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PENN IMAGE COMPUTING & SCIENCE LAB

Data interoperability of DTI-TK for DTI analysis
&
A preview of ITK-SNAP 2.0

Gary Hui Zhang, Paul A Yushkevich, and James C Gee

Penn Image Computing & Science Laboratory (PICSL)
Department of Radiology, University of Pennsylvania

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Data interoperability of DTI-TK for DTI analysis

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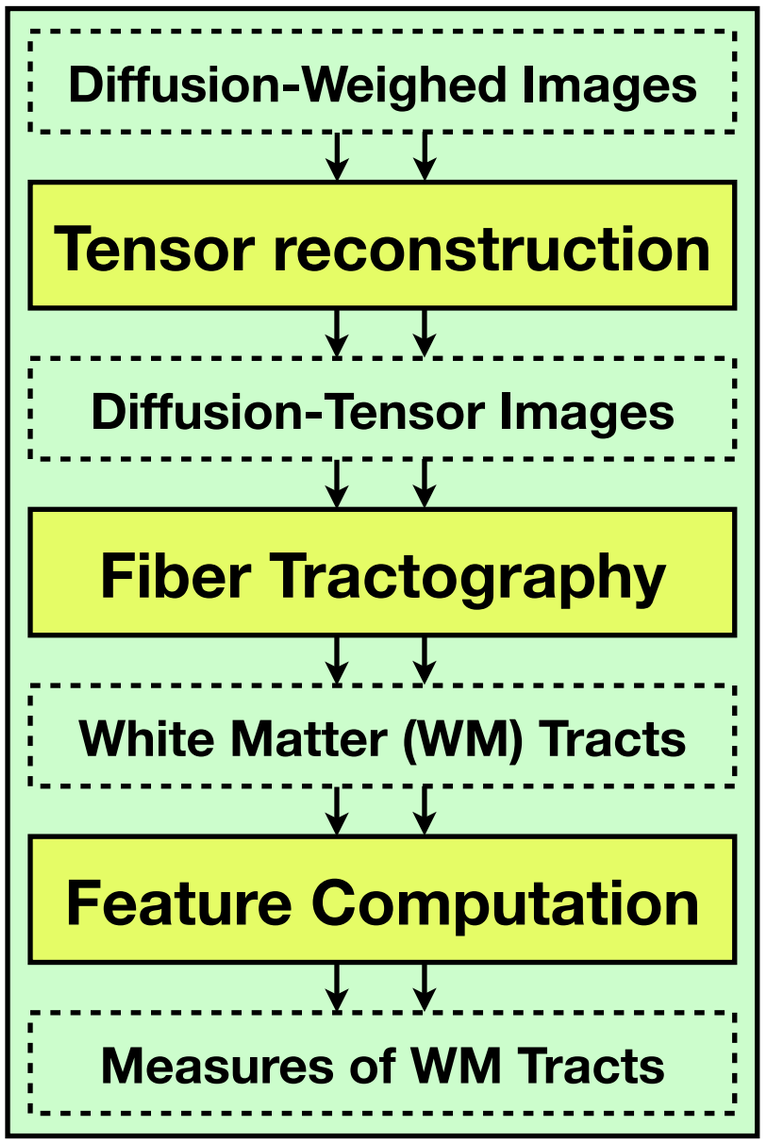
A typical DTI analysis pipeline for a single subject



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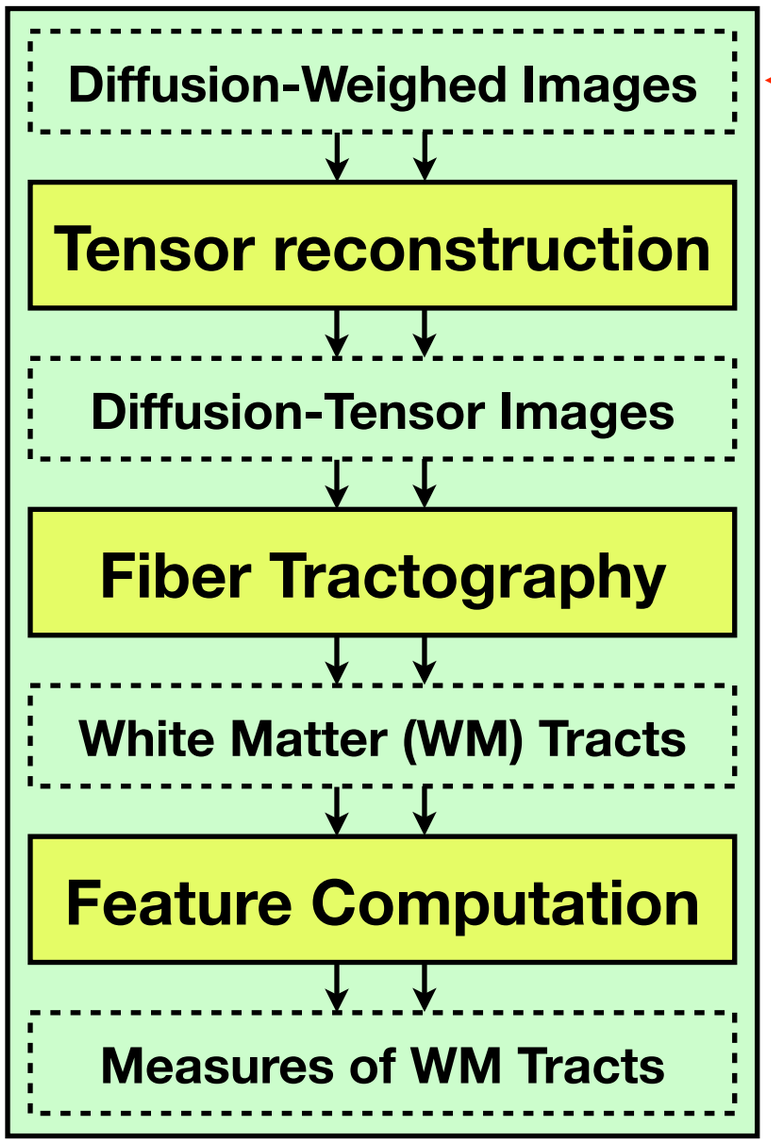

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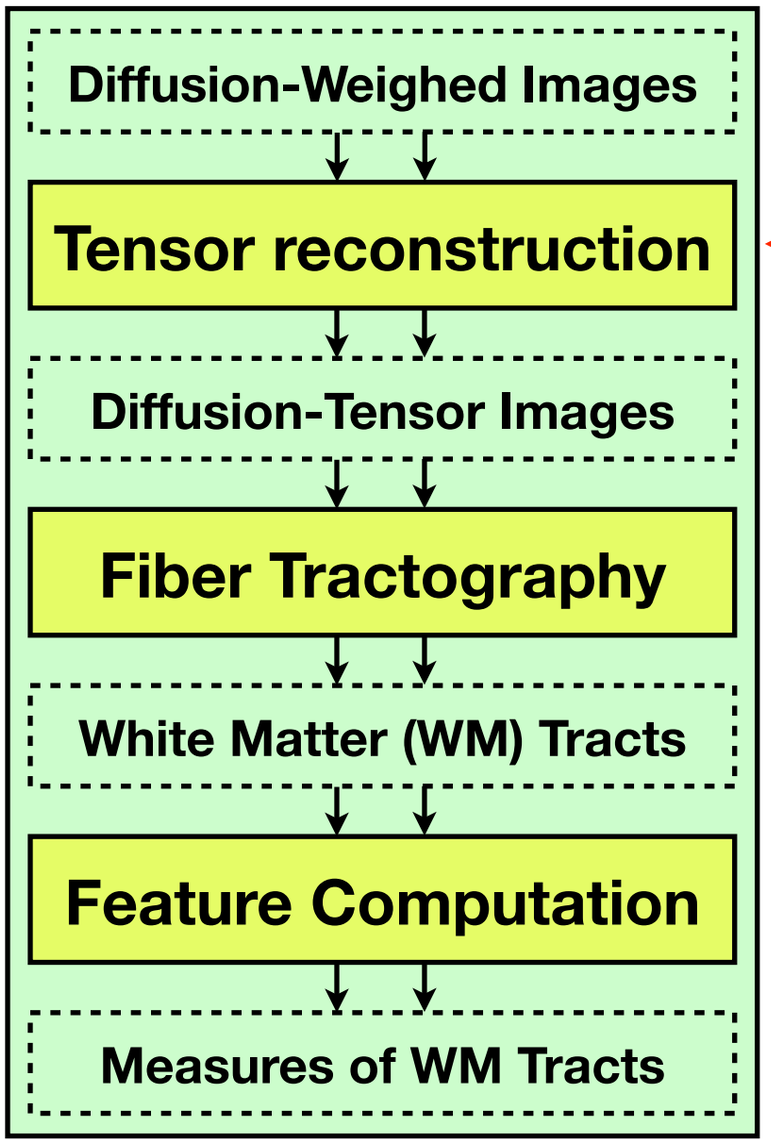

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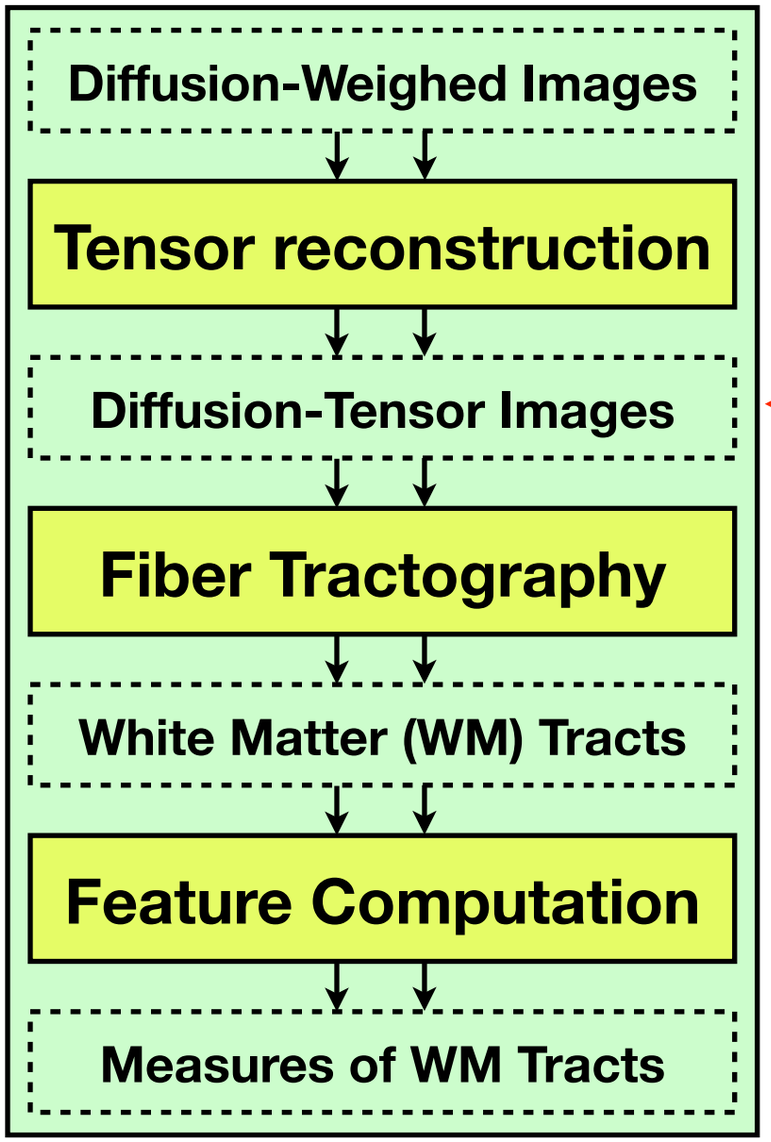

