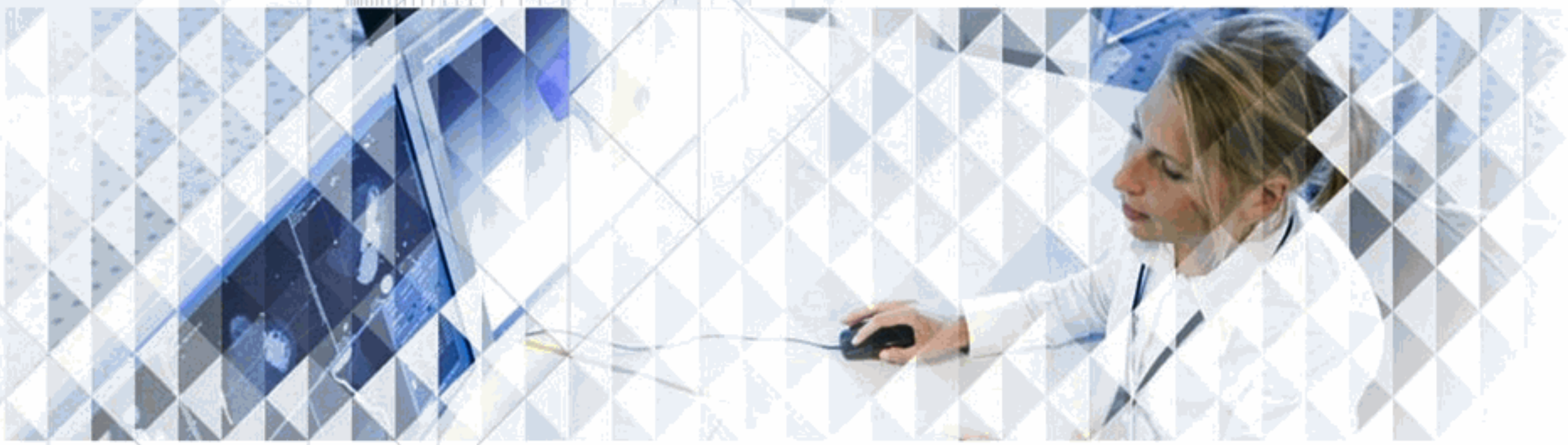


Recent Developments on Quantitative Multimodal Imaging at Fraunhofer MEVIS

From Research to Clinical Use

Horst Hahn
Fraunhofer MEVIS and Jacobs University

NA-MIC all hands meeting
10 Jan 2013, Salt Lake City

Fraunhofer MEVIS

Fraunhofer
MEVIS

Institute for Medical Image Computing

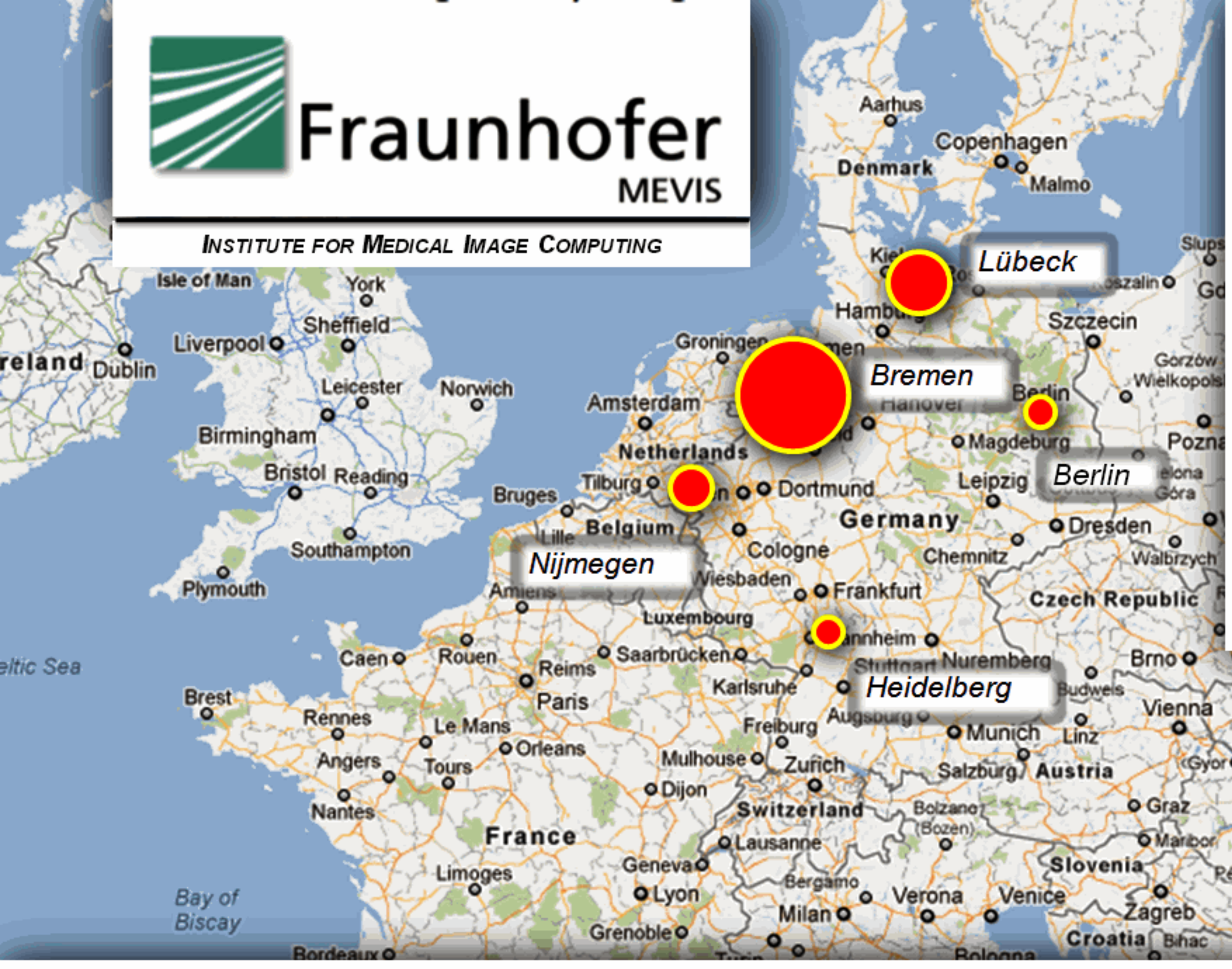
Bremen, Lübeck,
Nijmegen, Heidelberg, Berlin*

Horst Hahn

Bremen Townhall (~1400)
&
Cathedral (~1100)

Fraunhofer MEVIS

Institute for Medical Image Computing



Brain
Lung
Breast
Prostate
Liver
Kidney
Colon
Cardio-Vascular

Diagnosis, Intervention, Therapy:

Image Processing, Visualization, HCI, IGT/Navigation, CAD, Registration, MR Sequence Development, Biophysical Modeling and Simulation

Fraunhofer MEVIS *and* MeVis Medical Solutions

two independent institutions originating from Bremen

non-profit
research organisation

~100

Fraunhofer
MEVIS

INSTITUTE FOR MEDICAL IMAGE COMPUTING

www.mevis.fraunhofer.de

commercial, Inc., AG,
stock exchange since Nov 2007

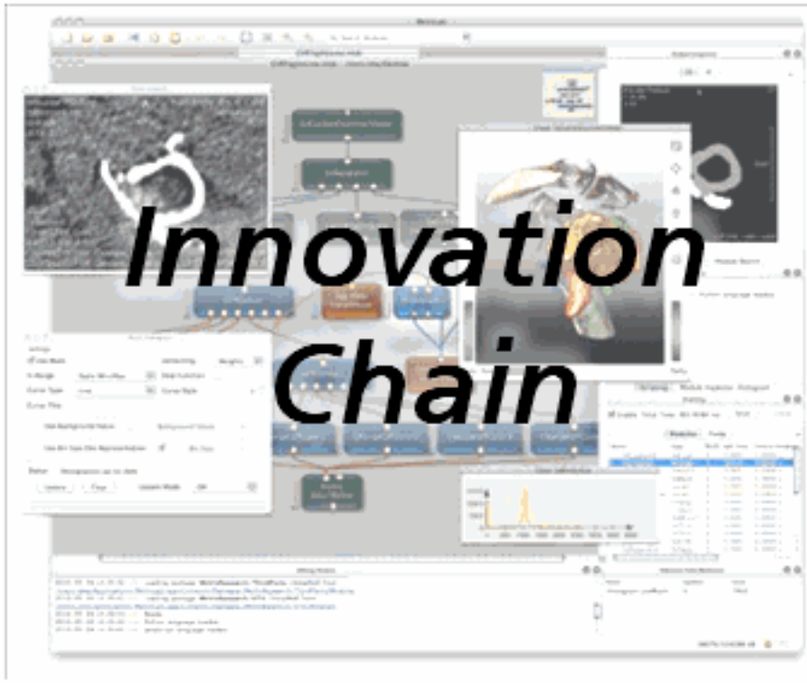
~170

MeVis
MEDICAL SOLUTIONS

51% → MeVis BREASTCARE

41% → Medis

12. September 2006
TV-Studio Berlin ZDF



Innovation Chain

DEUTSCHER GRÜNDER PREIS

Eine Initiative von

stern | Sparkasse

ZDF | PORSCHE

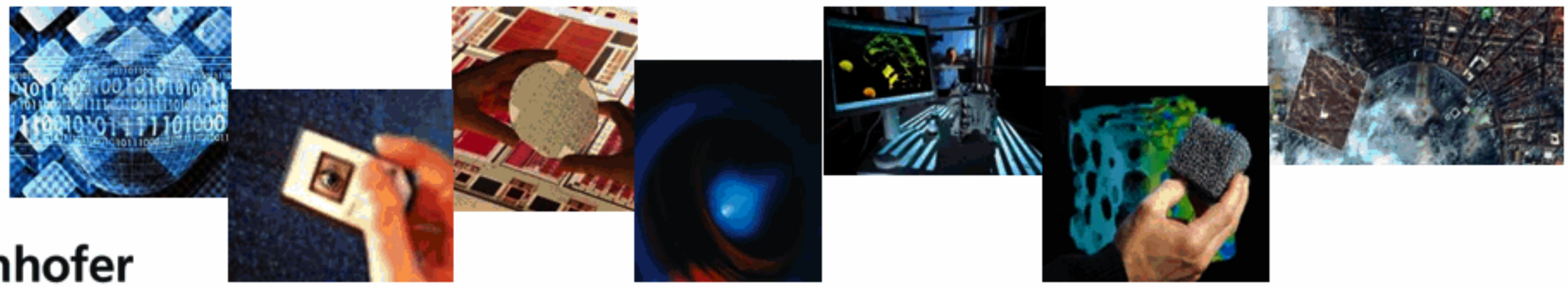
Fraunhofer MEVIS since Jan 2009

Fraunhofer Gesellschaft

- *60 institutes and 20+ centers in Germany*
- *20,326 employees in 2011*
- *1.85 billion (Mrd) EUR total budget in 2011*
- *200 million EUR forgeign revenues in 2011*
- *> 70% external revenues*

