An open-source framework for multi-modal pulmonary image analysis

ITK-Lung: A Software Framework for Lung Image Processing and Analysis
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The 2017 International Workshop on Pulmonary Imaging

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Why should you care?

List of collaborators

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"More widespread use of all [pulmonary] imaging biomarkers has been limited for a number of key reasons, including: 1) lack of support to harmonize image acquisition software; ***2) universally available image analysis software;*** *3) regulatory boundaries for emerging approaches; and 4) historically weak links between respiratory and radiology clinical programs."*

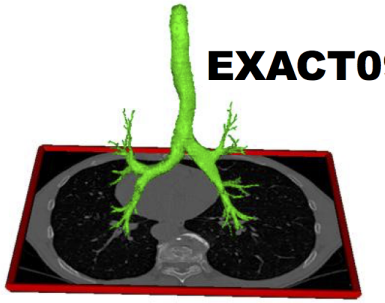
— E. A. Hoffman et al., JMRI 2015.

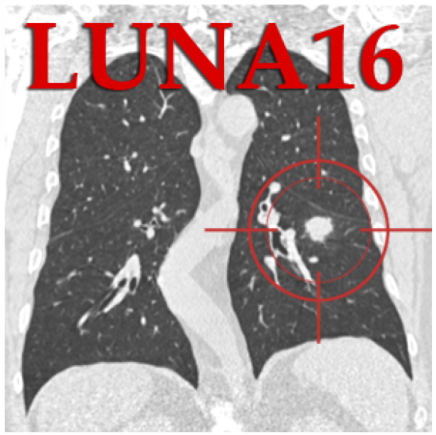
"publications = advertisements"

"An article about computational science in a scientific publication is not the scholarship itself, it is merely advertising of the scholarship. The actual scholarship is the complete software development environment and the complete set of instructions which generated the figures."

— Jonathan Buckheit and David Donoho (Jon Claerbout)