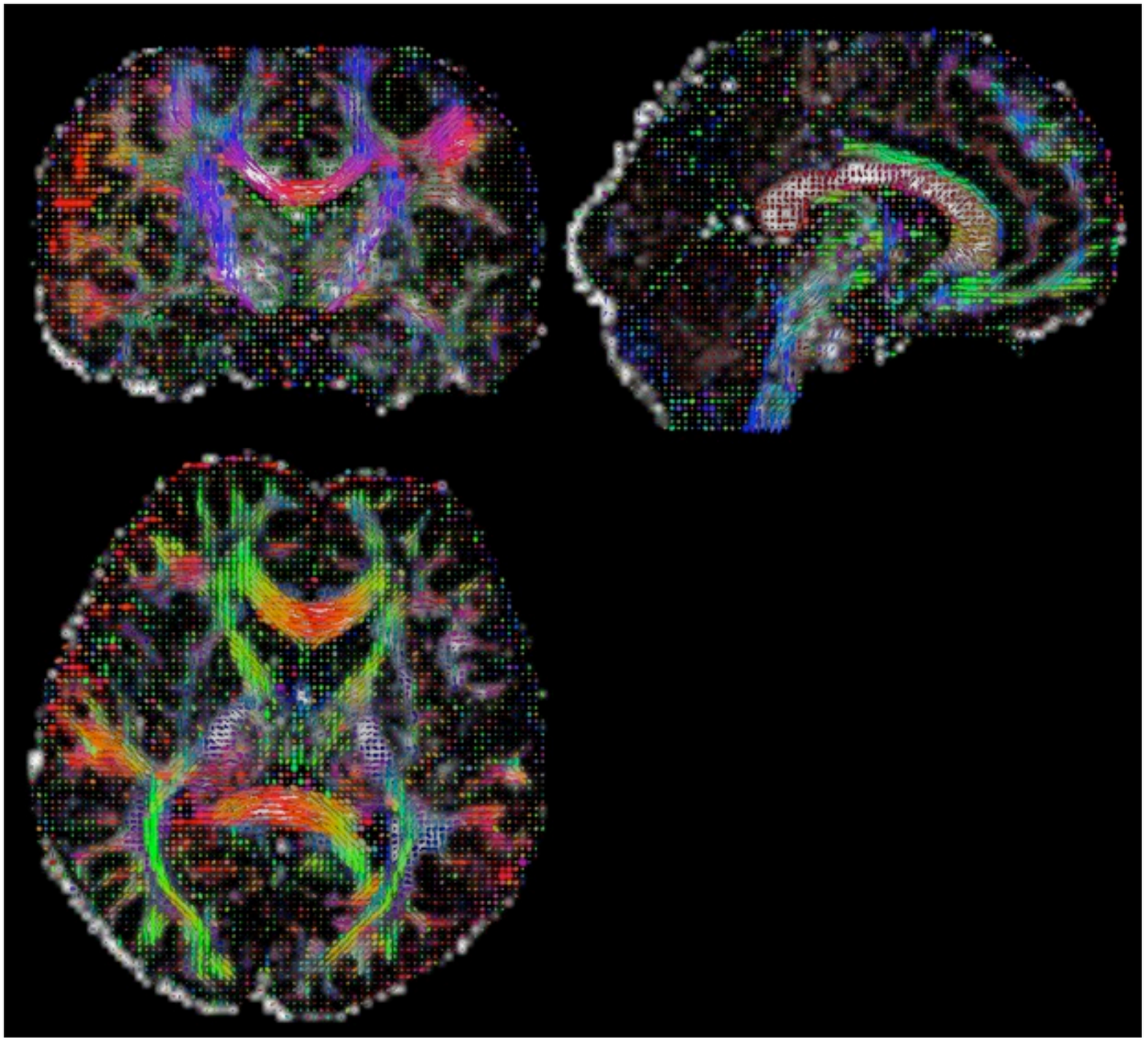

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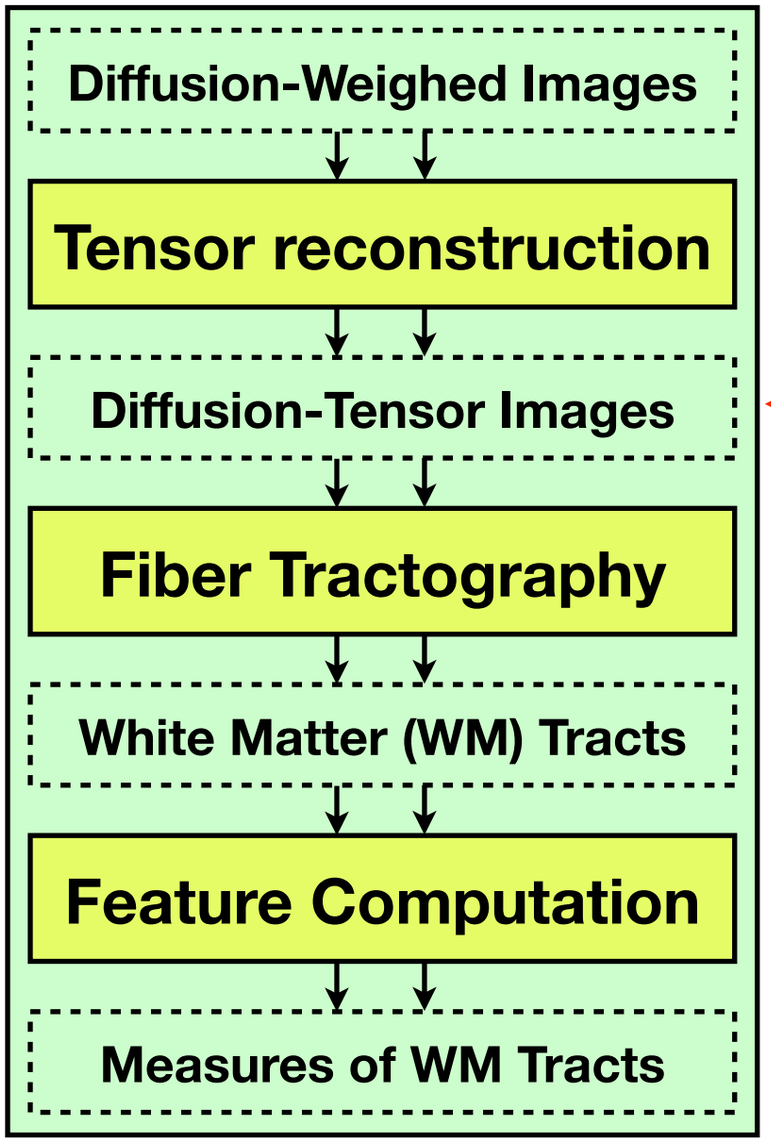

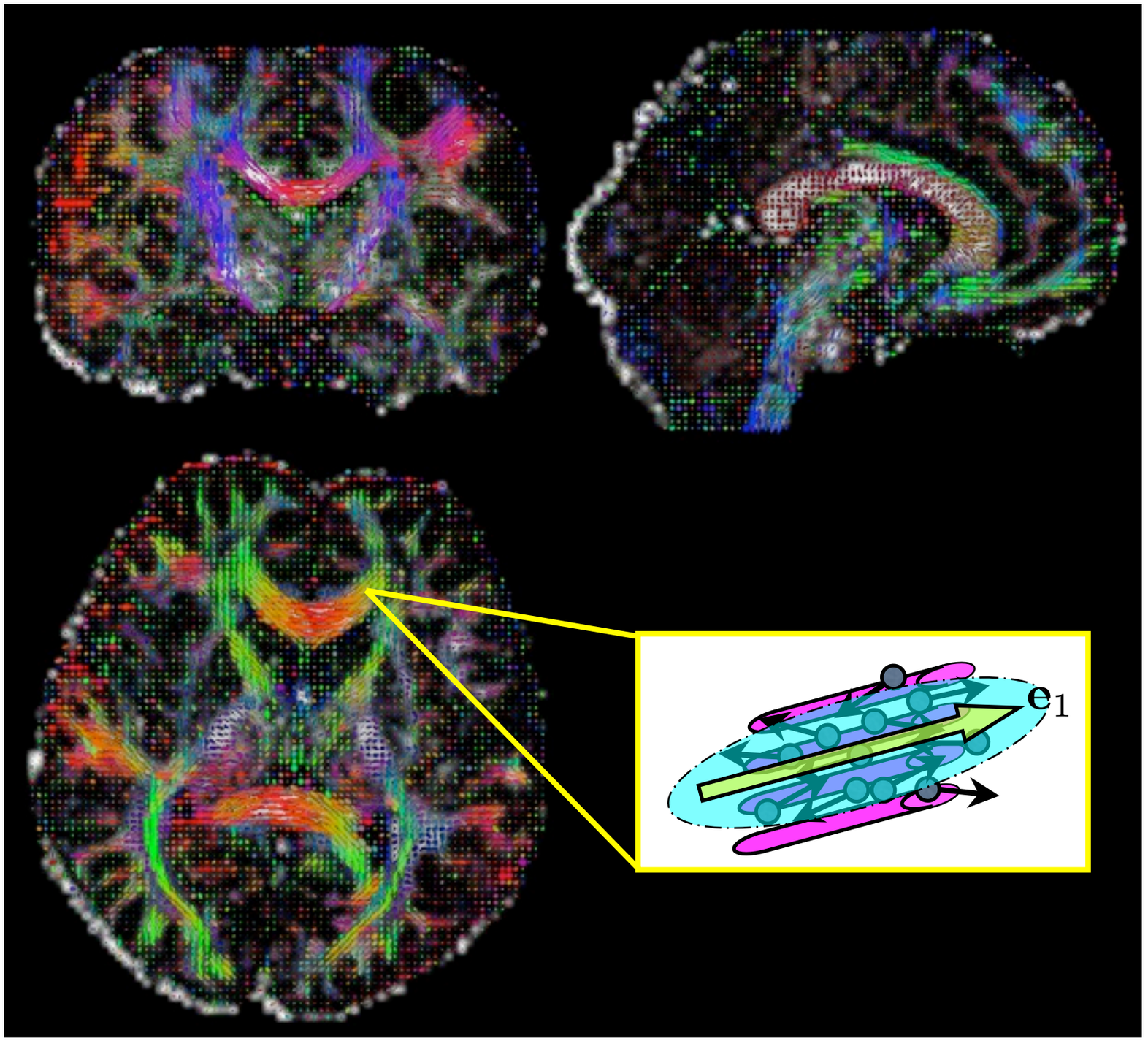

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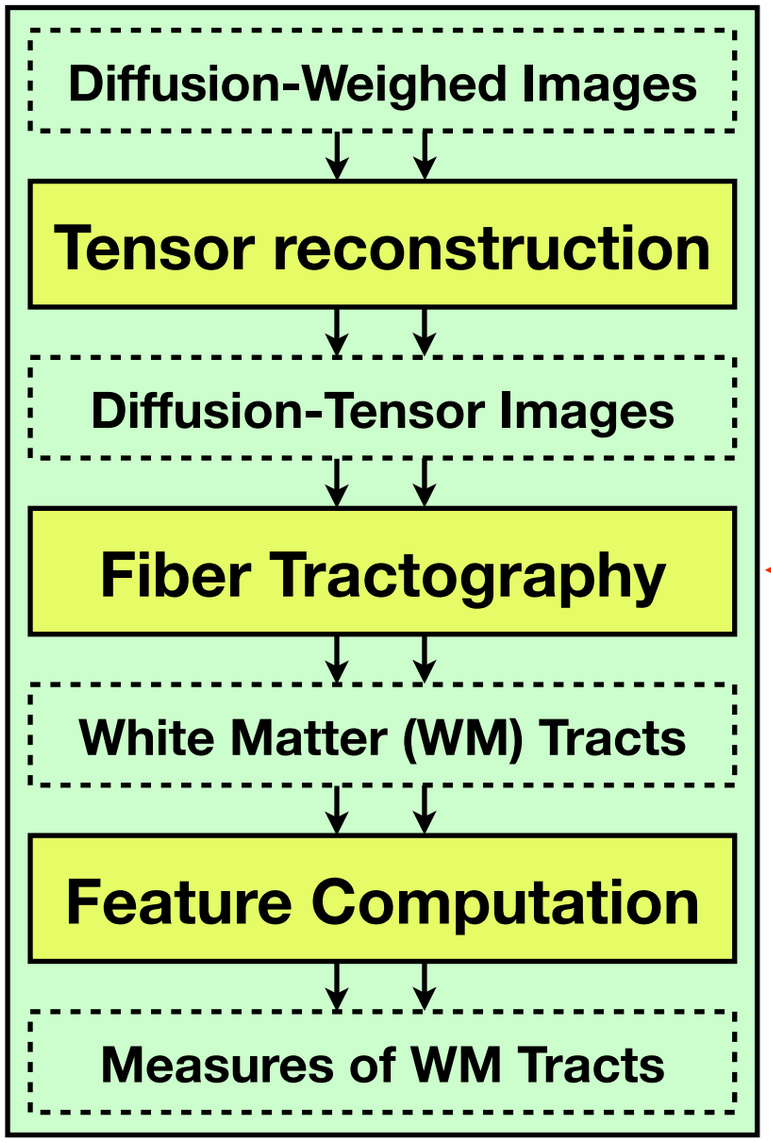

