



NeuroFedora

Free Software for Free Neuroscience

NeuroFedora Contributors

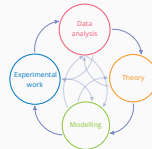
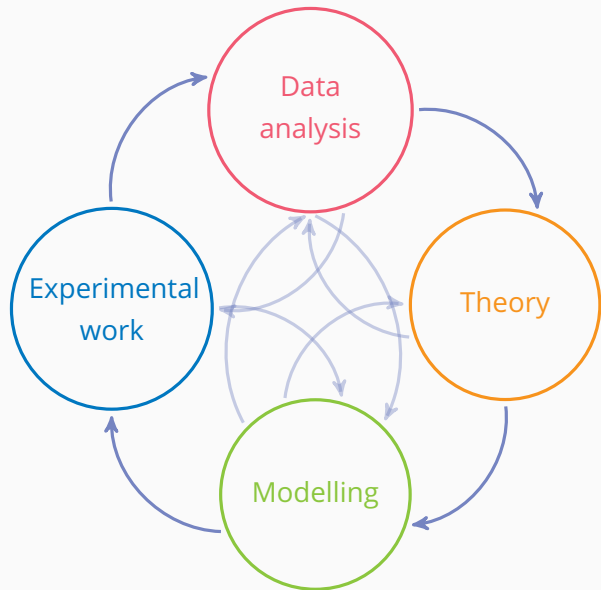


How: Research Pipeline

2019-11-30

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└─ How: Research Pipeline

How: Research Pipeline



1. A simplified diagram. Actually a lot more complex
2. General workflow of research-based work.
3. Most work now-a-days is being carried out with the use of computer software, such as ...

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,

Experimental:

- EEG, ECoG, intracellular and extracellular single and multi neuron recording,
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Data analysis:

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- Machine Learning, Big Data, Deep learning,

Theory and modelling:

- Simulators of all kinds,

1. Experimental: DICOM/Image viewers, fsl tools, software to drive the big machines
2. Data Analysis: Simple/complex libraries, from numpy, scipy to scikit-learn, tensorflow
3. Simulators: Neuron, NEST, plenty more...
4. Lots of hardware and software is required for basic neuroscience research.

Tools for the dissemination of knowledge⁴:

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

⁴also to a non-specialist audience.

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└─How: Research Pipeline

└─Tools of the trade: II

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1. common tools used by people in science and research

Free/Open (neuro) Science

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└ Free/Open (neuro) Science

Free/Open (neuro) Science

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 software⁵.

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

²Free software foundation

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└ Free/Open (neuro) Science

└ The ideal, in short:

1. simple definitions

The ideal, in short:

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Free software foundation

So we strive to use more and more FOSS

NEUROVIEW | VOLUME 96, ISSUE 5, P964-965, DECEMBER 06, 2017

A Commitment to Open Source in Neuroscience

[Padraig Gleeson](#) • [Andrew P. Davison](#) • [R. Angus Silver](#) • [Giorgio A. Ascoli](#)  

Open Access • DOI: <https://doi.org/10.1016/j.neuron.2017.10.013> •

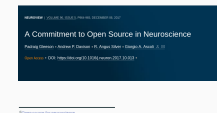
⁶Open source for neuroscience

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└ Free/Open (neuro) Science

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└ So we strive to use more and more FOSS



1. reproducibility crisis. unable to reproduce data, results
2. benefits of open-sourcing code. helps community. reuse. build-on and improve. publication becomes an advert for the code.

NeuroFedora: why, how, what?

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└ NeuroFedora: why, how, what?

NeuroFedora: why, how, what?

Neuroscience community: highly multidisciplinary

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

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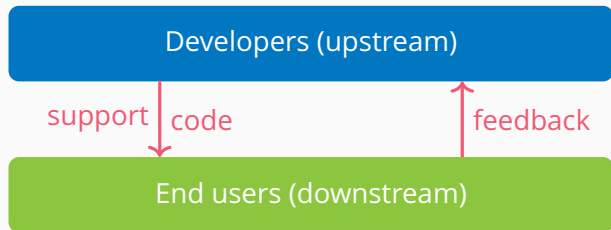
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└ NeuroFedora: why, how, what?

