

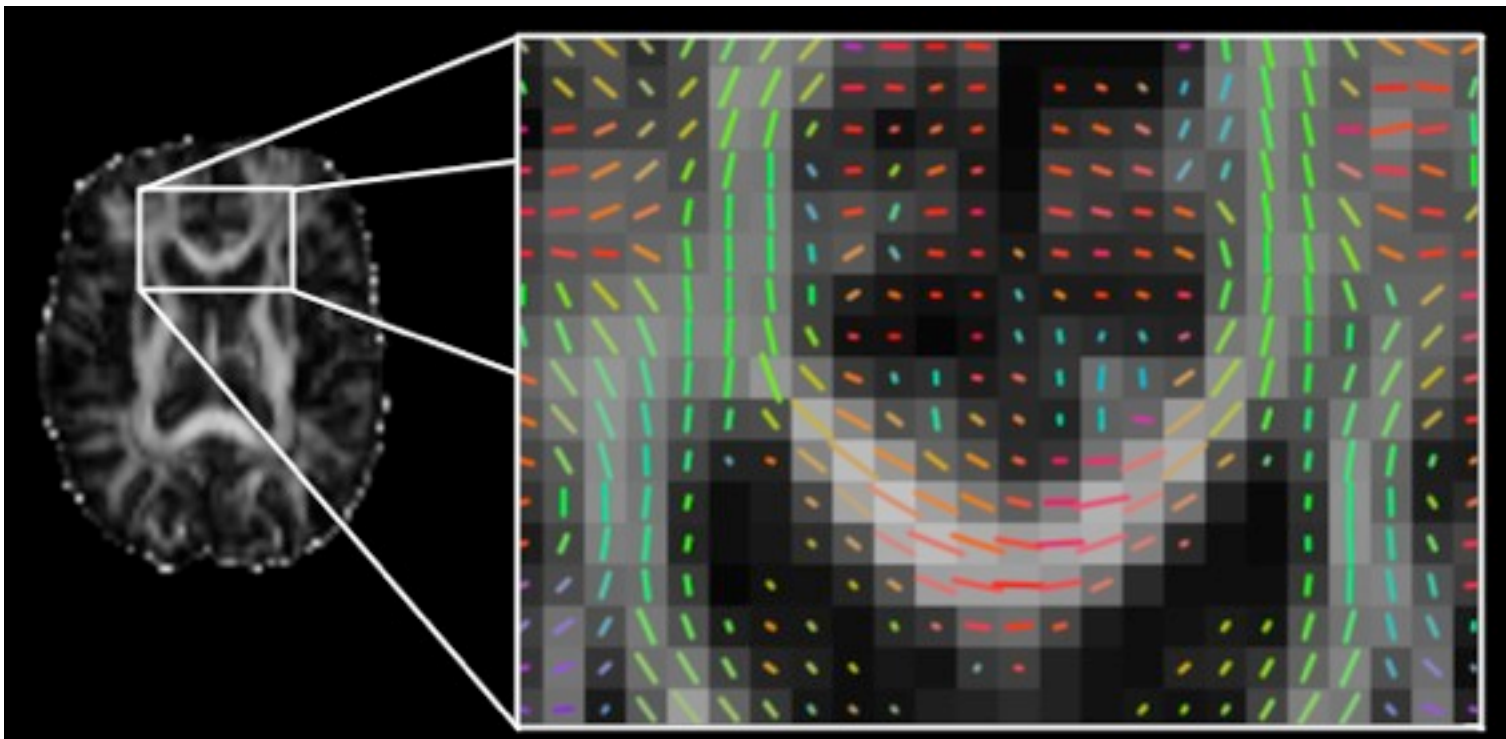
Medical image processing with TractoR

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useR! 2011, University of Warwick

Medical imaging

- Images from **MRI**, **CT**, **X-ray**, etc.; used for clinical diagnosis and prognosis, and biomedical research
- Essentially a 2D, 3D or 4D **array** of signal intensities
- Occasionally vector-valued



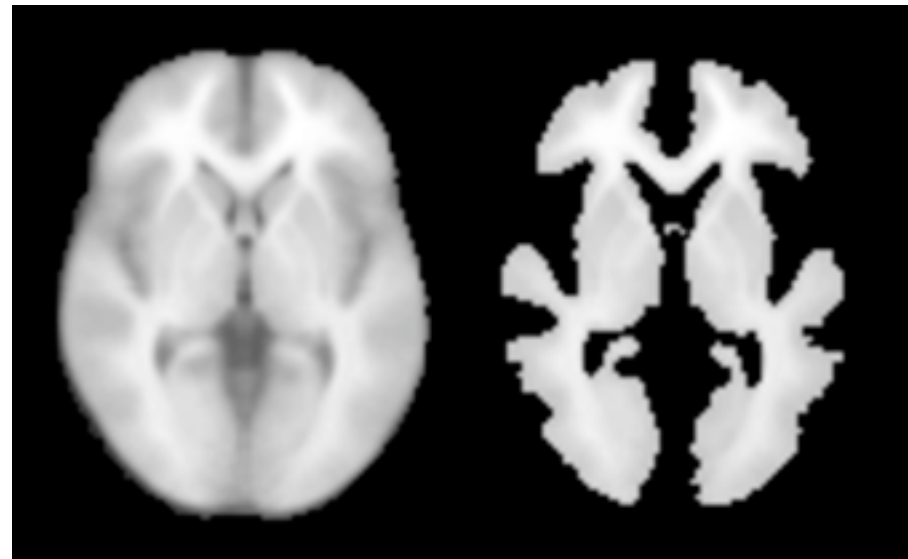
TractoR

- TractoR consists of five R packages and a shell interface
- Focus is on MRI images
- Core is the `tractor.base` package, which defines the main `MriImage` class
- This is a **reference class** containing the data array and some metadata:

```
> image
  Image source : /usr/local/tractor/share/mni/brain
  Image dimensions : 91 x 109 x 91 voxels
  Coordinate origin : (46,64,37)
  Voxel dimensions : 2 x 2 x 2 mm
  Data type : unsigned integer, 8 bits/voxel
  Additional tags : 0
  Sparseness : 71.38% (dense storage)
> image[45,55,45]
[1] 98
> max(image)
[1] 207
```

Features

- Support for reading/writing MriImage objects to/from standard image formats (**DICOM**, **Analyze**, **NIfTI-1**, **NIfTI-2**, **MGH**)
- Ability to store image data in a **sparse** or **dense** format
- Various **visualisation** options
- Create new images by applying arbitrary functions to other images; or by **thresholding**, **masking**, etc.



Additional packages

- **tractor.session** provides a file system abstraction, representing a set of images relating to a single subject, plus common image processing operations which are performed on sessions
- **tractor.native** provides C code with an R interface, for expensive functions such as diffusion MRI-based “fibre tracking”
- **tractor.nt** provides a demonstration implementation of “neighbourhood tractography”, an approach to white matter segmentation in the brain
- **tractor.utils** exists primarily to support the shell interface

Resources

- Forthcoming **paper** on TractoR in *J Stat Softw* special volume on Magnetic Resonance Imaging in R
- Full TractoR **source code** and high-level **documentation** available at <https://github.com/jonclayden/tractor>
- The **tractor.base** package is on CRAN (plus **RNiftyReg** for image registration)
- TractoR version 2.0 recently released
- See also the medical imaging **task view** on CRAN