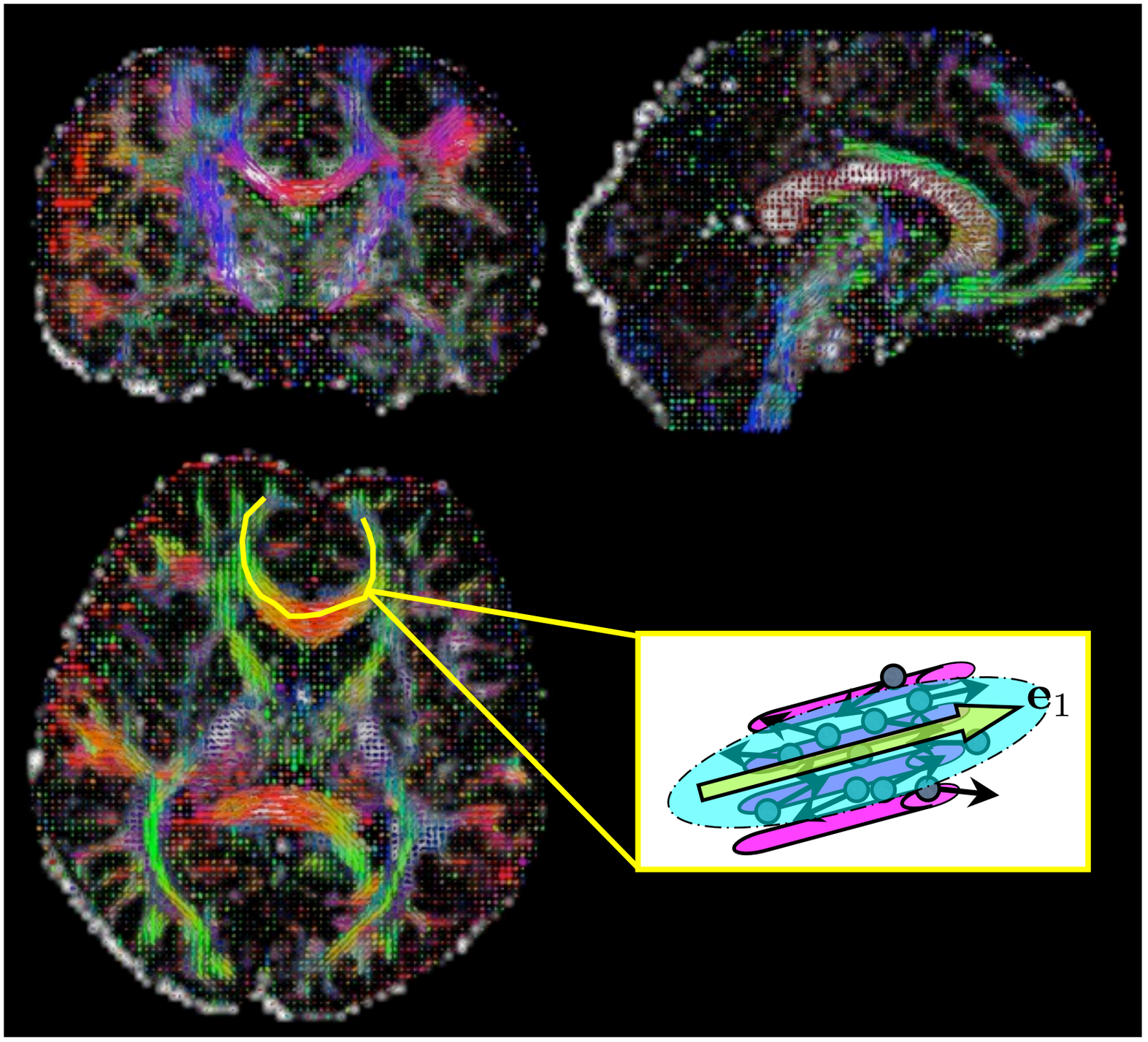

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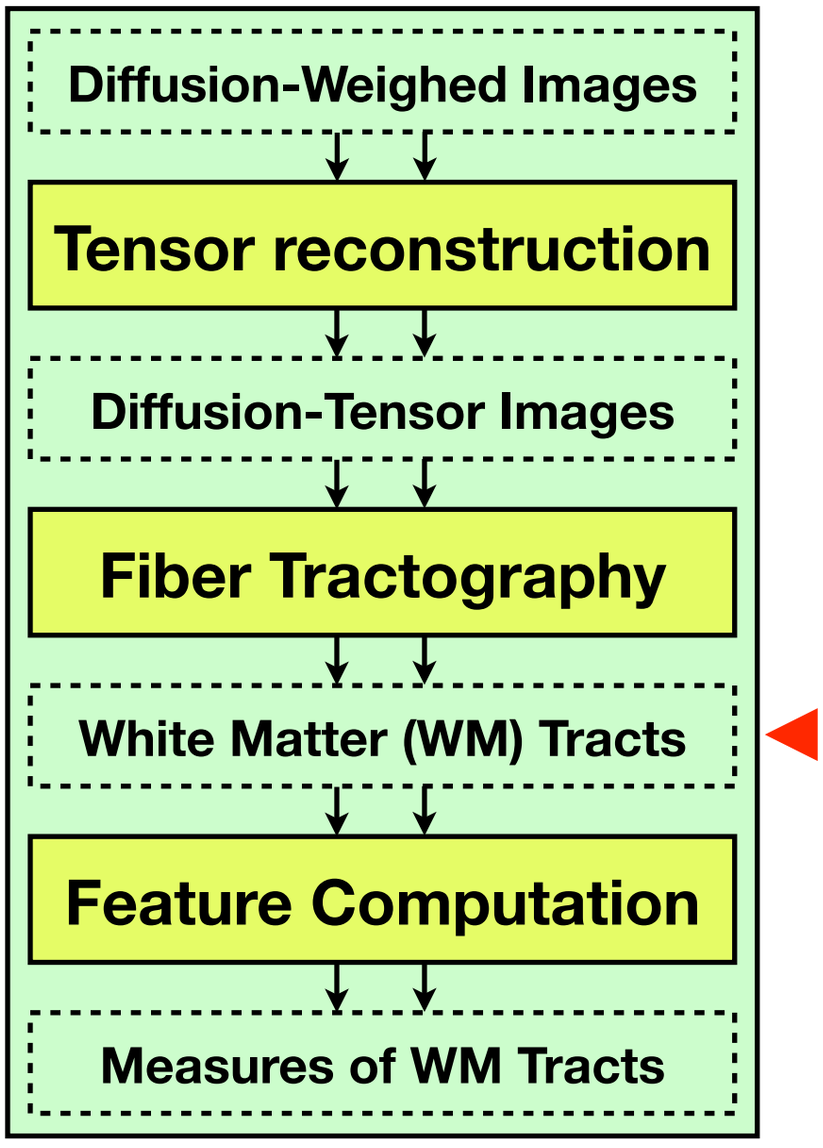

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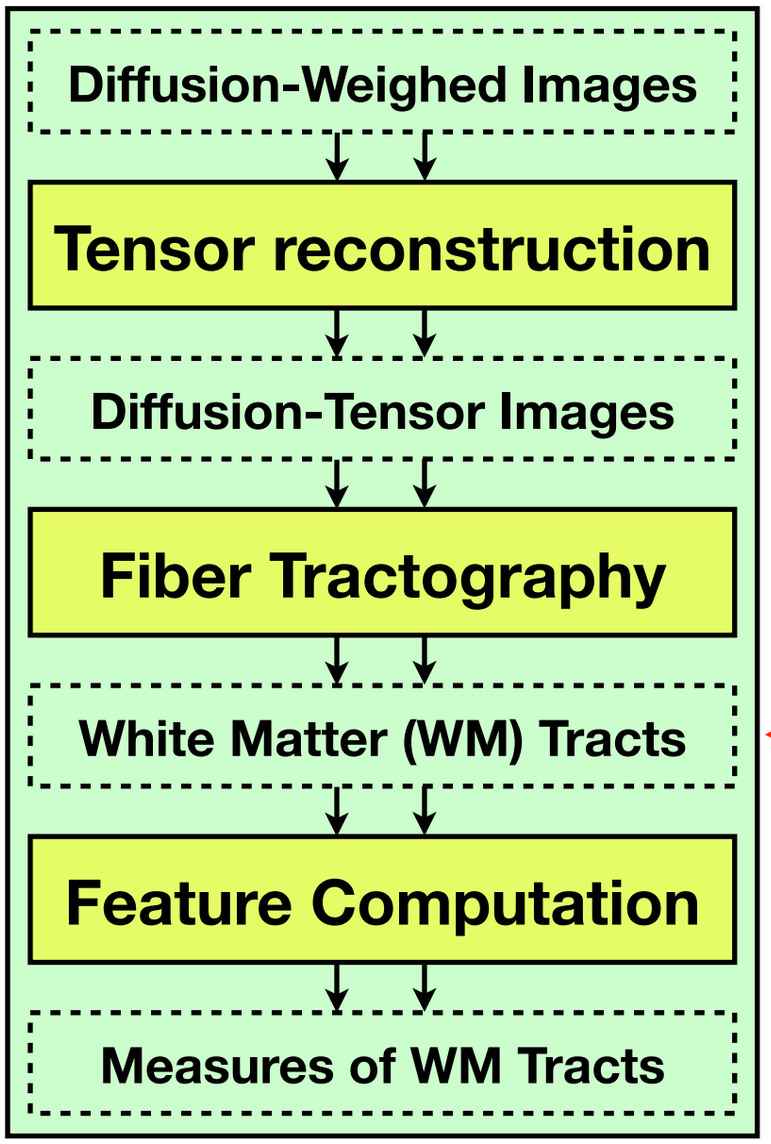