7 Groups:

- Information and Communication Technology
- Life Sciences
- Microelectronics
- Light & Surfaces
- Production
- Materials and Components - MATERIALS
- Defense and Security

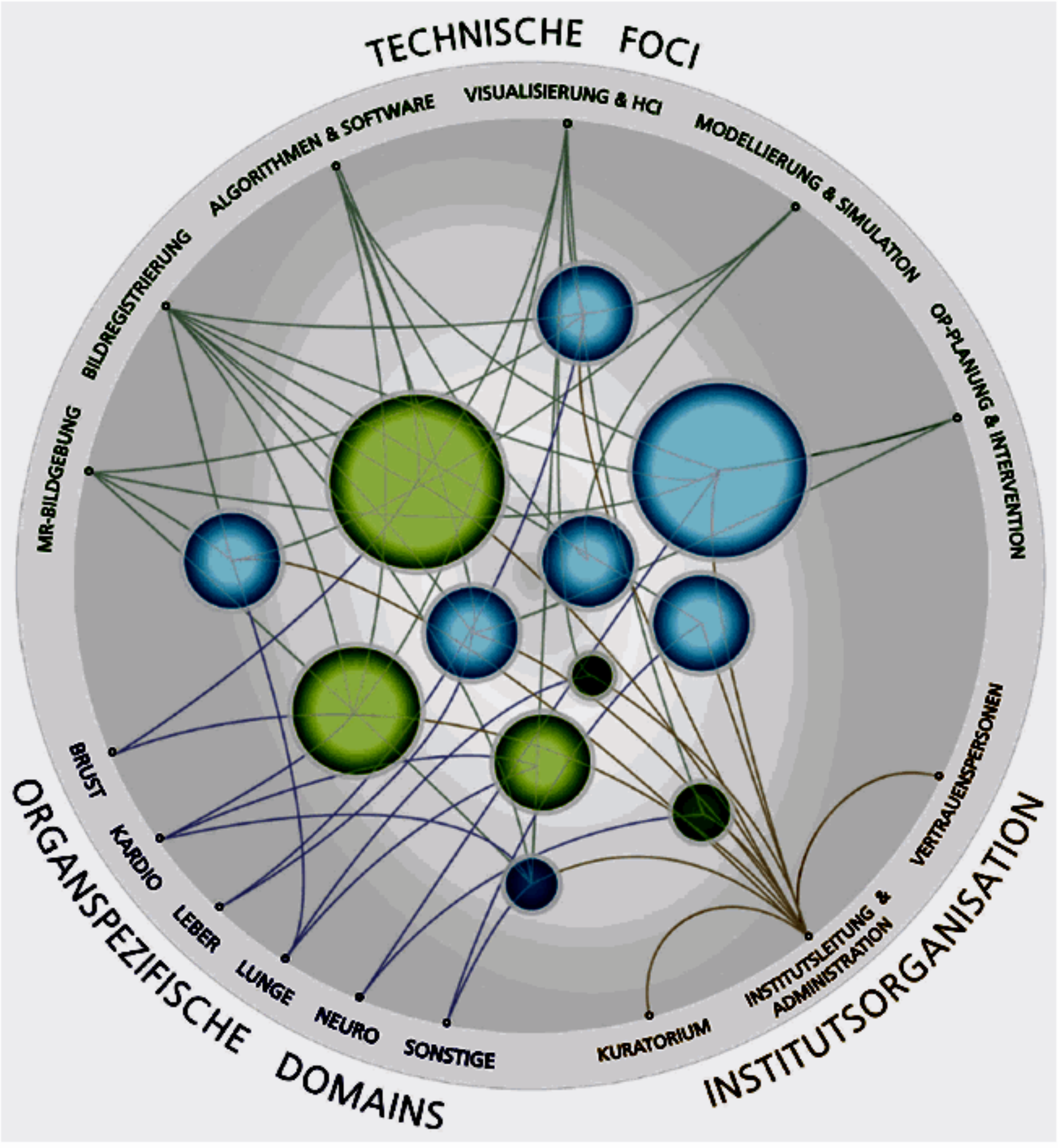


Fraunhofer MEVIS

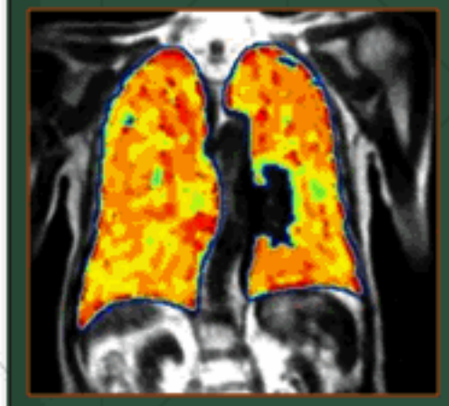
Internal Structure

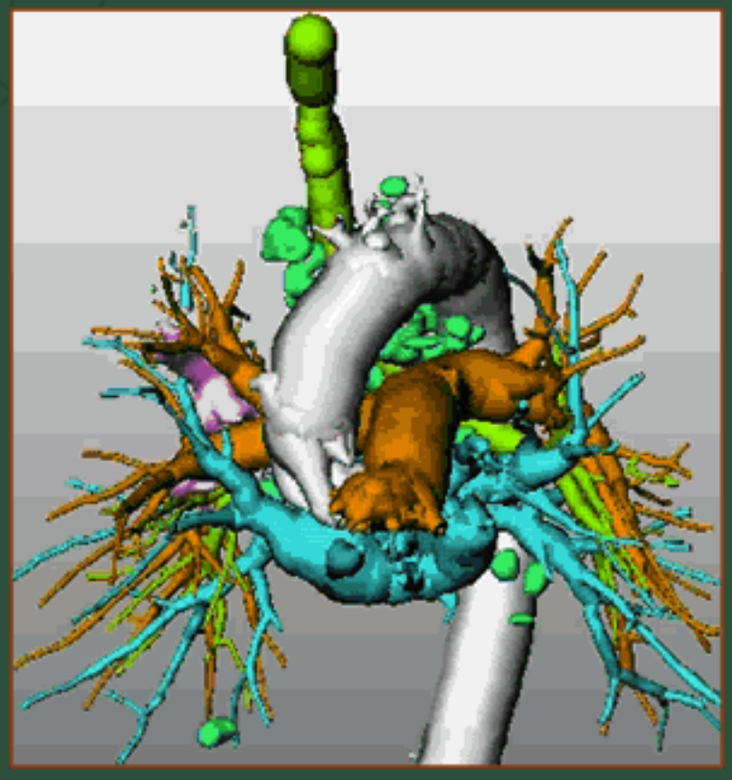
* domains
* foci
* projects

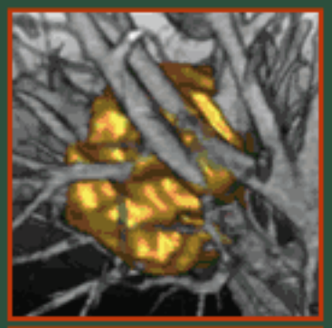
no bordered departments or groups

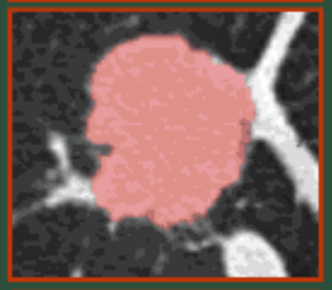


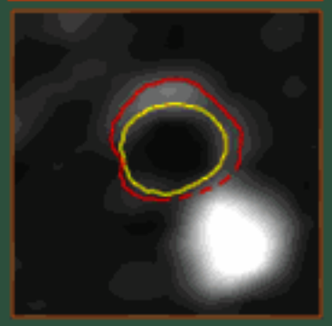
Lung Domain: Computer-based Methods for Quantitative Analysis of Pulmonary MR- and CT Images

