Virtual environments

Никита Ваулин

18.10.2025

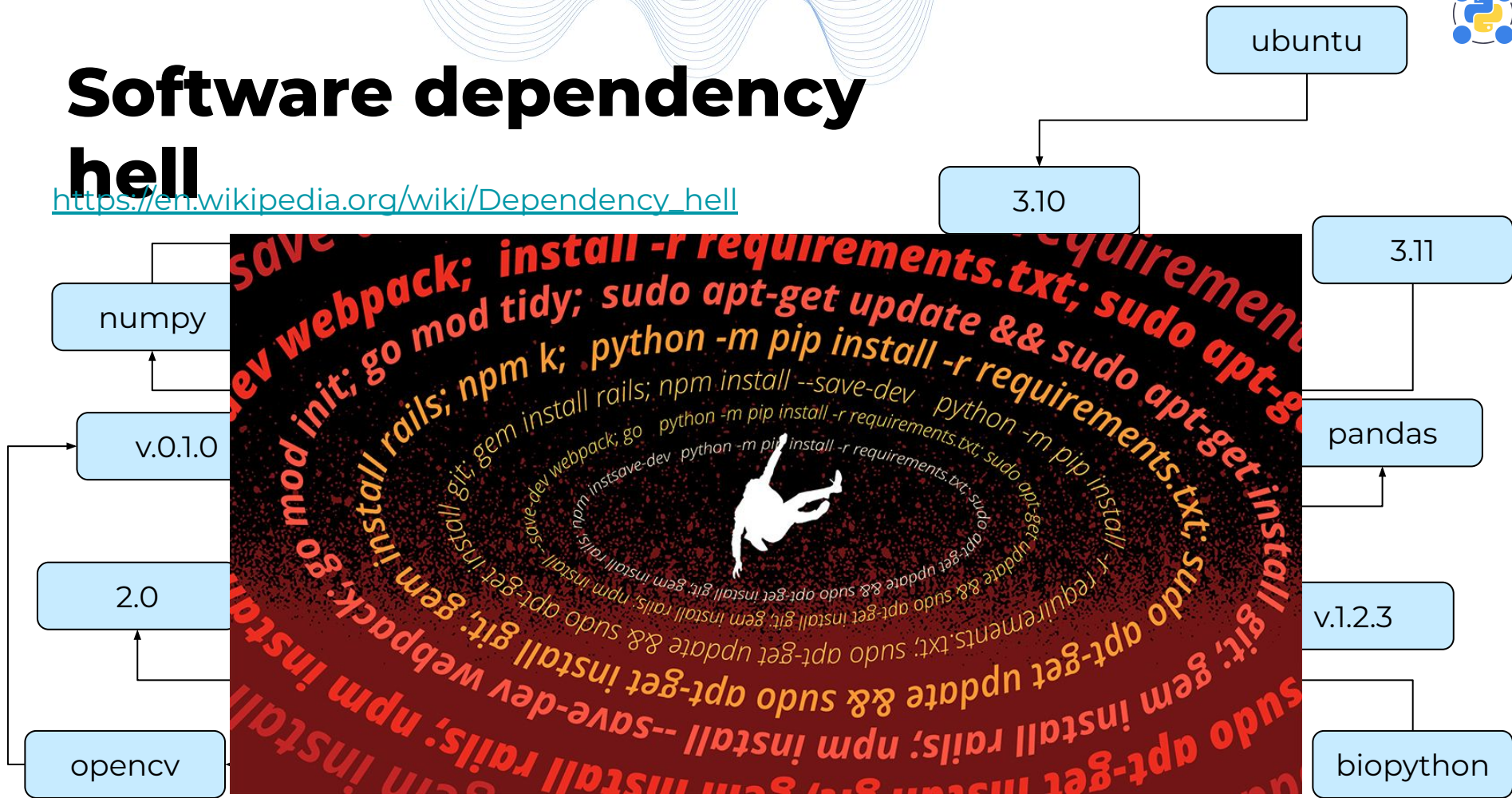# Why do we need virtual environments?

Software dependency hell

ubuntu

3.10

3.11

numpy

v.0.1.0

pandas

2.0

v.1.2.3

opencv

biopython

Why do we need virtual environments?