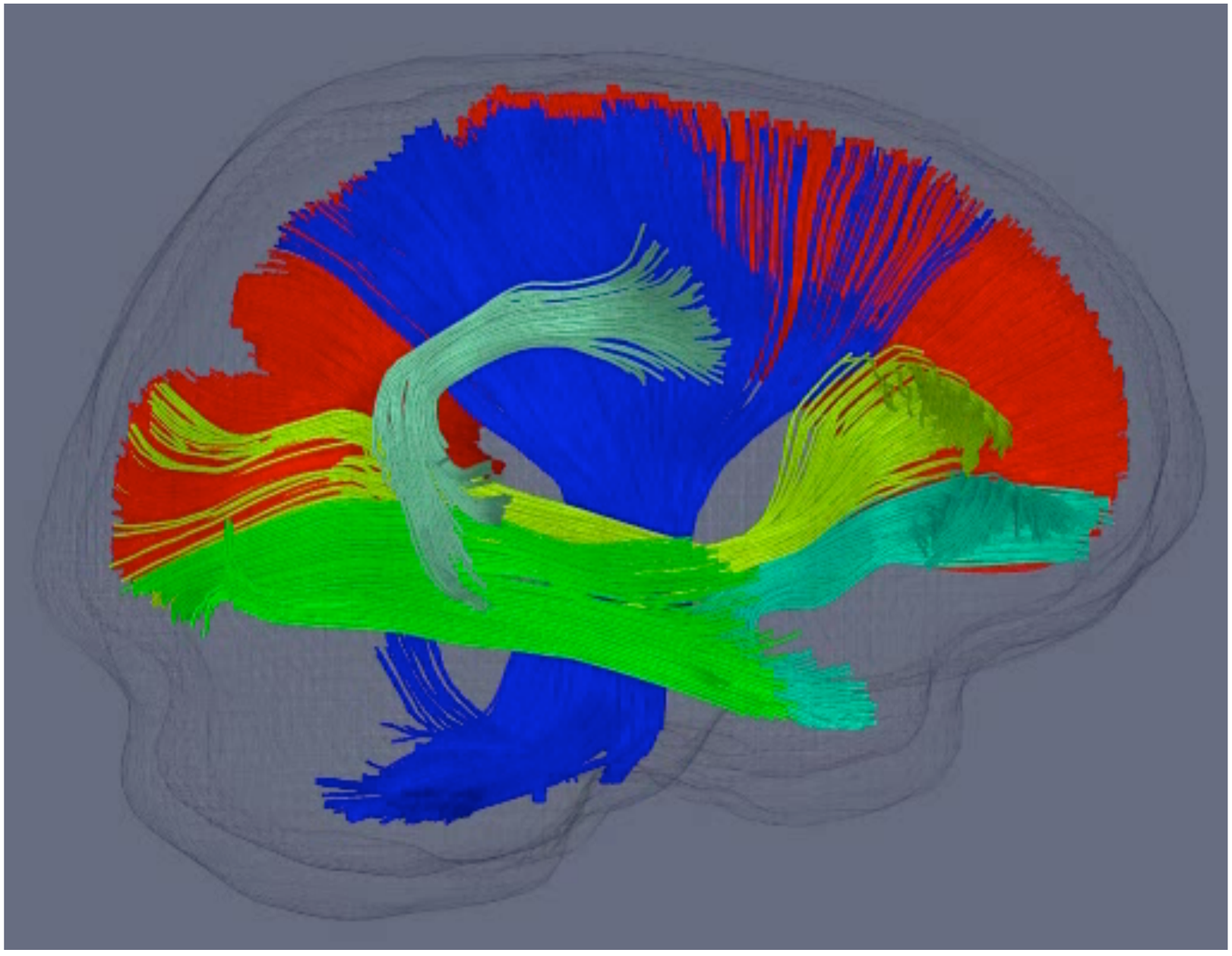

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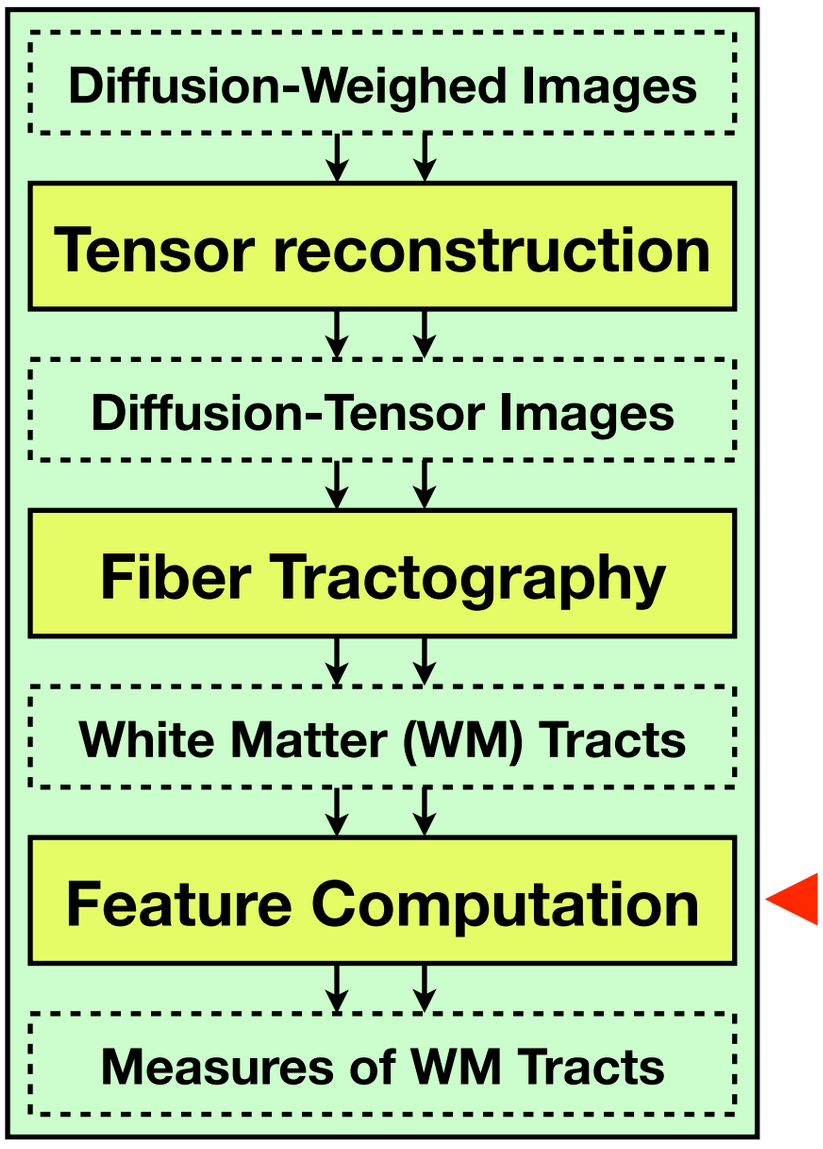

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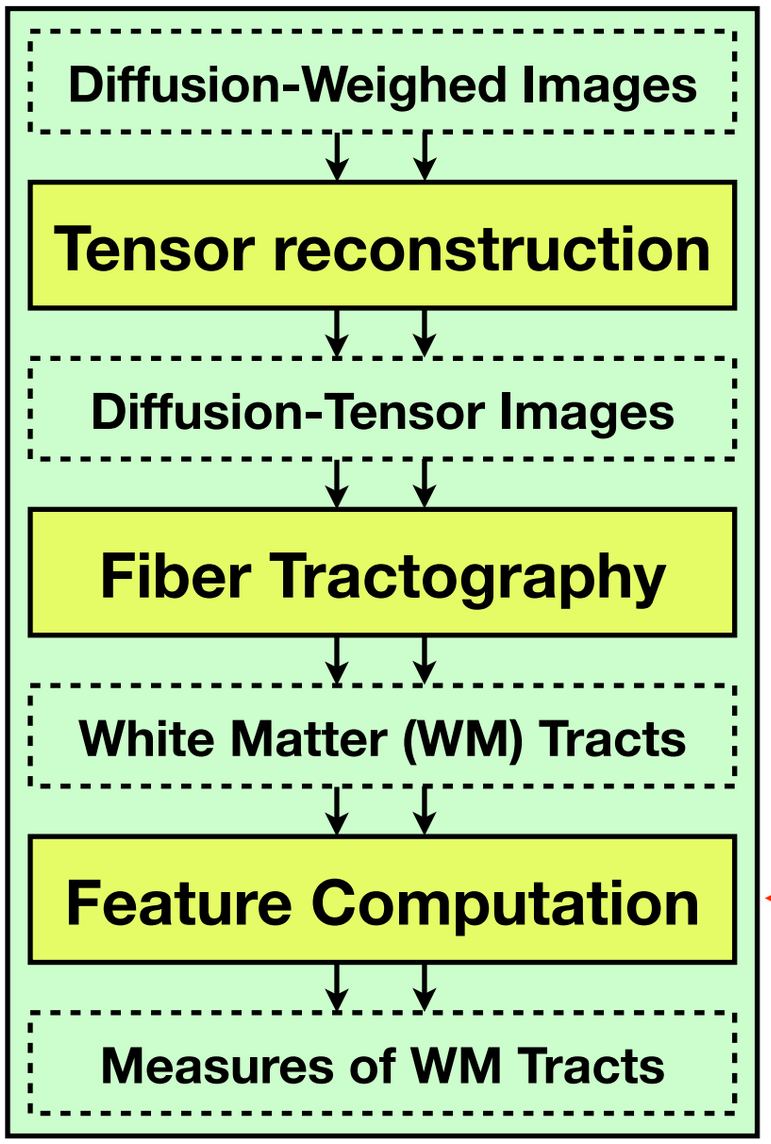

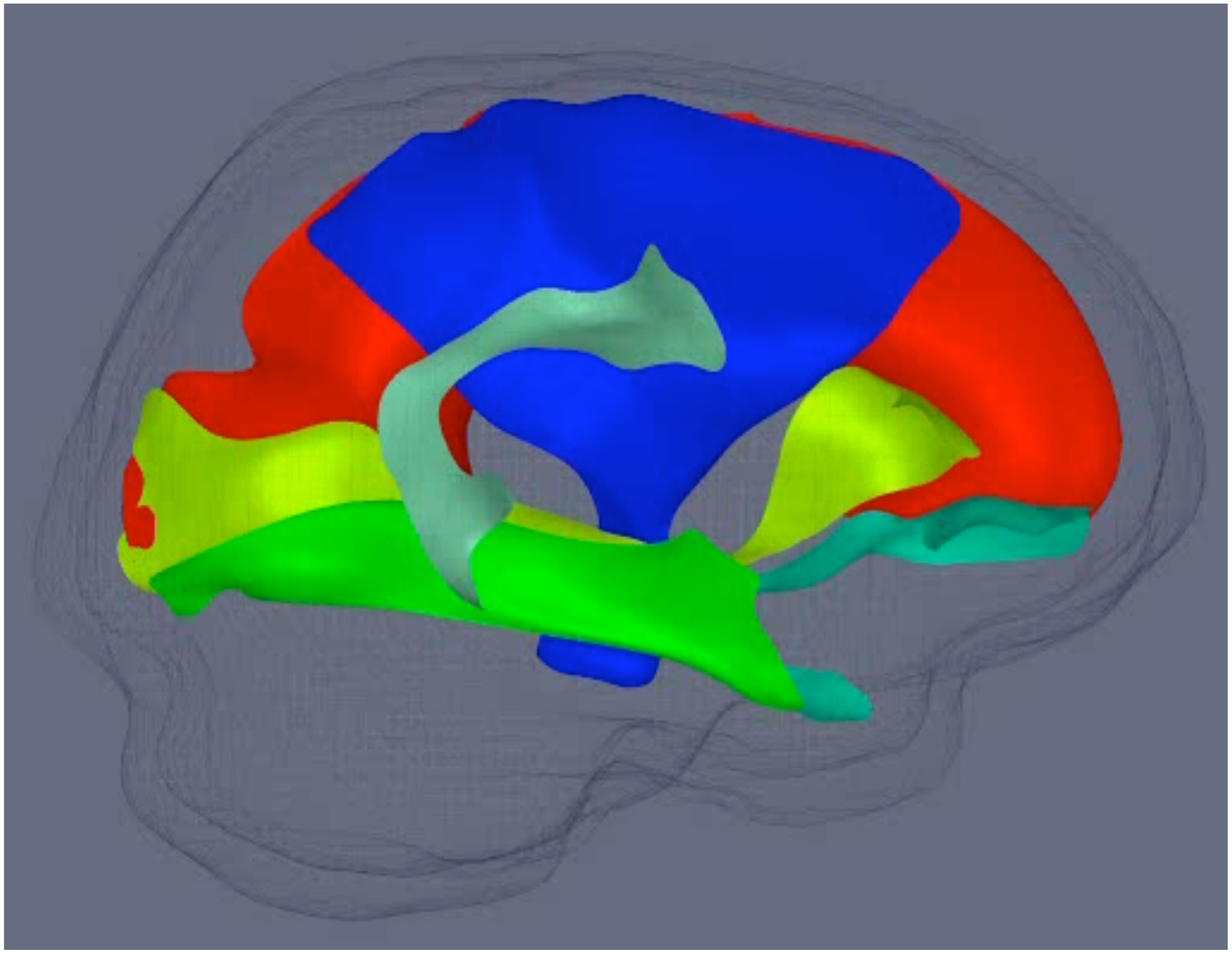

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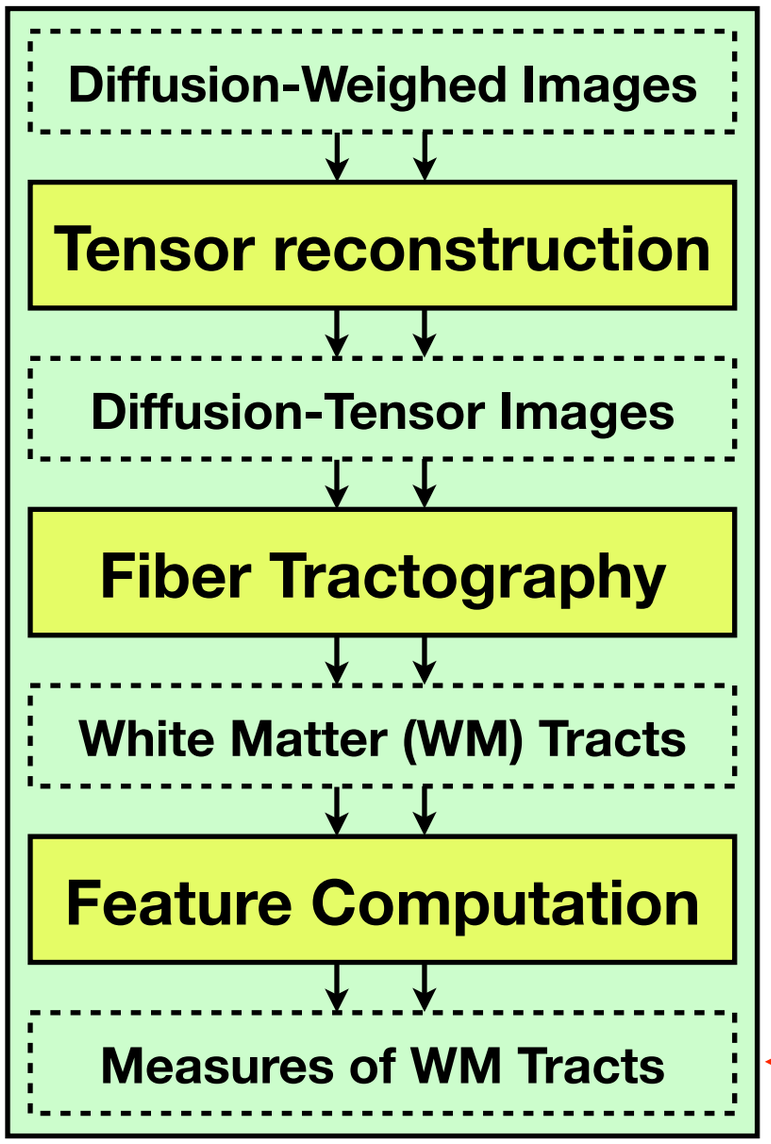