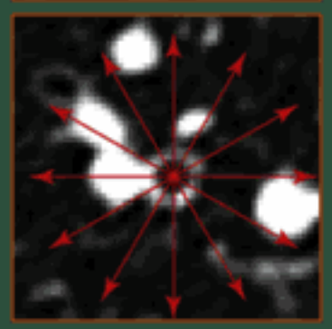


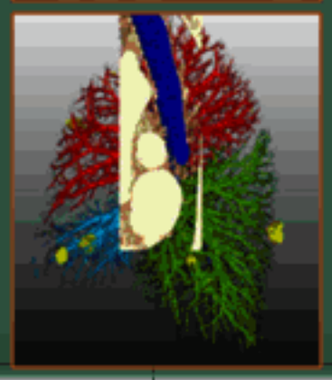


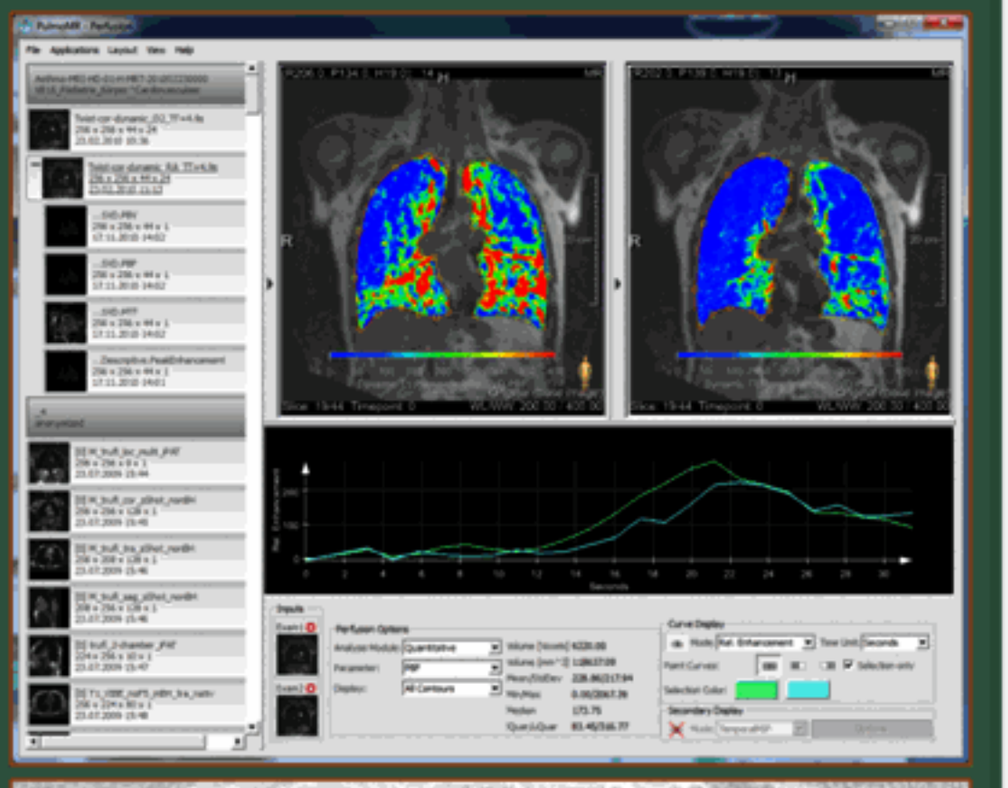


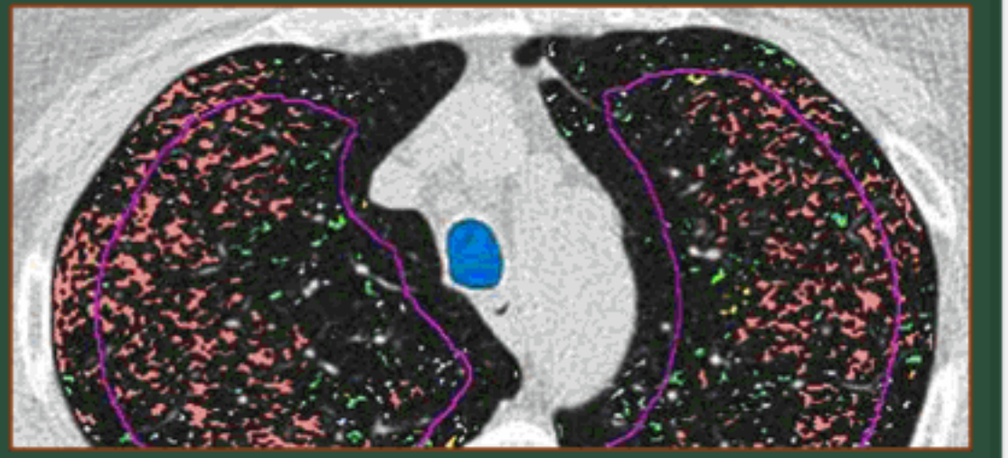


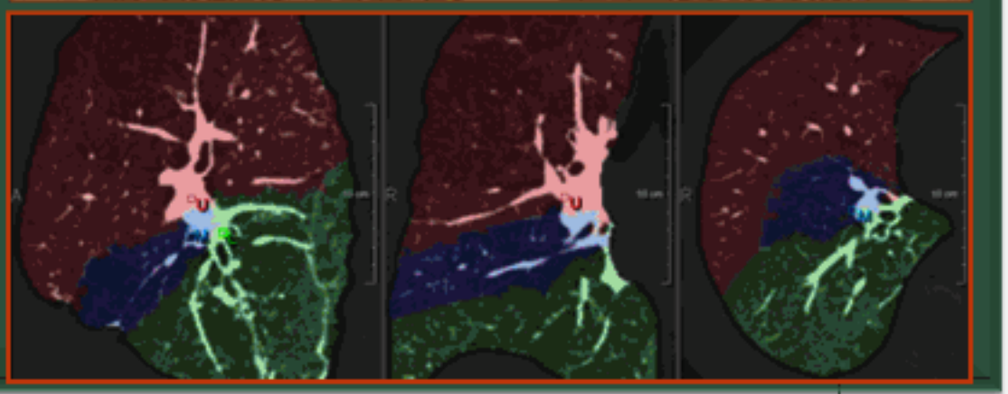


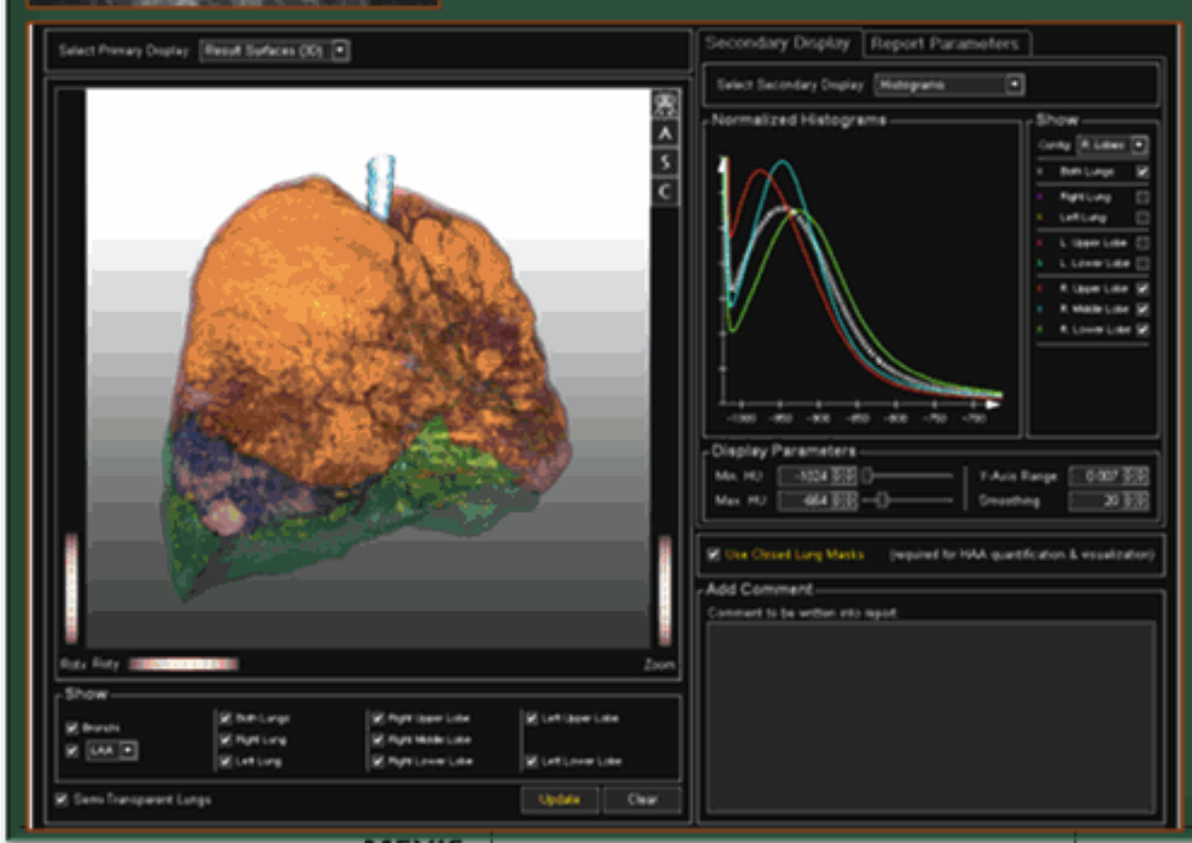




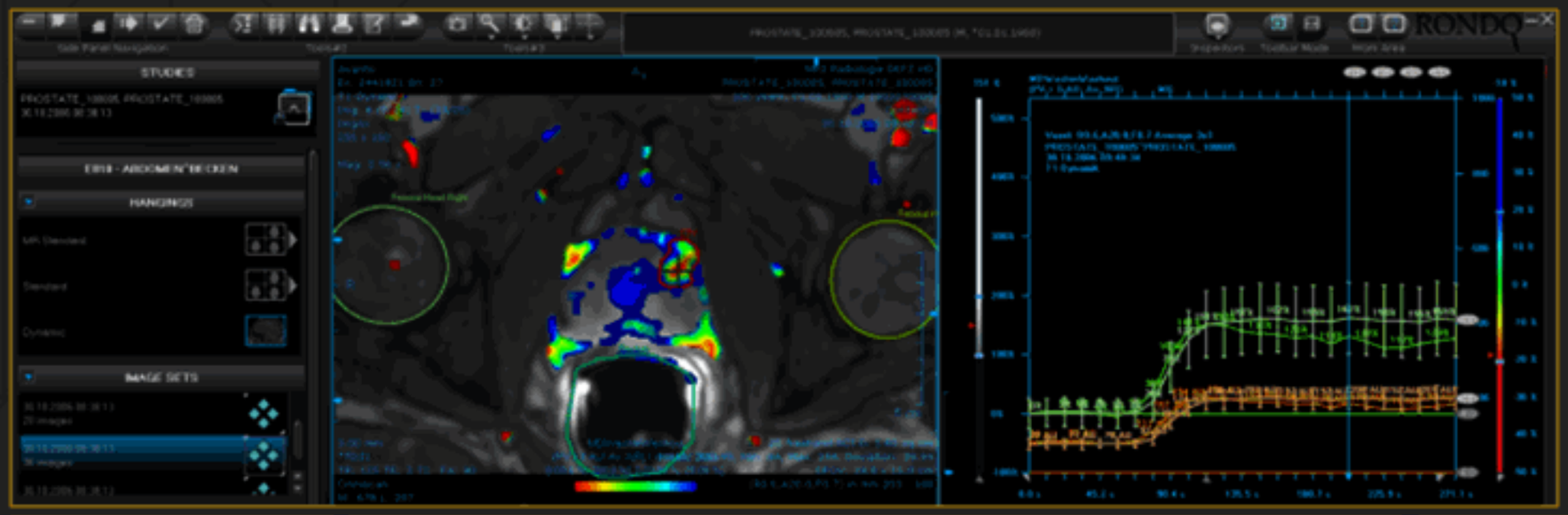


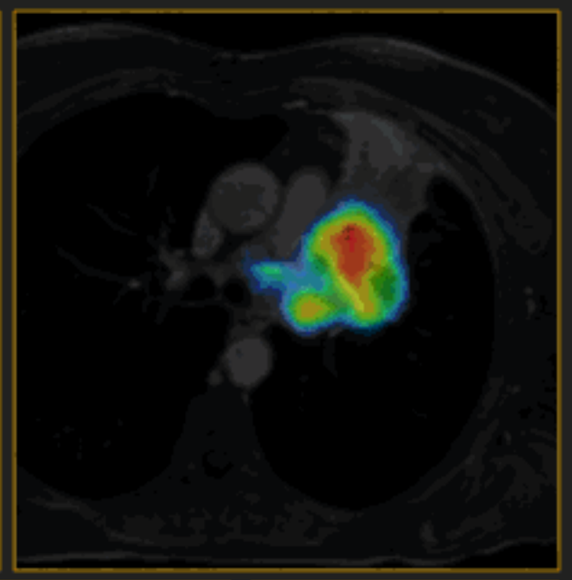


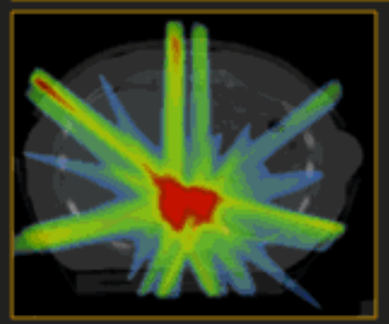


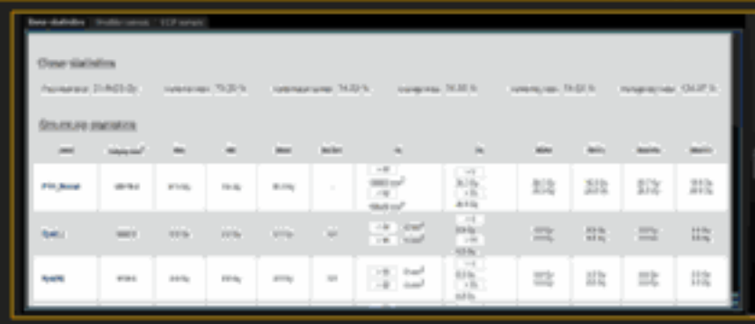


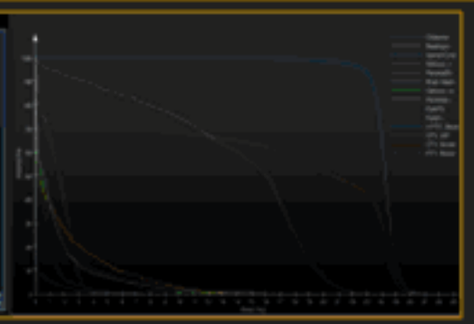
Onco Domain: Multimodal Diagnosis of Oncological Diseases and Optimization of Radiation Therapy Through Molecular Imaging