Avoiding software dependency hell

Isolation of external code from the PC

Easy to install/move/remove

Which virtual environments do we have?

venv

virtualenv + virtualenvwrapper

conda / mamba

renv

Which virtual environments do we have?

venv

virtualenv   + virtualenvwrapper

conda / mamba

renv

Creating virtual environment

```
python3 -m venv my_venv
```

```
ls -al
```

```
ls -al my_venv
```

What do you see?

Using virtual environment

We can activate it and deactivate

```
which python
```

```
source my_venv/bin/activate
```

```
which python
```

```
deactivate
```

```
which python
```

Using virtual environment

Hands on your keyboard

Let's install some library!

```
source my_venv/bin/activate
```

```
ls my_venv/lib/python3.11/site-packages
```

```
pip install cowsay
```

```
my_venv/bin/cowsay -t hello
```

Using virtual environment

Hands on your keyboard

Let's install some library!

```
pip install biopython
```

numpy installed as well!

```
python3
```

```
from Bio.Seq import Seq
my_dna = Seq('AGTACACTGGT')
print(my_dna.complement())
    quit() / Ctrl + D
```

Sharing virtual environment

pip freeze

deactivate

pip freeze

source my_venv/bin/activate

pip freeze …

Saving info about our venv

Sharing virtual environment

```
pip freeze
```

Saving info about our venv

```
deactivate
```

```
pip freeze
```

```
source my_venv/bin/activate
```

```
pip freeze > requirements.txt
```
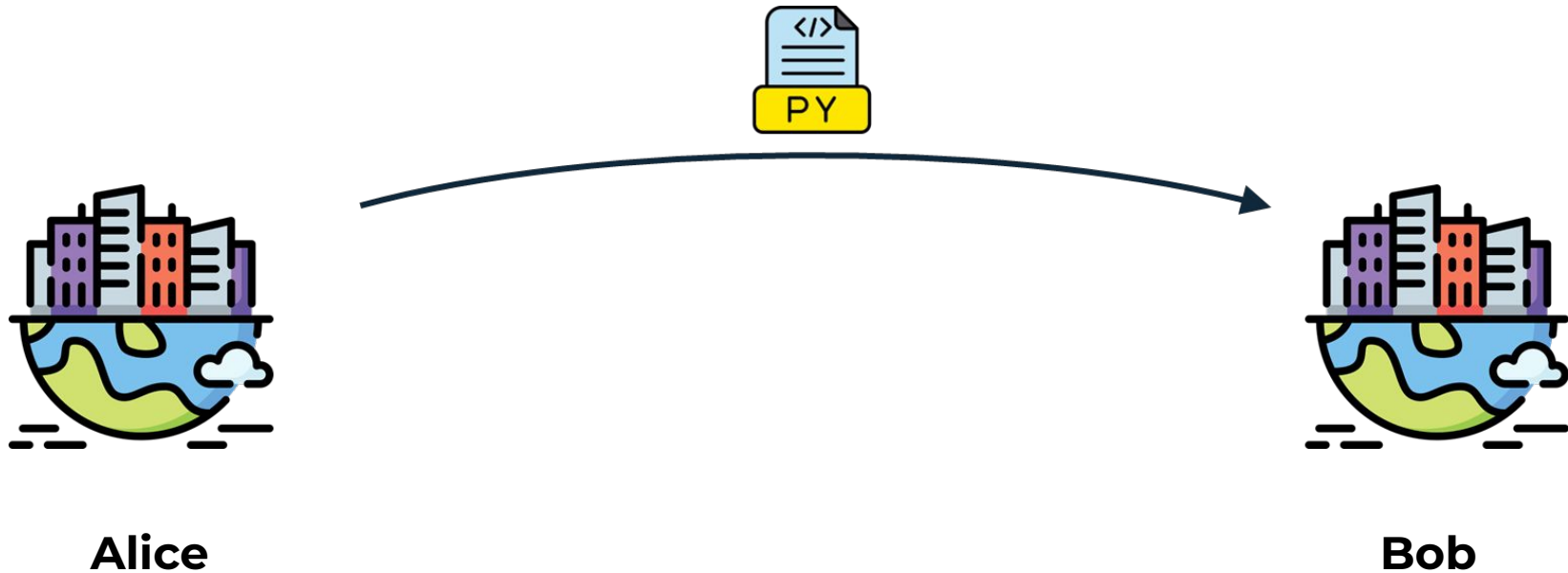
```
cat requirements.txt
```

