



NA-MIC

National Alliance for Medical Image Computing

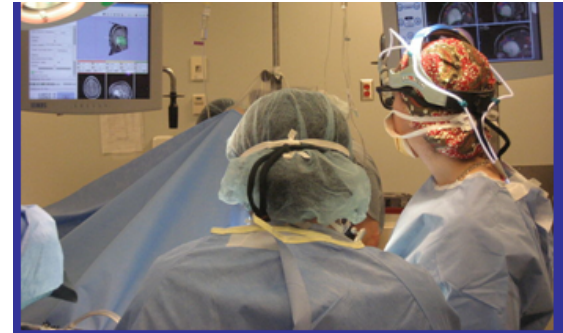
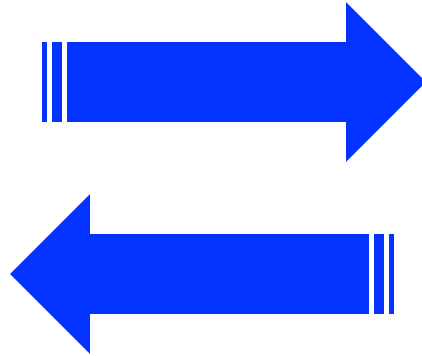
<http://na-mic.org>

Training & DTI Validation

**Sonia Pujol, PhD
NA-MIC Training Core P.I.**



Training Core Mission



→ **Teaching effort** to accelerate the transfer of NA-MIC technology to the community

→ **Technology sharing effort** to enable interoperability between open-source software

→ **Validation effort** to investigate the comparative performances of algorithms



2012 NA-MIC Training Workshops

17 workshops at national & international venues

1. SPIE Medical Imaging, San Diego, CA, February 2012
2. Iowa Training Workshop, Iowa City, Iowa. March 2012
3. ISBI 2012, Barcelona, Spain, April 2012
4. Slicer Workshop, Sydney Australia, April 2012
5. Slicer Master Class, Perth, Australia, May 2012
6. Slicer Master Classe, Darlinghurst, Australia, May 2012
7. Madrid-MIT Mvision, Madrid, Spain. May 2012
8. CARS 2012, Pisa, Italy. June 2012
9. AAPM 2012 meeting, Charlotte, NC. July 2012
10. BU Slicer Training Session, Boston, MA. August 2012
11. Slicer invited lecture, Mexico City, Mexico. September 2012.
12. HST.583 neuroimage analysis lab, September 2012.
13. MICCAI 2012 DTI Challenge, Nice, France. October 2012
14. Cranio-Maxillo Facial workshop, Cleveland. November. 2011
15. RSNA 2012, Chicago, IL. December 2012
16. HST.583 Diffusion Tensor Imaging Lab, December 2012
17. PNL Training workshop, Boston, MA. December 2012

In 2012, 704 clinical researchers and scientists participated in NA-MIC Workshops



Multi-disciplinary teaching

- Radiotherapy: AAPM 2012
- Radiology: RSNA 2012
- Neuroscience: SPIE 2012
- Cephalometry: CMF Cleveland 2012
- Image-Guided therapy: CARS 2012



NA-MIC workshops reach diverse audiences

Medical students

Software
developers

Computer
scientists

Residents



3DSlicer

Radiologists

Biomedical
engineers

Medical Physicists

Neurosurgeons



NA-MIC Workshops

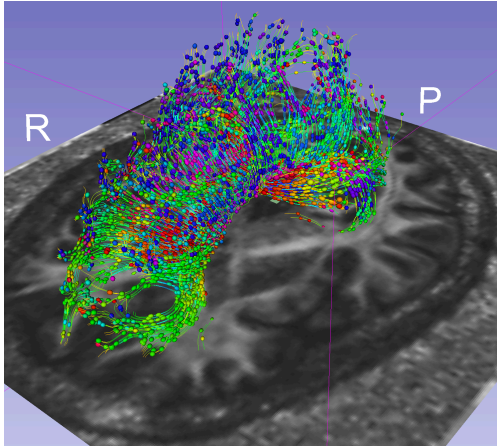


Hands-on workshops tailored for clinicians, clinical researchers, and scientists at national events, invited seminars, and international conferences

NA-MIC Training Workshops: National Venues



Psychiatry Neuroimaging Lab, Boston



Psychiatry
Neuroimaging
Laboratory

Home About the PNL People Research Publications Support


Psychiatry Neuroimaging Laboratory
Department of Psychiatry, Brigham and Women's Hospital
Harvard Medical School

Dr. Martha Shenton, Director

Dr. Marek Kubicki, Associate Director Dr. Sylvain Bouix, Associate Director

Contact: Joanna Daniluk
Tel: 617 525-6105
Fax: 617 525-6150
Email: daniluk@bwh.harvard.edu

Psychiatry Neuroimaging Laboratory
1249 Boylston St.
Boston, MA 02215
Directions to the Lab

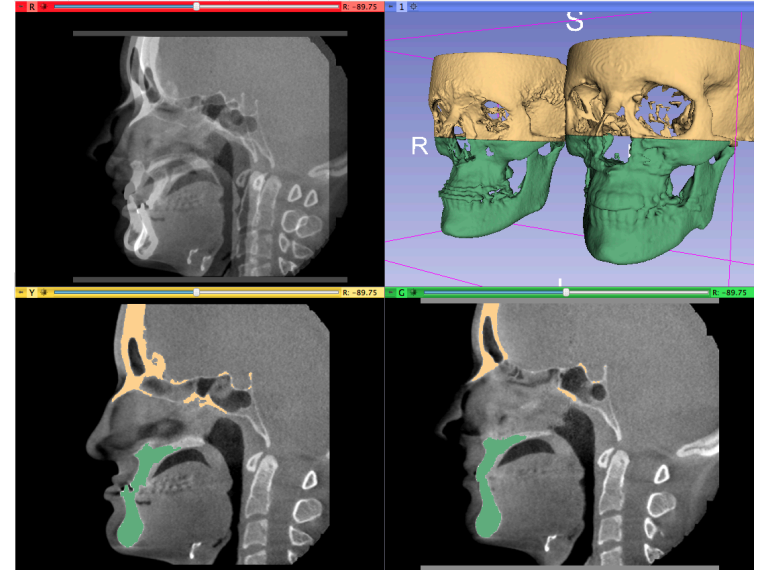


- Theme: An introduction to DTI analysis in Slicer4
- Local Organizer: Zora Kikinis, Ph.D.
- Workshop Faculty: Sonia Pujol, BWH
- 20 participants



Cranio-Maxillo Facial Workshop, Cleveland

- Theme: Open-source 3D image analysis in dentistry
- Workshop Faculty
Beatriz Paniagua, UNC
Tung Nguyen, UNC
Lucia Cevidanes, U.Michigan
- 11 participants
- Dental dataset





University of Iowa, Iowa City



Agenda

Time	Tuesday, March 20, 2012
9:00-9:10 AM	3D Slicer, a Platform for Medical Image Computing (Ron Kikinis)
9:10-9:55 AM	Data Loading and 3D Visualization (Sonia Pujol)
9:55-10:45 AM	DTI Tutorial: From DWI Images to tracts (Sonia Pujol)
10:45-11:00 AM	Coffee Break
11:00-12:15 PM	Neurosurgical Workflow (Sonia Pujol)
12:15-1:30 PM	Lunch
1:30-3:00 PM	XNAT, Registration (Hans Johnson)
3:00-3:30 PM	Coffee Break
3:30-5:00 PM	BWH QIN project: Quantitative MRI of prostate cancer as a biomarker and guide for treatment: Presentation and Slicer demo (Andrey Fedorov)
Time	Wednesday, March 21, 2012
09:00-10:30 AM	Programming in Slicer4 (Sonia Pujol) (Andrey Fedorov, Demian Wassermann)
10:30-10:45 AM	
10:30 AM-11:30 AM	SimpleITK w
11:30-12:00 PM	Concluding
1:00-5:00 PM	DWI Discussion (Demian Wassermann) (By Invitation or

Two-day Slicer4 user and developer training workshop

- Local organizer:

Hans Johnson, Univ. of Iowa

David Welch, Univ. of Iowa

- Workshop Faculty:

Sonia Pujol, BWH

Ron Kikinis, BWH

Demian Wasserman, BWH

Andriy Fedorov, BWH

- Audience: 36 scientists and clinical researchers



HST.583 Course, Boston

- Harvard-MIT Health Science and Technology

The screenshot shows the MIT OpenCourseWare website for the course HST.583 Functional Magnetic Resonance Imaging: Data Acquisition and Analysis. The page includes a navigation menu with options like Home, Courses, Donate, About OCW, Help, and Contact Us. A search bar is present in the top right. The main content area displays the course title and a list of course features: Course Home, Syllabus, Readings, Lecture Notes, Labs, Assignments, and Exams. Below the course title, there are brain scan images and bar charts comparing Sham Acupuncture and Verum Acupuncture groups. The page also lists the level as Graduate and the instructor as Dr. Randy Gollub (Course Director). A citation for a study by Kong et al. (2009) is provided at the bottom.

MIT OPEN COURSEWARE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Home Courses Donate About OCW Help Contact Us Enter search keyword

Home > Courses > Health Sciences and Technology > Functional Magnetic Resonance Imaging: Data Acquisition and Analysis

HST.583 Functional Magnetic Resonance Imaging: Data Acquisition and Analysis

Level: Graduate

Instructors: Dr. Randy Gollub (Course Director)

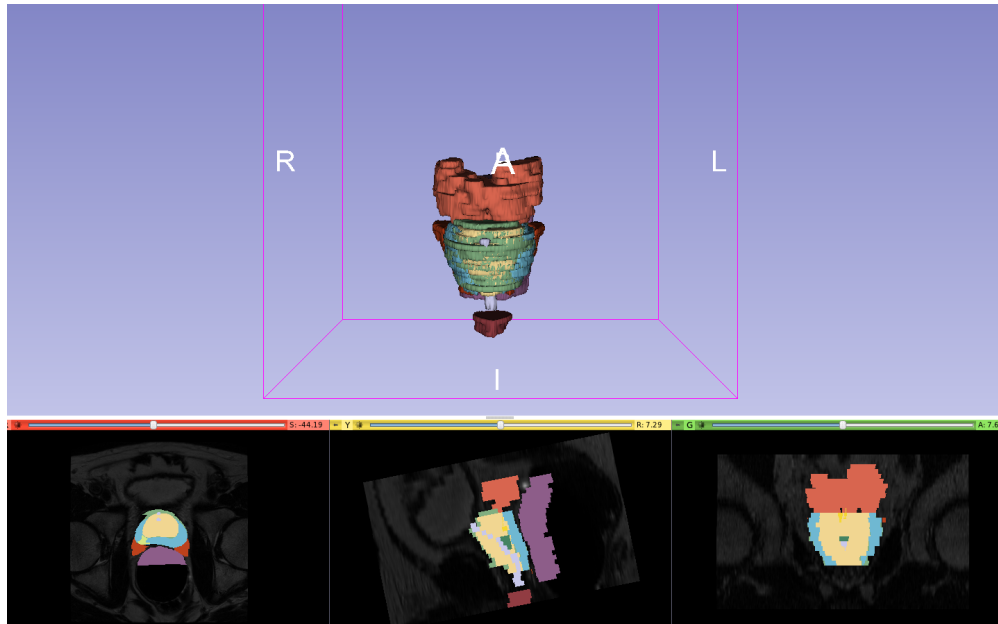
Course Features
Course Description
Technical Requirements

Study conducted by some HST.583 students to assess the brain basis of pain structure and expectancy-evoked placebo treatments. (Source: Kong, J., T. J. Kaptchuk, G. Polich, I. Kirsch, M. Vangel, C. Zyloney, B. Rosen, and R. Gollub. "Expectancy and treatment interactions: A dissociation between acupuncture analgesia and expectancy evoked placebo analgesia." *NeuroImage* 45, no. 3 (15 April 2009): 940-949. doi:10.1016/j.neuroimage.2008.12.025. Courtesy of Elsevier, Inc., <http://www.sciencedirect.com>. Used with permission.)

- Diffusion Tensor Imaging Analysis Lab
- Life Cycle of Medical Imaging Data Lab (S.Pujol)



Boston University, Boston



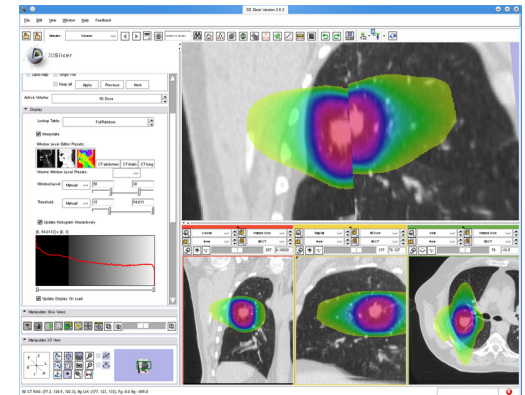
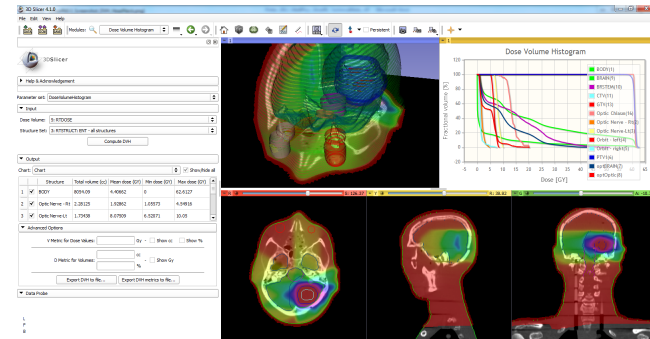
- Basics of data loading and 3D visualization of prostate models in Slicer4
- Introduction to label map, MRML file, and Slicer scene
- Tutorial organizer: Carl Jaffe, BU
- Tutorial faculty: Sonia Pujol, BWH
- Audience: BU Radiology residents

NA-MIC Training Workshops: International Conferences



AAPM 2012, Charlotte, NC

- Theme: 3DSlicer for radiation therapy research
- Gregory Sharp, Nadya Shusharina, James Shackelford,, MGH
- 25 participants





SPIE 2012, San Diego

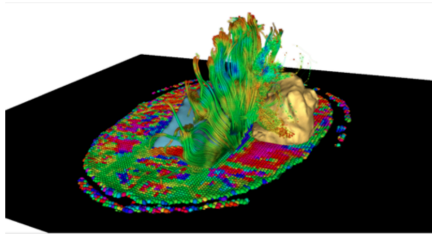


[Contents \[show\]](#)

Exploring Brain Connectivity in-vivo: from Theory to Practice - A hands-on analysis workshop on Diffusion MRI by the National Alliance for Medical Image Computing (NA-MIC)

Course Description:

The development of Diffusion Tensor Magnetic Resonance Imaging (DT-MRI) has opened up the possibility of studying the complex organization of the brain's white matter in-vivo. By measuring the diffusion of water molecules in tissues, the technique gives insights into the structure and orientation of major white matter pathways, and DT-MRI findings have the potential to play a critical role in the extraction of meaningful information for diagnosis, prognosis and following of treatment response. The course will guide participants through the fundamental aspects of DT-MRI data analysis, as well as the challenges of transferring cutting-edge DT-MRI techniques to clinical routine. The format will include a series of hands-on sessions with the participants running DT-MRI analysis on their own laptops, to provide a practical experience of extracting useful clinical information from Diffusion MR images. The hands-on sessions will use DT-MRI tools from the NA-MIC toolkit, which include the 3DSlicer software, an open-source platform for medical image processing and 3D visualization used in biomedical and clinical research. Participants will be guided through an integrated workflow for exploring the brain white matter in a series of datasets that will be provided as part of the course. This event is part of the on-going effort of the NIH-funded National Alliance for Medical Image Computing (NA-MIC) to transfer the latest advances in biomedical image analysis to the scientific and clinical community.



http://www.na-mic.org/Wiki/index.php/SPIE_2012_DTI_Workshop

SPIE 2012 Course: “Exploring Brain Connectivity in vivo: from Theory to Practice”

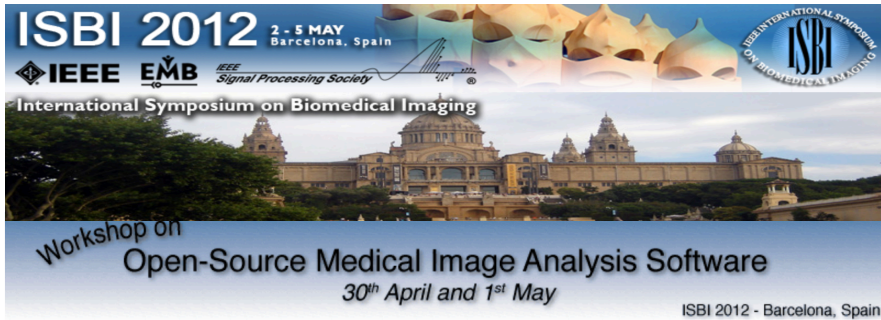
- Guido Gerig, Utah
- Martin Styner, UNC
- Sonia Pujol, BWH

Full pipeline on the fundamentals of DTI

Lectures & hands-on sessions on acquisition, analysis and interpretation of DT-MRI data



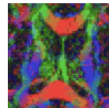
ISBI 2012, Barcelona



- Two-day ISBI 2012 workshop on Open-source medical image analysis software
- Invited lecture on 3D Slicer
- Interoperability of 3D Slicer with open-source packages
- Workshop organizers: Wiro Niessen, Erasmus NC, Marc Modat, UCL

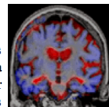
Home
Important Dates
Invited Speakers
Program
Call for Papers
S/W links

Eurobioimaging and ISBI present: Workshop on Open Source Medical Image Analysis software



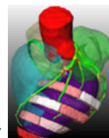
Organizers: [Wiro Niessen](#) (Erasmus MC) and [Marc Modat](#) (UCL)

EuroBioImaging is aimed at providing a research infrastructure for biomedical imaging research. One of the goals of the ESFRI (European Strategy Forum on Research Infrastructures) project EuroBioImaging is to provide easy access to advanced, validated, quantitative image processing and analysis methods. Currently, a wide range of medical image analysis applications and platforms are available. These are targeted at different user groups, varying from software developers to end-users. This workshop aims to bring together both developers and users of medical image analysis software to discuss the state-of-the-art and future development of medical image analysis software. Topics of the workshop include:



- open source software / platforms
- inter-operability between software / platforms
- evaluation, validation & challenges
- open access databases
- workflows in image processing workflows
- open source licenses

The program will feature a series of invited talks by software developers and researchers who have significantly contributed to the field. It will also include contributed talks that will be selected on the basis of an abstract. In addition to the presentations, there will be special slots for demos as well as some round table discussions for drafting a road map for future resource development in the context of Eurobioimaging.