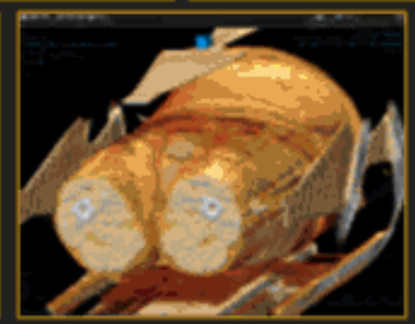


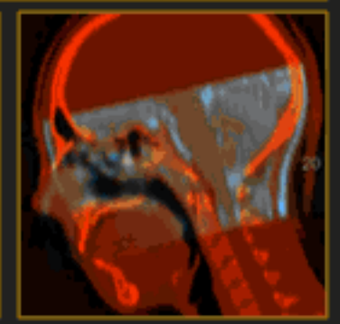








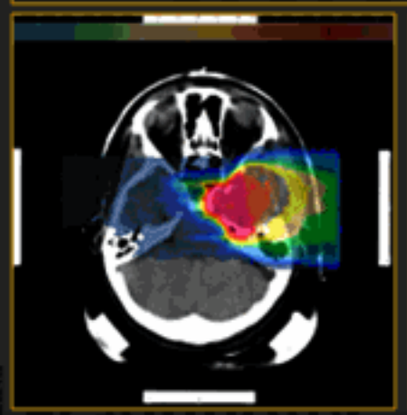


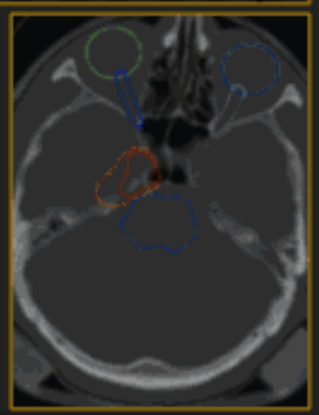


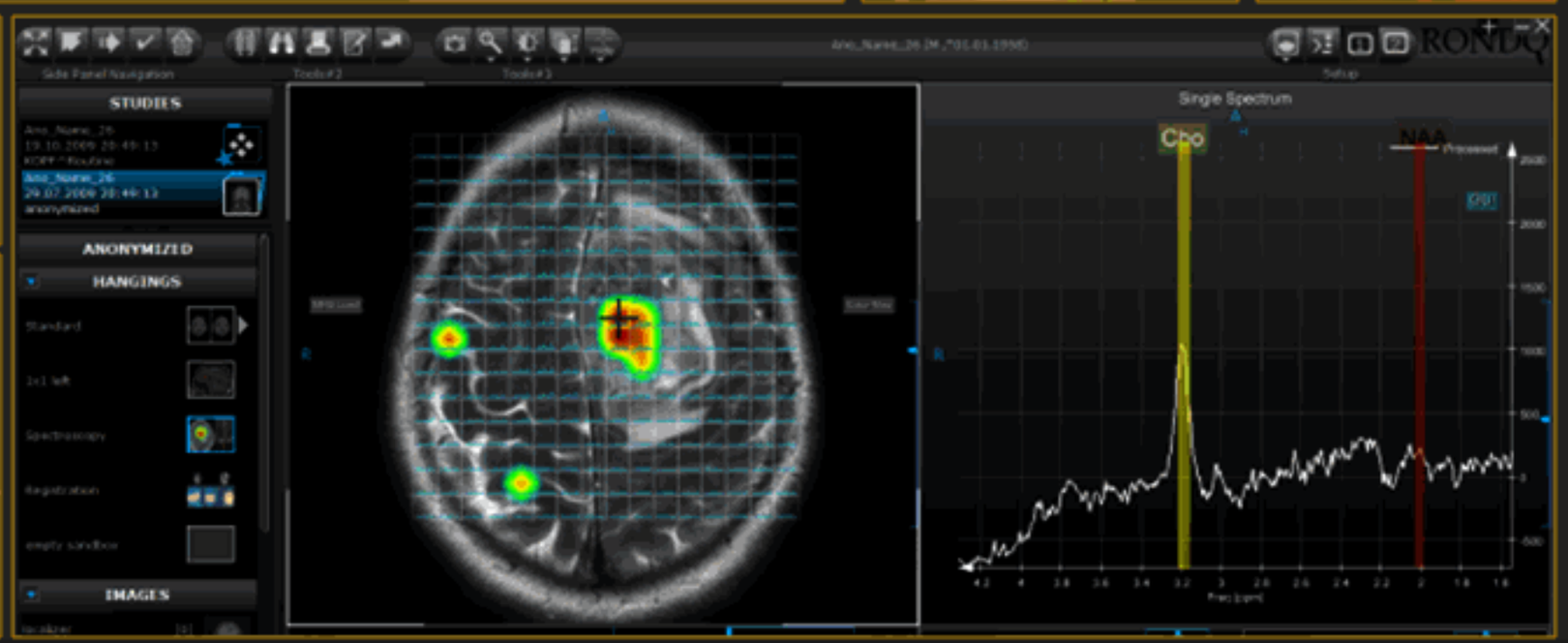
Fraunhofer MEVIS

MeVis MEDICAL SOLUTIONS

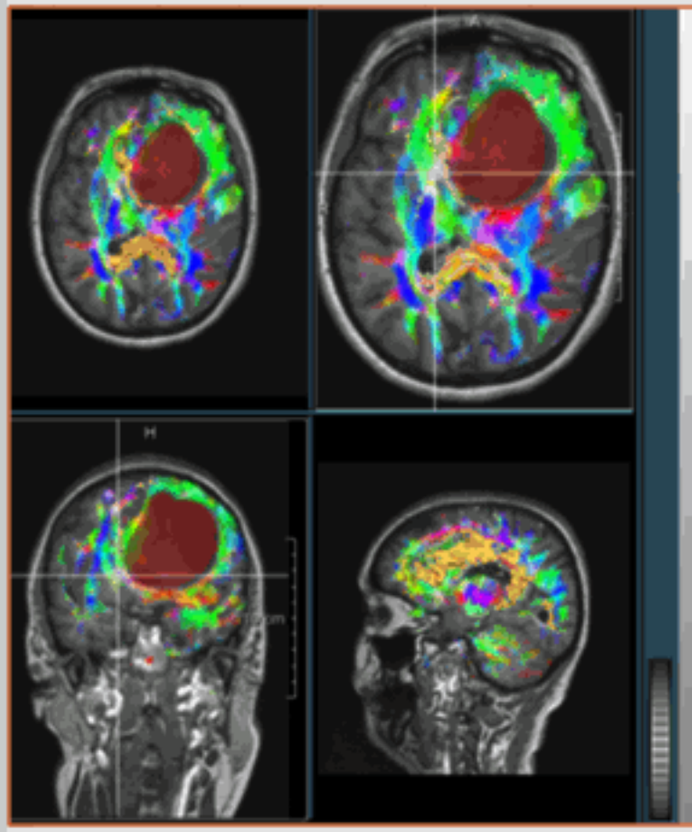
RONDO

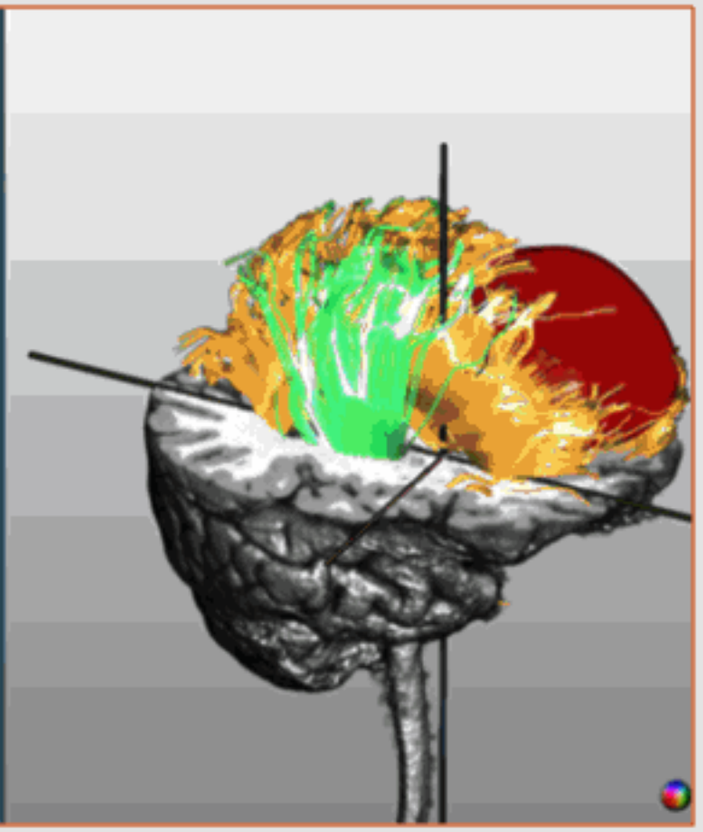


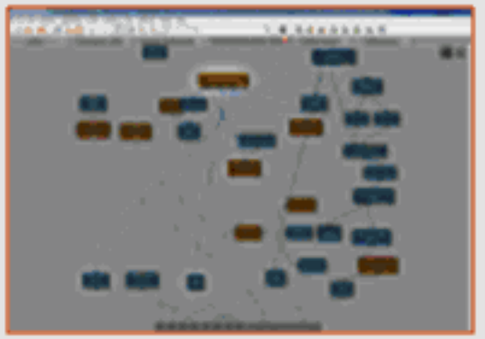


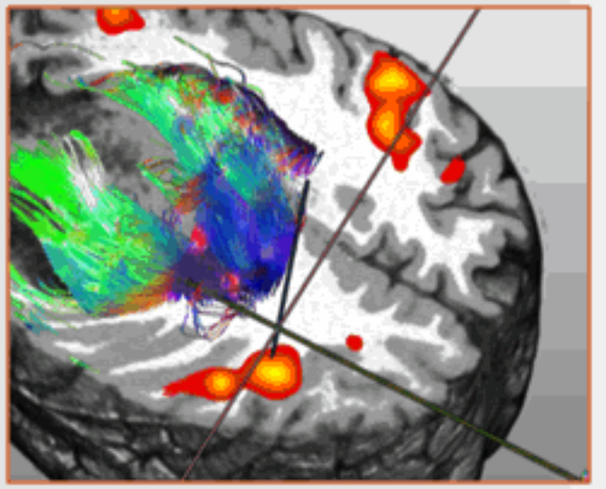


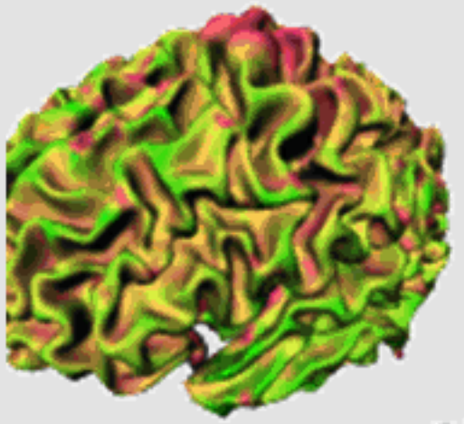
Neuro Domain: An Extendible Software Assistant for Efficient and Reproducible Evaluation of Neuroimaging Data