Competitions



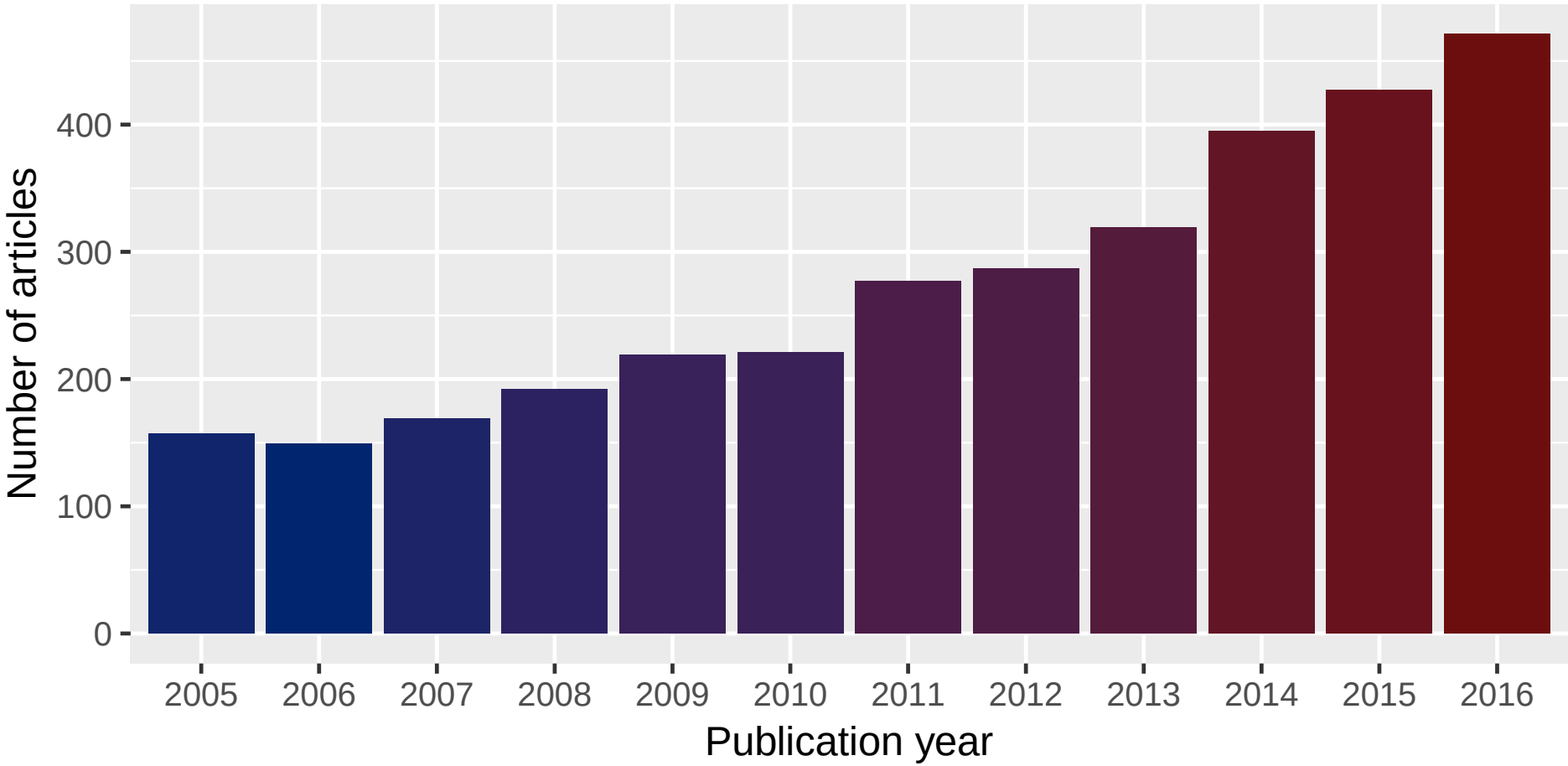


What does the neuroimaging community offer?

Great packages such as:

- AFNI
- FSL
- FreeSurfer $\longrightarrow$ NeuroQuant®
- SPM
- ANTs

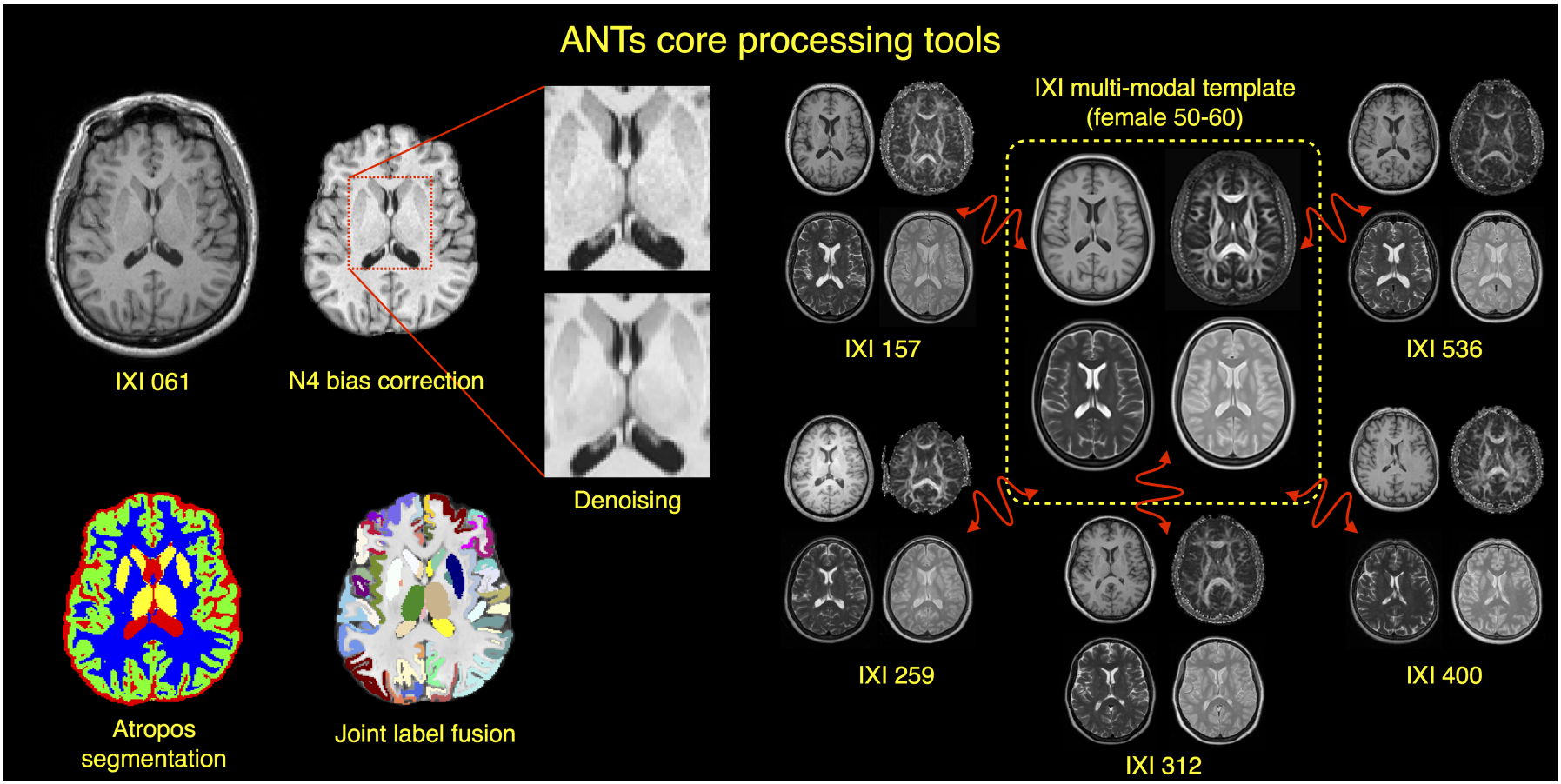
Public & robust software $\longrightarrow$ research output