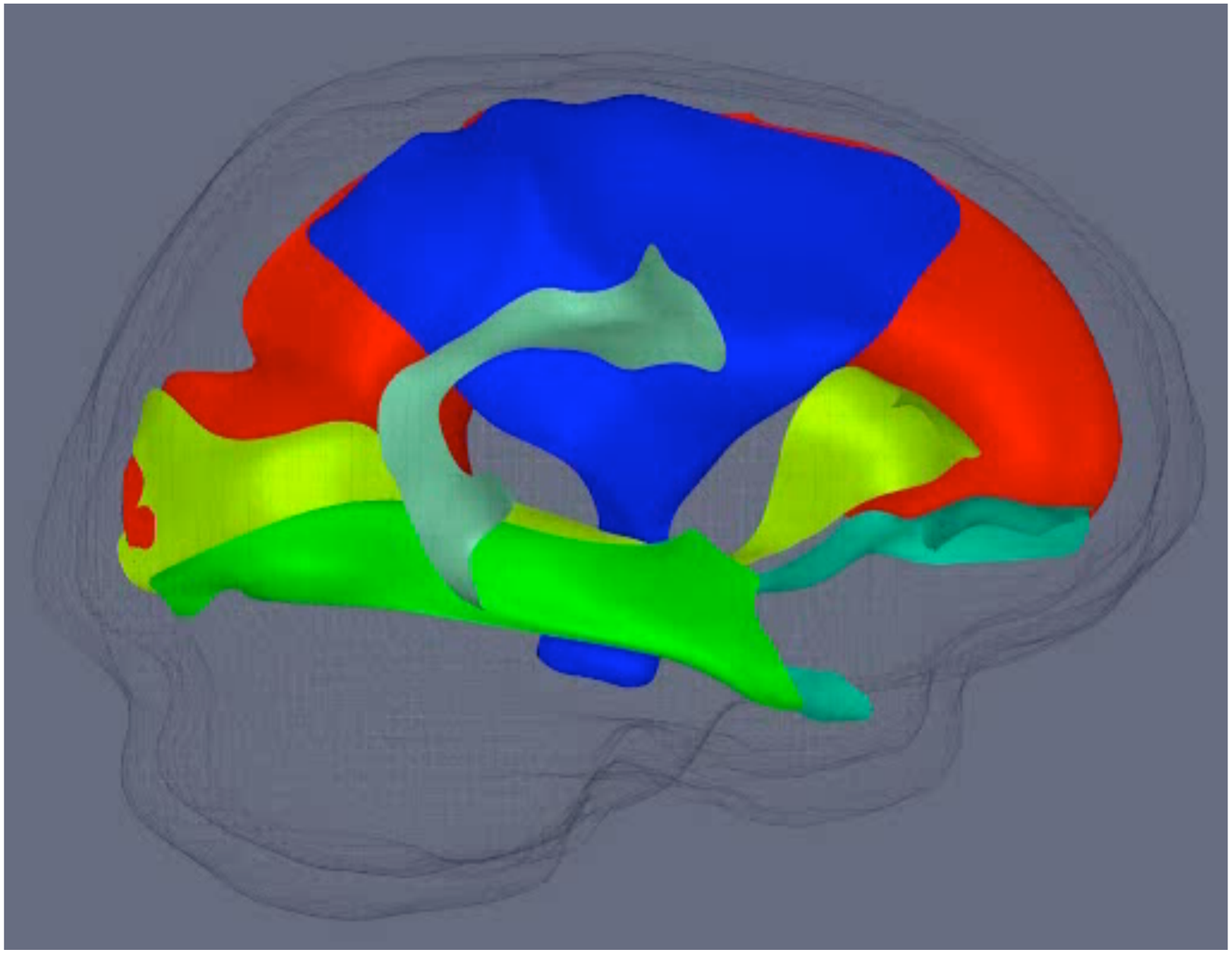

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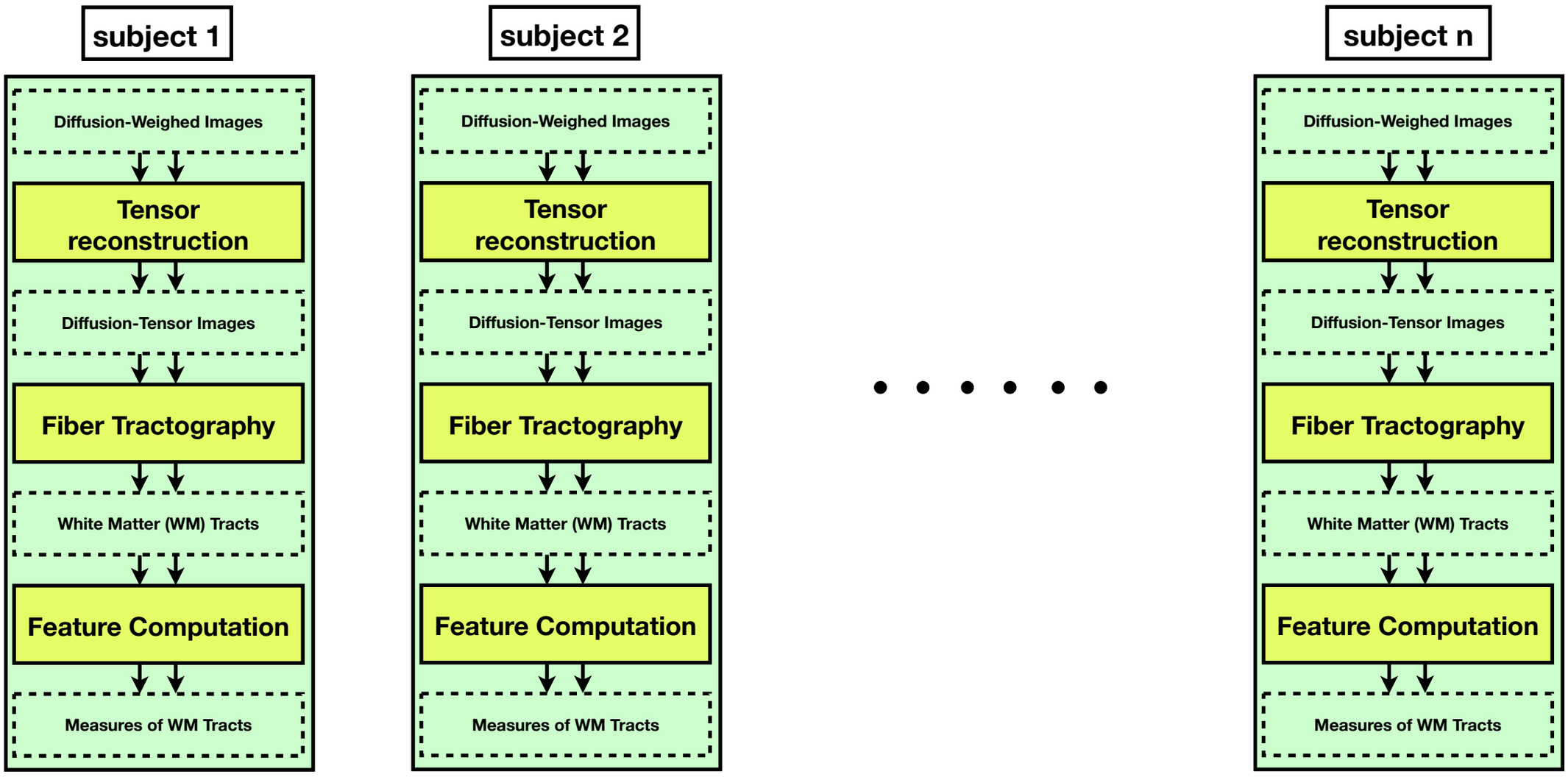
A typical DTI analysis pipeline for group studies



Population studies ← **Spatial Normalization**

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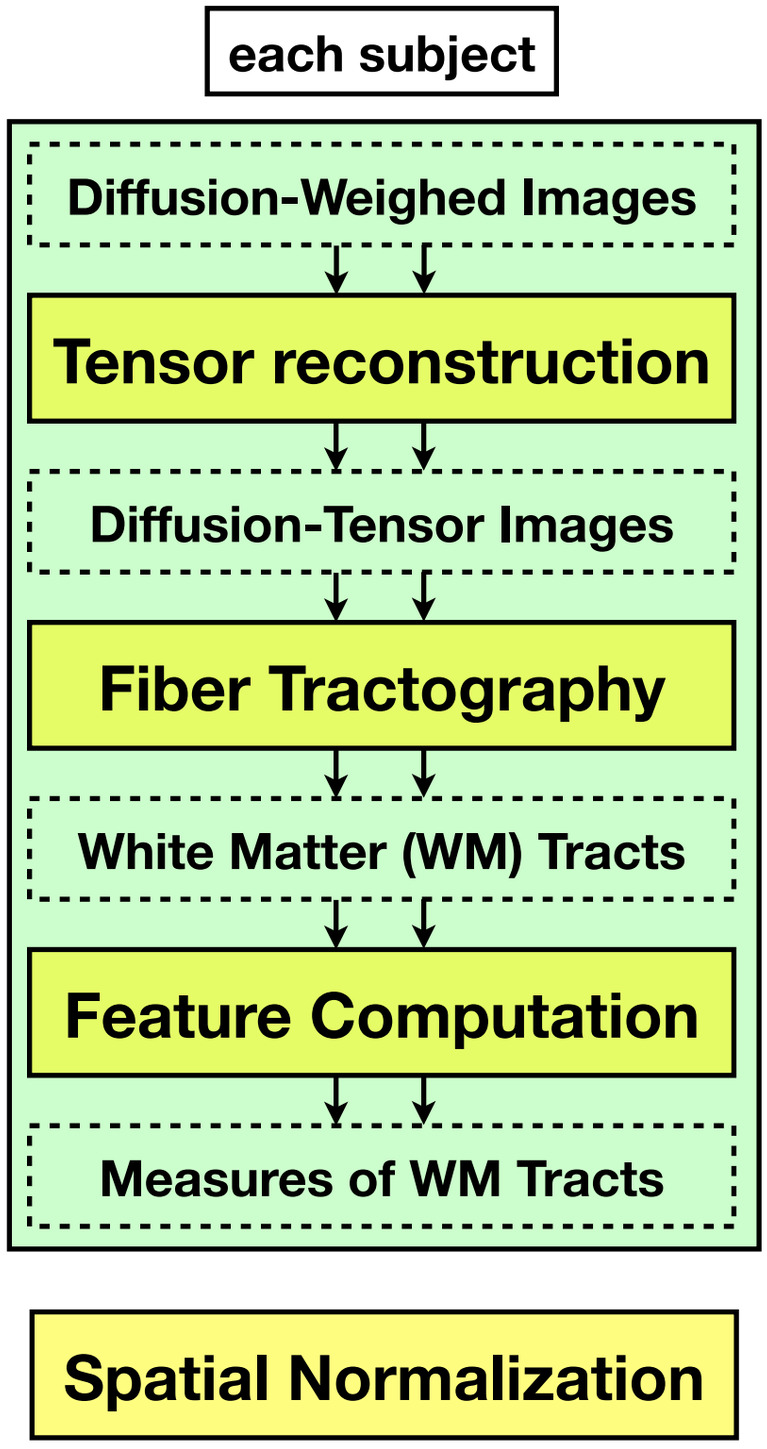
How do existing DTI tools support DTI analysis?



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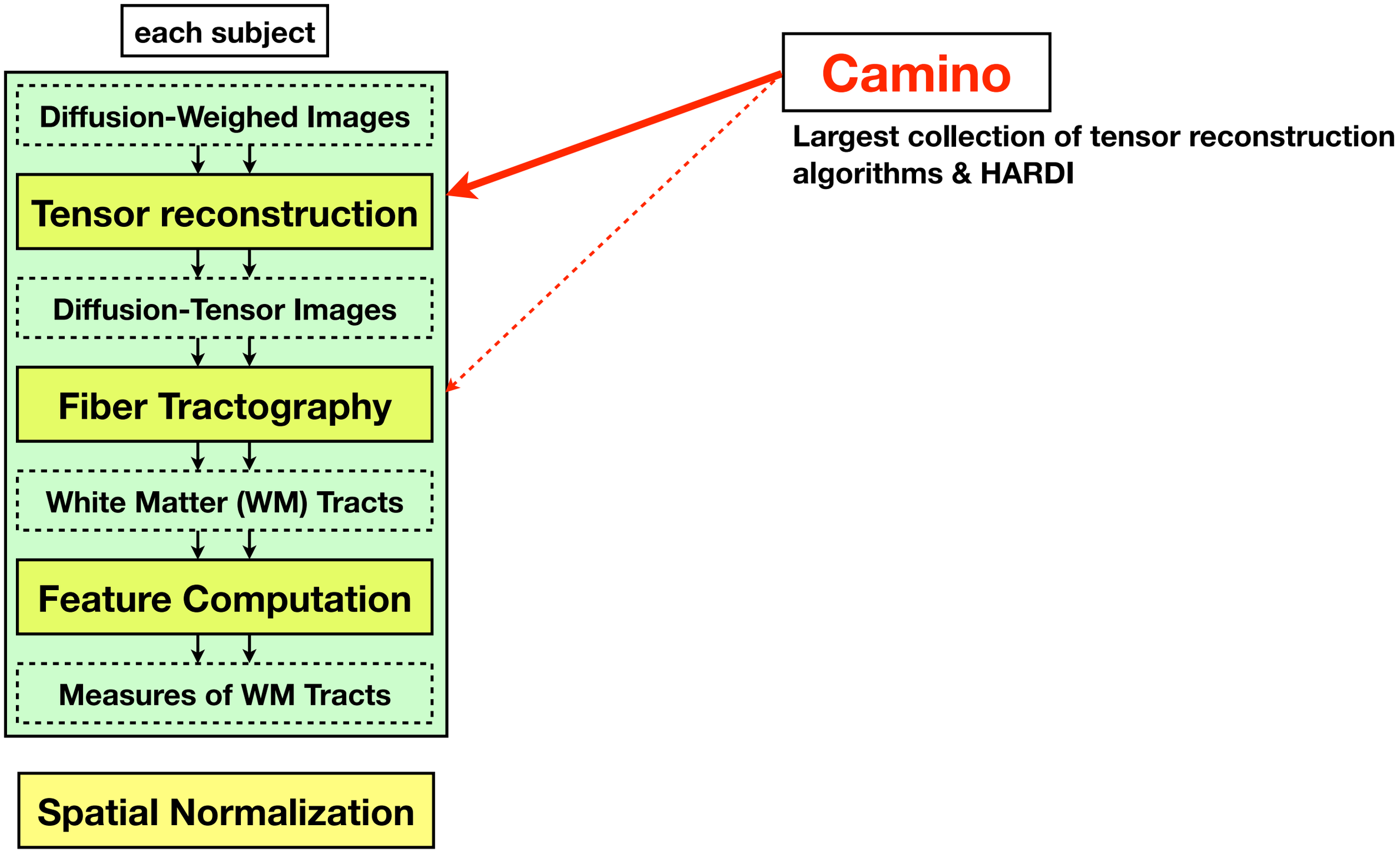

