Tyranny!!!

Cartesian grid q-space reconstruction

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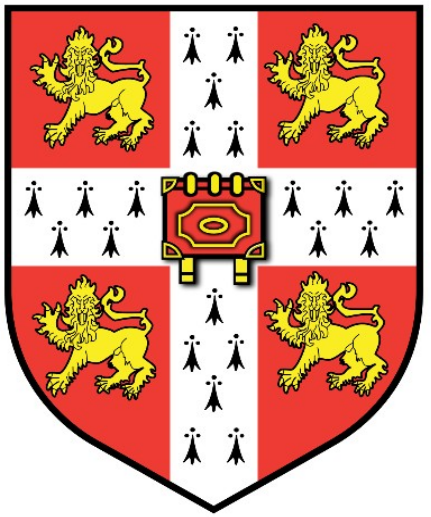


Non-parametric!!! Mostly ...

ODF calculated from Diffusion Spectrum Imaging (Wedeen et al.)

$$\psi_{DSI}(\hat{\mathbf{u}}) = \int_0^{\infty} P(r\hat{\mathbf{u}})r^2 dr$$

ODF calculated from Generalized Q-Sampling Imaging (Yeh et al.)

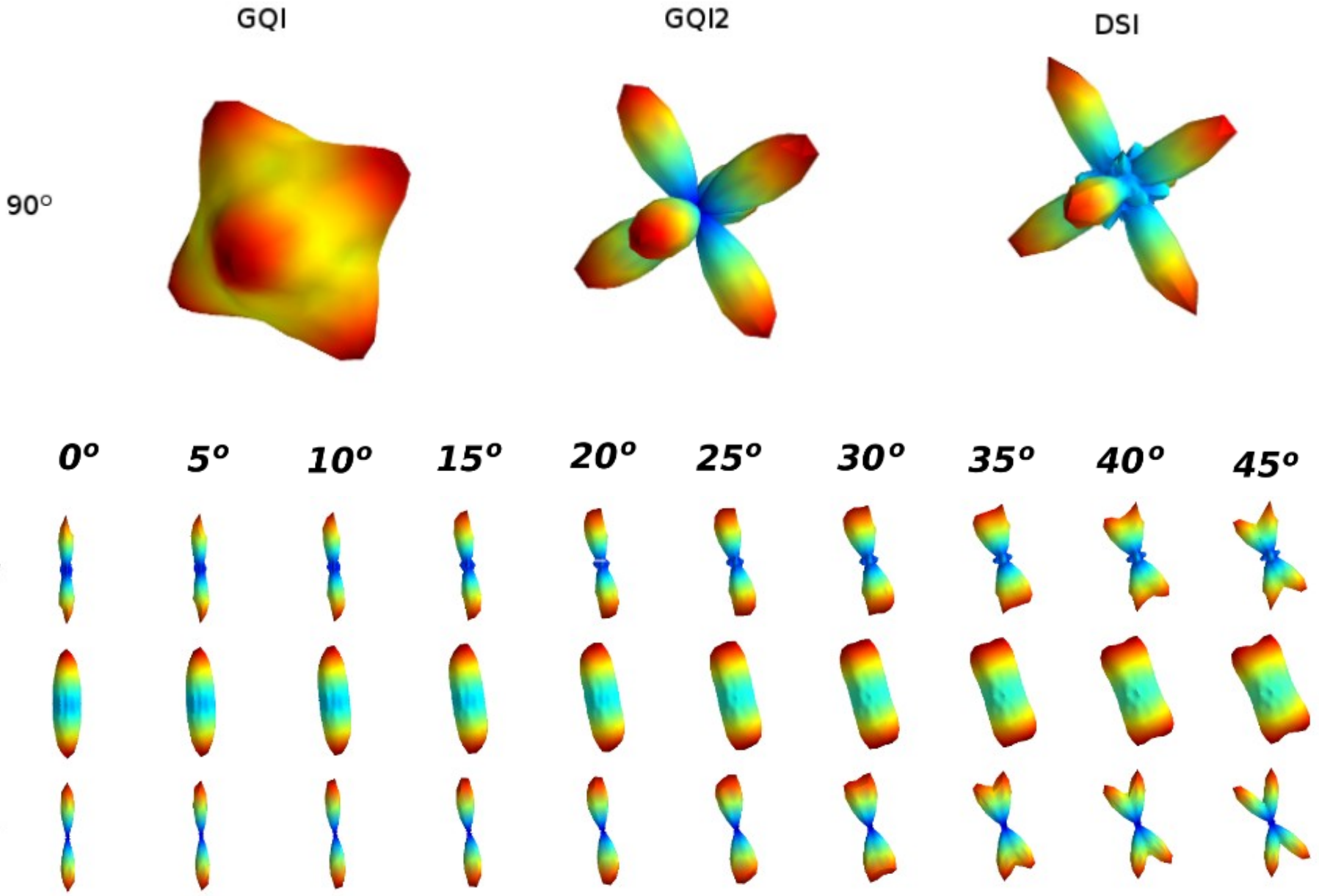
$$\begin{aligned}\psi_{GQI}(\hat{\mathbf{u}}) &= \int_0^{\lambda} Q(r\hat{\mathbf{u}})dr \\ &= \lambda \int S(\mathbf{q})\mathtt{sinc}(2\pi r\mathbf{q}\cdot\hat{\mathbf{u}})d\mathbf{q}\end{aligned}$$