CARS 2012, Pisa



CARS 2012

Computer Assisted Radiology and Surgery
26th International Congress and Exhibition



Faculty

Sonia Pujol, Ph.D., Harvard University, Boston, USA
Gabor Fichtinger, Ph.D., Queen's University, Kingston, Canada
Nobuhiko Hata, Ph.D., Harvard University, Boston, USA
Junichi Tokuda, Ph.D., Harvard University, Boston, USA

Hands-on Workshop on Image-guided therapy



Saturday June 30, 2012
9:00 am – 4:30 pm
Palazzo dei Congressi, Pisa, Italy

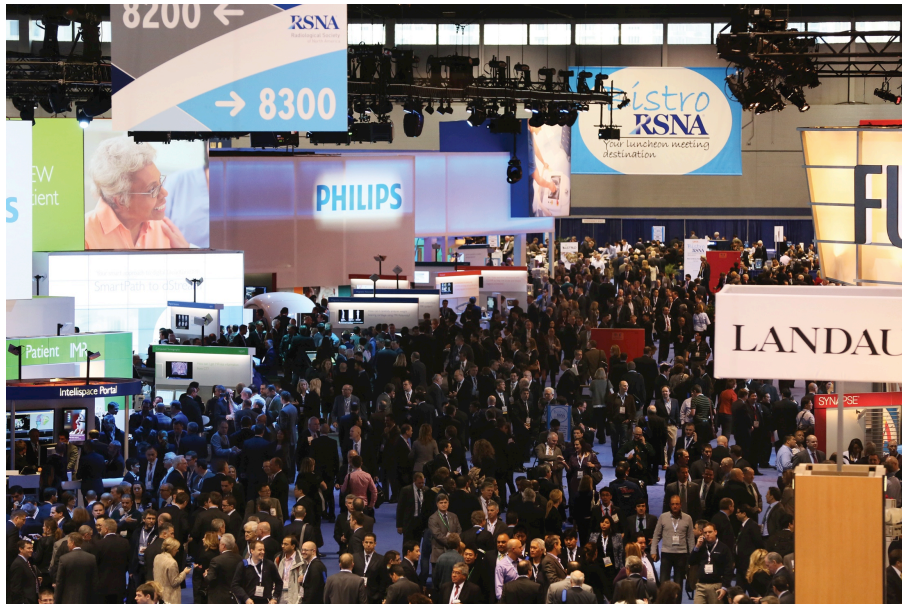
A joint event of the National Alliance for Medical Image Computing (NA-MIC),
the Neuroimage Analysis Center (NAC),
and the National Center for Image-Guided Therapy (NCIGT)
funded through the National Institutes of Health.

http://www.na-mic.org/Wiki/index.php/CARS_2012

contact: spujol@bwh.harvard.edu



RSNA 2012



- RSNA 2012: 75,000 participants
- NA-MIC 1-week long series of events
 - Refresher courses: 3 hours hands-on courses (>100 attendees)
 - Quantitative Imaging Reading Room: 54 hours demos





One-week long series of events at RSNA

Sunday, November 25	Monday, November 26	Tuesday, November 27	Wednesday, November 28	Thursday, November 29	Friday, November 30
<p>8:00am-11:00am. 3D Slicer Exhibit 🔗, Quantitative Imaging Reading Room, Lakeside Learning Center, Hall E, LL-QRR3007</p>	<p>8:00am-11:00am. 3D Slicer Exhibit 🔗, Quantitative Imaging Reading Room, Lakeside Learning Center, Hall E</p>	<p>8:00am-11:00am. 3D Slicer Exhibit 🔗, Quantitative Imaging Reading Room, Lakeside Learning Center, Hall E</p>	<p>8:00am-12:15pm. 3D Slicer Exhibit 🔗 Quantitative Imaging Reading Room, Lakeside Learning Center, Hall E</p>	<p>8:00am-12:15pm. 3D Slicer Exhibit 🔗, Quantitative Imaging Reading Room, Lakeside Learning Center, Hall E</p>	
<p>-</p>	<p>-</p>	<p>-</p>	<p>-</p>	<p>-</p>	
<p>11:00am-12:30pm. RSNA Refresher Course: "Quantitative Medical Imaging for Clinical Research and Practice" Katarzyna Macura, Sonia Pujol, Ron Kikinis 🔗. Room S401CD</p>	<p>12:15pm-1:15pm. Meet-The-Experts Session 🔗, Quantitative Imaging Reading Room, Lakeside Learning Center, Hall E</p>	<p>12:30pm-2:00pm. RSNA Refresher Course: "3D Visualization of DICOM images for Radiology Applications" Sonia Pujol, Kitt Shaffer, Ron Kikinis 🔗. Room S401CD</p>	<p>12:15pm-1:15pm. Meet-The-Experts Session 🔗, Quantitative Imaging Reading Room, Lakeside Learning Center, Hall E</p>	<p>12:15pm-1:15pm. Meet-The-Experts Session 🔗, Quantitative Imaging Reading Room, Lakeside Learning Center, Hall E</p>	<p>8:00am-12:45pm. 3D Slicer Exhibit 🔗, Quantitative Imaging Reading Room, Lakeside Learning Center, Hall E</p>
<p>-</p>	<p>-</p>	<p>-</p>	<p>-</p>	<p>-</p>	
<p>12:30pm-6:00 pm. 3D Slicer Exhibit 🔗 Quantitative Imaging, Lakeside Learning Center, Hall E</p>	<p>1:15pm-6:00 pm. 3D Slicer Exhibit 🔗, Quantitative Imaging, Lakeside Learning Center, Hall E</p>	<p>12:30pm-6:00 pm. 3D Slicer Exhibit 🔗, Quantitative Imaging, Lakeside Learning Center, Hall E</p>	<p>1:15pm-6:00 pm. 3D Slicer Exhibit 🔗, Lakeside Learning Center, Hall E</p>	<p>1:15pm-6:00pm. 3D Slicer Exhibit 🔗, Quantitative Imaging Reading Room, Lakeside Learning Center, Hall E</p>	
<p>-</p>	<p>-</p>	<p>-</p>	<p>-</p>	<p>-</p>	

Thanks to Slicer developer team



RSNA 3D Visualization Course

3D interactive visualization of liver & lung segments

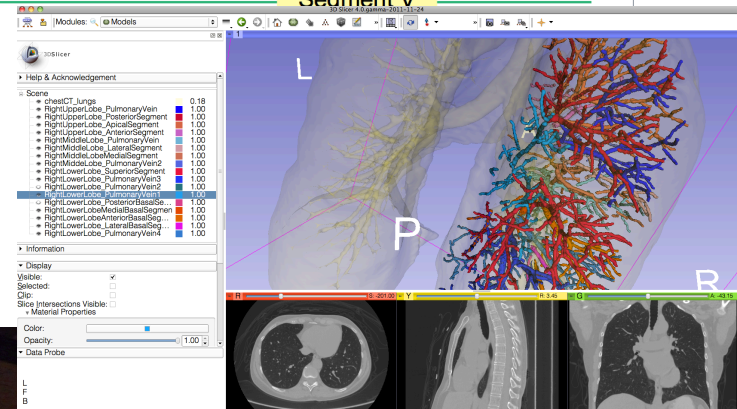
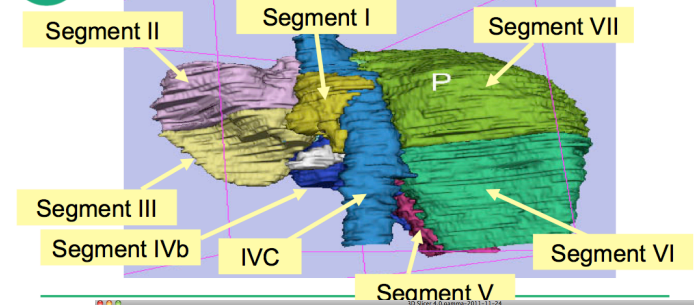
5th edition (RSNA 2008, 2009, 2010, 2011, 2012)

Course Instructors:

- Kitt Shaffer, MD, PhD,
Vice Chairman for Radiology
Research, BU Medical Center
- Sonia Pujol, Ph.D., BWH
- 105 international attendees

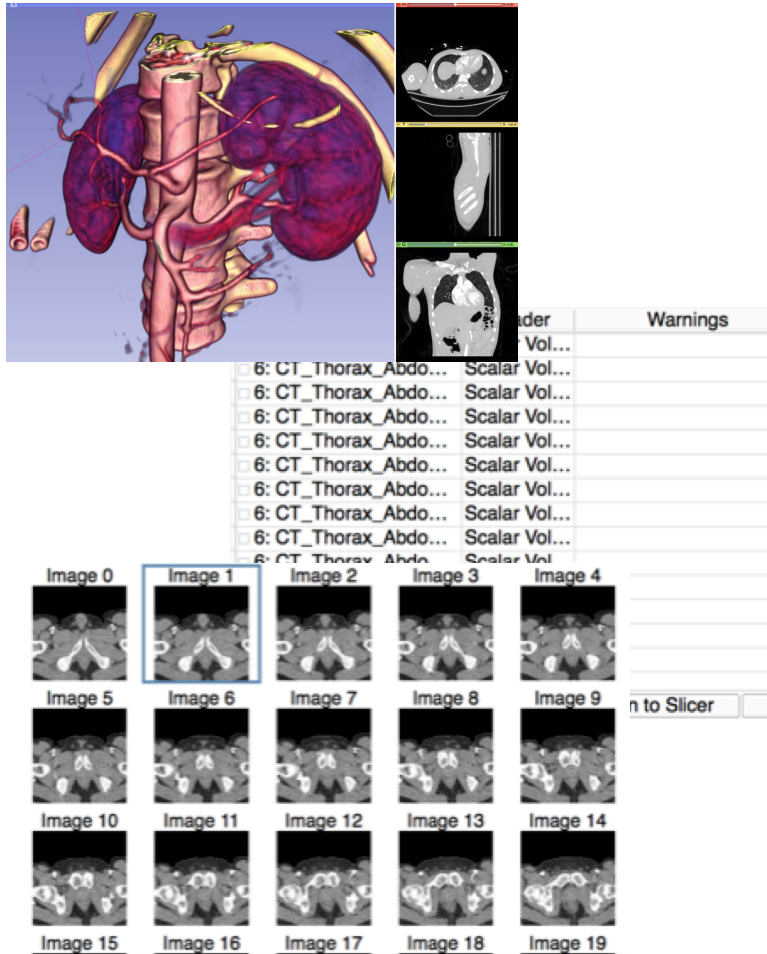
<http://na-mic.org>

SPL 3D models of the liver





3D Visualization course: New Additions



- DICOM data loading in Slicer 4
- GPU-based Volume rendering



RSNA Quantitative Imaging Course

Measurements of small volumetric changes in slow growing tumors, and quantitative imaging analysis of FDG-PET/CT data

4th edition (RSNA 2009, 2010, 2011, 2012)

Course Instructors:

- Katarzyna Macura, MD, PhD, JHU
- Sonia Pujol, Ph.D., BWH

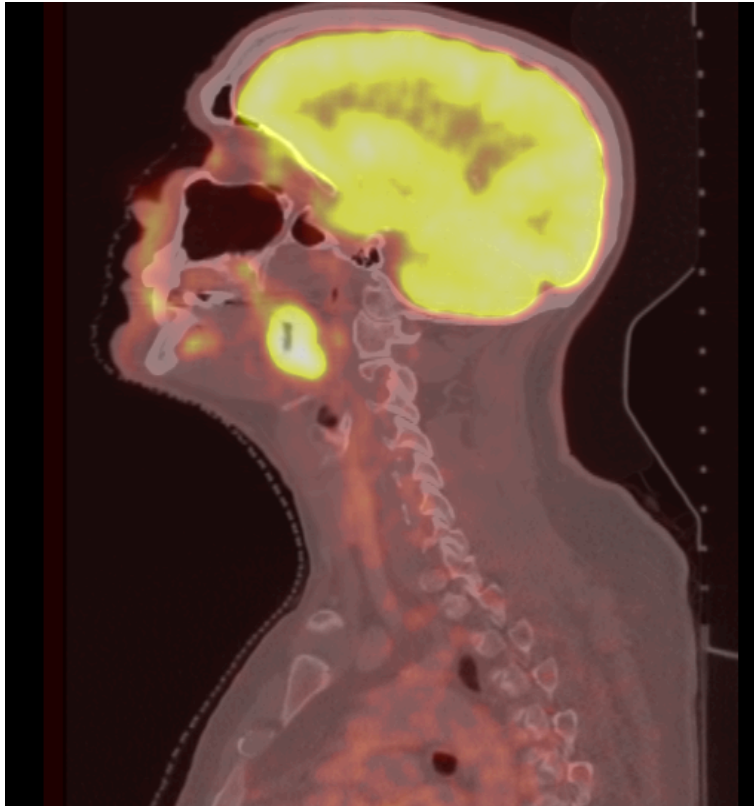
- 105 international attendees





Quantitative Image Analysis

Course: New Addition



New Clinical case:

→ Measurement Metabolic Activity in squamous cell carcinoma using the FDG-PET/CT Standard Uptake Value Computation module in Slicer4



Quantitative Imaging Reading Room Exhibit

RSNA 2012 Quantitative Imaging Reading Room



3D Slicer: An Open Source Platform for Segmentation, Registration, Quantitative Imaging, and 3D Visualization of Multi-Modal Image Data

Sonia Pujol, Ph.D., Steve Pieper, Ph.D., Andriy Fedorov, Ph.D., Ron Kikinis, M.D.
Surgical Planning Laboratory, Brigham and Women's Hospital, Harvard Medical School, Boston MA

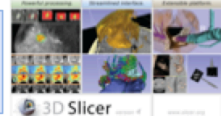


About 3D Slicer

3D Slicer is a multi-platform, free and open source software package for visualization and medical image computing.

The software platform is community created for the purpose of subject specific medical image analysis and visualization. Slicer includes support for:

- Multi-modality imaging including, MRI, CT, US, nuclear medicine, and microscopy
- Multi organ from head to toe
- Bidirectional interface for devices
- Expandable and interfaced to multiple toolkits



Slicer was initiated as a masters thesis project between the Surgical Planning Laboratory at the Brigham and Women's Hospital and the MIT Artificial Intelligence Laboratory in 1998. Over the last decade, Slicer has been supported by an active community of academic and research partners, enabled by the funding from the National Institutes of Health. The software was downloaded over 43,000 times in 2012 alone, and has been referenced in hundreds of academic publications. The latest version of the software - 3D Slicer 4.2 - has been released in November 2012.

License: Slicer binaries and source code are available under a BSD-style, free open source licensing agreement under which there are no reciprocity requirements, no restrictions on use, and no guarantees of performance. Slicer leverages a variety of toolkits and software methodologies that have been licensed the NA-MIC kit. Please see http://wiki.na-mic.org/Wiki/index.php/NA-MIC_Kit for more information.

Segmentation & Registration

Segmentation is required for defining features of interest in imaging data for quantification and analysis.

3D Slicer has a variety of interactive and automated segmentation methods:

- support for manual contouring and editing
- region growing and label sets
- graph cuts with gesture support
- local entropy and hierarchical brain segmentation for morphological studies

The desktop application provides interactive visualization of the results and an intuitive GUI.

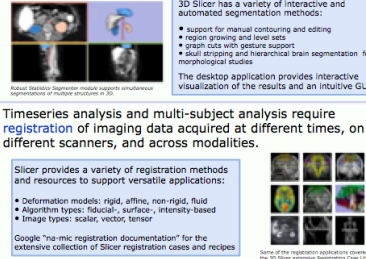
Robust Statistics Segmentation module supports simultaneous segmentation of multiple structures in 3D.

Timeseries analysis and multi-subject analysis require registration of imaging data acquired at different times, on different scanners, and across modalities.

Slicer provides a variety of registration methods and resources to support versatile applications:

- Deformation models: rigid, affine, non-rigid, fluid
- Algorithm types: fiducial-, surface-, intensity-based
- Image types: scalar, vector, tensor

Google "na-mic registration documentation" for the extensive collection of Slicer registration cases and recipes



Multi-modality Visualization

A combined visualization of multiple imaging modalities and derived data can provide clinician scientists with an integrated understanding of anatomy and pathology.

Support of 2-, 3- and 4-D image data visualization (reformats, volume rendering)

- modality-independent (MR, CT, PET, US and more)
- DICOM data exchange interoperability
- parameter maps and VOIs
- surface models & glyphs
- measurement tools & annotations
- charts

Support of 2-, 3- and 4-D image data visualization (reformats, volume rendering)

Visualization of 3D reconstructed cerebral vasculature of the prostate. Reconstructed vasculature from T1w, T2w, T2* (functional imaging) (T1w) (T2w) (T2* (T2w))

Visualization of 3D reconstructed cerebral vasculature of the prostate. Reconstructed vasculature from T1w, T2w, T2* (functional imaging) (T1w) (T2w) (T2* (T2w))

Visualization of 3D reconstructed cerebral vasculature of the prostate. Reconstructed vasculature from T1w, T2w, T2* (functional imaging) (T1w) (T2w) (T2* (T2w))

Visualization of 3D reconstructed cerebral vasculature of the prostate. Reconstructed vasculature from T1w, T2w, T2* (functional imaging) (T1w) (T2w) (T2* (T2w))

Quantitative Analysis

A free and open source platform can improve access to standard methods of image quantification and facilitate development and validation of new imaging biomarkers.

3D Slicer includes tools to quantify:

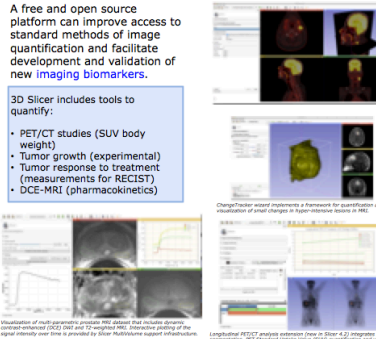
- PET/CT studies (SUV body weight)
- Tumor growth (experimental)
- Tumor response to treatment (measurements for RECIST)
- DCE-MRI (pharmacokinetics)

ChangeDetector widget implements a framework for quantification and visualization of serial images in hyper-resolution volumes in MRI.

3D Slicer has been used extensively for brain tumor volume quantification and visualization of the brain.

Registration of 3D Slicer with the medical image (PET/CT) data, the brain tumor volume, and the brain tumor volume. The brain tumor volume is the brain tumor volume. The brain tumor volume is the brain tumor volume.

Longitudinal PET/CT analysis pipeline (Free in Slicer 4.2) integrates DICOM registration, PET standardization (SUV), quantification and analysis, visualization of multiple structures into a single processing workflow.



Clinical Research Applications

3D Slicer has been used in clinical research, with IRB clinical protocols appropriately created and managed. In image-guided therapy (IGT) research, Slicer is frequently used to construct and visualize collections of MRI data that are available pre- and intra-operatively, and to display the tracked spatial position of surgical instruments.

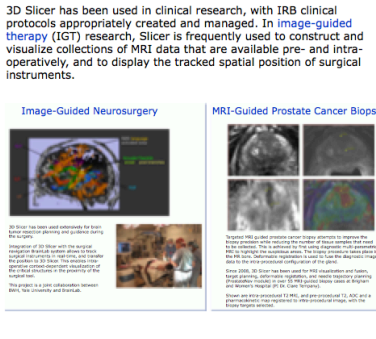
Image-Guided Neurosurgery

MRI-Guided Prostate Cancer Biopsy

3D Slicer has been used extensively for brain tumor volume quantification and visualization of the brain.

Registration of 3D Slicer with the medical image (PET/CT) data, the brain tumor volume, and the brain tumor volume. The brain tumor volume is the brain tumor volume.

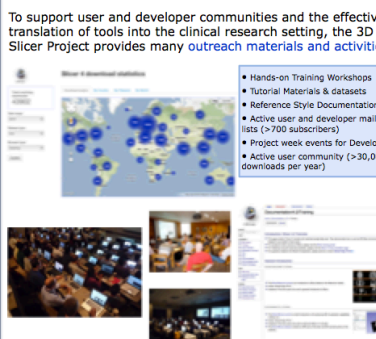
Longitudinal PET/CT analysis pipeline (Free in Slicer 4.2) integrates DICOM registration, PET standardization (SUV), quantification and analysis, visualization of multiple structures into a single processing workflow.



Community, Learning & Support

To support user and developer communities and the effective translation of tools into the clinical research setting, the 3D Slicer Project provides many outreach materials and activities.