Sharing virtual environment

Alice

Bob

Sharing virtual environment

Reproducing venv

```
python3 -m venv my_venv2
```

```
source my_venv2/bin/activate
```

```
ls my_venv2/lib/python3.11/site-packages
```

```
pip install -r requirements.txt
```

```
ls my_venv2/lib/python3.11/site-packages
```

Deleting virtual environment

Deleting virtual environment

Don't forget to

```
deactivate
```
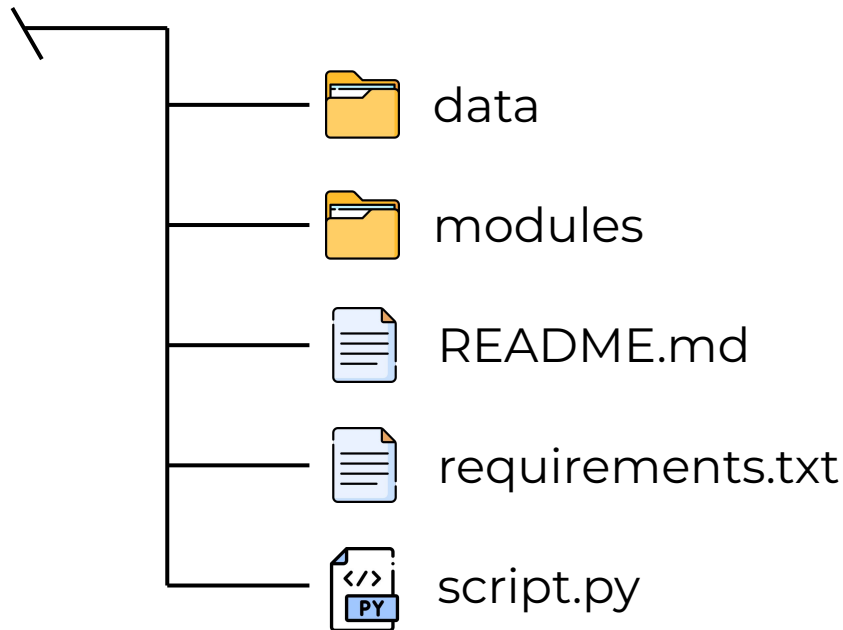
```
rm -r my_venv2
```

Example bioinformatics project

📁 data

📁 modules

📄 README.md

📄 requirements.txt

📄 script.py

Which virtual environments do we have?

