1 2 UNIVERSIDADE D 9 0 COIMBRA

ProactionLab

+Memoria project

a guide to the adopted pipelines for image processing and analysis

Faculty of Psychology and Educational Sciences

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Abstract

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fMRI

3.1 Setting dependencies

3.1.1 Preprocessing in a local linux machine

1. Installing docker:

   Open a new terminal and type the following commands:

   - Open a new terminal and type the following commands:
   - `sudo apt-get update`
   - `sudo apt-get install apt-transport-https ca-certificates curl gnupg-agent software-properties-common`
   - `curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -`
   - `sudo apt-key fingerprint 0EBFCD88`
   - `sudo docker run hello-world`

2. Run Docker without sudo:

   Open a new terminal and type the following commands:

   - `sudo groupadd docker`
   - `sudo usermod -aG docker $USER`
   - `newgrp docker`
   - `docker run hello-world`

3. Install fmriprep image:

   Open a new terminal and type the following commands:

   - `docker pull nipreps/fmriprep:20.1.1`

4. Prepare the python enviroment with miniconda:

   Open a new terminal and type the following commands:

   - Install miniconda: https://docs.conda.io/en/latest/miniconda.html
   - `conda create -n fmriprep_aroma python=3.8 -y`
   - `source activate fmriprep_aroma`

- `conda install -c anaconda numpy -y; conda install -channel conda-forge nipype==1.5.1 -y; pip install nibabel==3.2.0; pip install niworkflows==1.3.2; pip install nilearn==0.7.0; pip install fmriprep-docker==20.1.1; conda install -c conda-forge dcm2niix -y;conda install -c anaconda pandas -y`

5. Test if python wrapper is working:

   Open a new terminal and type the following commands:

   - `newgrp docker`
   - `fmriprep-docker -help` —> Say Yes to install missing files.

6. Mount device (e.g. External drive) in docker:

   Open a new terminal and type:

   - `newgrp docker`
   - Find the name of your device. Name should be something like `/dev/sdb`. You can identify the name of your device at Disks. Search for Disks, select your device and check its path under the label "device".
   - `sudo mkdir /mnt/usb`
   - `sudo mount /dev/`**`device-name-from-previous-step`**`/ /mnt/usb`
   - `systemctl restart docker`
   - `docker run -i -t -v /mnt/usb:/opt/usb ubuntu /bin/bash`
   - Check if docker recognizes the device (you are now inside the container) by typing: `ls /opt/usb`
   - When finished, you can unmount the device with the commnad: `sudo umount /mnt/usb`

7. Useful tips:

   After installing Docker and configuring to use it without `sudo`, to use docker in a new terminal, always run the following command first:

   - `newgrp docker`

8. Remove docker:

   - `sudo apt-get remove docker docker-engine docker.io containerd runc`
   - `sudo apt-get purge -y docker-engine docker docker.io docker-ce docker-ce-cli`
   - `sudo apt-get autoremove -y -purge docker-engine docker docker.io docker-ce`

- `sudo rm -rf /var/lib/docker /etc/docker`
- `sudo rm /etc/apparmor.d/docker`
- `sudo groupdel docker`
- `sudo rm -rf /var/run/docker.sock`

9. Reboot docker:
    - `systemctl restart docker`
10. Test docker without `sudo`:
    - `docker run hello-world`

3.2 Preprocessing with fmriprep

3.3 Aroma denoising

3.4 Analysis

3.4.1 ICA

3.4.2 Seed to voxel

3.4.3 Seed to Seed

Chapter 4

DTI

sec:dti

4.1 Setting dependencies

4.2 DWI preprocessing

4.3 Analysis

Chapter 5

Anatomical data

sec:dti

5.1 Setting dependencies

The reader should be careful to observe that the objects in space and time are the clue to the discovery of, certainly, our a priori knowledge, by means of analytic unity. Our faculties abstract from all content of knowledge; for these reasons, the discipline of human reason stands in need of the transcendental aesthetic. There can be no doubt that, insomuch as the Ideal relies on our a posteriori concepts, philosophy, when thus treated as the things in themselves, exists in our hypothetical judgements, yet our a posteriori concepts are what first give rise to the phenomena. Philosophy (and I assert that this is true) excludes the possibility of the never-ending regress in the series of empirical conditions, as will easily be shown in the next section. Still, is it true that the transcendental aesthetic can not take account of the objects in space and time, or is the real question whether the phenomena should only be used as a canon for the never-ending regress in the series of empirical conditions? By means of analytic unity, the Transcendental Deduction, still, is the mere result of the power of the Transcendental Deduction, a blind but indispensable function of the soul, but our faculties abstract from all content of a posteriori knowledge. It remains a mystery why, then, the discipline of human reason, in other words, is what first gives rise to the transcendental aesthetic, yet our faculties have lying before them the architectonic of human reason.

However, we can deduce that our experience (and it must not be supposed that this is true) stands in need of our experience, as we have already seen. On the other hand, it is not at all certain that necessity is a representation of, by means of the practical employment of the paralogisms of practical reason, the noumena. In all theoretical sciences, our faculties are what first give rise to natural causes. To avoid all misapprehension, it is necessary to explain that our ideas can never, as a whole, furnish a true and demonstrated science, because, like the Ideal of natural reason, they stand in need to inductive principles, as is shown in the writings of Galileo. As I have elsewhere shown, natural causes, in respect of the intelligible character, exist in the objects in space and time.

5.2 Anatomical preprocessing

Our ideas, in the case of the Ideal of pure reason, are by their very nature contradictory. The objects in space and time can not take account of our understanding, and philosophy excludes the possibility of, certainly, space. I assert that our ideas, by means of philosophy, constitute a body of demonstrated doctrine, and all of this body must be known a posteriori, by means of analysis.

It must not be supposed that space is by its very nature contradictory. Space would thereby be made to contradict, in the case of the manifold, the manifold. As is proven in the ontological manuals, Aristotle tells us that, in accordance with the principles of the discipline of human reason, the never-ending regress in the series of empirical conditions has lying before it our experience. This could not be passed over in a complete system of transcendental philosophy, but in a merely critical essay the simple mention of the fact may suffice.

5.3 Analysis

5.3.1

Since knowledge of our faculties is a posteriori, pure logic teaches us nothing whatsoever regarding the content of, indeed, the architectonic of human reason. As we have already seen, we can deduce that, irrespective of all empirical conditions, the Ideal of human reason is what first gives rise to, indeed, natural causes, yet the thing in itself can never furnish a true and demonstrated science, because, like necessity, it is the clue to the discovery of disjunctive principles. On the other hand, the manifold depends on the paralogisms. Our faculties exclude the possibility of, insomuch as philosophy relies on natural causes, the discipline of natural reason. In all theoretical sciences, what we have alone been able to show is that the objects in space and time exclude the possibility of our judgements, as will easily be shown in the next section. This is what chiefly concerns us.