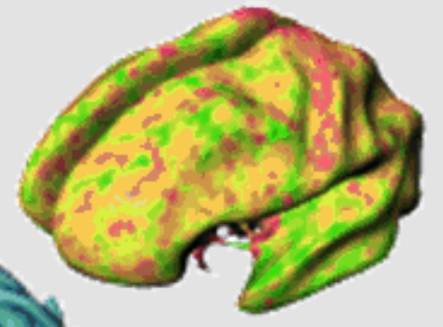


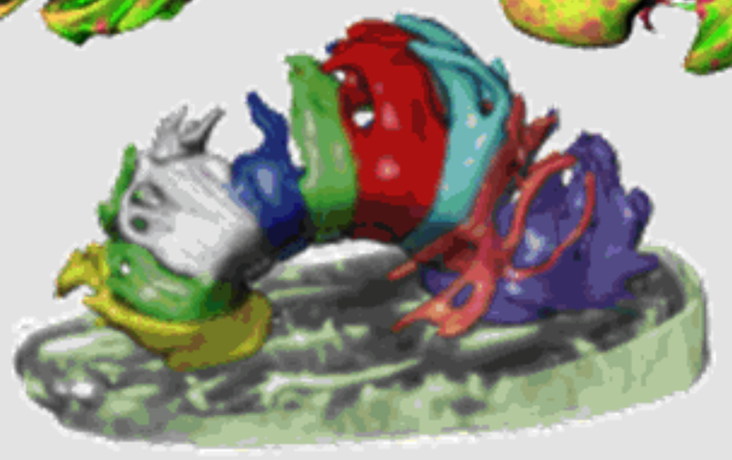


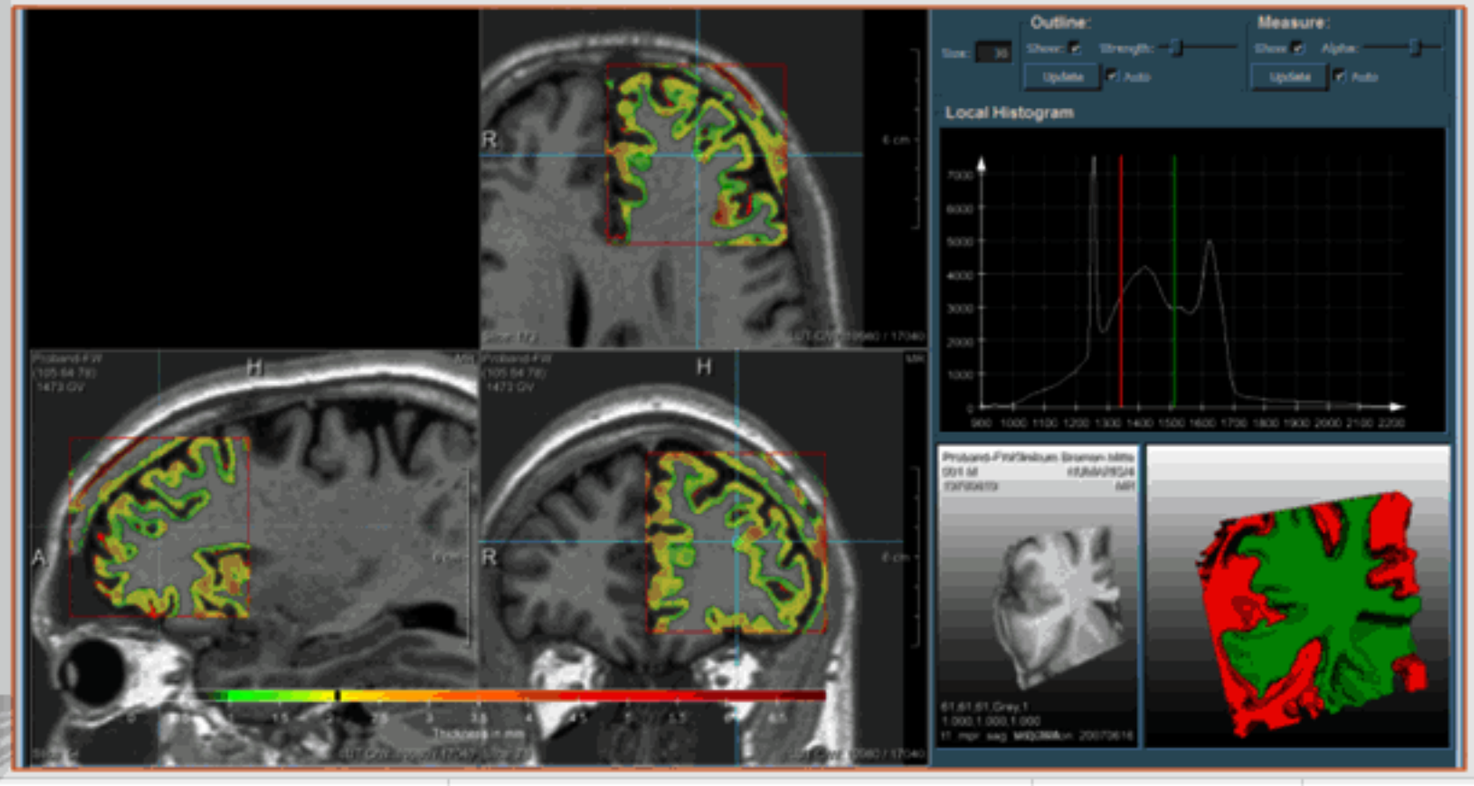


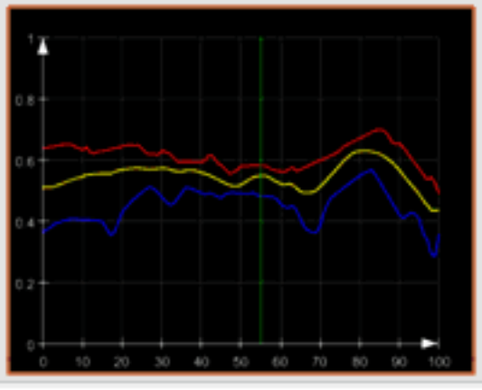


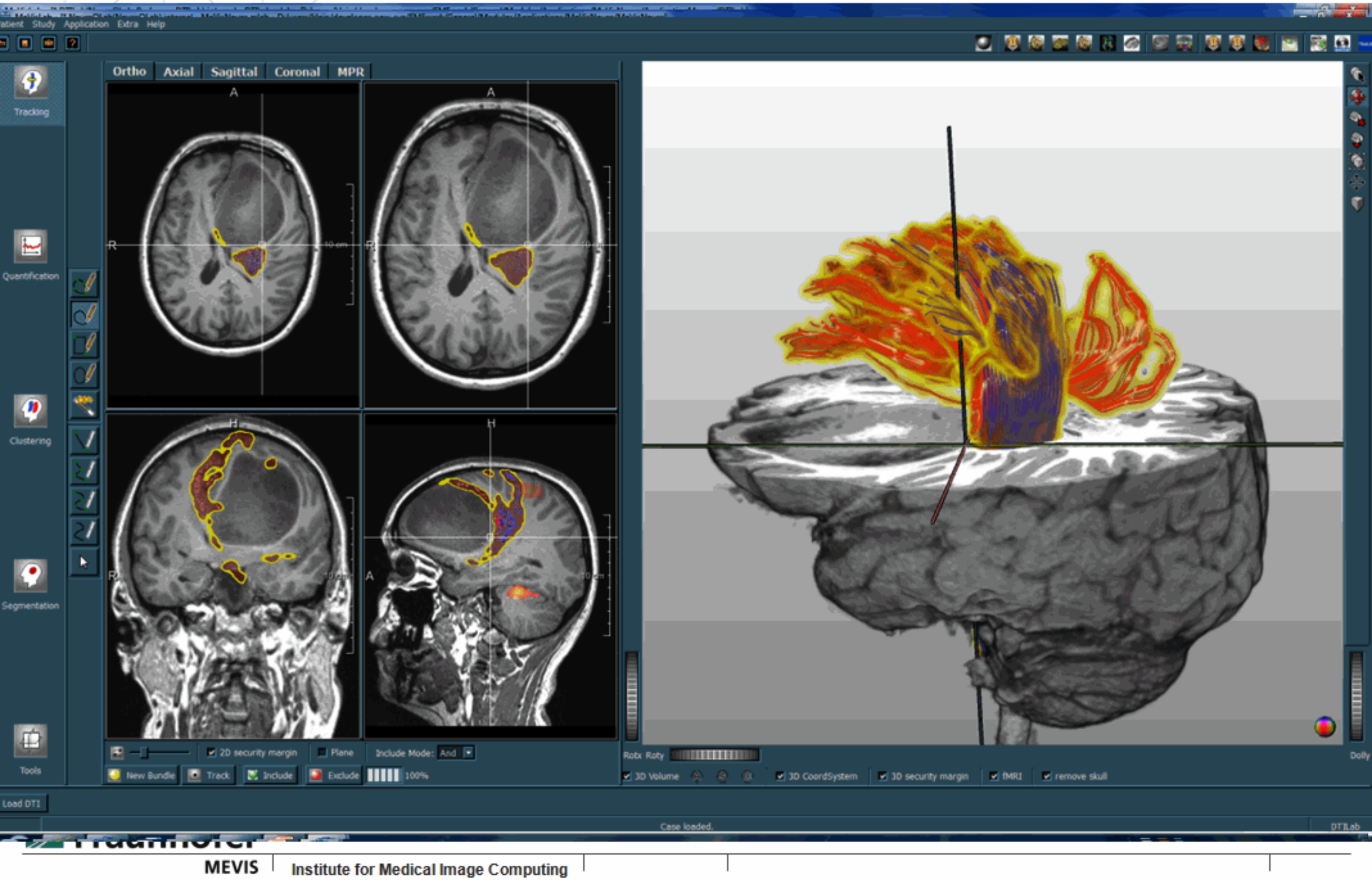








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Tracking
Quantification
Clustering
Segmentation
Tools
Ortho
Axial
Sagittal
Coronal
MPR
2D security margin
Plane
Include Mode:
And
New Bundle
Track
Include
Exclude
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Load DTI
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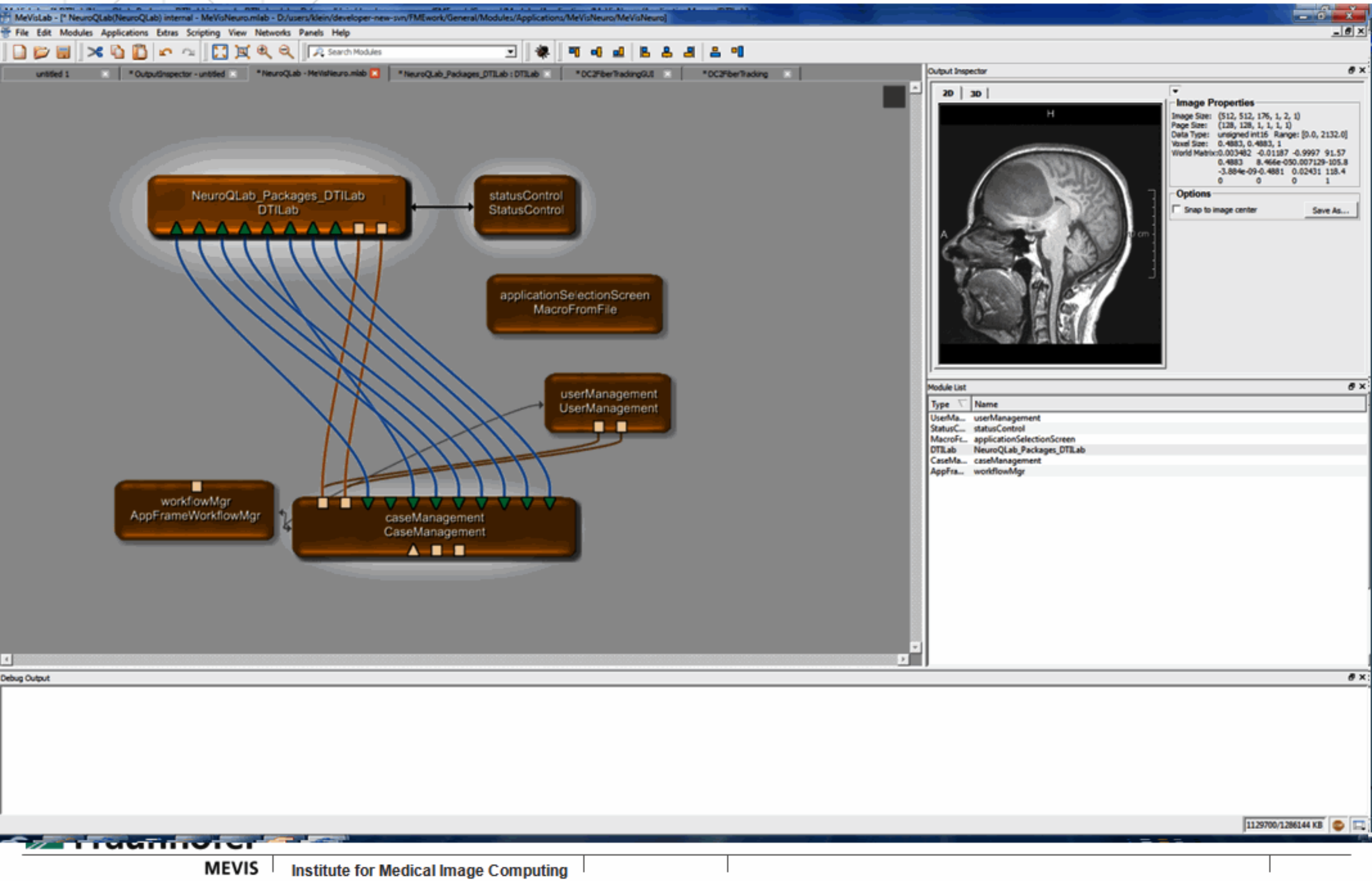
DTILab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File Edit Modules Applications Extras Scripting View Networks Panels Help
Search Modules
untitled 1
* OutputInspector - untitled
* NeuroQLab - MeVisNeuro.mlab
* NeuroQLab_Packages_DTILab : DTILab
* DC2FiberTrackingGUI
* DC2FiberTracking
NeuroQLab_Packages_DTILab
DTILab
statusControl
StatusControl
applicationSelectionScreen
MacroFromFile
userManagement
UserManagement
workflowMgr
AppFrameWorkflowMgr
caseManagement
CaseManagement
Output Inspector
2D
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A
Image Properties
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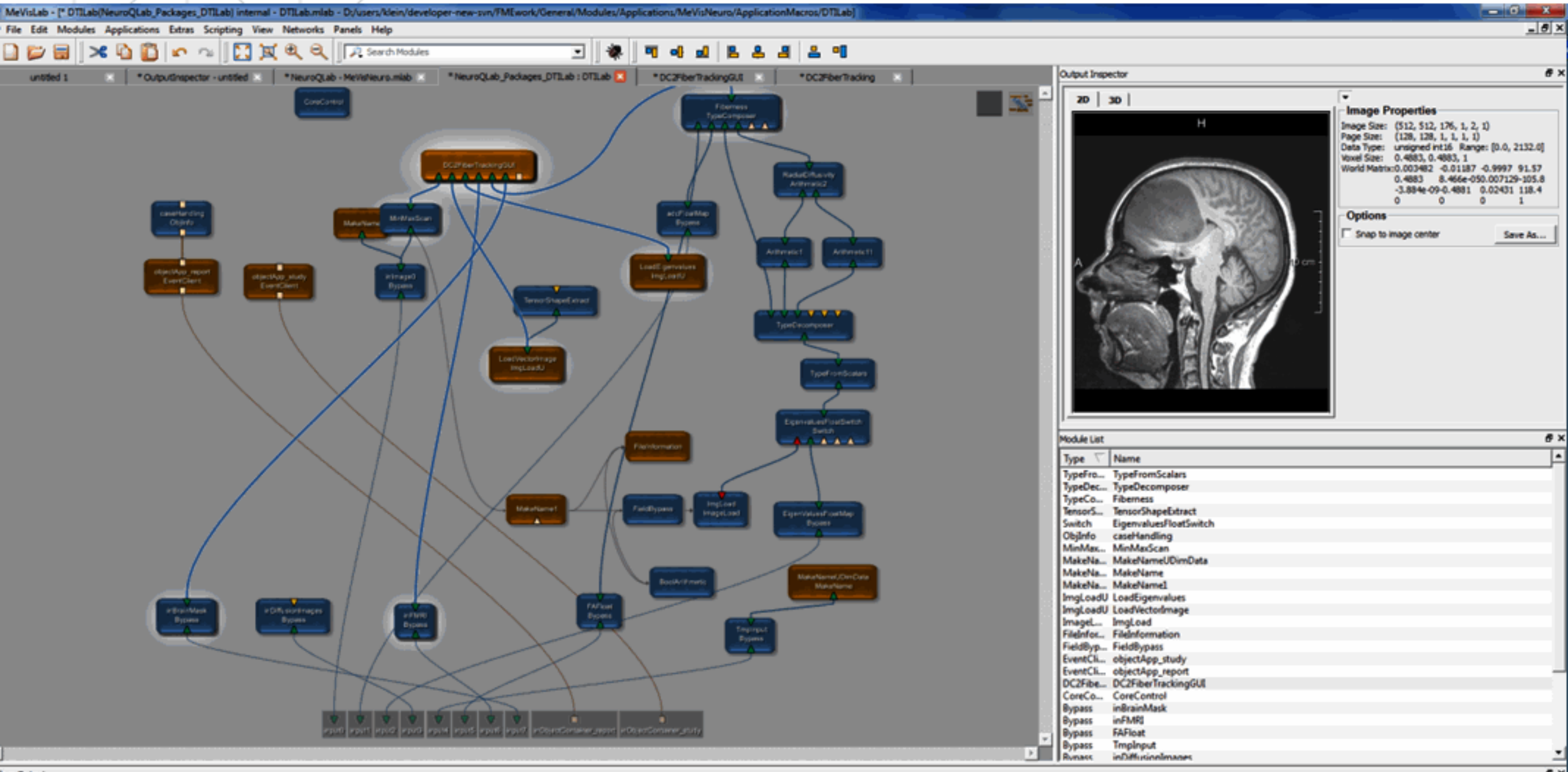
0.4883 8.466e-05 0.007129 -105.8
-3.884e-09 -0.4881 0.02431 118.4
0 0 0 1
Options
Snap to image center
Save As...
Module List
Type
Name
UserMa... userManagement
StatusC... statusControl
MacroFc... applicationSelectionScreen