ODF calculated from GQI with consideration of radial projection (Yeh et al.).
We call this QGI2 (Garyfallidis thesis).

$$\begin{aligned}\psi_{GQI2}(\hat{\mathbf{u}}) &= \int_0^{\lambda} Q(r\hat{\mathbf{u}})r^2 dr \\ &= \lambda^3 \int S(\mathbf{q})H(2\pi r\mathbf{q}\cdot\hat{\mathbf{u}})d\mathbf{q}\end{aligned}$$

$$\text{where } H(x) = \begin{cases} \frac{2\cos(x)}{x^2} + \frac{(x^2-2)\sin(x)}{x^3}, & x \neq 0 \\ 1/3, & x = 0 \end{cases}.$$

Simple analytical form: $\psi_{GQI2} = \mathbf{s} \cdot \mathrm{H}((6D.G \circ \mathbf{b} \circ \mathbb{1}) \cdot G)\lambda^3/\pi$



Strategy for the workshop

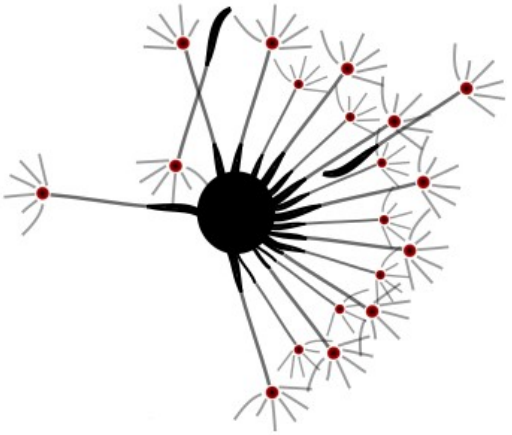
- Use GQI2 to calculate the ODFs of the data.
- Find the peaks of the ODFs.
- If a single peak then fit the Single Tensor (WLS)

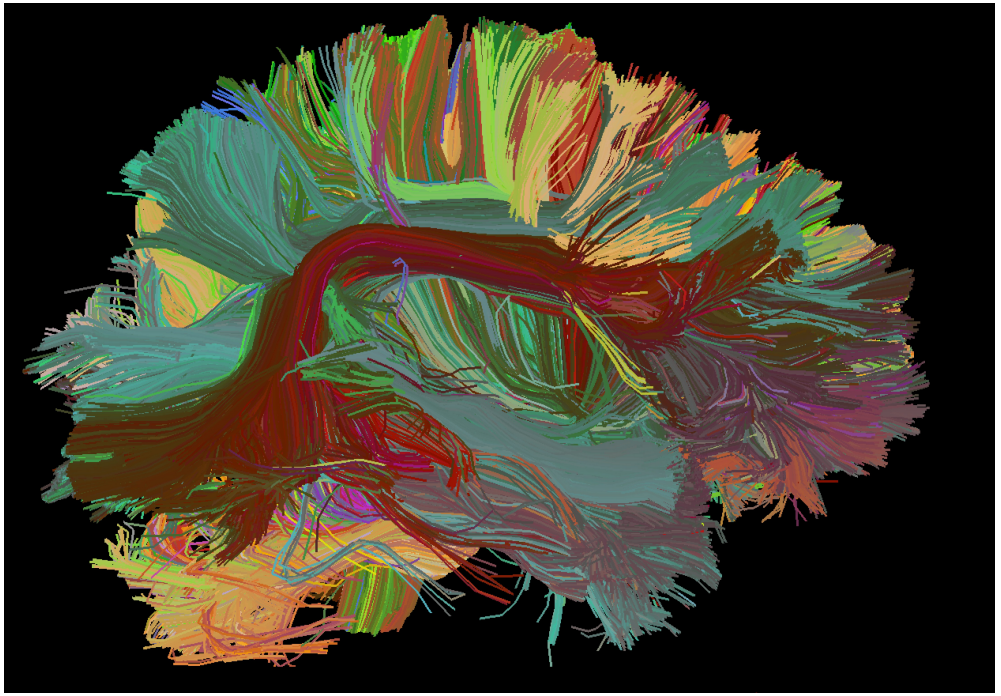
  and return the analytical ODF for the Single Tensor.
- Else return the GQI2 ODFs (with no noise very close to the real ODFs).

  In order to deal with the different SNRs we applied different sampling lengths for each SNR.

Diffusion Imaging in Python

DIPY.org





- Reconstruction
  - DTI, GQI, DSI, EIT
  - SHM, QBI (CSD)
- Propagation
  - Deterministic
    - Fact, Euler
  - Probabilistic
- Analysis
- Segmentation
  - QuickBundles

Contribute, Share, Collaborate, Communicate
Program in a language for human beings.

Thank you...