Benefits of open-source:

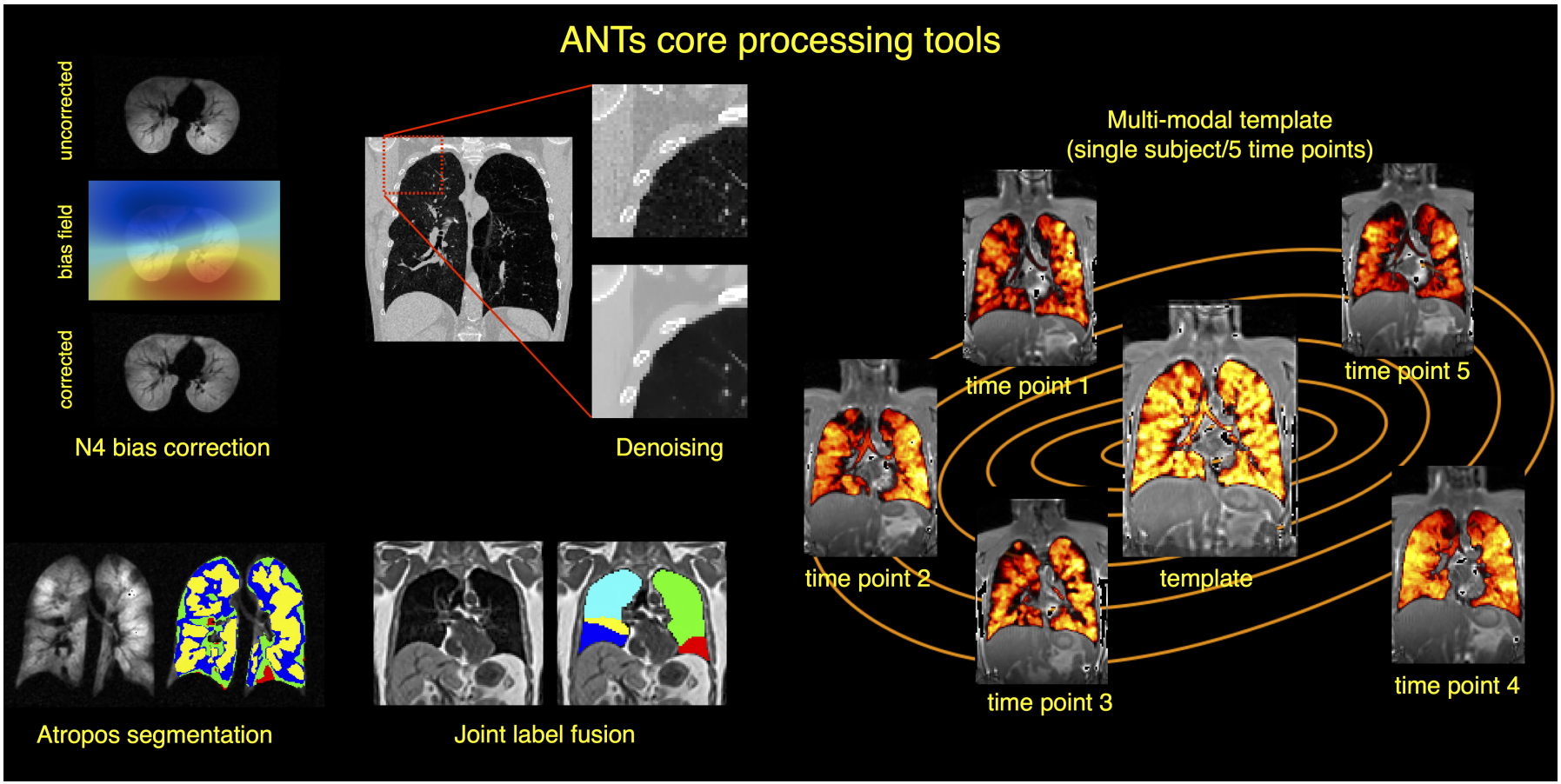
- Motivates community-based support:
  - bug fixes (*"Given enough eyeballs, all bugs are shallow."*),
  - new features,
  - reproducibility, and
  - community tech support.
- Learn directly from journal manuscripts *and* implementations.
- Tremendous cost-savings.
- *"Don't reinvent the wheel."*

ANTs core tools for neuroimage analysis



ITK-Lung

ANTs core tools for lung image analysis



Proposed core functionality

Functionality	CT	1H MRI	3He MRI	PET
registration	○	○	○	○
template generation	○	○	○	○
lung segmentation	○	○	‡	‡
lobe segmentation	○	○	‡	‡
airway segmentation	○	–	–	–
vessel segmentation	○	–	–	–
functional segmentation	∗	–	○	∗
feature indices	○	–	∗	∗

'○': previously published work

'∗': cross-modality functionality

'‡': simultaneous structural acquisitions