DTILab NeuroQLab_Packages_DTILab
CaseMa... caseManagement
AppFra... workflowMgr
Debug Output
1129700/1286144 KB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File Edit Modules Applications Extras Scripting View Networks Panels Help
Search Modules
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*OutputInspector - untitled
*NeuroQLab - MeVisNeuro.mlab
*NeuroQLab_Packages_DTILab : DTILab
*DC2FiberTrackingGUI
*DC2FiberTracking
CoreControl
DC2FiberTrackingGUI
MinMaxScan
TensorShapeExtract
LoadEigenvalues
TypeDecomposer
TypeFromScalars
MakeName1
FieldBypass
ImgLoad
EigenvaluesFloatSwitch
BoolArithmetic
FAFloat
TmpInput
FileInformation
inBrainMask
inDiffusionImages
inFMRI
inObjectContainer_report
inObjectContainer_study
Output Inspector
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Image Properties
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0 0 0 1
Options
Snap to image center
Save As...
Module List
Type
Name
TypeFro... TypeFromScalars
TypeDec... TypeDecomposer
TypeCo... Fiberness
TensorS... TensorShapeExtract
Switch EigenvaluesFloatSwitch
ObjInfo caseHandling
MinMax... MinMaxScan
MakeNa... MakeNameUDimData
MakeNa... MakeName
MakeNa... MakeName1
ImgLoadU LoadEigenvalues
ImgLoadU LoadVectorImage
ImageL... ImgLoad
FileInfor... FileInformation
FieldByp... FieldBypass
EventCli... objectApp_study
EventCli... objectApp_report
DC2Fibe... DC2FiberTrackingGUI
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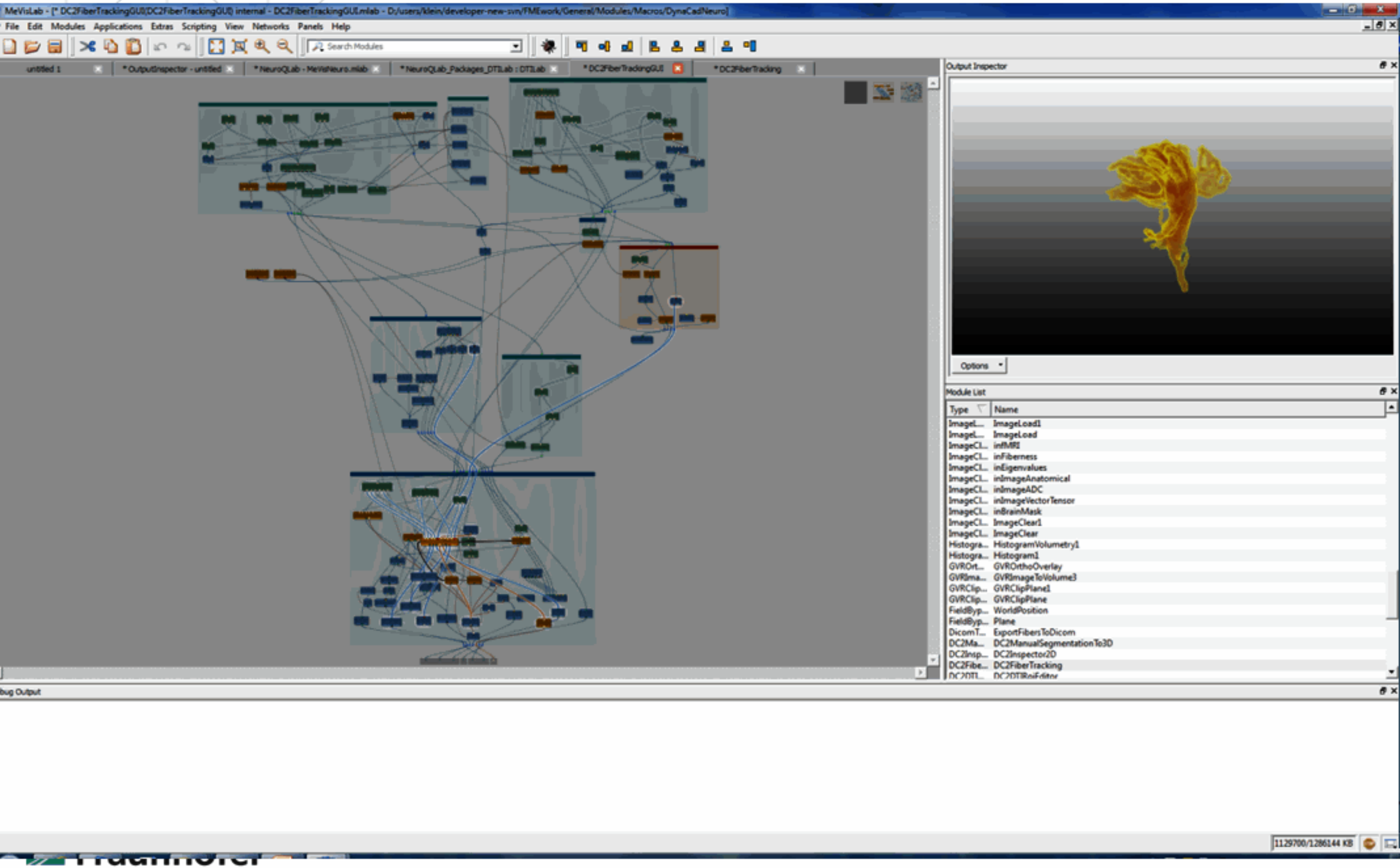
Debug Output
1129700/1286144 KB