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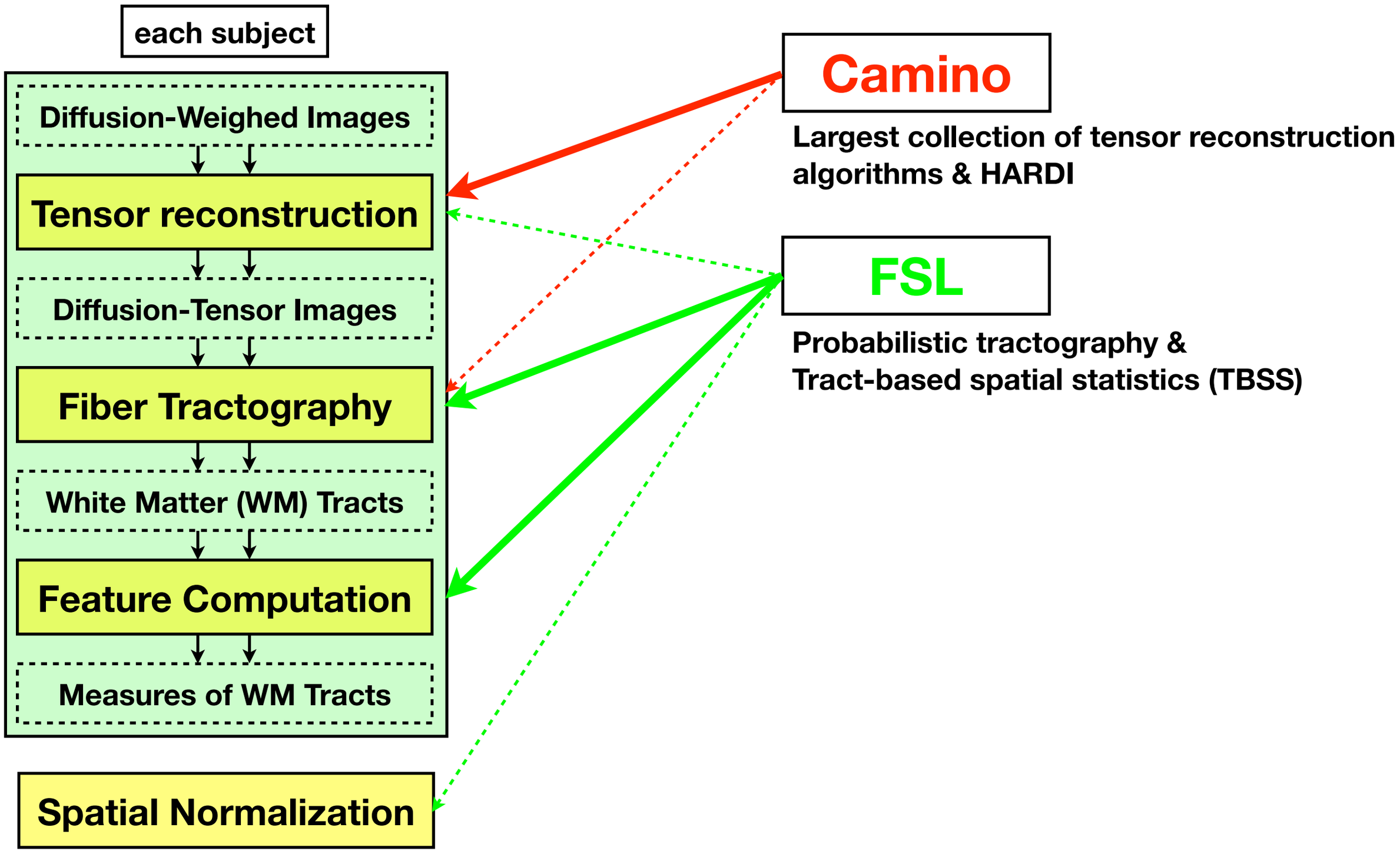

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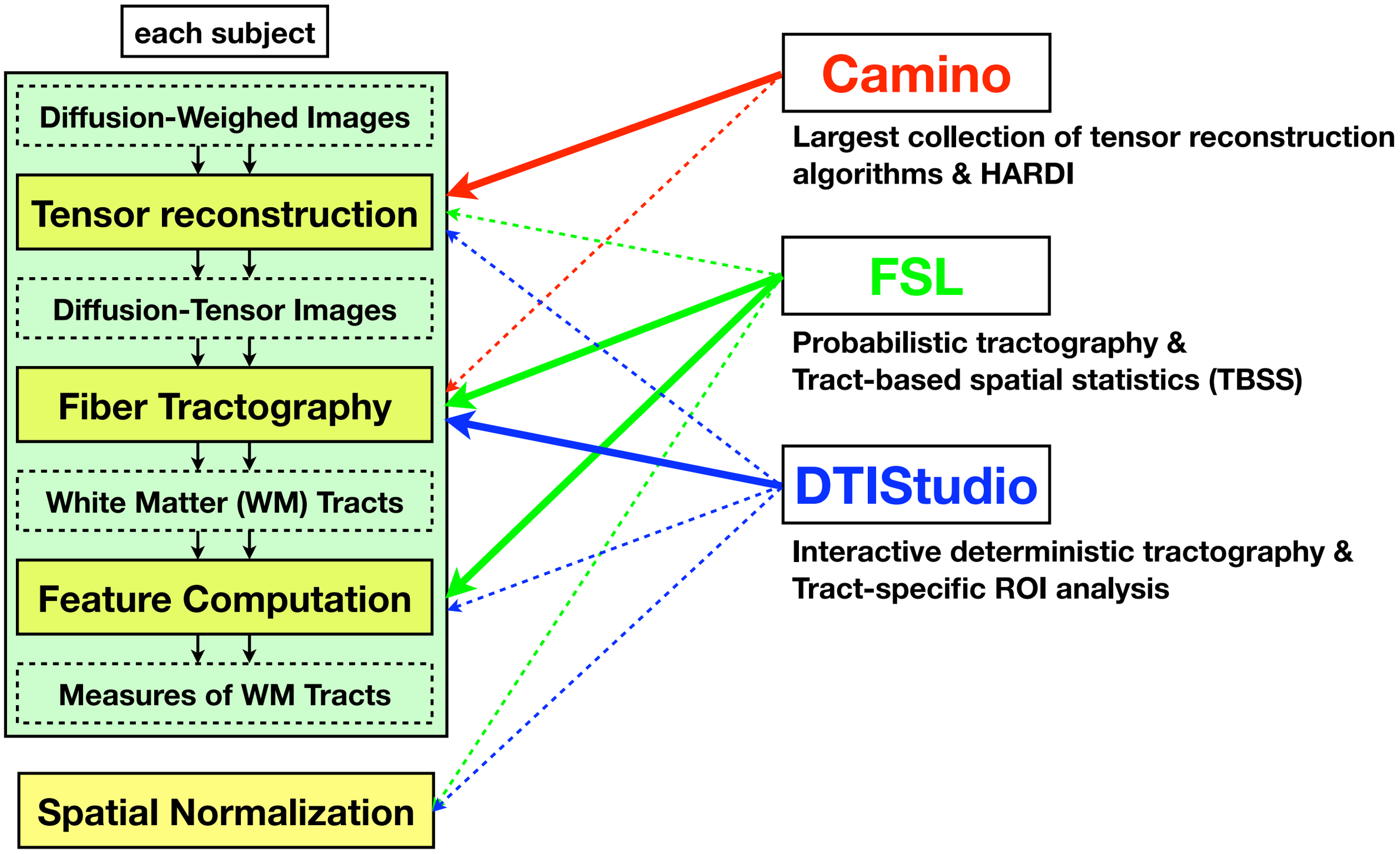

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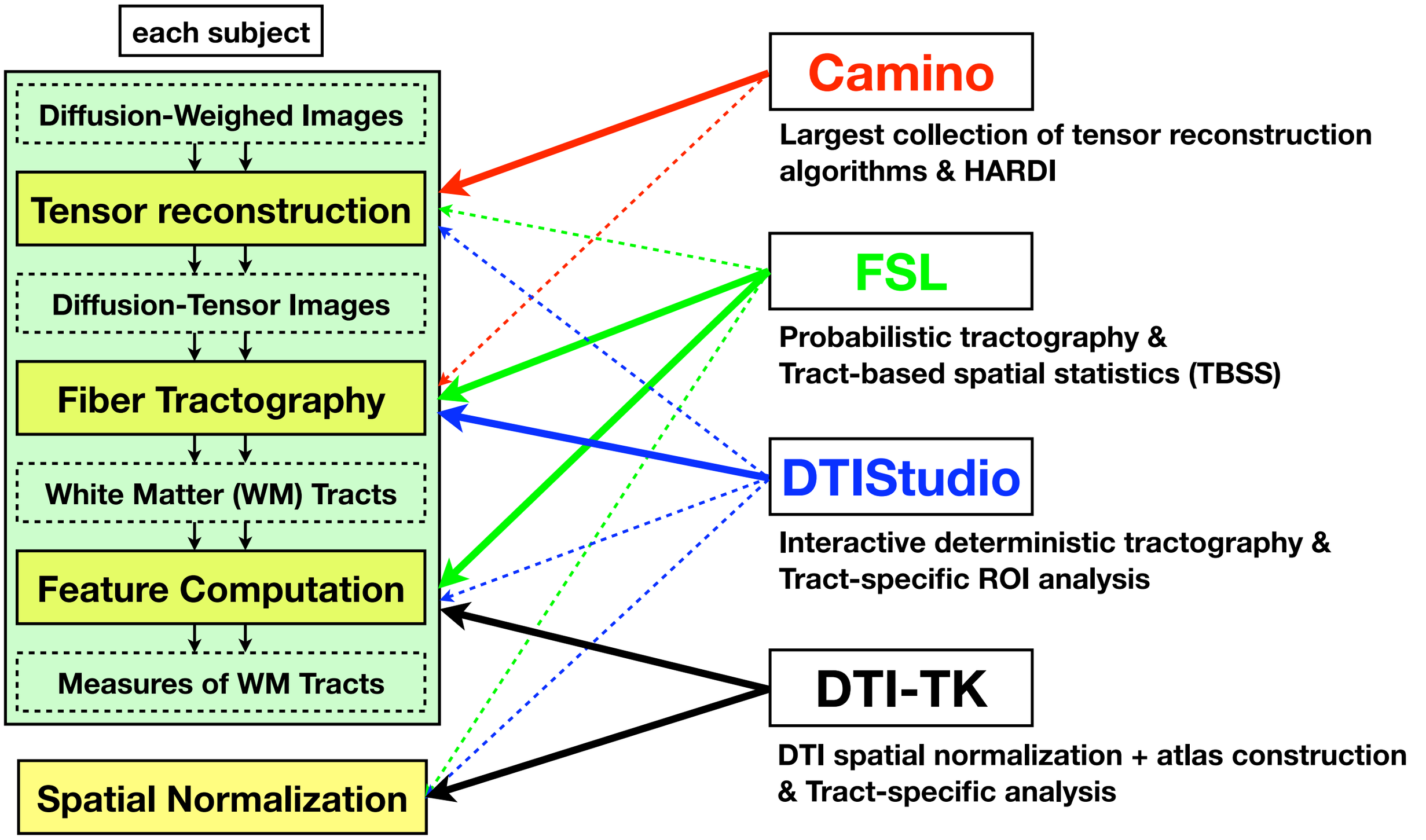