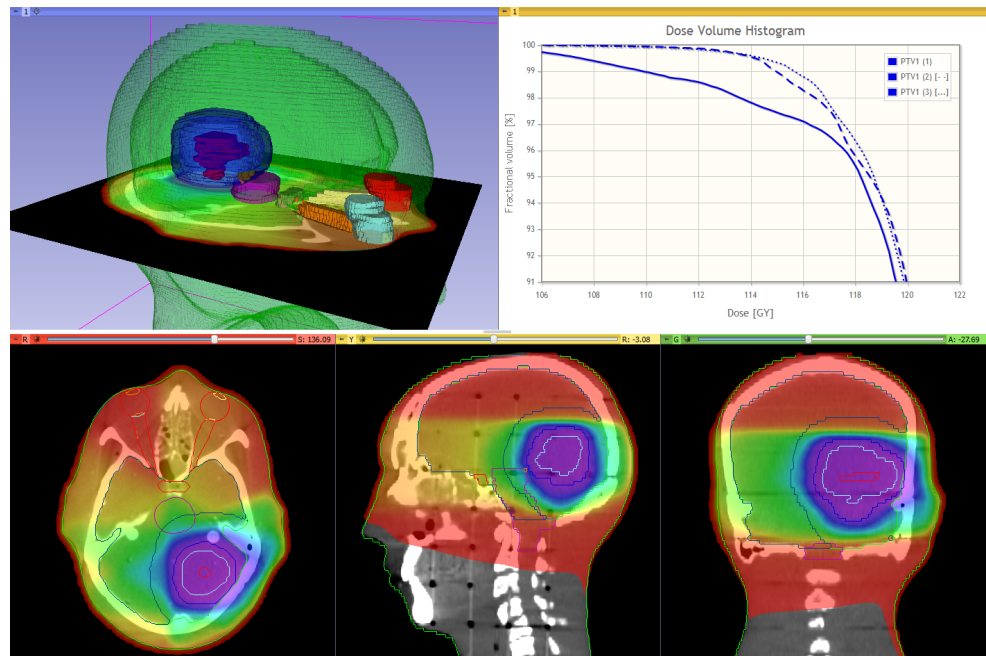
- Hands-on Training Workshops
- Tutorial Materials & datasets
- Reference Style Documentation
- Active user and developer mailing lists (>700 subscribers)
- Project week events for Developers
- Active user community (>30,000 downloads per year)





QIRR New Addition: SlicerRT

- SlicerRT Extension
 - DICOM-RT import
 - RT-specific analysis:
 - Dose Accumulation
 - Dose Comparison (gamma)
 - Isodose contours / surfaces
 - Contour Comparison
 - Contour Morphology
 - Plastimatch
 - BSpline registration
 - Landwarp registration



- Csaba Pinter, Andras Lasso, An Wang, David Jaffray, and Gabor Fichtinger, “SlicerRT: Radiation therapy research toolkit for 3D Slicer”, Med. Phys. 39 (10), October 2012
- <https://www.assembla.com/spaces/slicerrt/>

NA-MIC International Outreach



NA-MIC Outreach: Australia

Creating Tools for Medical Image Computing

a presentation by

Dr Ron Kikinis, Director, Surgical Planning Laboratory, Brigham and Women's Hospital,
Harvard Medical School, Boston, USA

sponsored by



When: 2nd May 2012, 5:30 - 7:30 PM

Where: Conference Room 4, Ground Floor, Aikenhead Wing, St Vincent's Hospital, 41 Victoria Parade, Fitzroy, VIC 3065, [click here to download campus map](#).

Entry: HISA members are invited to attend free of charge. Non-members \$25.



Professor Kikinis investigates how to extract information and knowledge out of biomedical imaging data and use the knowledge to help diagnosis and treatment. Medicine is primarily an empiric field of science with relatively little theory. The engineering sciences, on the other hand, have a solid theoretical foundation, which allows easy hypothesis formation and extrapolation. This results in very different scientific cultures and how the scientific method is used in each field. Working as a translator between medical doctors, computer scientists and physicists is both a great privilege and an enormous challenge. Surprisingly few concepts are shared among these fields of science, which makes successful interdisciplinary work difficult to accomplish.

The fields of Radiology and Surgery are undergoing a quiet revolution, which started several decades ago. Capabilities of imaging devices have evolved in leaps and bounds, producing a larger quantity of more complex data. In order to take advantage of these novel capabilities in

diagnostics and treatment, it is necessary to research, develop and deploy new image processing capabilities and, for treatments, to link them to devices.

Successful research in this field requires interdisciplinary teams with effective communications and shared values. While prototypes are sufficient for algorithm research, translation into biomedical research requires the creation of tools that can be used by physicians. Industrial involvement in this process only occurs after the value of a new capability has been demonstrated in translational research.

For the last decade, Professor Kikinis has focused on creating a software platform to make it easier to translate engineering prototypes for image post-processing into diagnostics and surgical treatment.

In his talk, Professor Kikinis will discuss current state-of-the-art tools and recent progress from a personal perspective.

Open Source Image Processing Software for Translational Clinical Research.

Master Class and Public Lecture,
May 14-16, 2012, The University of Western Australia, Perth, AU

Creating Tools for Medical Image Computing.

May 2, 2012: St Vincent's Hospital, Melbourne

April 26, 2012: St Vincent's Hospital, Darlinghurst



NA-MIC Outreach: Spain



Invited 2-day event:

- DTI analysis
- Neurosurgical Planning
- Programming in Slicer

Workshops Faculty

- Pollina Golland, MIT
- Ron Kikinis, BWH
- Sonia Pujol, BWH

Madrid-MIT
m+visión
CONSORTIUM
Innovation, Leadership, Impact

 Universidad
Rey Juan Carlos



NA-MIC Outreach: Mexico



PRIMER SIMPOSIO EN BIOINGENIERIA MEDICA

El Primer Simposio en Bioingeniería Médica es un evento académico y de investigación orientado a los estudiantes y profesionales del área médica que utilizan la tecnología en sus actividades profesionales. Este año nos hemos dado a la tarea de reunir a especialistas expertos en diversas áreas relacionadas con la medicina para que nos compartan sus conocimientos, experiencias y perspectivas en cada una de sus áreas.

Consideramos que este evento es enriquecedor no solamente para la formación académica de nuestros estudiantes de la Licenciatura en Bioingeniería Médica, sino también, para todos los profesionales del área médica quienes sin duda encontrarán información valiosa para sus labores diarias.

"Esperamos contar con su valiosa y entusiasta participación."

Universidad Autónoma del Estado de México

"2013, 50 Aniversario Luctuoso del Poeta Heriberto Enriquez"

Invited Lecture:

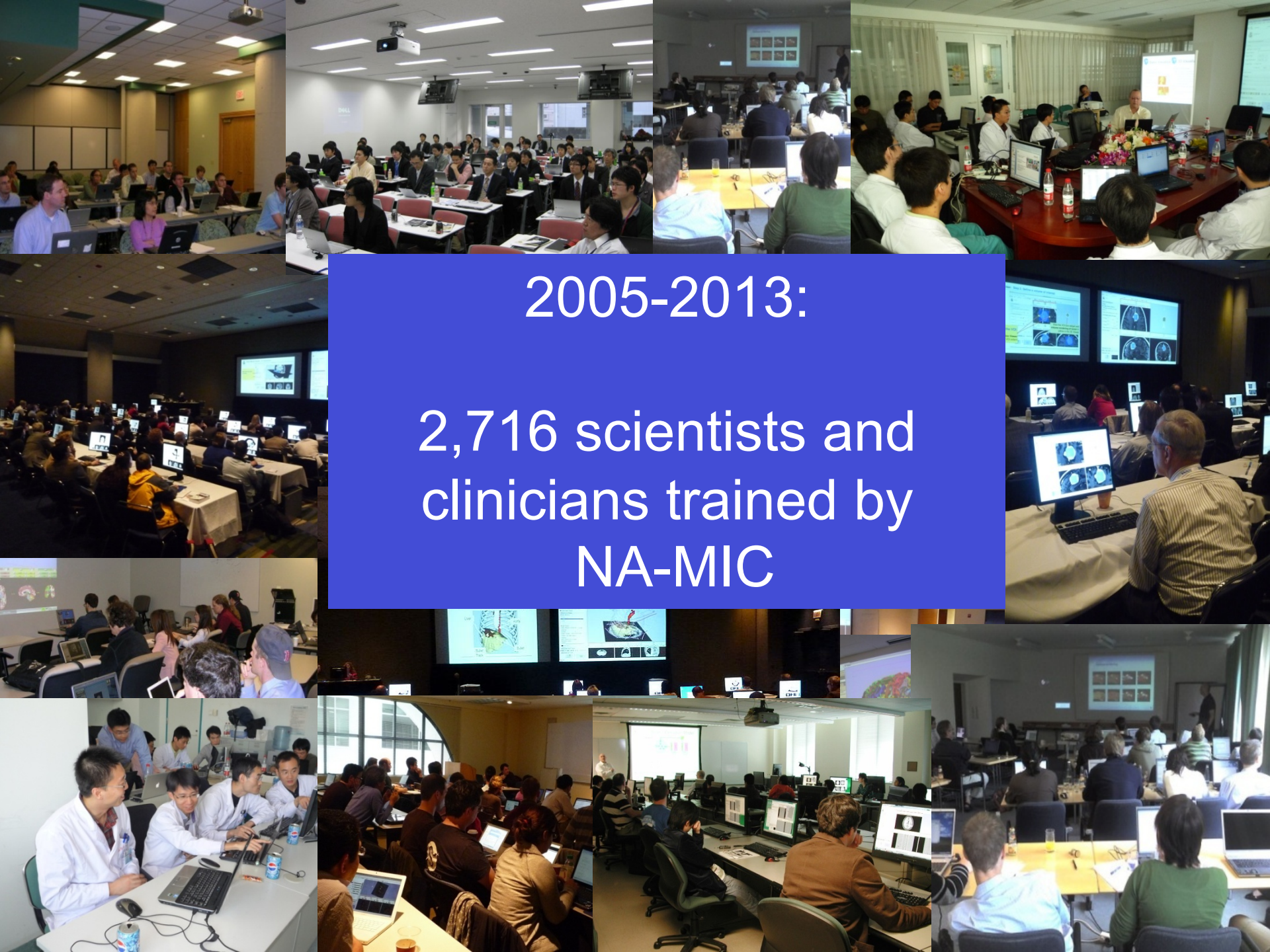
« The 3DSlicer open-source platform for medical image computing and image-guided therapy. »
Sonia Pujol, BWH

Audience: 200
biomedical engineering
students



2013 training events:
17 workshops
704 NA-MIC training workshop participants





2005-2013:

2,716 scientists and
clinicians trained by
NA-MIC



Dissemination Update

14th Project Week: Salt Lake City, Utah, January 2012

- 104 attendees: 19 academic institutions, 6 companies
- 57 Projects: Segmentation, Registration, IGT, Radiotherapy, Informatics, DTI, Engineering

15th Project Week: MIT, Summer June 2012

- 88 attendees: 20 academic institutions, 8 companies
- 62 Projects: TBI, Radiation Therapy, Huntington's Disease, Atrial Fibrillation, IGT, Segmentation, Registration, Tractography, Vessels, Engineering



NA-MIC standard methodology for technology sharing

Sonia Pujol, Ph.D. – Steve Pieper, Ph.D.



Slicer Execution Model

NA-MIC AHM
2006

Slicer3:Execution Model

[Home](#) < Slicer3:Execution Model

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- [1 Abstract](#)
- [2 Status](#)
- [3 Documentation](#)
- [4 Background](#)

Abstract

The purpose of the Slicer3 Execution Model is to facilitate a "run-everywhere" philosophy for algorithm writers. NAMIC has adopted a standard for algorithm "self-description" that is followed when command line executables are written. Slicer, the grid, clusters, etc... will be able to use the executables directly in their environment.

Status

The Slicer3 execution model contains three components:

1. Module Description Parser - This is a C++ library that parses an xml description of a module and creates C++ classes that can be accessed in applications.
2. Command Line Processing - This is a C++ program that uses the Module Description Parser to generate C++ code that parses the command line arguments specified in the xml module description. This code can be included in the command line module to access the command line arguments at run-time.
3. Slicer3 GUI - This GUI and related MRML and Logic classes uses the Module Description Parser to create GUI, MRML and Logic classes for each module "discovered" at run-time.

Currently, an initial implementation of all three components is complete.

[Here](#) is a discussion page on how to deal with reference systems in the Execution Model.

Documentation

Look at the [Execution Model Documentation](#) for details.

Background

The initial implementation of the Slicer3 Execution Model followed a Wiki discussion of requirements and implementation options. Refer to the [Execution Model Discussion](#) for background and motivation.



Slicer Execution Model

NA-MIC AHM
2006

NA-MIC Training
Workshop
2008



MITK presentation by Ivo Wolf, Marco Nolden, Sascha Zelzer

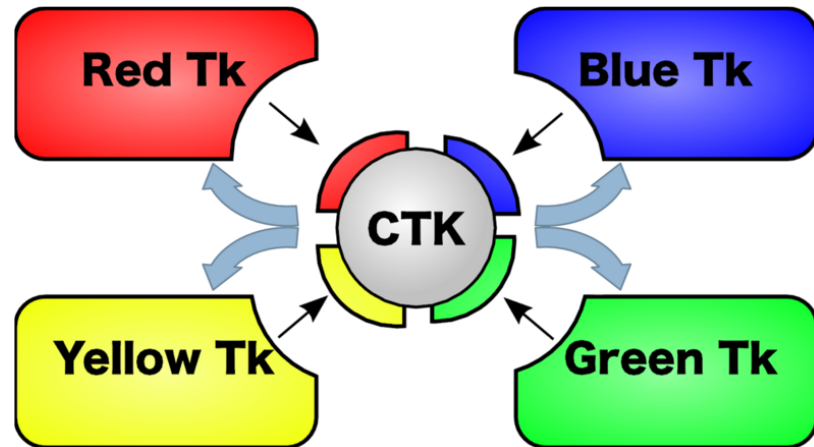


Slicer Execution Model

NA-MIC AHM
2006

NA-MIC Training
Workshop
2008

CTK 2009





Slicer Execution Model

NA-MIC AHM
2006

NA-MIC Training
Workshop
2008

CTK 2009

CTK CLI 2012

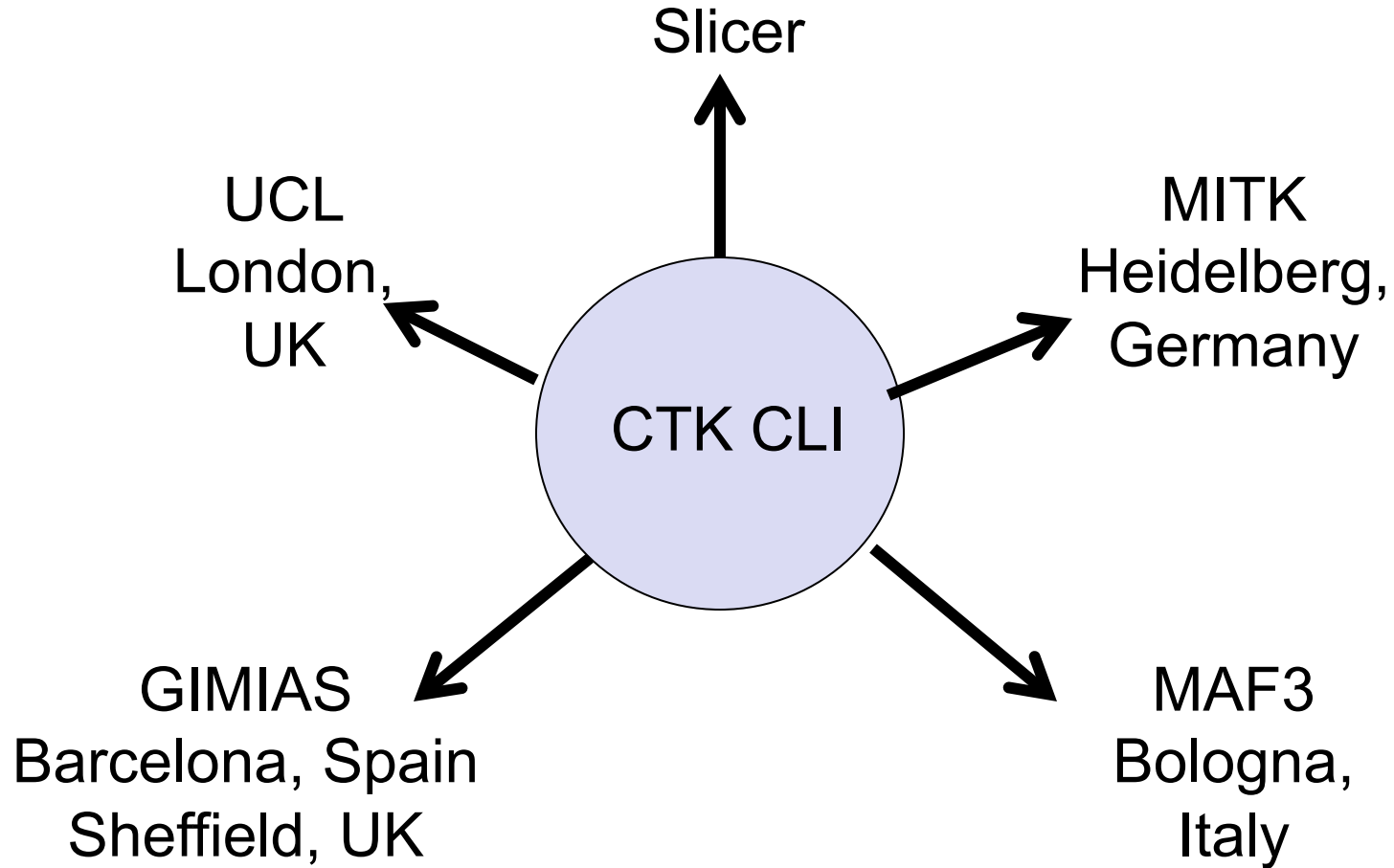


CTK Hackfest, Boston, 2012

→ CTK adoption of
Slicer Execution model



CTK CLI





ISBI 2012 Open-source workshop

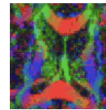


- 3DSlicer presentation



Home
Important Dates
Invited Speakers
Program
Call for Papers
S/W links

Eurobioimaging and ISBI present: Workshop on Open Source Medical Image Analysis software

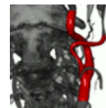
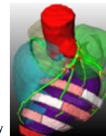
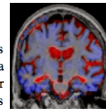


Organizers: [Wiro Niessen](#) (Erasmus MC) and [Marc Modat](#) (UCL)

EuroBioImaging is aimed at providing a research infrastructure for biomedical imaging research. One of the goals of the ESFRI (European Strategy Forum on Research Infrastructures) project EuroBioImaging is to provide easy access to advanced, validated, quantitative image processing and analysis methods. Currently, a wide range of medical image analysis applications and platforms are available. These are targeted at different user groups, varying from software developers to end-users. This workshop aims to bring together both developers and users of medical image analysis software to discuss the state-of-the-art and future development of medical image analysis software. Topics of the workshop include:

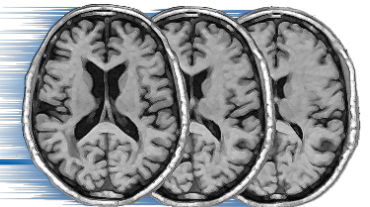
- open source software / platforms
- inter-operability between software / platforms
- evaluation, validation & challenges
- open access databases
- workflows in image processing workflows
- open source licenses

The program will feature a series of invited talks by software developers and researchers who have significantly contributed to the field. It will also include contributed talks that will be selected on the basis on an abstract. In addition to the presentations, there will be special slots for demos as well as some round table discussions for drafting a road map for future resource development in the context of Eurobioimaging.