MeVisLab - [* DC2FiberTrackingGUI(DC2FiberTrackingGUI) internal - DC2FiberTrackingGUI.mlab - D:/users/klein/developer-new-svn/FMEwork/General/Modules/Macros/DynaCadNeuro]
File Edit Modules Applications Extras Scripting View Networks Panels Help
Search Modules
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*OutputInspector - untitled
*NeuroQLab - MeVisNeuro.mlab
*NeuroQLab_Packages_DTILab : DTILab
*DC2FiberTrackingGUI
*DC2FiberTracking
Output Inspector
Options
Module List
Type
Name
ImageL... ImageLoad1
ImageL... ImageLoad
ImageCL... infMRI
ImageCL... inFiberness
ImageCL... inEigenvalues
ImageCL... inImageAnatomical
ImageCL... inImageADC
ImageCL... inImageVectorTensor
ImageCL... inBrainMask
ImageCL... ImageClear1
ImageCL... ImageClear
Histogra... HistogramVolumetry1
Histogra... Histogram1
GVROrt... GVROrthoOverlay
GVRIma... GVRImageToVolume3
GVRClip... GVRClipPlane1
GVRClip... GVRClipPlane
FieldByp... WorldPosition
FieldByp... Plane
DicomT... ExportFibersToDicom
DC2Ma... DC2ManualSegmentationTo3D
DC2Insp... DC2Inspector2D
DC2Fibe... DC2FiberTracking
bug Output
1129700/1286144 KB

MeVisLab - [* DC2FiberTrackingGUI(DC2FiberTrackingGUI) internal - DC2FiberTrackingGUI.mlab - D:/users/klein/developer-new-svn/TMEwork/General/Modules/Macros/DynaCadNeuro]
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*OutputInspector - untitled
*NeuroQLab - MeVisNeuro.mlab
*NeuroQLab_Packages_DTILab : DTILab
*DC2FiberTrackingGUI
*DC2FiberTracking
Output Inspector
Options
Module List
Type
Name
ImageL... ImageLoad1
ImageL... ImageLoad
ImageCL... infMRI
ImageCL... inFiberness
ImageCL... inEigenvalues
ImageCL... inImageAnatomical
ImageCL... inImageADC
ImageCL... inImageVectorTensor
ImageCL... inBrainMask
ImageCL... ImageClear1
ImageCL... ImageClear
Histogra... HistogramVolumetry1
Histogra... Histogram1
GVROrt... GVROrthoOverlay
GVRIma... GVRImageToVolume3
GVRClip... GVRClipPlane1
GVRClip... GVRClipPlane
FieldByp... WorldPosition
FieldByp... Plane
DicomT... ExportFibersToDicom
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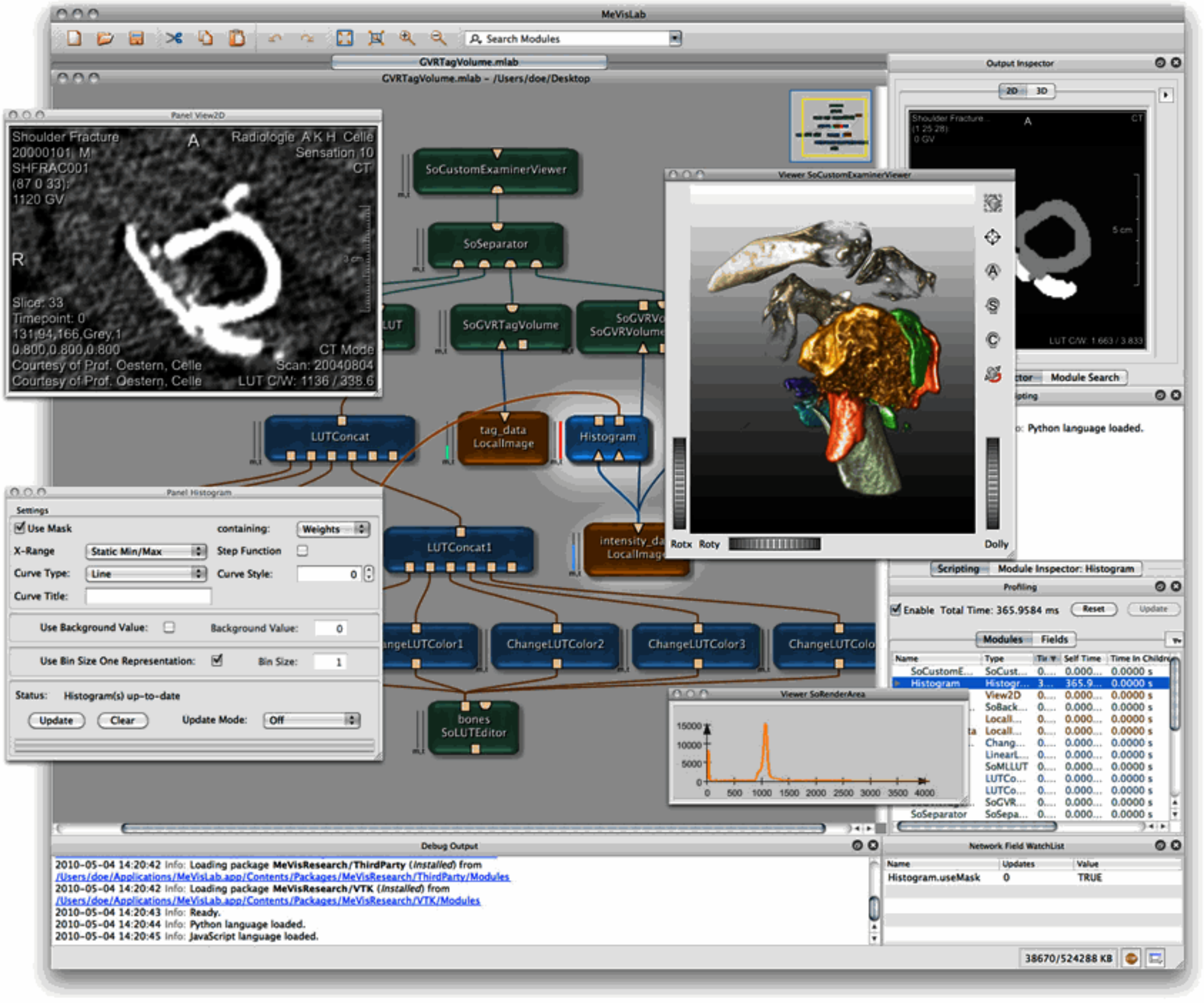
DC2Fibe... DC2FiberTracking
Debug Output
1129700/1286144 KB