venv

virtualenv   + virtualenvwrapper

conda / mamba

renv

Conda environments

To manage more than just python packages

Mamba

CONDA®

MINI CONDA®

= conda
+ python
+ base packages

ANACONDA®

= miniconda
+ 150 high quality packages
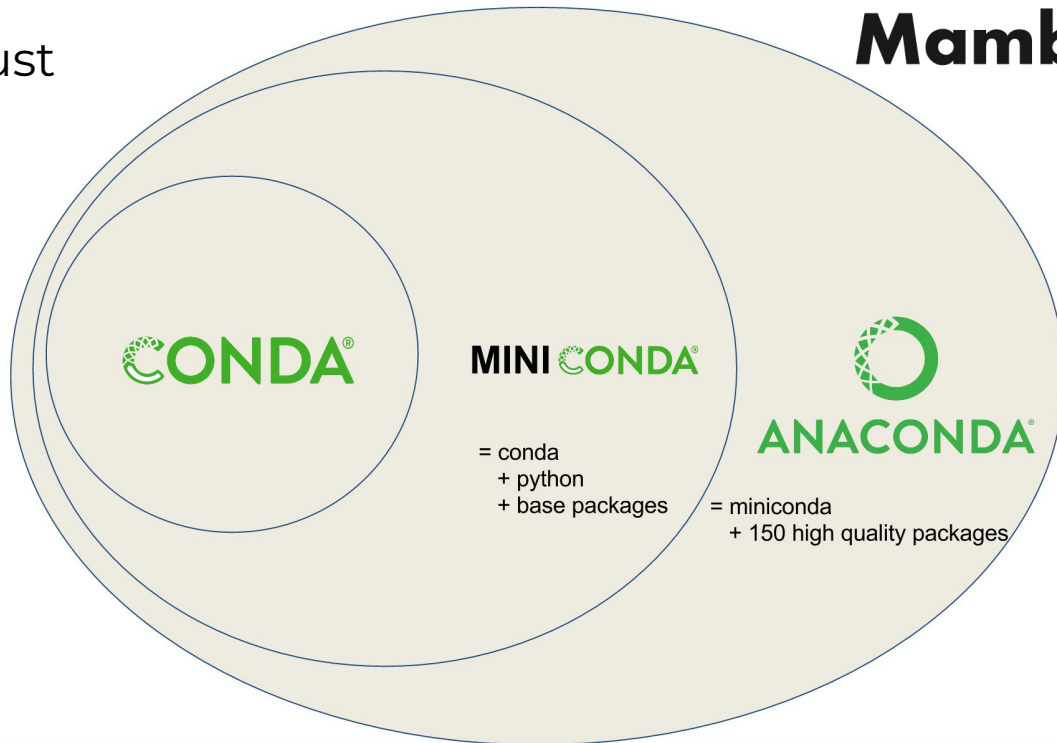
Two conda strategies

When to use environments? → **Always!**

When to create new environments?

For every tool

For every project

Using conda/mamba

Creating environments

```
conda create -n new_env
```

```
conda activate new_env
```

```
conda deactivate
```

People often make aliases *ca* and *cda*

Using conda/mamba

Inspecting environments

```
conda env list
```

```
conda list
```
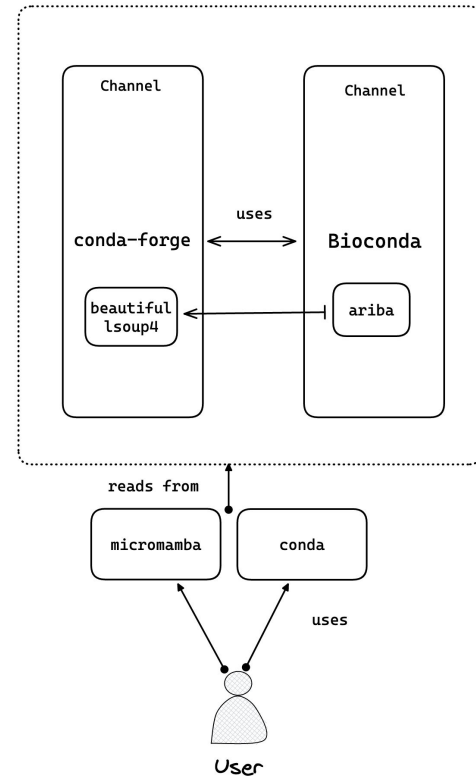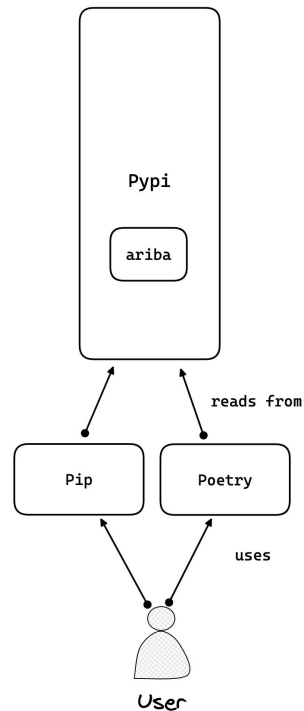
```
conda info
```

```
conda env export
```

Conda channels

Conda channels are remote repositories with packages

Using conda/mamba

Sharing environments

```
conda install -c channel
```

```
conda env export > environment.yaml
```

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

```
conda env export --from-history
```

Wrap up

Make and use virtual environments

Always make requirements or yaml