[Banner Photo Credit](#)

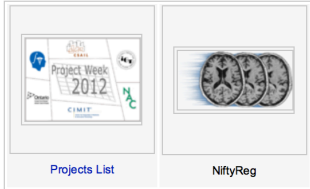
- NiftyReg (UCL, London) presentation





NA-MIC Summer Project week

2012 Summer Project Week:NiftyReg



What is Niftyreg?

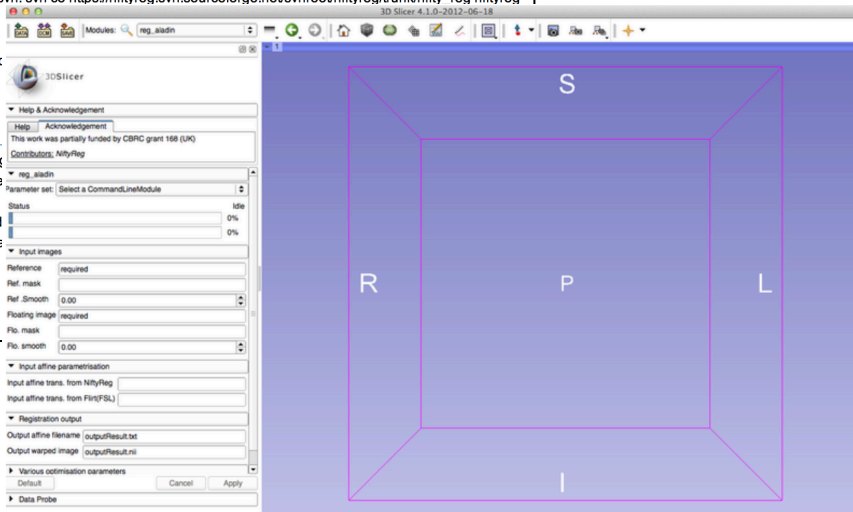
- Light-weight package for medical image registration.
- Global (rigid/affine) registration based on a block-matching technique.
- Local deformation (non-rigid) based on a cubic B-Spline parametrisation.
- Implementation: C/C++ [SIMD, OpenMP, CUDA]
- All dependencies are included into the project (nifticlib, zlib, [NRRD, png]).
- Installation through CMake and step-by-step install can be found [here](#)
- Trunk can be downloaded through svn: `svn co https://niftyreg.svn.sourceforge.net/svnroot/niftyreg/trunk/nifty_reg niftyreg`

Key Investigators

- University College London: Marc Modat
- BWH: Sonia Pujol

Objective

NiftyReg is an open-source package and non-linear registration developed by Sebastien Ourselin at the Centre for Computing, University College London. The objectives are to make NiftyReg available to the wider medical image computing community.

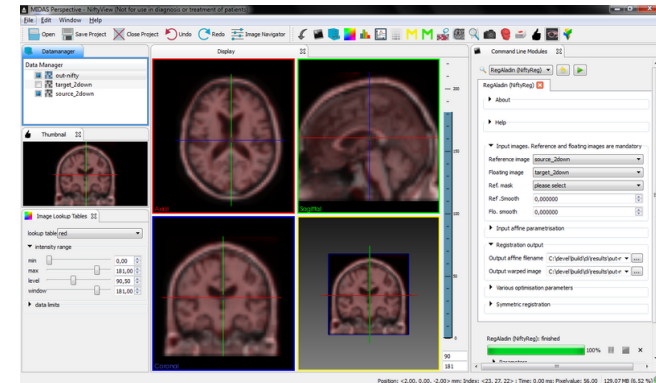
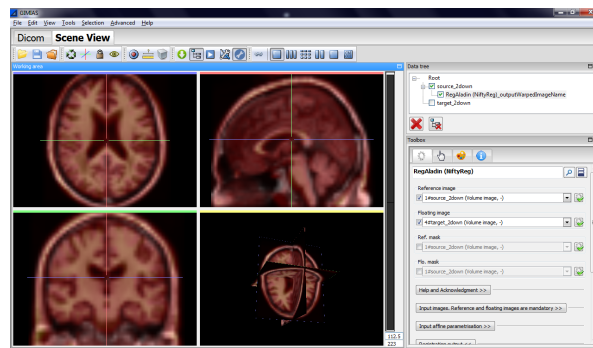
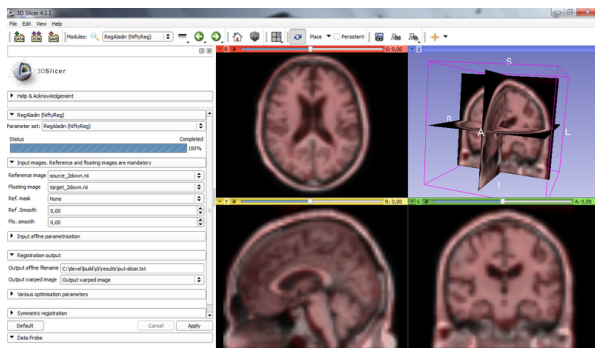
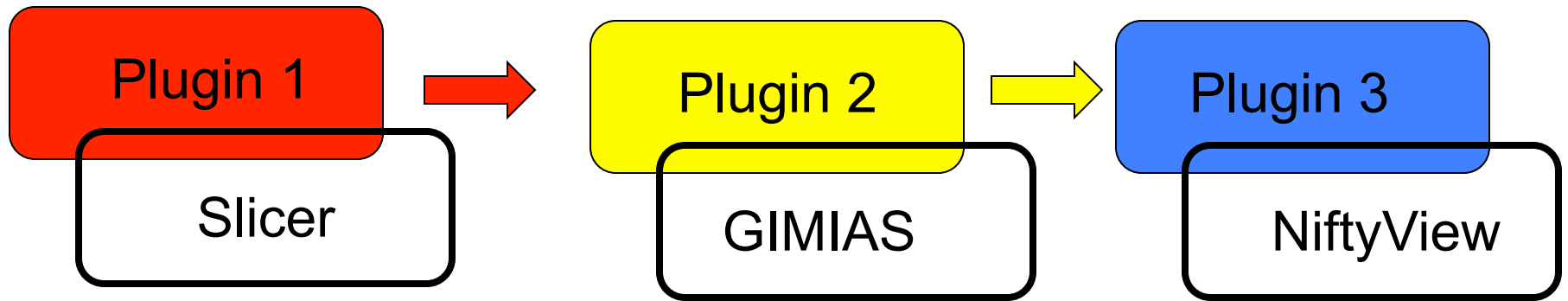


- Integration of NiftyReg library as Slicer CLI Extension

Marc Modat, UCL
Sonia Pujol, BWH



NiftyReg integration



http://www.commontk.org/index.php/Documentation/CLI_In_Context



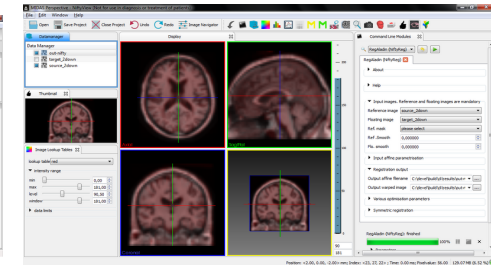
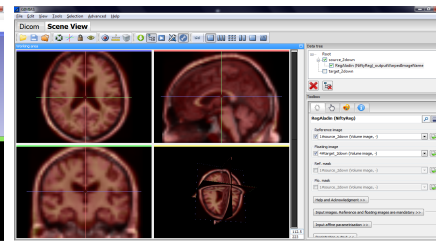
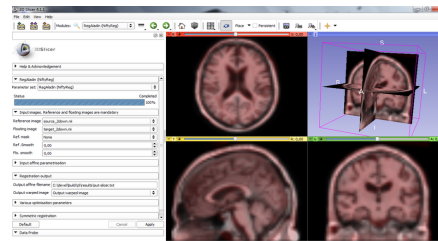
Slicer Execution Model

NA-MIC AHM
2006

NA-MIC Training
Workshop
2008

CTK 2009

CTK CLI 2012



http://www.commonstk.org/index.php/Documentation/CLI_In_Context

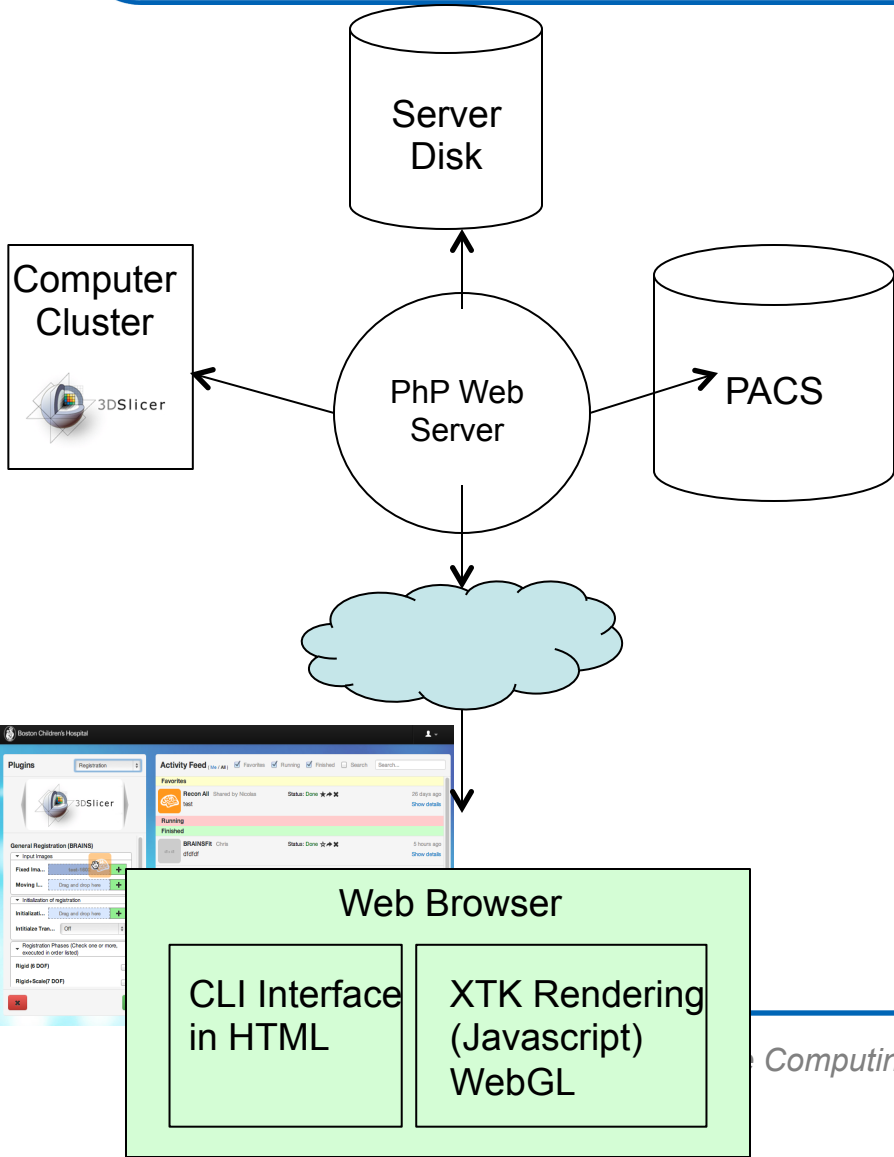


Slicer SEM leverages interoperability between packages





Open-source platform “ChRIS”



Slicer CLI modules
accessible via the web

Client/Server application for
Slicer remote execution on
PACS data

Dr. Rudolph Pienaar
Dr. Ellen Grant
Nicolas Rannou

Children's Hospital, Boston,
MA



RSNA Liver tutorial

Anatomical Structures

- Vessels
 - IVC
 - MainPortalVein
 - LeftHepaticVein_and_Branches
 - MiddleHepaticVein_and_Branches
 - RightHepaticVein_and_Branches
 - LeftPortalVein_and_Branches
 - RightPortalVein_and_Branches
 - CaudateVeins
- Segments
 - LiverSegment_I
 - LiverSegment_II
 - LiverSegment_III
 - LiverSegment_IVa
 - LiverSegment_IVb
 - LiverSegment_V
 - LiverSegment_VI
 - LiverSegment_VII
 - LiverSegment_VIII
- CT Volume

Training

3D Exploration of Liver Segments

The liver dataset is a contrast-enhanced CT abdominal scan of a healthy 36 year-old male.

Question 1 of 3

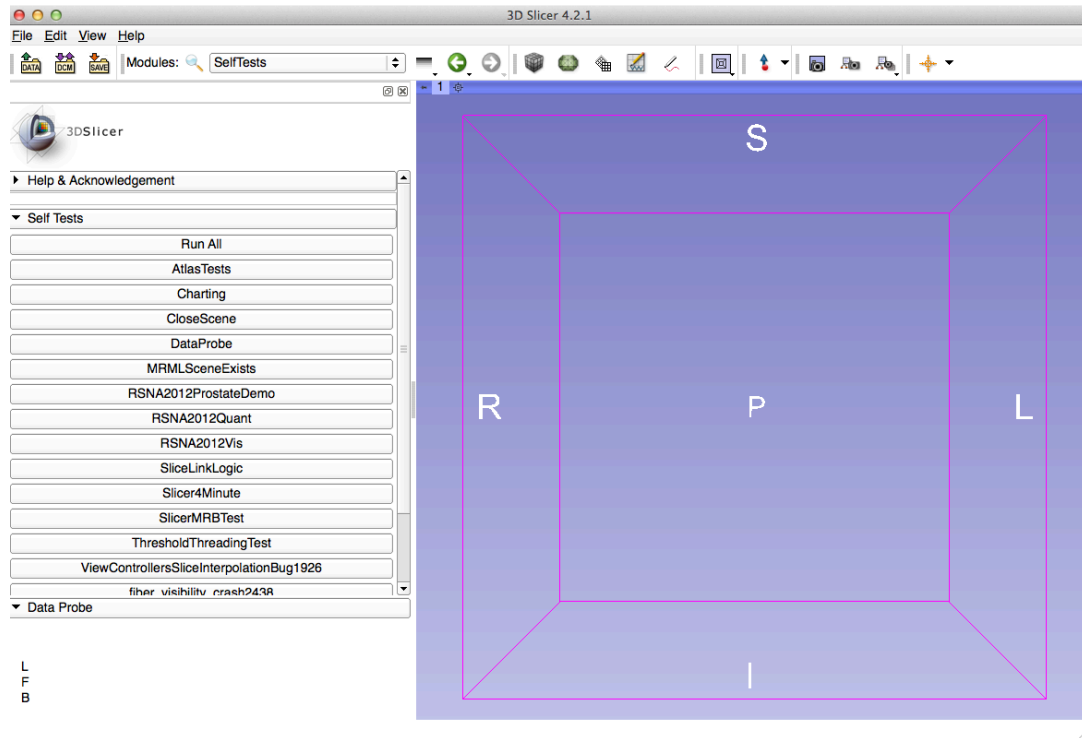
1. What organ abuts the left-most margin of segment II in this patient?

- Lung
- Kidney
- Stomach
- Pancreas

Check My Answer!



Slicer Automated testing: done!



- Python implementation (**Steve Pieper**) for self-tests of tutorials integrated to Slicer distribution
- Users can confirm correct execution of a module based on the tests
- First use at RSNA 2012



Summer 2012 Tutorial Contest

- 5 tutorial submissions
- First prize winner:



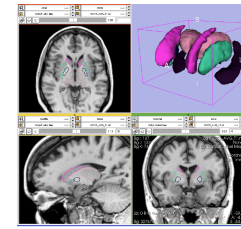
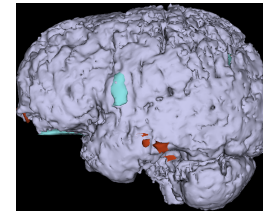
NA-MIC
National Alliance for Medical Image Computing
<http://www.na-mic.org>

Qualitative and quantitative comparison of two RT dose distributions

James Shackleford
Nadya Shusharina
Greg Sharp

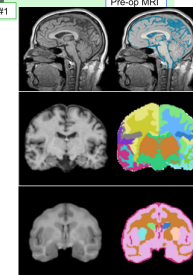
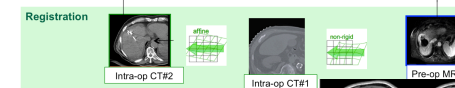
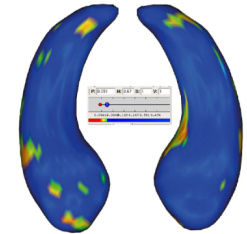
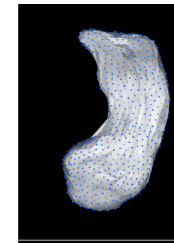
Massachusetts General Hospital
jshackleford@partners.org | (617) 726-0186
NA-MIC Tutorial Contest: Summer 2012

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BRAINSCut Output example for sub-cortical structures

Select	Status	Name	Category	Description	HomePage
<input type="checkbox"/>	<input checked="" type="checkbox"/>	ABC			
<input type="checkbox"/>	<input checked="" type="checkbox"/>	ARCTIC	Cortical Thickness	ARCTIC is an r	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	EMFiberClusteringModule	Tractography	An EM approa	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	ExampleCommandLine	Examples	An example of	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	ExampleLoadableModule	Examples	An example of	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	HammerRegistration	Work in Progress	HammerRegist	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	LabelDistanceEstimation	Statistics		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	platinatch-slice			
<input type="checkbox"/>	<input checked="" type="checkbox"/>	PythonGdcmScriptedModule	Developer Tools	This is an exa	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	TclGdcmScriptedModule	Developer Tools	This is an exa	



```

Left DNI Diffusion:
Dose (in: # of Number: 1
DNI (in: # of Number: 1
gradient (in: # of Number: 1
0 [ 0.000000 0.000000 0.000000 ] 1
1 [ 0.481450 -0.110100 -0.097010 ] 1
2 [ -0.480872 -0.735050 -0.144710 ] 1
3 [ -0.261660 -0.941310 -0.264100 ] 1
4 [ 0.049584 0.624304 0.052720 ] 1
5 [ 0.277700 0.526170 -0.444890 ] 1
6 [ -0.480394 -0.119970 -0.094241 ] 1
7 [ 0.738210 0.102300 0.050207 ] 1
8 [ 0.447370 0.733450 -0.287241 ] 1
9 [ -0.338020 -0.941390 -0.140171 ] 1
10 [ -0.327440 -0.438410 0.738333 ] 1
11 [ -0.080100 -0.521300 0.050202 ] 1
12 [ 0.977630 0.181324 -0.104756 ] 1
13 [ -0.000170 0.181320 -0.072206 ] 1
14 [ -0.080120 0.733350 0.050196 ] 1
15 [ -0.080650 0.942202 -0.236111 ] 1
16 [ 0.651370 -0.518670 0.050197 ] 1
17 [ 0.225890 -0.518870 0.736940 ] 1
18 [ 0.281820 -0.174250 0.050196 ] 1
19 [ -0.621590 0.737700 -0.287270 ] 1
20 [ 0.327680 -0.940540 0.140196 ] 1
21 [ 0.150270 -0.943070 -0.264073 ] 1
22 [ 0.057630 -0.170850 0.450133 ] 1
23 [ 0.979220 -0.172460 0.099521 ] 1
=====
QC result summary:
=====
Image information check: PASS
Diffusion information check: PASS
DNI (in: # of check): PASS
Intra-op-view check: PASS
Gradient-view check: PASS