└ Neuroscience community: highly multidisciplinary

1. Full of people from various fields
2. Not all have the required XP

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



1. The dev may not provide instructions on how to use the software
2. Difficult for people who lack programming knowledge to build/use the tool directly from the dev.
3. End users not always provide feedback



(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**

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└ NeuroFedora: why, how, what?

└ (Anecdotal) notes on development of research software

1. Given how interdisciplinary neuroscience is, most researchers are NOT trained in development
2. based on anecdotal evidence, software used in research is not of the best quality
3. may or may not meet development standards
4. may have an instruction set on how to install/use the software
5. resolving dependencies can be difficult

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(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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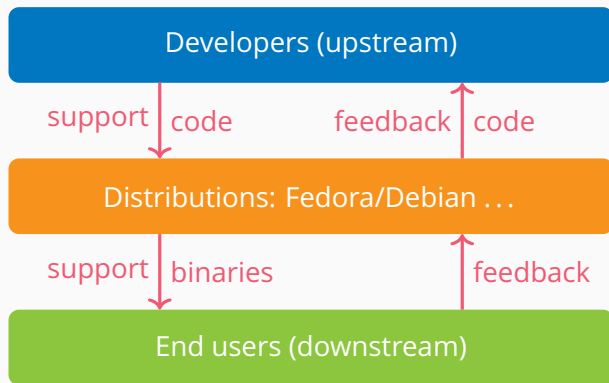
└ NeuroFedora: why, how, what?

└ (Anecdotal) notes on users of research software

1. The other side of the bridge is the users
2. also suffer from resolving dependencies
3. lack the required skill/knowledge of programming, they have a hard time setting up and using the software
4. If correctness of a tool cannot be verified, how can the correctness of the scientific result be claimed?

- waste time and effort installing (and reinstalling) their software stacks
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Distributions liaison between developers and users

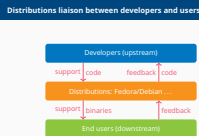


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NeuroFedora: why, how, what?

Distributions liaison between developers and users

1. role of distros:
2. liaison between the users and developers
3. provide feedback, report bugs to the dev
4. simplify installation/usage XP



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

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└ NeuroFedora: why, how, what?

└ Distributions, like Fedora, are in a unique position:

1. high end servers. multiple mirrors across the globe
2. firm packaging guidelines; go through a heavy-duty review process; proper testing of the software before releasing to the general user
3. many contributors hail from different backgrounds, and have a lot to learn
4. provide help to the users

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Primary goal:

- Provide a **ready to use, integrated FOSS platform** for neuroscientists⁷.

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!

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NeuroFedora: current metrics

- Turned a year old, in September 2019⁸,
- 20 volunteers
 - 16 package maintainers
 - 5 designers, newcomers
 - only 5 from a neuroscience background
- software:
 - 135 tools (packages) ready to install⁹:
 - Neuron, InterViews, NEST, Genesis, Brian (v1 and v2), Moose, python-libNeuroML, PyLEMS, PyNWB, ...
 - ~180 in queue¹⁰.
 - NeuroMLlite, pyNeuroML, NetPyNE, ...

⁸ in its second iteration

⁹ src.fedoraproject.org: Neuro-SIG

¹⁰ [Pagure.io](https://pagure.io): Neuro-SIG: issues

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Search: "NeuroFedora"



Mailing list: neuro-sig@lists.fedoraproject.org

IRC: [#fedora-neuro](#) on Freenode

Telegram: t.me/NeuroFedora

Documentation neuro.fedoraproject.org

Blog: neuroblog.fedoraproject.org

Pagure.io (FOSS Git forge): [neuro-sig/NeuroFedora](https://pagure.io/NeuroFedora)

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Pagure.io (FOSS Git forge): [neuro-sig/NeuroFedora](https://pagure.io/NeuroFedora)