



Save and unzip the *cognestic23_notebooks.zip* file on your local drive.

! Please note that for some workshops there might be some last-minute updates. In that case, a tutor will ask you to obtain the latest version of their notebooks before the start of the session via the [Cognestic Wiki page](#).

Download and install either [miniconda](#) or [Anaconda](#) with a Python version of at least 3.8.

Open the downloaded *cognestic23_notebooks* folder in a Terminal and create the *cognestic23* conda environment:

- If you are using Windows PC, type this command:
`conda env create -f environment_Win.yml`
- If you are using Linux or Mac, type this command:
`conda env create -f environment.yml`

It will take a while to install the environment, but once it is done, you will see this message:

```
done
#
# To activate this environment, use
#
#   $ conda activate cogneastic23
#
# To deactivate an active environment, use
#
#   $ conda deactivate
```

From now on, each time you want to use the Cognestic23 notebooks, first open the folder that contains the notebooks in the Terminal and type these 2 commands:

```
conda activate cogneastic23
```

```
jupyter notebook
```

3 Accessing specific workshops only

Instructions above are for accessing and using the whole set of COGNESTIC-23 materials. If you are interested in a specific workshop only, see the particulars for each workshop on the COGNESTIC-23 Wiki page:

<https://imaging.mrc-cbu.cam.ac.uk/methods/COGNESTIC2023>