```

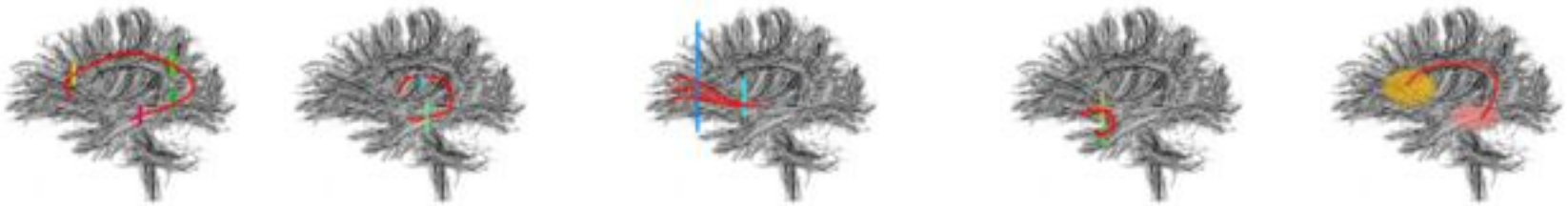
→ Next Tutorial Contest: NA-MIC Summer Project Week 2012

DTI Tractography Validation Update



NA-MIC pilot initiative

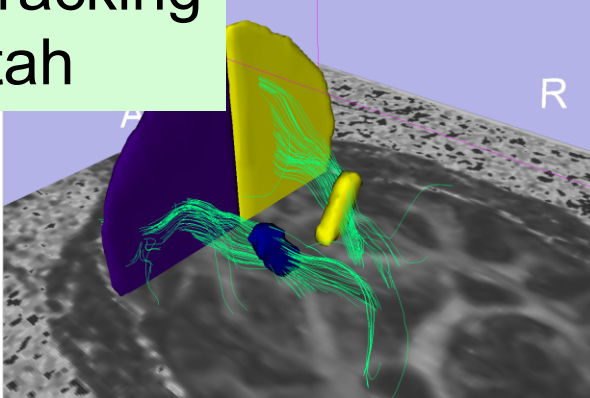
- Exploratory work on validation of DTI tractography
- Cross-comparison of tractography algorithms on major white matter fascicles



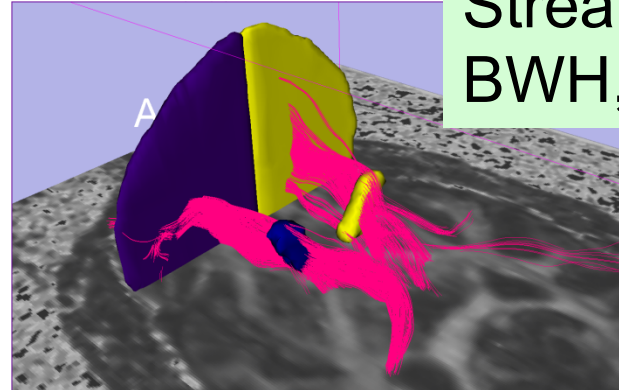


Early Implementation

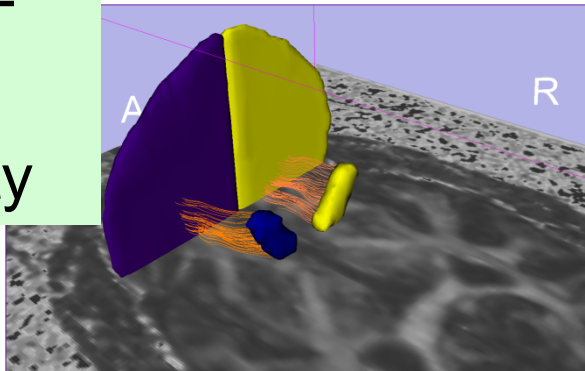
Fiber Tracking
SCI, Utah



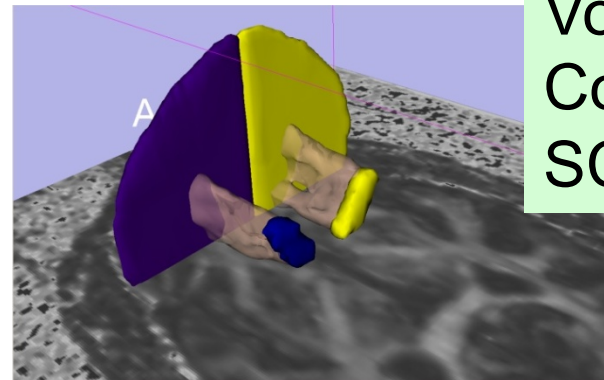
Streamline
BWH, Harvard



GTRACT
Iowa
University



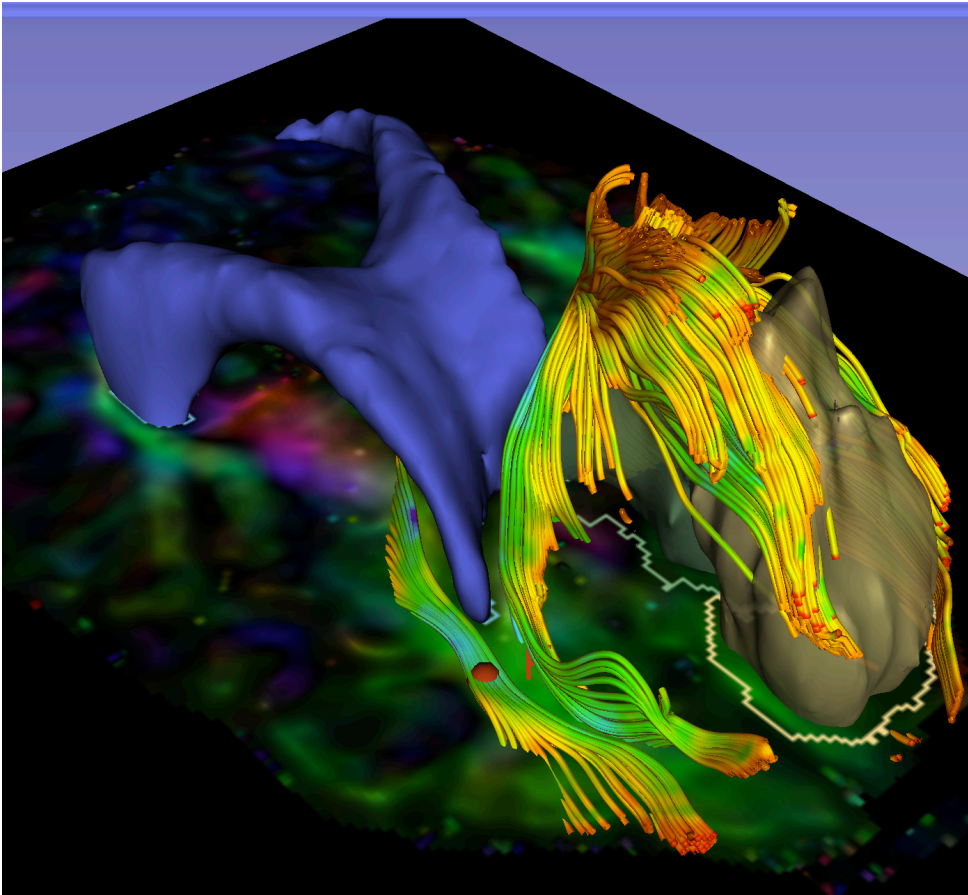
Volumetric
Connectivity
SCI, Utah



Pujol et al. ISMRM 2009



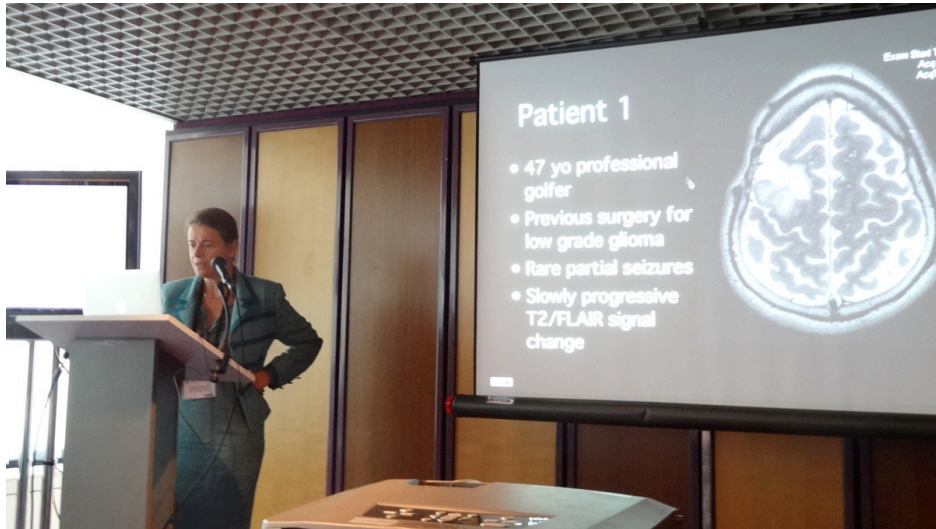
DTI for Neurosurgery



Pre-operative assessment of white matter anatomy for tumors located in eloquent areas where motor, sensory, speech and cognitive function reside.



What does the clinician want to see?



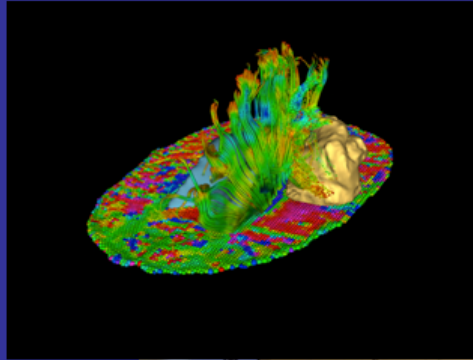
Dr. Alexandra Golby

- Where is the tract?
- Is it normal?
- Is it symmetric?
- Is anything missing?
- Is it functional?



MICCAI 2011 DTI Challenge, 1st Edition

14th International Conference on Medical Image Computing and Computer Assisted Intervention



DTI Tractography for Neurosurgical Planning: A Grand Challenge



MICCAI 2011 Workshop
Sunday September 18, 9am-6pm
Westin Harbour Castle
Toronto, Canada

Workshop Faculty

Sonia Pujol, PhD, Surgical Planning Laboratory, Harvard Medical School
Ron Kikinis, MD, Surgical Planning Laboratory, Harvard Medical School
Alexandra Golby, MD, Brigham and Women's Hospital, Harvard Medical School
Guido Gerig, PhD, The Scientific Computing and Imaging Institute, University of Utah
Martin Styner, PhD, Neuroimage Research and Analysis Laboratory, University of North Carolina
William Wells, PhD, Surgical Planning Laboratory, Harvard Medical School
Carl-Fredrik Westin, PhD, Laboratory of Mathematics in Imaging, Harvard Medical School
Sylvain Gouttard, MSc, The Scientific Computing and Imaging Institute, University of Utah

National Alliance for Medical Image Computing

http://www.na-mic.org/Wiki/index.php/Events_DTI_Tractography_Challenge_MICCAI_2011



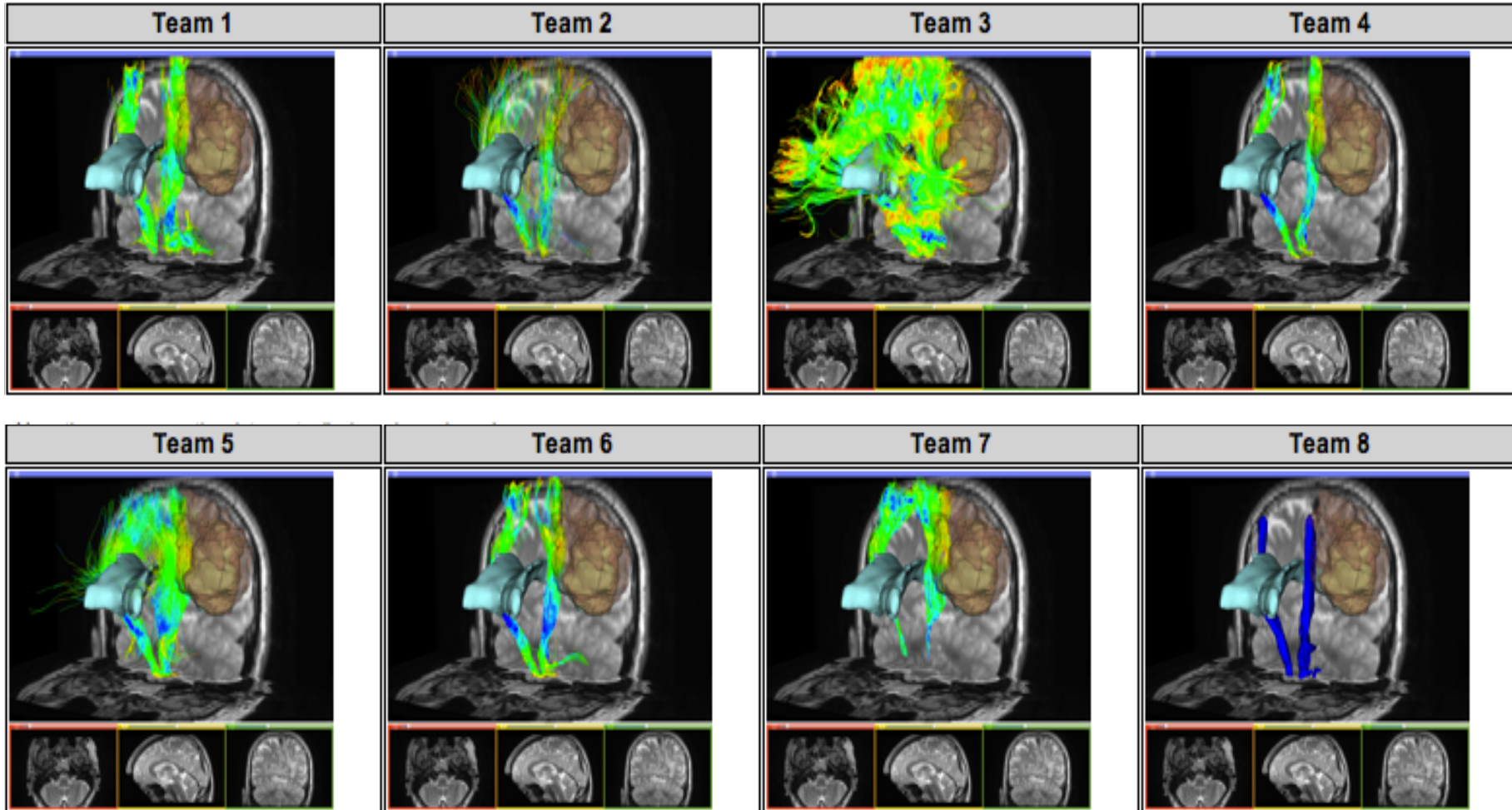
MICCAI 2011 Workshop



- 8 tractography teams
- 2 practising neurosurgeons
- 23 international participants



MICCAI 2012 DTI Challenge, 1st Edition





MICCAI 2012 DTI Challenge, 2nd Edition

MICCAI 2012 DTI Tractography Challenge Second Edition

[INTRODUCTION](#)[THE CHALLENGE](#)[FACULTY](#)[KEYNOTE SPEAKER](#)[DATA](#)[REGISTRATION](#)[CONTACT](#)

Welcome to the 2nd edition of the MICCAI DTI Tractography Challenge. The workshop will be held on Monday October 1st, 2012 as part of the 15th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI 2012).



The 15th International Conference on Medical Image Computing and Computer Assisted Intervention
1-5 October 2012 - Acropolis Convention Center - Nice, France



<http://dti-challenge.org>



MICCAI 2012 DTI Challenge



- 10 tractography teams
- 5 practising neurosurgeons
- 36 international participants



Faculty

- Sonia Pujol, BWH
- Ron Kikinis, BWH
- Alexandra Golby, BWH
- Arya Nabavi, Kiel Hospital, Germany
- Guido Gerig, SCI Utah
- Martin Styner, UNC
- William Wells, BWH
- CF Westin, BWH
- Laurent Chauvin, BWH



Keynote Speaker

- Dr. Carlo Pierpaoli, NIH

Considerations on the use of Diffusion MRI tractography to investigate brain connectivity

Tractography: The Good, The Bad and the Ugly



Neurosurgeons



- **Dr. Alexandra Golby**, Brigham and Women's Hospital, Harvard Medical School, Boston, USA
- **Dr. Arya Nabavi**, University Hospital Schleswig-Holstein, Kiel, Germany
- **Dr. Sandrine De Ribaupierre**, Western University, London, Ontario, Canada
- **Dr. David Fortin**, Sherbrooke University, Sherbrooke, Canada
- **Dr. Francesco Cardinale**, Epilepsy and Parkinson Surgery Centre "Claudio Munari", Milan, Italy



National Alliance for Medical Image Computing
<http://na-mic.org>



10 international teams

- USA (3)
 - Canada (2)
 - France
 - Italy
 - Germany
 - Turkey
 - Spain
- 19 tractography methods represented



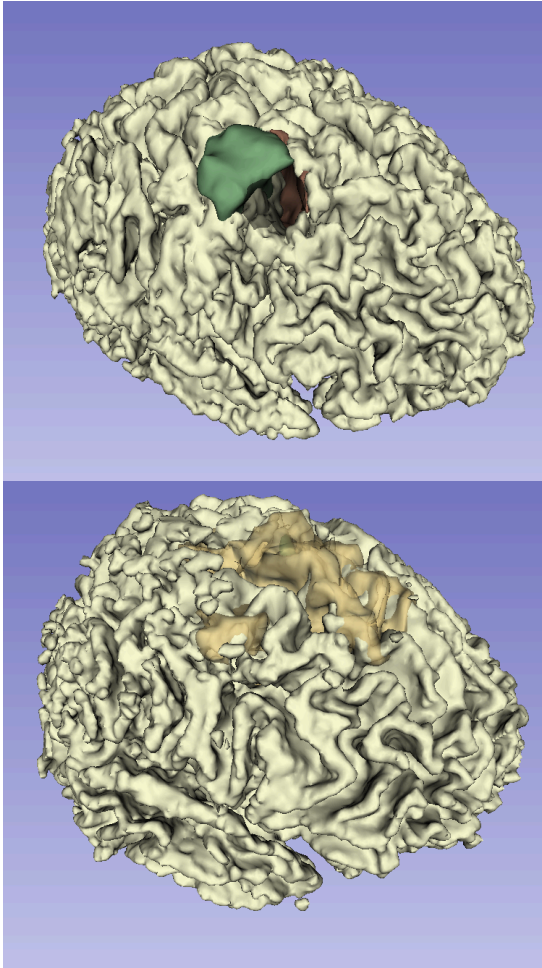


10 international teams

1. *Ali R. Khan, Maged Goubran, Jonathan C. Lau, Roy Eagleson, Terry M. Peters, and Sandrine de Ribaupierre. Robarts Research Institute, London, Canada*
2. *Aymeric Stamm, Olivier Commowick, Patrick Perez, and Christian Barillot. INSERM U746-CNRS UMR6074-INRIA University of Rennes I, Rennes, France*
3. *-Peter F. Neher, Bram Stieltjes, Marco Reisert, Hans-Peter Meinzer, and Klaus H. Fritzsche. German Cancer Research Center, Heidelberg, Germany*
4. *.Antonio Tristan-Vega, Santiago Aja-Fernandez, and Carl-Fredrik Westin. University of Valladolid, Valladolid, Spain*
5. *Riza Alp Guler, Ali Demir, and Gozde Unal. Sabanci University, Istanbul, Turkey*
6. *Alessio Moscato, and Francesco Cardinale, Niguarda Hospital, Milan, Italy*
7. *Gabriel Girard, Maxime Chamberland, Jean-Christophe Houde, David Fortin, and Maxime Descoteaux. Sherbrooke University, Sherbrooke, Canada*
8. *Joy Matsui, Eun Young Kim, Vincent Magnotta, and Hans Jonhson. University of Iowa, Iowa City, USA*
9. *Sudhir K Pathak, Deepa Krishnaswamy, and Walter Schneider, University of Pittsburgh, Pittsburgh, USA*
10. *Hesamoddin Salehian, Guang Cheng, Jiaqui Sun, and Baba Vemuri. University of Florida, Gainesville, USA*