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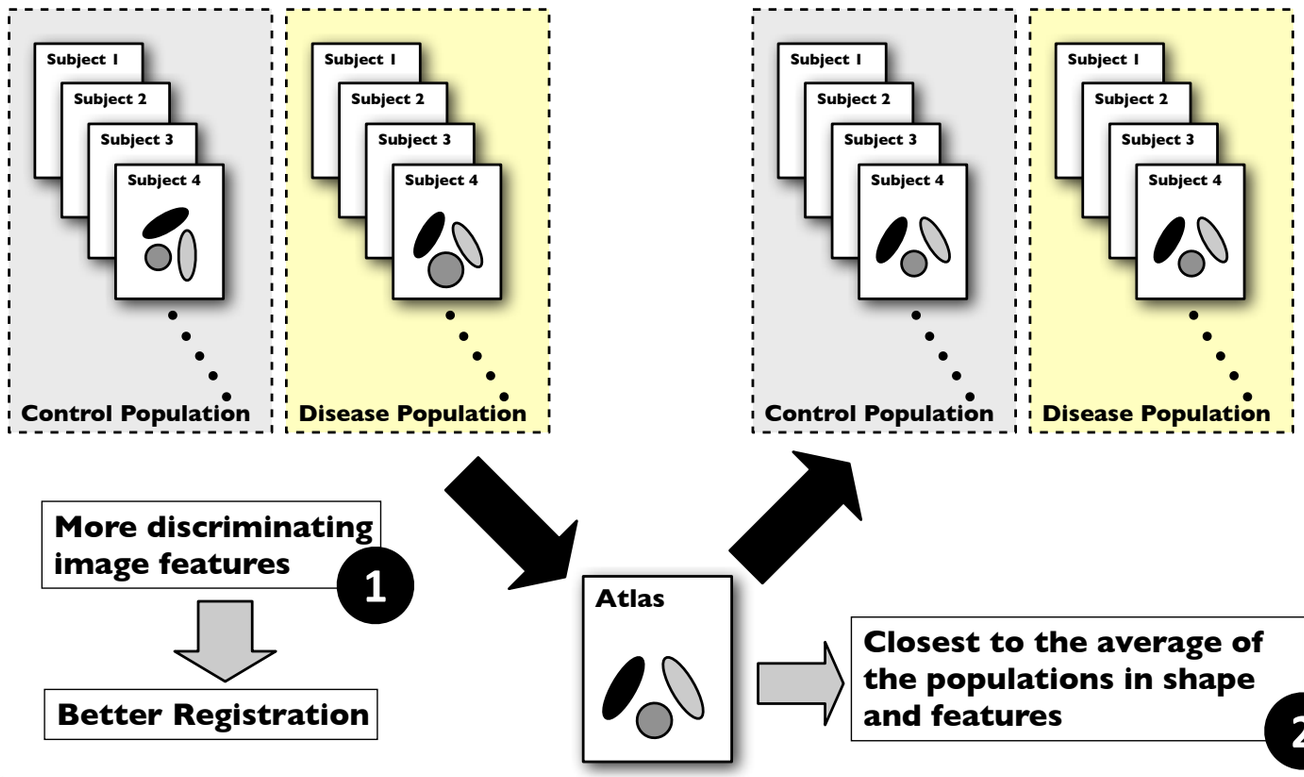
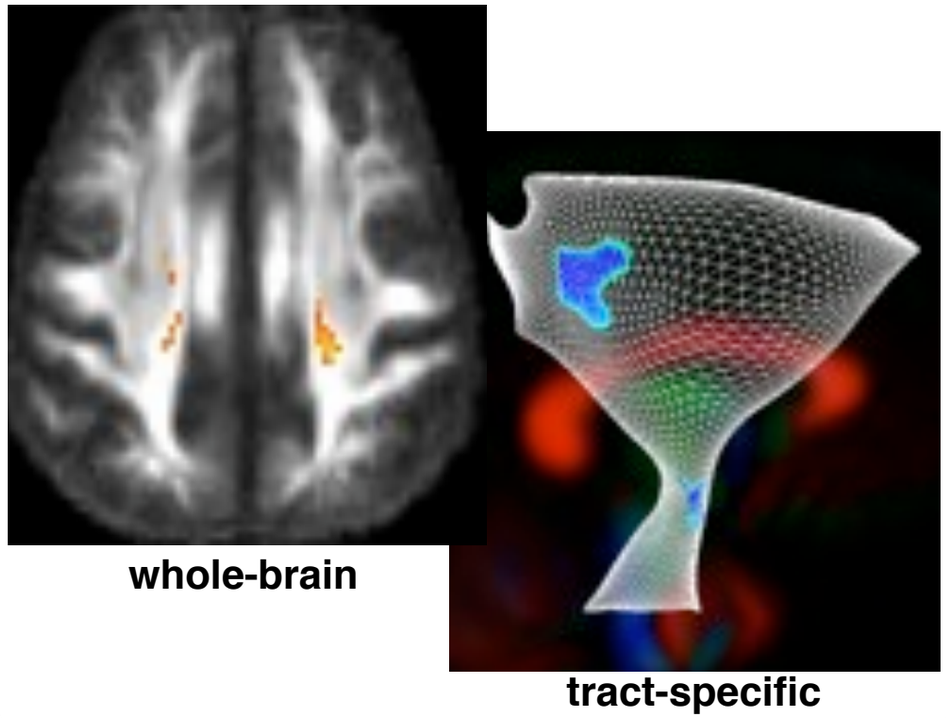
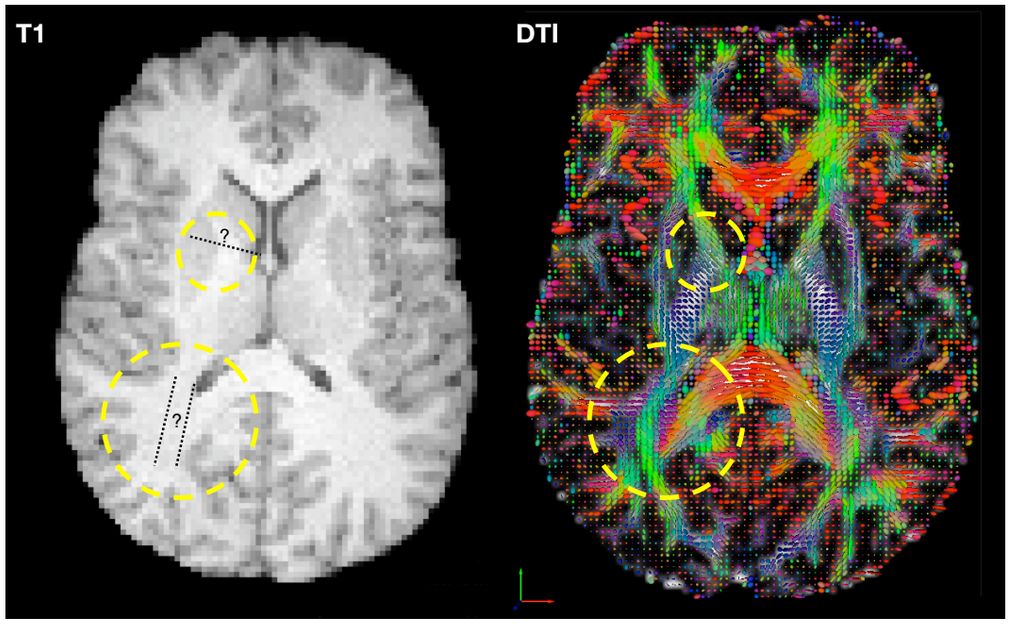
Spatial normalization and atlas construction



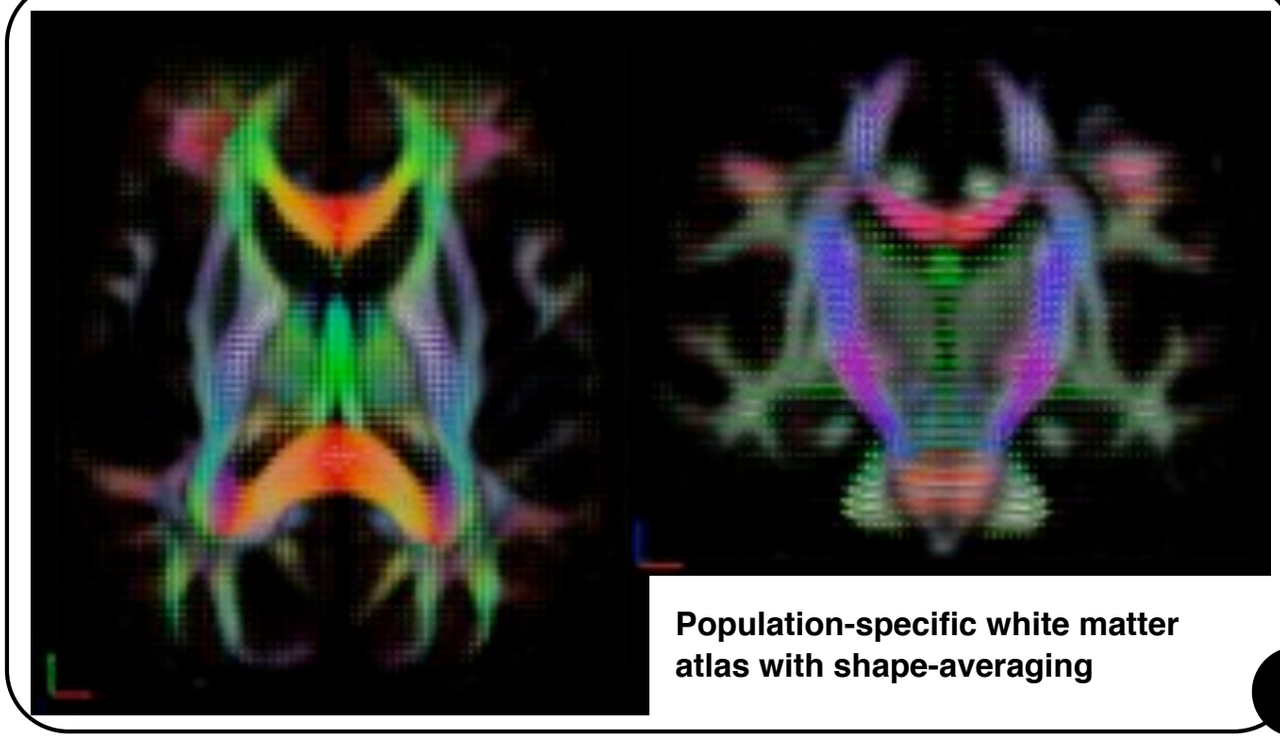
White matter morphometry





Tensor-based registration leverages rich discriminating features afforded by DTI

1



Population-specific white matter atlas with shape-averaging

2

For download, visit http://www.nitrc.org/projects/dtitk

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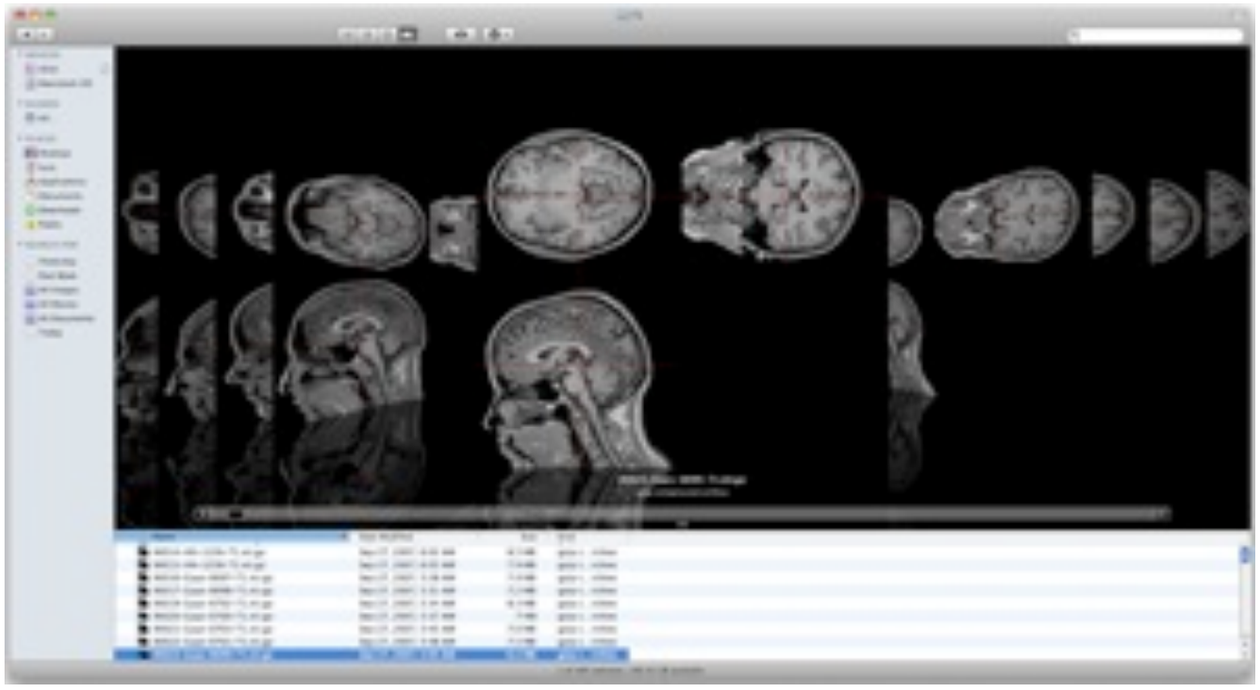
DTI-TK Quick Look Plugin for Mac OSX

About DTI-TK Quick Look Plugin

This plugin uses the Mac OS X Leopard's built-in innovative Quick Look framework to enable a quick assessment of any 3-dimensional image volume in the supported medical image formats (NIfTI / Analyze / FreeSurfer) directly from the Finder. Using the Finder's Cover Flow mode, a large collection of medical images can be browsed through and quickly inspected just as easy as flipping through your photos. Furthermore, a large number of images can be compared side-by-side by selecting them together in the Finder, then pressing the space bar to bring up the Quick Look preview mode.



