NeuroFedora

Free Software for Free Neuroscience

NeuroFedora Contributors

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How: Research Pipeline

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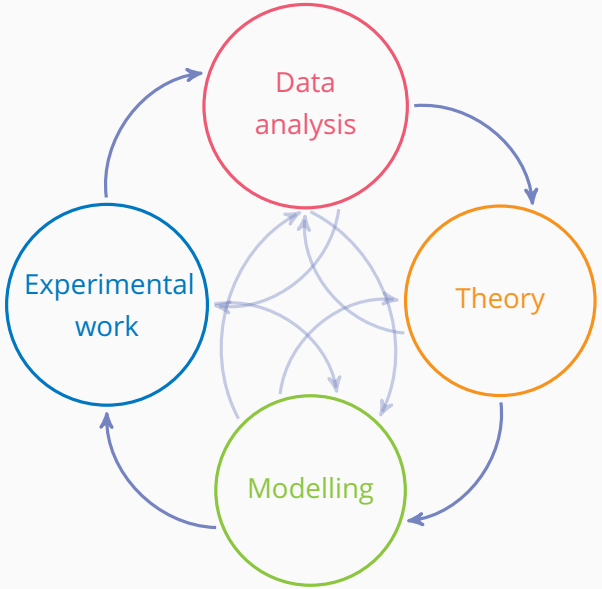
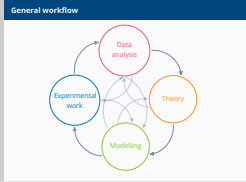
General workflow





1. A simplified diagram. Actually a lot more complex

Tools of the trade

Experimental:

- EEG, ECoG, intracellular and extracellular single and multi neuron recording,
- CT, DOI, MRI, f-MRI, MEG, PET,

Data analysis:

- Statistics,
- Machine Learning, Big Data, Deep learning,

Theory and modelling:

- Simulators of all kinds,

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1. Lots of hardware and software is required for basic neuroscience research.

Tools of the trade: II

Tools for the dissemination of knowledge[4]:

- visualisation,
- academic writing,
- non academic writing: blogging . . . ,
- podcasting,
- video making,
- creating teaching materials,
- collaborative tools and utilities

[4] also to a non-specialist audience.

1. Often ignored, but not less important

Free/Open (neuro) Science

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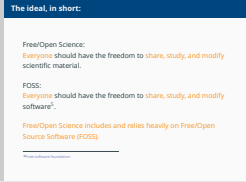
The ideal, in short:

Free/Open Science:
Everyone should have the freedom to share, study, and modify scientific material.

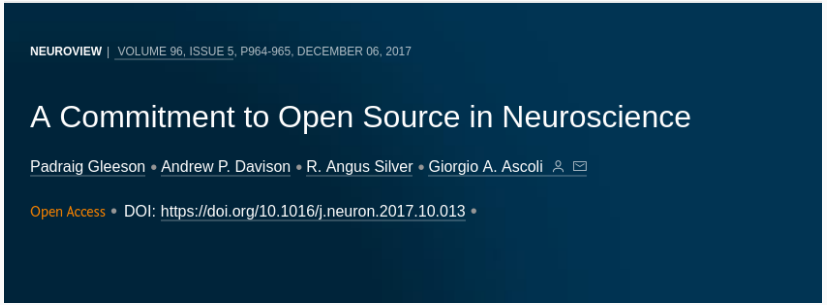
FOSS:
Everyone should have the freedom to share, study, and modify software[5].

Free/Open Science includes and relies heavily on Free/Open Source Software (FOSS).

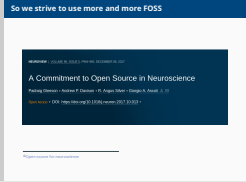
[2] Free software foundation



So we strive to use more and more FOSS



[6] Open source for neuroscience



NeuroFedora: why, how, what?