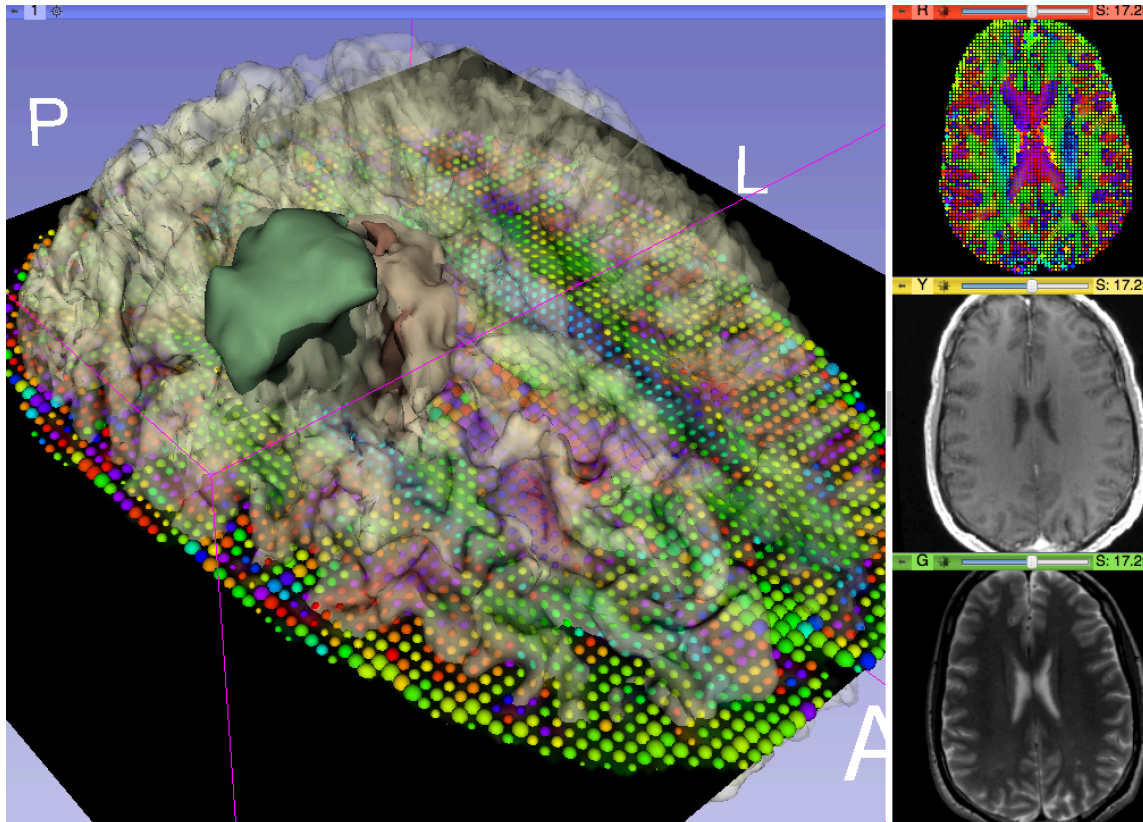
Patients



- Patient 1: Recurrent/residual anaplastic astrocytoma Grade III
- Patient 2 : Oligodendroglioma grade II
- Patient 3: Oligodendroglioma Grade II
- Patient 4: Anaplastic astrocytoma Grade III



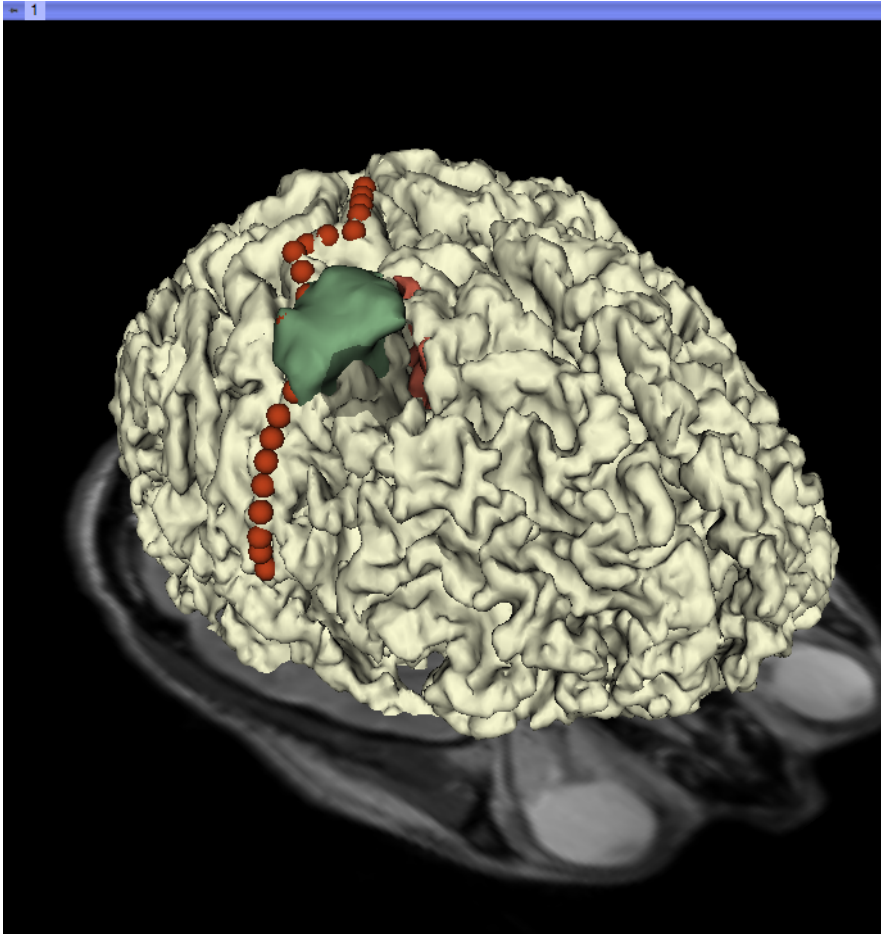
Challenge Datasets



- T1, T2, DWI, DTI
- Pre-segmented tumor regions
- 3D White Matter Surface



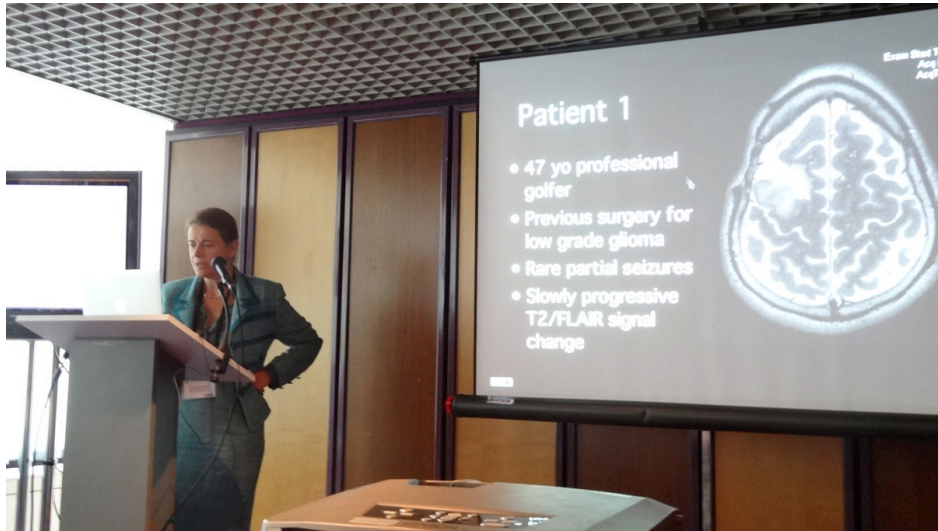
Challenge Datasets (new)



- Delineation of pre-central gyrus (expected motor cortex location)



What does the clinician want to see?



Dr. Alexandra Golby, MICCAI 2012

- Where is the tract?
- Is it normal?
- Is it symmetric?
- Is anything missing?
- Is it functional?



DTI Challenge Evaluation

- Quantitative assessment (STAPLE, DICE, FA Profile)
- Qualitative evaluation by clinicians and DTI experts

- 2nd Edition: Standardization effort
- Web-based questionnaire for review



Panel of reviewers

Practicing neurosurgeons and DTI experts:

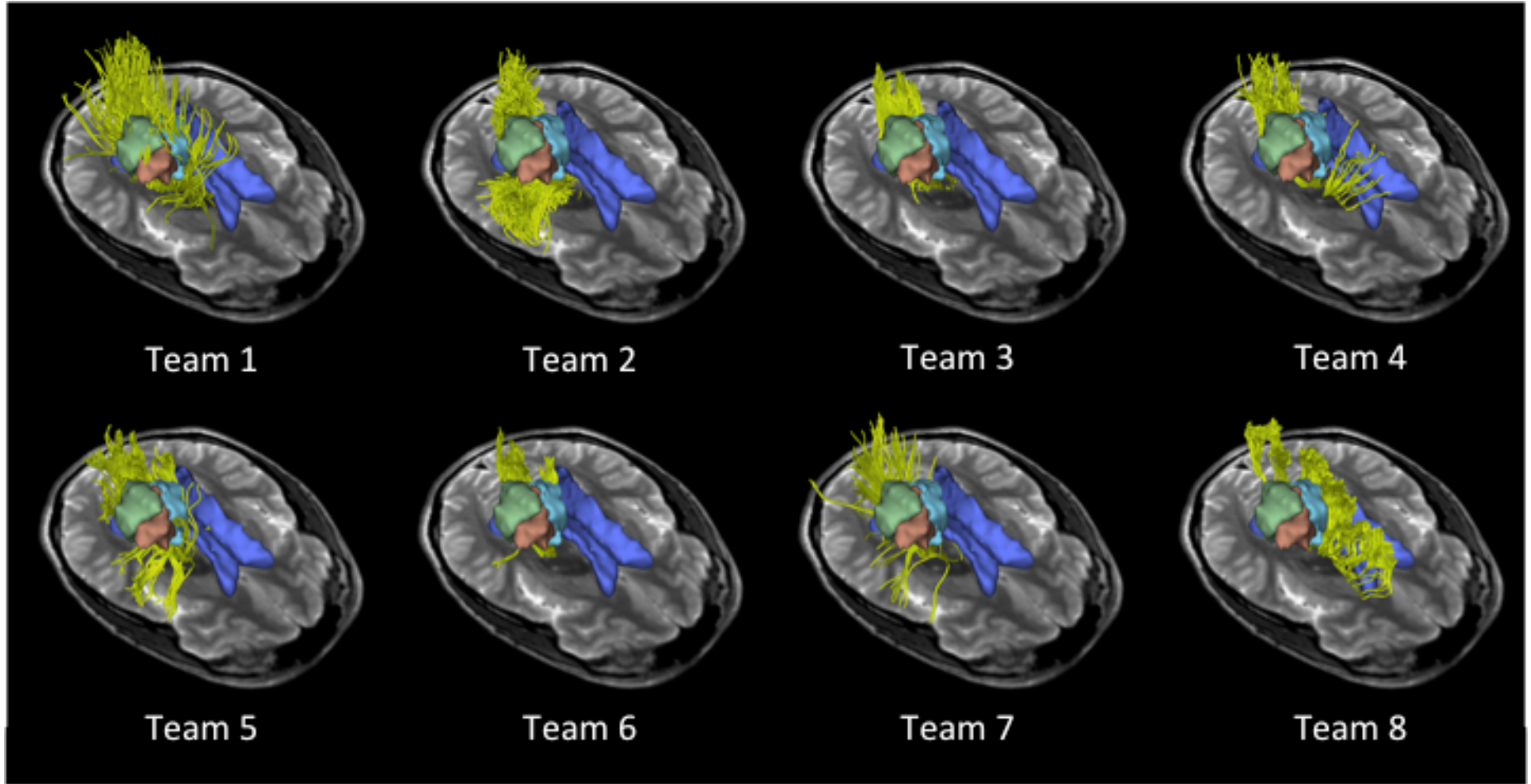
1. Dr. Alexandra Golby
2. Dr. Arya Nabavi
3. Dr. Ron Kikinis
4. Dr. Carlo Pierpaoli
5. Dr. Carl-Fredrik Westin

DTI Tractography Challenge

Preliminary Results

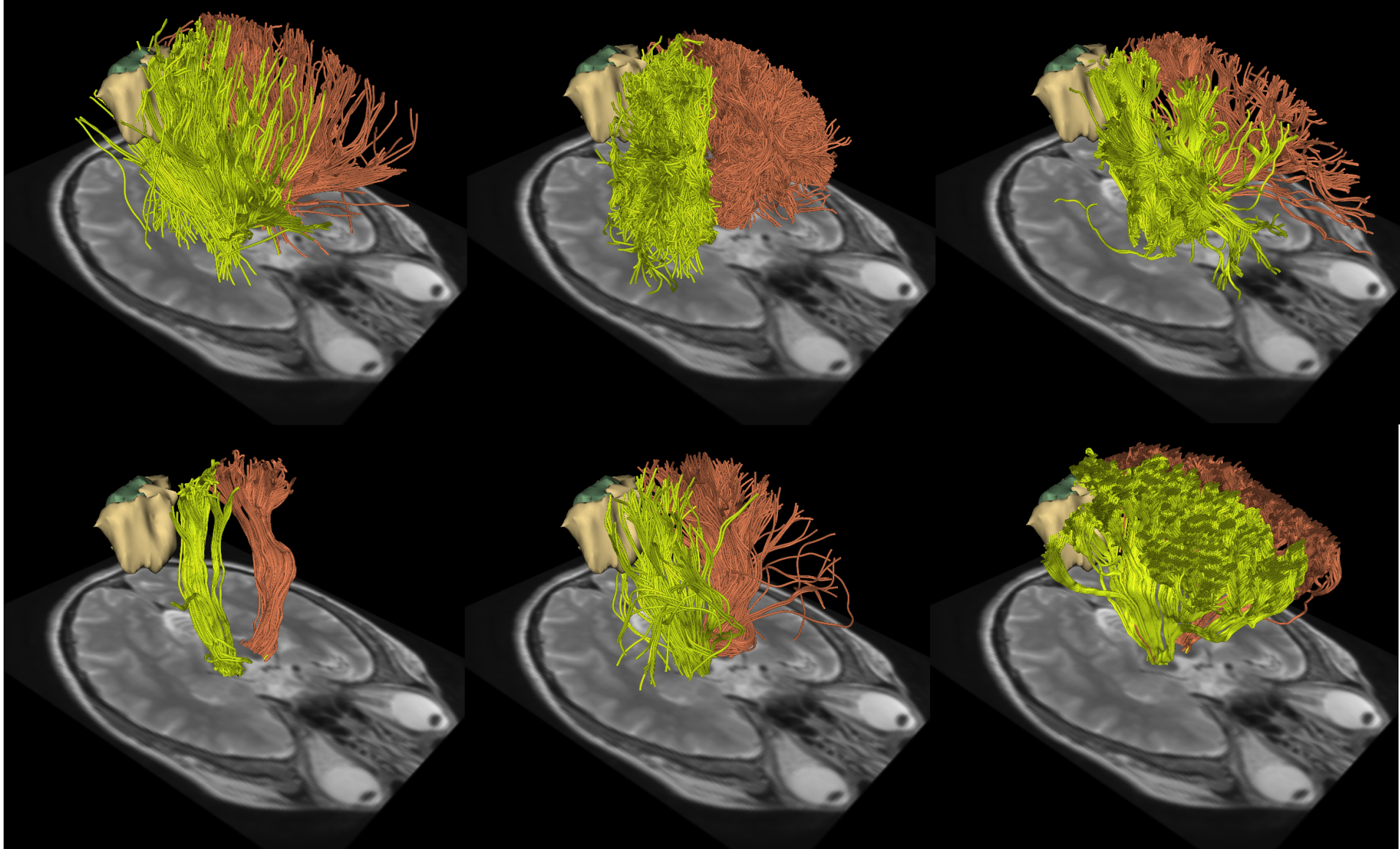


Patient1 (pre-workshop)





Patient 3 (5-hour on-site challenge)



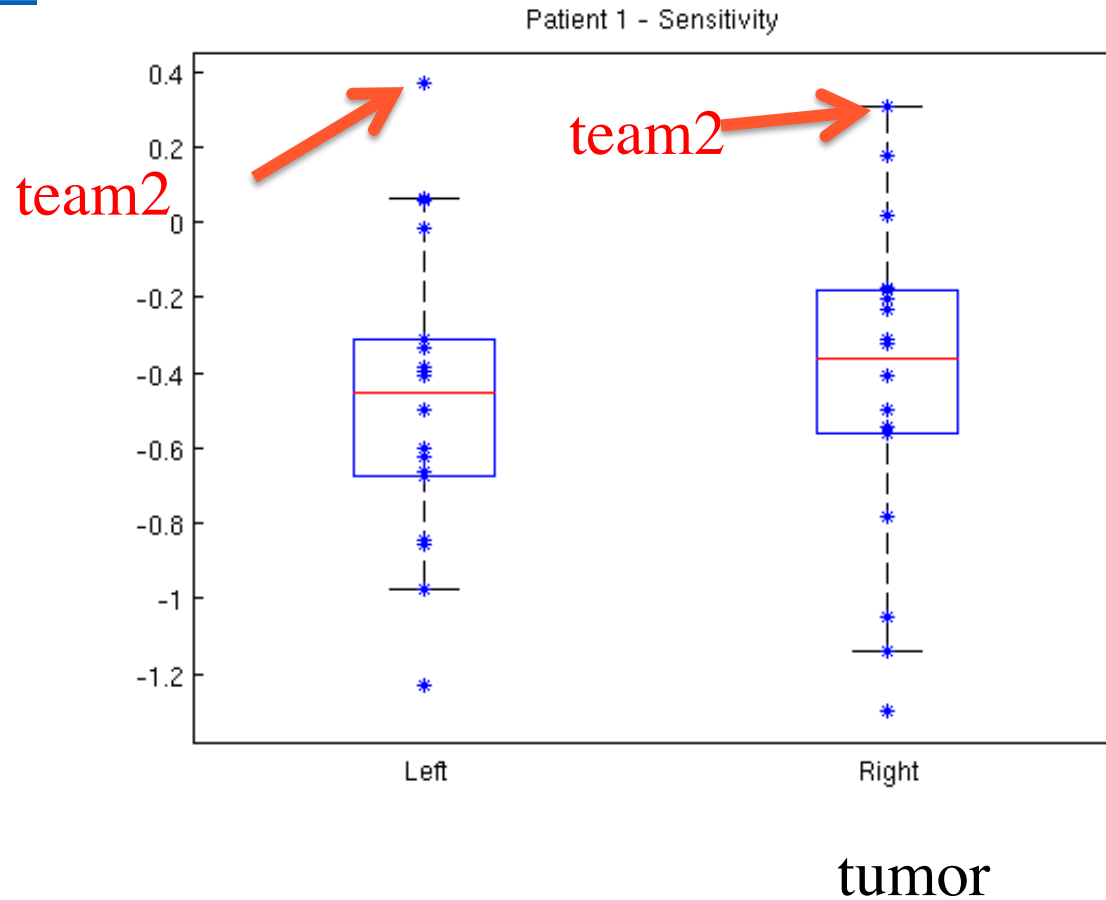


Quantitative evaluation

- **Metric 1:** STAPLE sensitivity score
- **Metric 2:** Dice coefficient of overlap
- **Metric 3:** Fiber FA profile along tract