System Requirements

Mac OS X 10.5 or later

Download Details

Company:	university of pennsylvania
Version:	1.7.3
Post Date:	June 8, 2009

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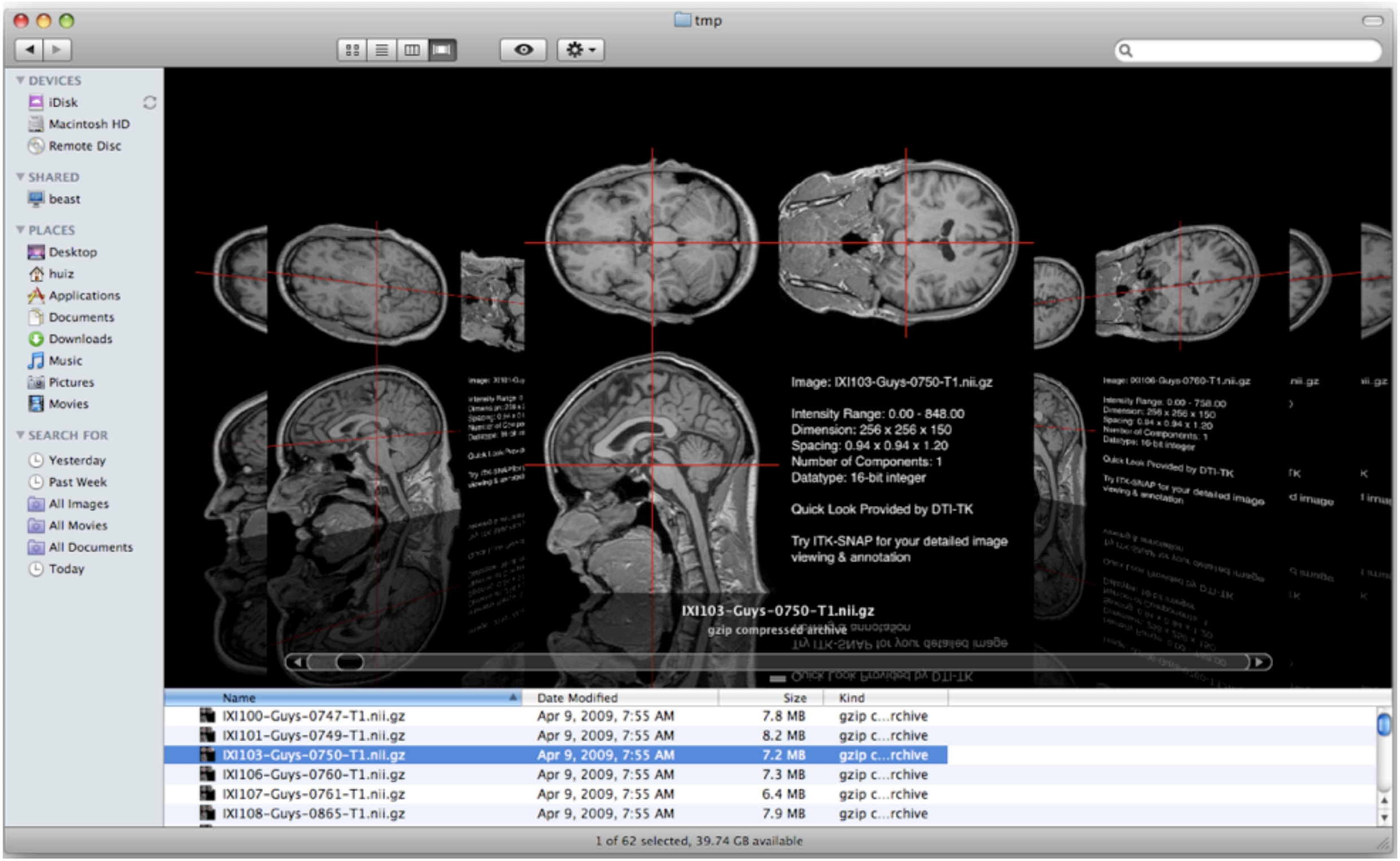
DTI-TK Quick Look Plugin: Cover Flow Mode



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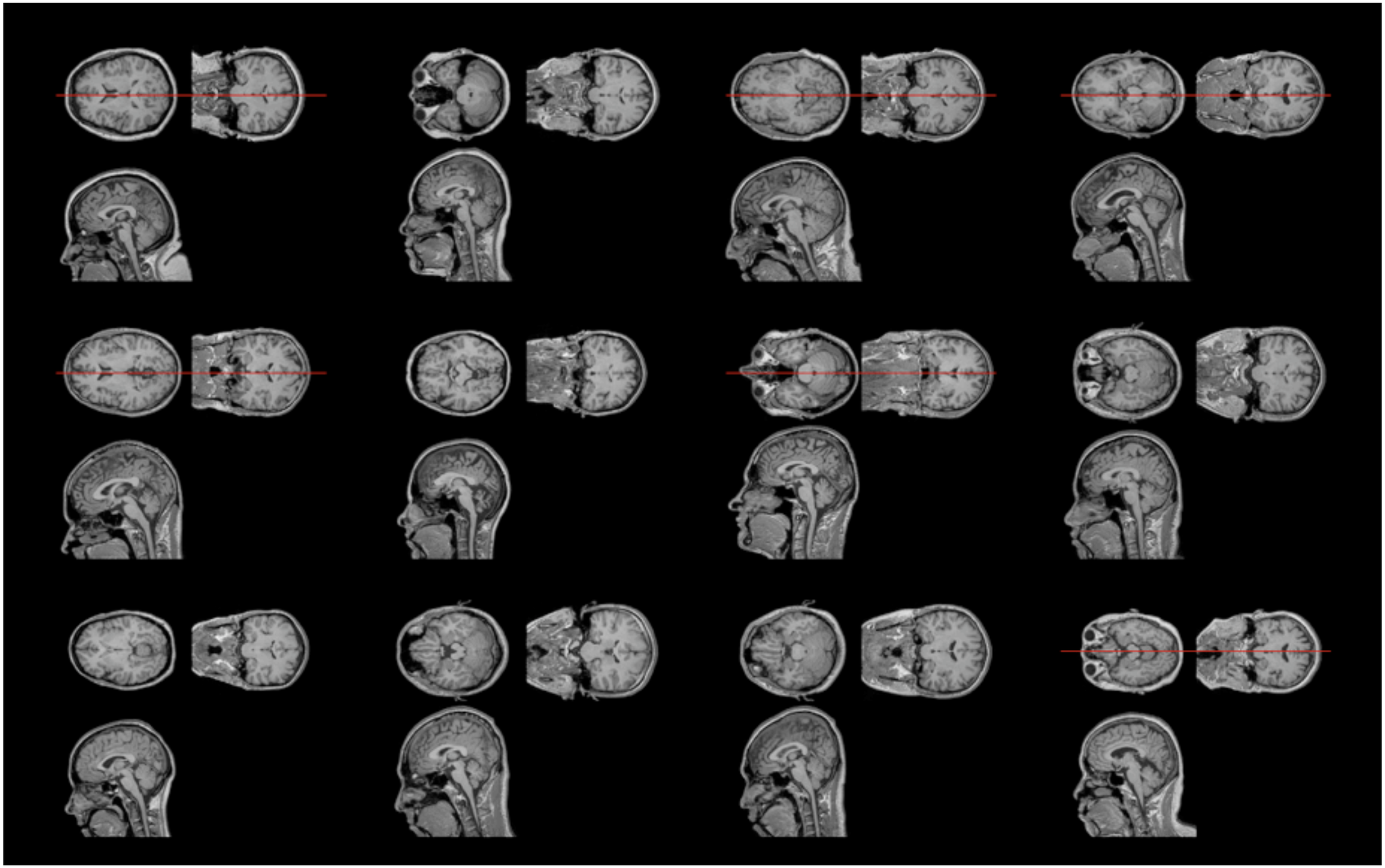
DTI-TK Quick Look Plugin: Multi-Volume Preview



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Data interoperability of diffusion tensor images

$$\mathbf{D} = \begin{pmatrix} D_{xx} & D_{yx} & D_{zx} \\ D_{yx} & D_{yy} & D_{zy} \\ D_{zx} & D_{zy} & D_{zz} \end{pmatrix}$$
$$= \lambda_1 \mathbf{e}_1 \mathbf{e}_1^{\mathsf{T}} + \lambda_2 \mathbf{e}_2 \mathbf{e}_2^{\mathsf{T}} + \lambda_3 \mathbf{e}_3 \mathbf{e}_3^{\mathsf{T}}$$

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Data interoperability of diffusion tensor images

$$\mathbf{D} = \begin{pmatrix} D_{xx} & D_{yx} & D_{zx} \\ D_{yx} & D_{yy} & D_{zy} \\ D_{zx} & D_{zy} & D_{zz} \end{pmatrix} \longleftarrow \text{matrix representation}$$

$$= \lambda_1 \mathbf{e}_1 \mathbf{e}_1^{\mathsf{T}} + \lambda_2 \mathbf{e}_2 \mathbf{e}_2^{\mathsf{T}} + \lambda_3 \mathbf{e}_3 \mathbf{e}_3^{\mathsf{T}}$$

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matrix representation

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eigensystem representation

DTI-TK

$$(D_{xx}, D_{yx}, D_{yy}, D_{zx}, D_{zy}, D_{zz})$$

lower triangular

This is the NIfTI Tensor standard

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Data interoperability of diffusion tensor images

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DTI-TK

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lower triangular

This is the NIfTI Tensor standard

Camino

$D_{xx}, D_{yy}, D_{zz}, D_{yx}, D_{zx}, D_{zy}$

individual NIfTI scalar files

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Data interoperability of diffusion tensor images

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Camino

$D_{xx}, D_{yy}, D_{zz}, D_{yx}, D_{zx}, D_{zy}$

individual NIfTI scalar files

FSL

$\lambda_1, \lambda_2, \lambda_3, \mathbf{e}_1, \mathbf{e}_2, \mathbf{e}_3$

individual NIfTI scalar or vector files

or

$(D_{xx}, D_{yx}, D_{zx}, D_{yy}, D_{zy}, D_{zz})$

upper triangular

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Data interoperability of diffusion tensor images

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This is the NIfTI Tensor standard

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individual NIfTI scalar files

FSL

$\lambda_1, \lambda_2, \lambda_3, \mathbf{e}_1, \mathbf{e}_2, \mathbf{e}_3$

individual NIfTI scalar or vector files

or

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upper triangular

DTIStudio

$D_{xx}, D_{yy}, D_{zz}, D_{yx}, D_{zx}, D_{zy}$

individual Analyze files for export

$\mathrm{FA}, \mathbf{e}_1$

individual raw binary files for import

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Data interoperability tools in DTI-TK

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Data interoperability tools in DTI-TK

- Interoperability to Camino, FSL, and DTIStudio

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Data interoperability tools in DTI-TK

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- Benefits

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    - Access to new capability of DTI-TK, such as the **tract-specific analysis**.

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  - Improve the quality of DTI analysis within the neuroimaging community
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    - New techniques can be more easily compared to existing tools

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A preview of ITK-SNAP 2.0

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Overview of ITK-SNAP

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- ITK-SNAP is a software application used to **segment structures in 3D medical images**. It provides **semi-automatic segmentation** using active contour methods, as well as **manual delineation** and **image navigation**.

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  - Full NIfTI support - enabling synchronized image navigation across multiple ITK-SNAP sessions even when images have oblique orientation

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  - User experience enhancement, including redesigned user interface, native file chooser, and automatic check for update

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ITK-SNAP 2.0 Preview Demo

For download, visit http://www.itksnap.org

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- ITK-SNAP
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Thank you for your attention.