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Neuroscience community: highly multidisciplinary

- various specialities: biologists, mathematicians, physicists, chemists, psychologists, . . . ,
- small proportion of trained software developers

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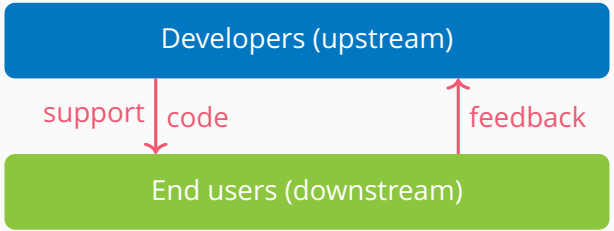
FOSS: Developers and users



FOSS: Developers and users
Developers (upstream)
support
code
feedback
End users (downstream)

(Anecdotal) notes on development of research software

- often single developer, or small development teams
- limited maintenance, short-lived projects
- limited access to hardware/resources
- limited code quality
- limited use of established best practices
- limited testing for correctness (!)
- complex dependency chains
- lack of documentation and support
- lack of community development know-how

1. Give how interdisciplinary neuroscience is, most researchers are NOT trained in development
2. This implies, and this is based on anecdotal evidence, that the software used in research is not of the best quality

(Anecdotal) notes on users of research software

- waste time and effort installing (and reinstalling) their software stacks
- rarely run test suites (!)
- rarely report bugs upstream
- rarely send improvements upstream
- are unaware of helpful development tools

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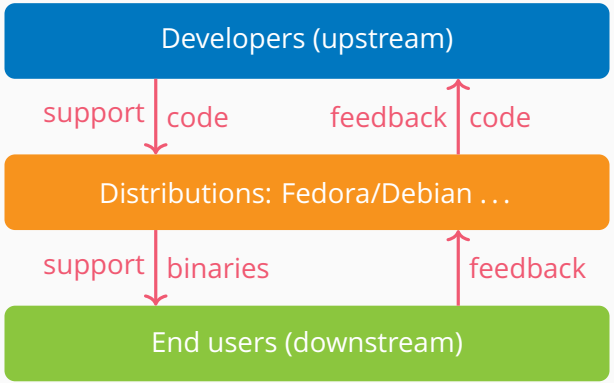
1. The other side of the bridge is the users
2. Because they aren't trained, they have a hard time setting up and using the software
3. If correctness of a tool cannot be verified, how can the correctness of the scientific result be claimed?

Distributions liaison between developers and users



Distributions liaison between developers and users
Developers (upstream)
support code feedback code
Distributions: Fedora/Debian . . .
support binaries feedback
End users (downstream)

Distributions, like Fedora, are in a unique position:

- liaison between upstream and users
- have the infrastructure
- follow best practices in software development
- constantly work on community development
- learn from one another—train while working
- disseminate information to end-users

NeuroFedora:

Primary goal:

- Provide a ready to use, integrated FOSS platform for neuroscientists[7].

Secondary/collateral goals:

- help improve the standard and maintenance of tools
- help users develop software development skills
- make neuroscience accessible to non-specialists

[7] Researchers, academics, hobbyists, anyone!

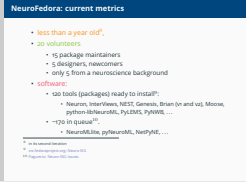
NeuroFedora: current metrics

- less than a year old[8],
- 20 volunteers
  - 15 package maintainers
  - 5 designers, newcomers
  - only 5 from a neuroscience background
- software:
  - 120 tools (packages) ready to install[9]:
    - Neuron, InterViews, NEST, Genesis, Brian (v1 and v2), Moose, python-libNeuroML, PyLEMS, PyNWB, ...
  - ~170 in queue[10].
    - NeuroMLlite, pyNeuroML, NetPyNE, ...

8 in its second iteration

9 src.fedoraproject.org: Neuro-SIG

10 Pagure.io: Neuro-SIG: issues



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