STAPLE



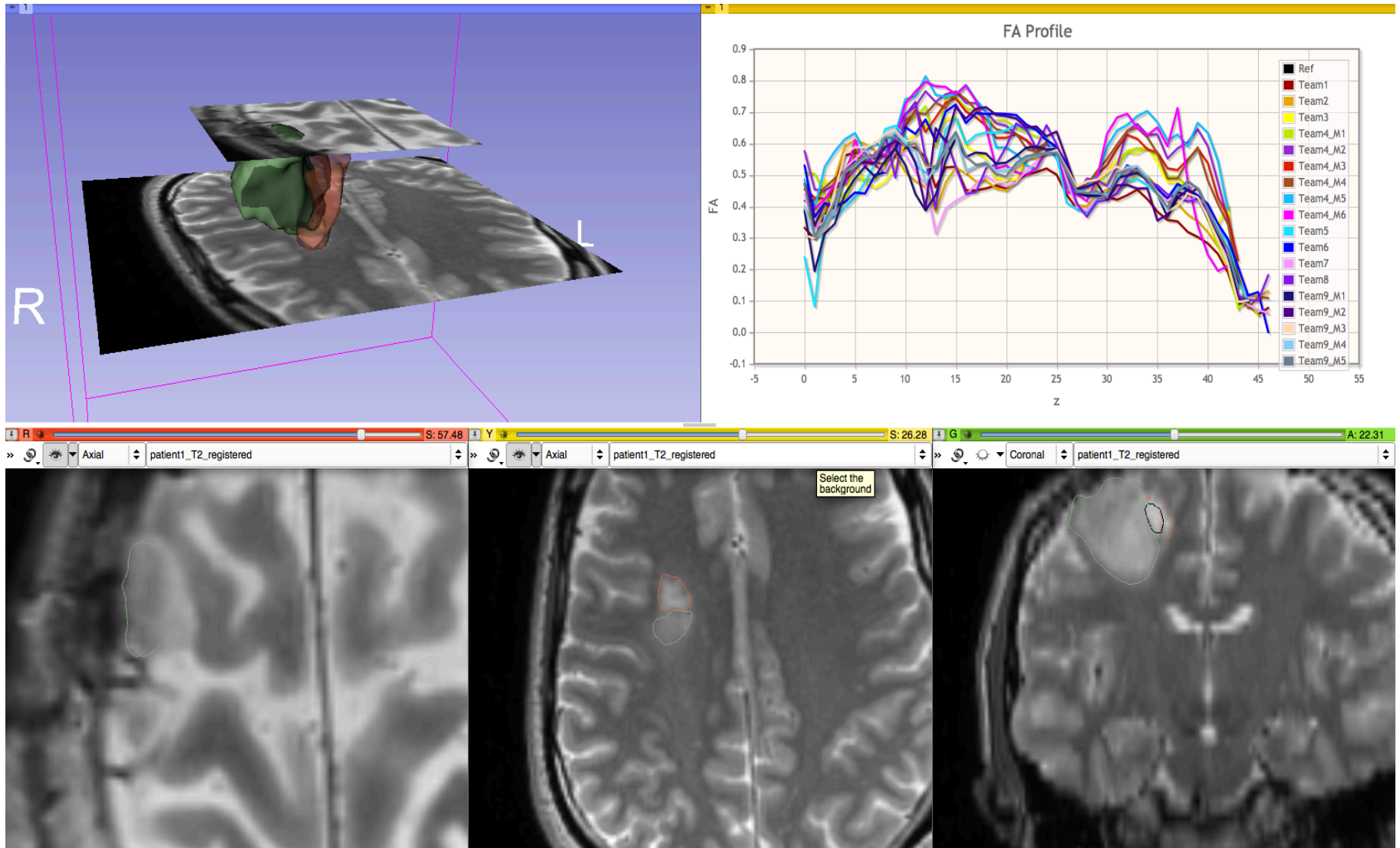


Dice coefficient of overlap

- Patient1:
 mean: 25.81 % (left) / 26.48 % (right)
 peritumoral mean: 36.37 %
- Patient2:
 mean: 25.89 % (left) / 22.35 % (right)



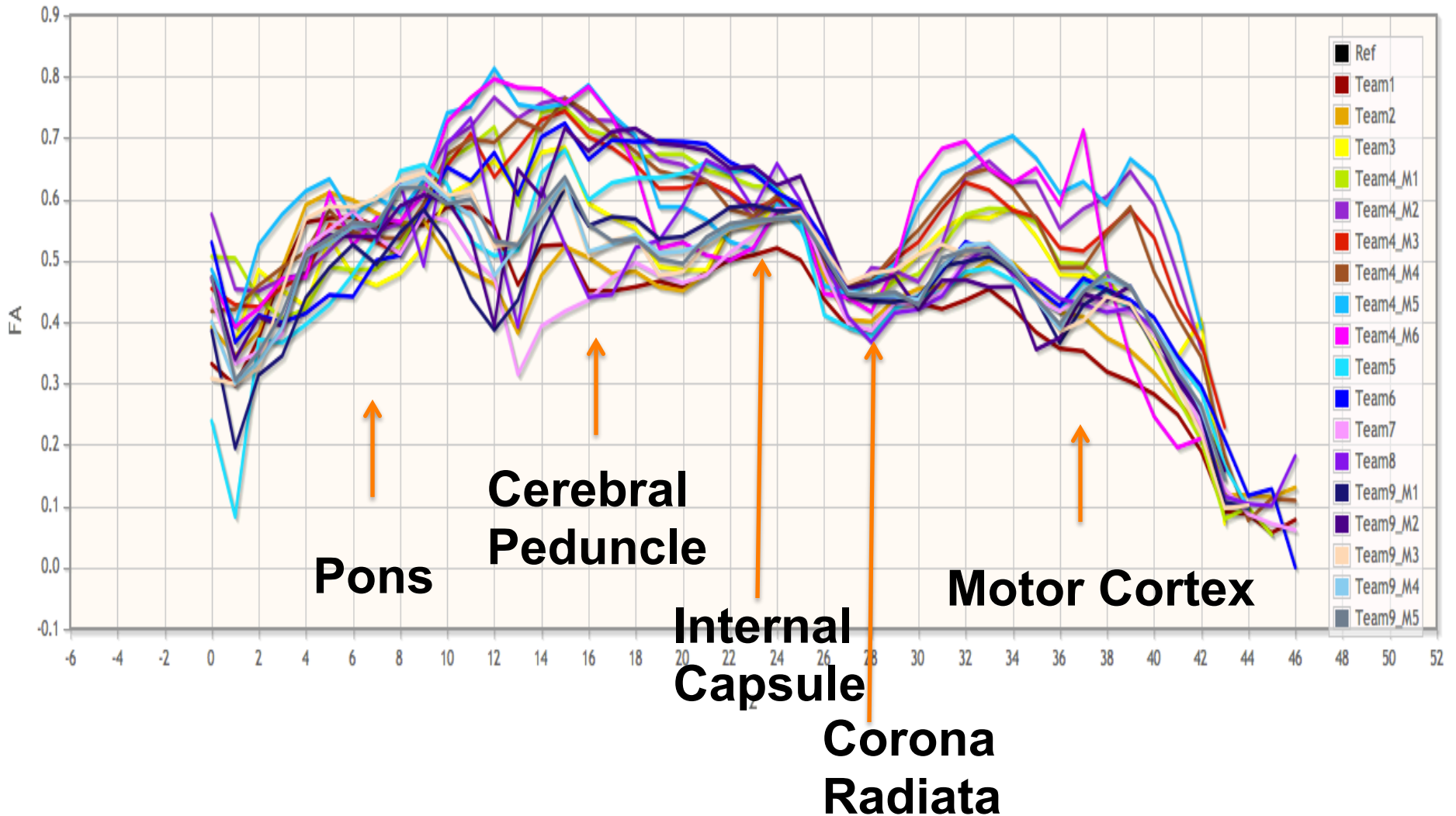
FA Profile





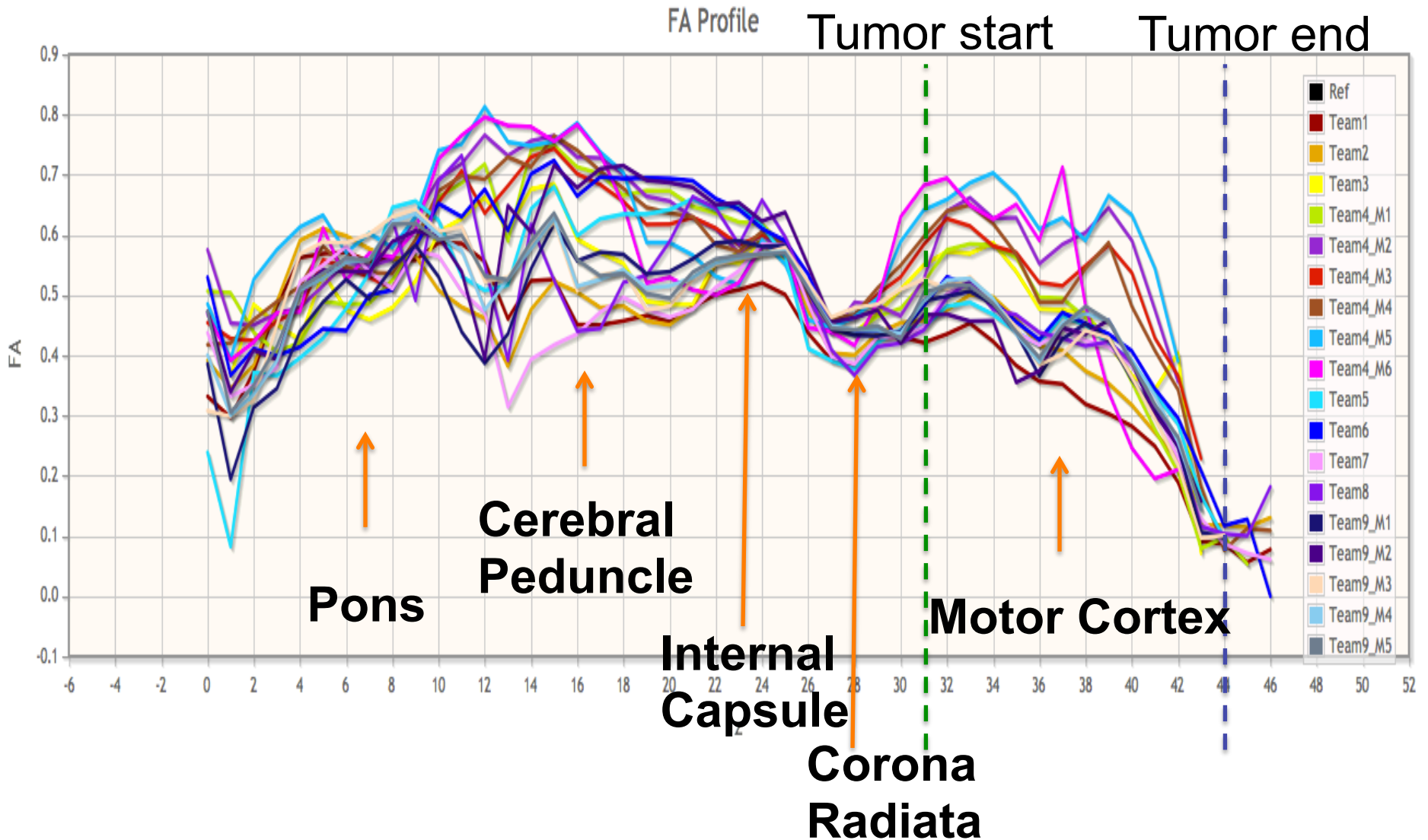
FA Profile

FA Profile





FA Profile





Clinical evaluation criteria

C1. Presence of False Negative Tracts

C2. Presence of False Positive Tracts

C3. Correct depiction of the CST in specific anatomical regions

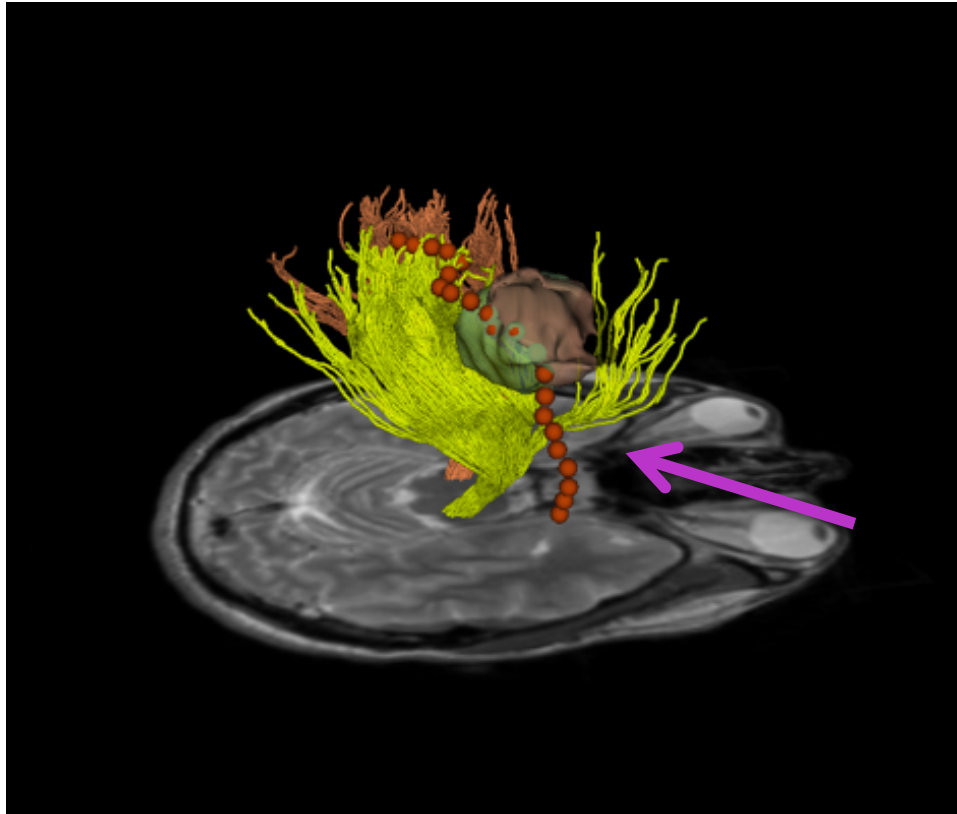
C4. Correct depiction of the peritumoral tracts

C5. Presence of implausible tracts

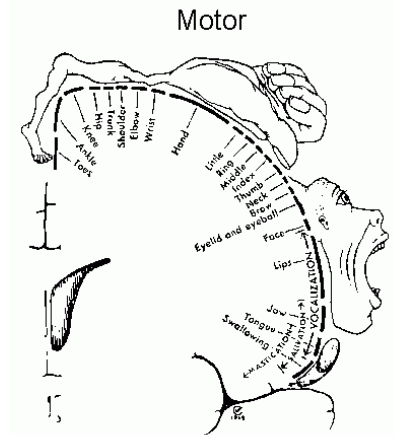
C6. Clinical relevance of the tractography reconstruction



C1. False Negative



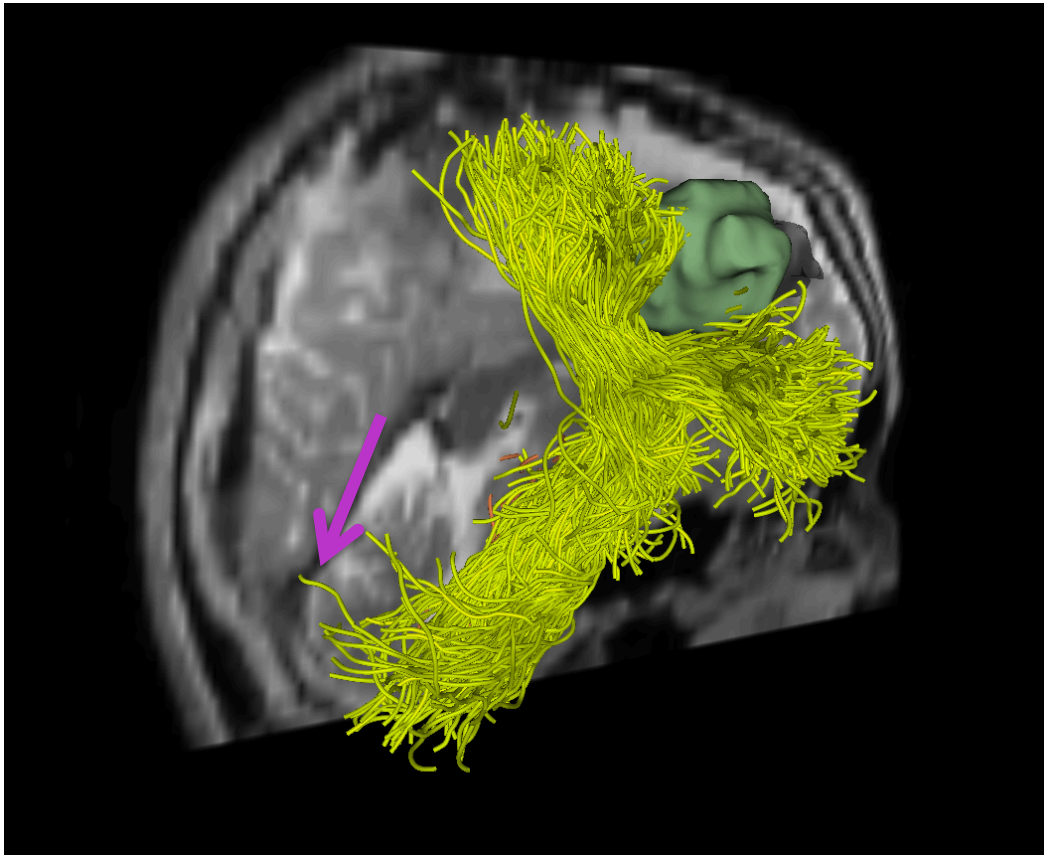
Which parts of the corticospinal tract are missing?



(After W. Penfield and T. Rasmussen, 1950)



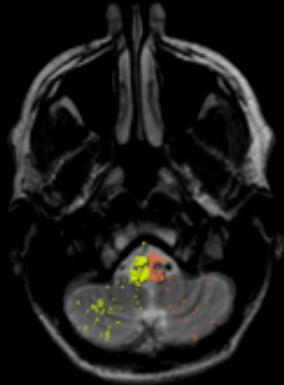
C2. False Positive



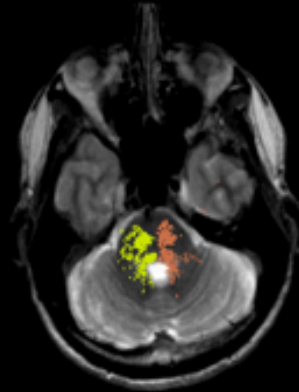
Did the tractography capture fiber bundles outside the corticospinal tract?
If yes, where are the false positive tracts?



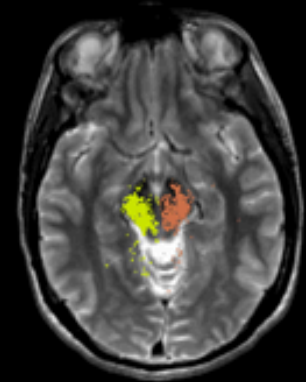
C3. Specific anatomical regions



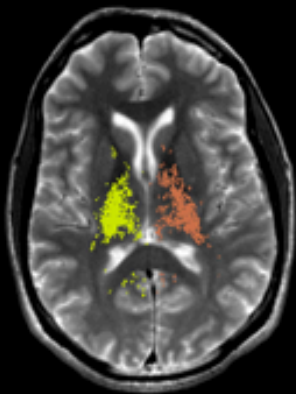
Pons



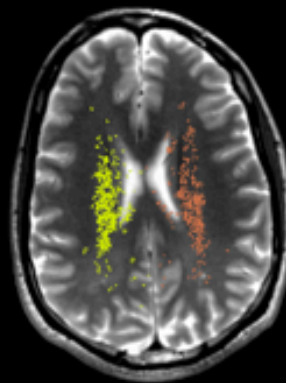
Medulla



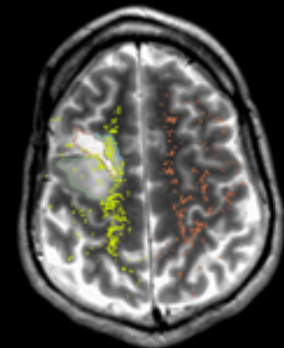
Cerebral peduncles



Internal Capsule



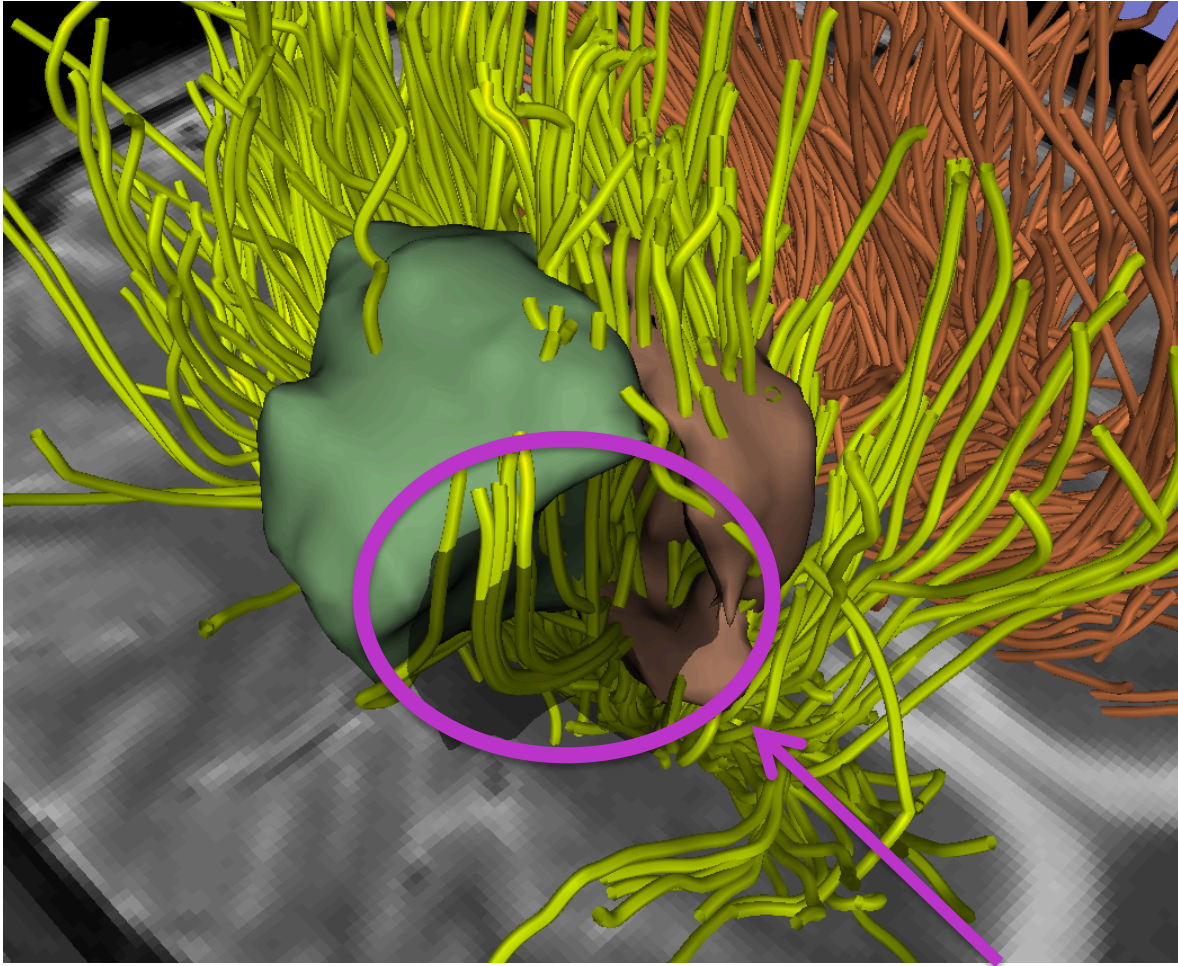
Corona Radiata



Motor Cortex



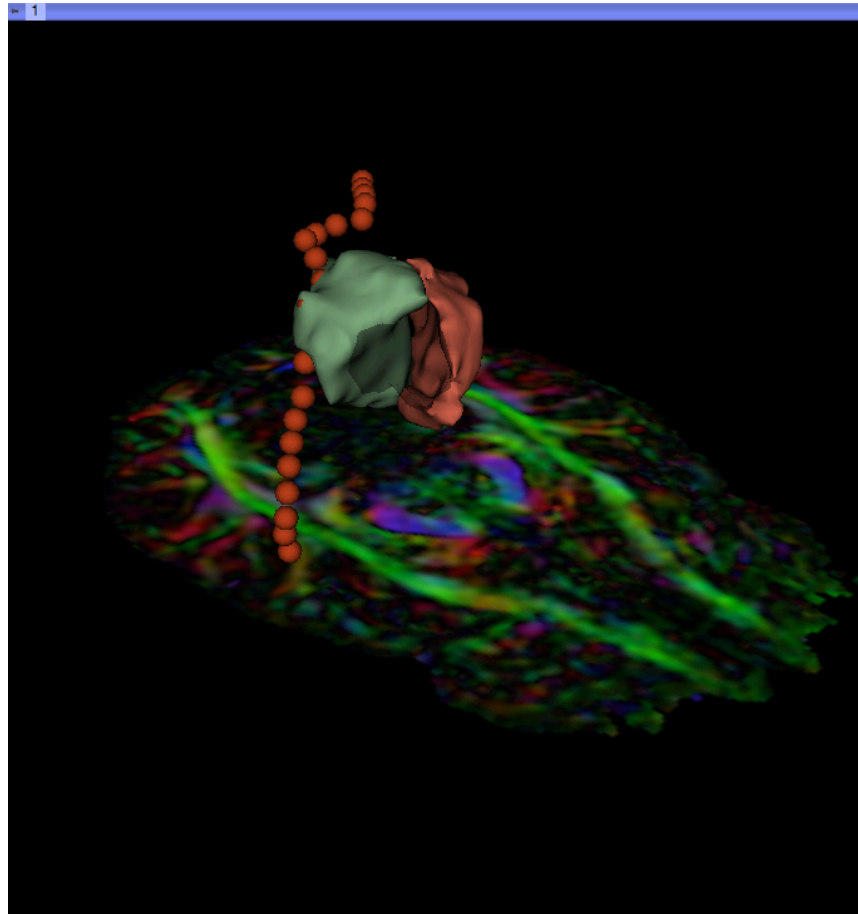
C5. Implausible Tracts



Are there tracts in place where they are implausible?



CST Lateral Projections





False Negative

1	2	3	4	5	6	7	8	9-1	9-5
3	4.5	2.25	2.25	3.25	2.25	2.5	1.75	3.5	2.5

False Positive

1	2	3	4	5	6	7	8	9-1	9-5
1.75	3.25	4.0	3.0	2.50	3.0	2.5	1.75	2.5	3.0



Anatomical regions

	1	2	3	4	5	6	7	8	9-1	9-5
CP	2.5	3	1.66	4	3	3.33	1.66	2	3	3
IC	2.5	3	2	3.5	2.66	3.33	2.66	2	2.5	2.5
MC	2	3.5	1.66	2.25	1.66	2.33	3.0	1.75	2.5	3.0

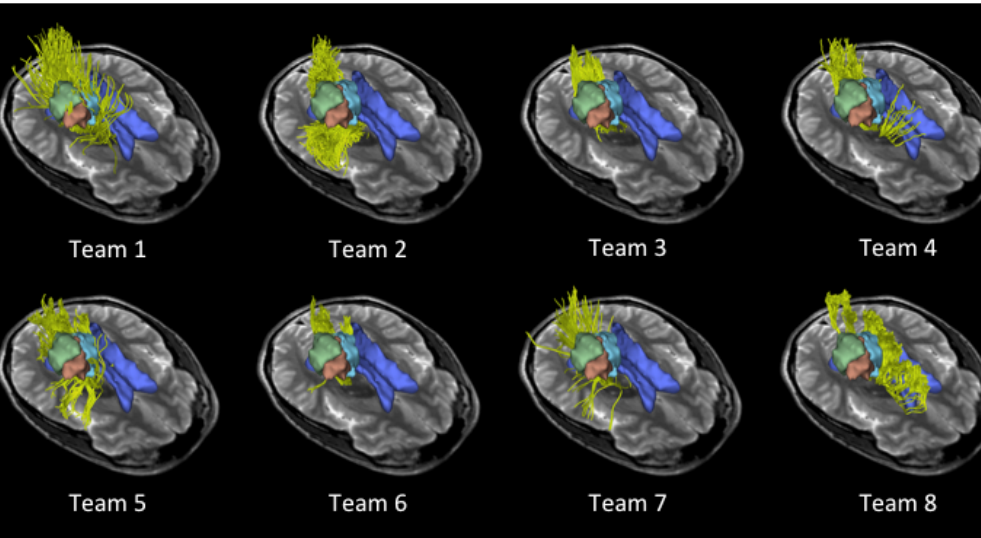


Overall Score [1-10]

1	2	3	4	5	6	7	8	9-1	9-5
4	7.66	3.3	4.75	4.75	5	4.25	2.25	6	6



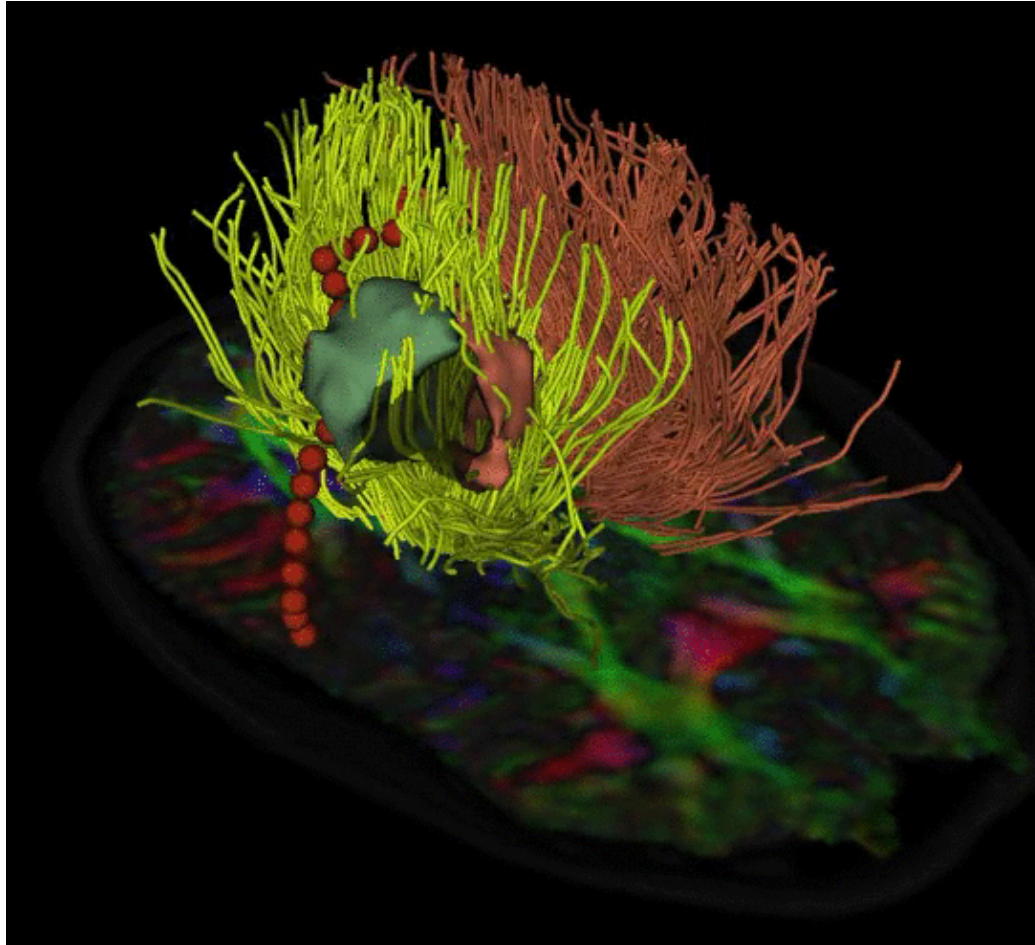
Workshops findings



- Large intra- and inter-algorithm variability
- Reviewer variability
- Improved results for some of teams

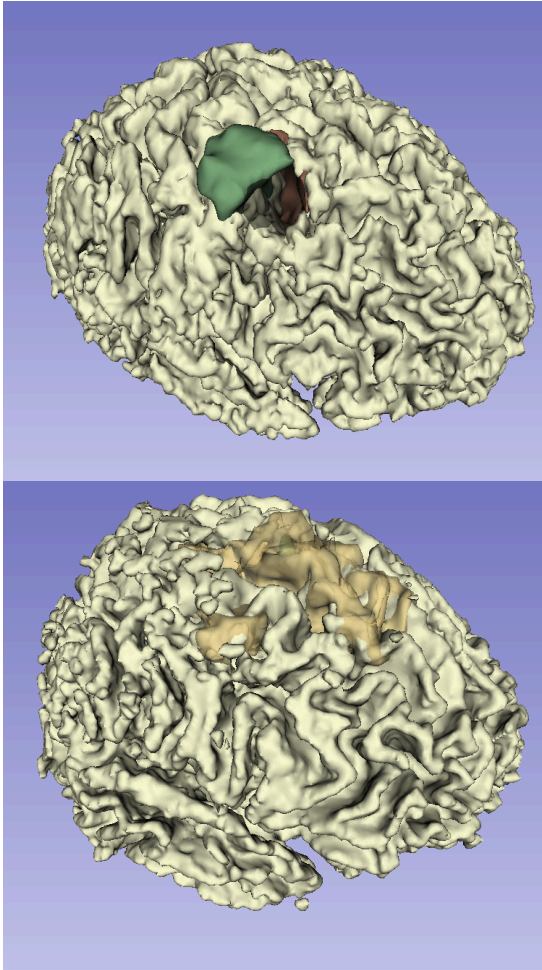


CST Lateral Projections





Back to the Patients



Patient 1: 47 yo professional golfer

Patient 2 : 32 yo woman with recurrent seizures

→ Tractography needs to be used with caution



MICCAI DTI Challenge: An international Effort

The two editions of the DTI Challenge gathered an international group representing 16 leading organizations

- DTI Experts
- Practising neurosurgeons
- Tractography algorithms developers
- Neuroradiologists

14th International Conference on Medical Image Computing and Computer Assisted Intervention



**DTI Tractography for Neurosurgical Planning:
A Grand Challenge**

MICCAI 2011 Workshop
Sunday September 18, 9am-6pm
Westin Harbour Castle
Toronto, Canada

Workshop Faculty
Soma Pujol, PhD, Surgical Planning Laboratory, Harvard Medical School
Bar Kikinis, MD, Surgical Planning Laboratory, Harvard Medical School
Alexandra Golby, MD, Brigham and Women's Hospital, Harvard Medical School
Guido Geng, PhD, The Scientific Computing and Imaging Institute, University of Utah
Martin Styner, PhD, NeuroImage Research and Analysis Laboratory, University of North Carolina
William Wells, PhD, Surgical Planning Laboratory, Harvard Medical School
Carl-Fredrik Westin, PhD, Laboratory of Mathematics in Imaging, Harvard Medical School
Sylvain Goutard, MSc, The Scientific Computing and Imaging Institute, University of Utah

National Alliance for Medical Image Computing
http://www.na-mic.org/Workshops/Workshop_DTITractography_Challenge_MICCAI_2011

MICCAI 2012 DTI Tractography Challenge
Second Edition

INTRODUCTION THE CHALLENGE FACULTY KEYNOTE SPEAKER DATA REGISTRATION CONTACT

Welcome to the 2nd edition of the MICCAI DTI Tractography Challenge. The workshop will be held on Monday October 1st, 2012 as part of the 15th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI 2012).

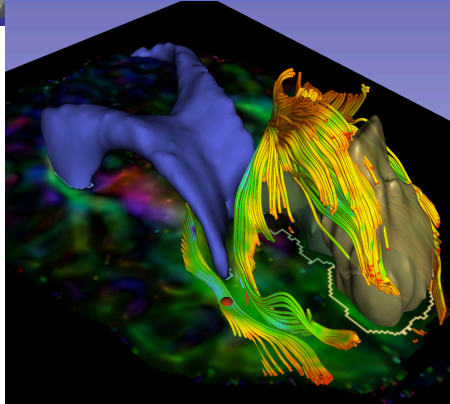
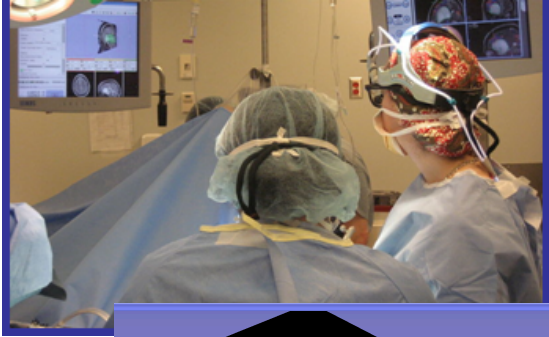


The 15th International Conference on Medical Image Computing and Computer Assisted Intervention
1-5 October 2012 - Acropolis Convention Center - Nice, France





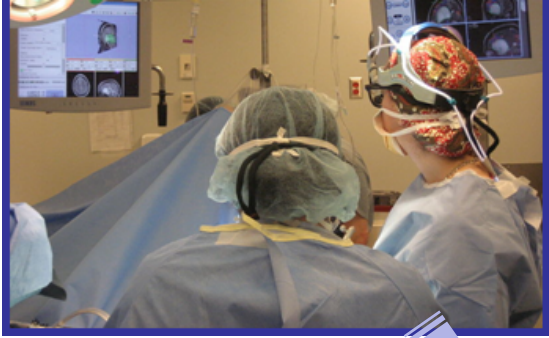
Working Group



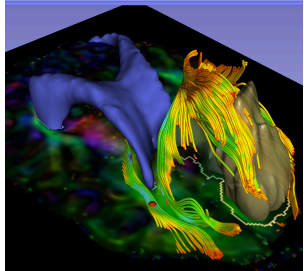
- Long-term goal: Validation
- Short-term goal:
Standardization effort:
 - Anatomy
 - Data
 - Evaluation



Working Group



Two-way bridge between the scientists who create the tractography tools, and the neurosurgeons who will use the tools in the clinics.





DTI Challenge: Conclusion

- Appropriate reflection of the current state of the art in the field
- Submission of an abstract to World Congress of Neurosurgery (WFNS 2013)
- Submission of new challenge proposal to MICCAI 2013
- On-going learning effort for the community