MeVisLab
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Panel View2D
Shoulder Fracture
20000101 M
SHFRAC001
(87 0 33):
1120 GV
A
Radiologie AKH Celle
Sensation 10
CT
R
Slice: 33
Timepoint: 0
131,94,166,Grey,1
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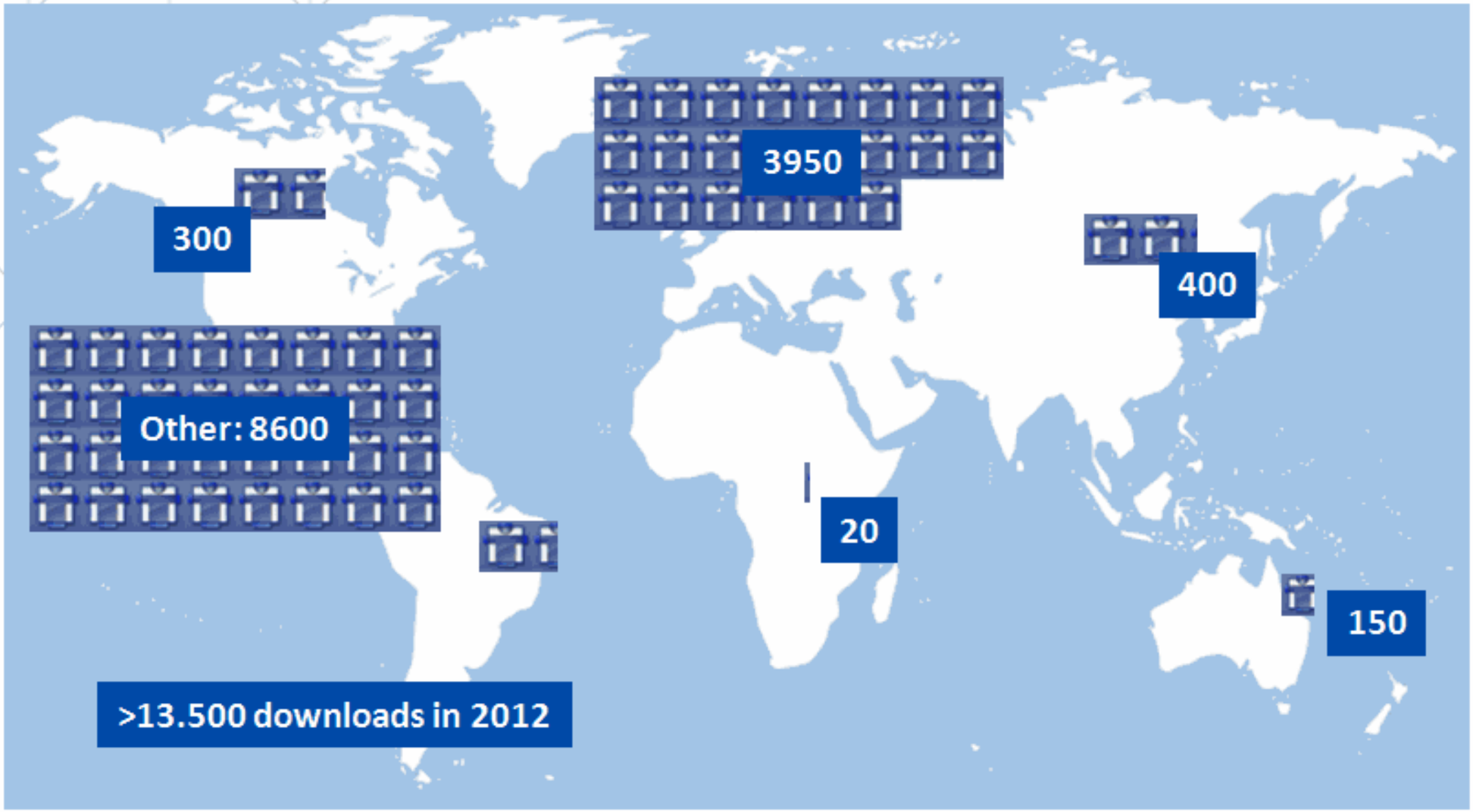
Courtesy of Prof. Oestern, Celle
Courtesy of Prof. Oestern, Celle
CT Mode
Scan: 20040804
LUT C/W: 1136 / 338.6
SoCustomExaminerViewer
SoSeparator
SoGVRTagVolume
LUTConcat
tag_data
LocalImage
Histogram
LUTConcat1
ChangeLUTColor1
ChangeLUTColor2
ChangeLUTColor3
bones
SoLUTEditor
Viewer SoCustomExaminerViewer
Rotx Roty
Dolly
Output Inspector
2D 3D
LUT C/W: 1663 / 3833
Module Search
Python language loaded.
Scripting
Module Inspector: Histogram
Profiling
Enable Total Time: 365.9584 ms
Reset
Update
Modules
Fields
Viewer SoRenderArea
Panel Histogram
Settings
Use Mask
containing:
Weights
X-Range
Static Min/Max
Step Function
Curve Type:
Line
Curve Style:
Curve Title:
Use Background Value:
Background Value:
Use Bin Size One Representation:
Bin Size:
Status:
Histogram(s) up-to-date
Update
Clear
Update Mode:
Off
Debug Output
2010-05-04 14:20:42 Info: Loading package MeVisResearch/ThirdParty (installed) from
/Users/doe/Applications/MeVisLab.app/Contents/Packages/MeVisResearch/ThirdParty/Modules
2010-05-04 14:20:42 Info: Loading package MeVisResearch/VTK (installed) from
/Users/doe/Applications/MeVisLab.app/Contents/Packages/MeVisResearch/VTK/Modules
2010-05-04 14:20:43 Info: Ready.
2010-05-04 14:20:44 Info: Python language loaded.
2010-05-04 14:20:45 Info: JavaScript language loaded.
Network Field WatchList
Name
Updates
Value
Histogram.useMask
0
TRUE
38670/524288 KB

MeVis
MEDICAL SOLUTIONS

MeVisLab User Community



CMIV
Center for Medical Image Science and Visualization

UNIVERSITATIS·LUBECENSIS·SIGILLUM

MHH Hannover Medical School

OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG

JÜLICH FORSCHUNGSZENTRUM

UNIVERSITÄT KOBLENZ · LANDAU

UNIVERSITÄT BERN

dkfz. DEUTSCHES KREBSFORSCHUNGSZENTRUM IN DER HELMHOLTZ-GEMEINSCHAFT

NCIRE The Veterans Health Research Institute

COLUMBIA UNIVERSITY

STANFORD UNIVERSITY

THE UNIVERSITY of WISCONSIN MADISON

5 Continents – 20 Nations
350 + Active Users Worldwide

LUMC Leiden University Medical Center

Erasmus MC

Image Sciences Institute

UMC St Radboud

MeVisLab Community W e

MeVisLab Community

The MeVisLab Community project provides add-on modules that extend the functionality of the MeVisLab software. All modules provided here are distributed as **open-source** software and maintained by the MeVisLab developer community.

Source Code

The MeVisLab Community source code is managed in a central Subversion repository hosted on SourceForge.net. The latest version of the project's trunk can be checked out with the following instruction set:

```
svn co https://mevislabmodules.svn.sourceforge.net/svnroot/mevislabmodules/trunk .
```

In order to build the MeVisLab Community source code, you need the MeVisLab Software Development Kit (SDK) which can be downloaded for free here.

Builds

The MeVisLab Community repository is continuously being compiled for Windows and Linux (Mac builds will be offered soon). Build reports and the current installers can be downloaded from the MeVisLab Community Builds page.

MeVisLab Co

The MeVisLab Community
functionality of the MeVis
open-source software an

Source Code

The MeVisLab Community
hosted on SourceForge.ne
out with the following inst

```
svn co https://mevislabmod
```

In order to build the MeVi
Software Development Kit

Builds

The MeVisLab Community
Linux (Mac builds will be
be downloaded from the M

MEVIS | Institute for Medica

MeVisLab Community Builds

Wednesday, 20. April 2011, 08:27:58

Trunk builds with MeVisLab2.1 Release SDKs of 24th of June 2010 with Qt fix.

Community Sources Main Page
View Sources
Doxygen Documentation from recent VC Rebuild
MeVisLab SDK Download Page

Community Sources Public and Administration Forum

	Rebuild	Incremental Build
LinuxGCC_64	Today, 2011/04/20 08:23	Today, 2011/04/20 08:25
MacOSXGCC_64	Today, 2011/04/20 08:11	Today, 2011/04/20 08:13
WindowsVC8	Today, 2011/04/20 07:16	Today, 2011/04/20 08:06
WindowsVC8_64	Today, 2011/04/20 05:39	Today, 2011/04/20 08:08
WindowsVC9	Today, 2011/04/20 08:02	Today, 2011/04/20 08:10

A Framework for Algorithm Evaluation and Clinical Application Prototyping using ITK

Rexilius J., Spindler W., Jomier J., Koenig M., Hahn H., Link F., Peitgen H.
MeVis, Center for Medical Diagnostic Systems and Visualization, Bremen, Germany

Published in The Insight Journal - 2005 MICCAI Open-Source Workshop.

Submitted by Jan Rexilius on 08-01-2005.

The usage of image processing has become an important and continuous growing field in medical imaging. Although a large amount of algorithms is available, only few are routinely applied within applications for clinical diagnosis support and treatment planning. New tools are required that allow for efficient evaluation and comparison of algorithms as well as the generation of dedicated user interfaces with sophisticated visualization for clinical applications. We propose a generic integration of ITK algorithms into the visual programming and rapid prototyping platform MeVisLab. One of the main limitation of ITK is its lack of visualization and interaction functionality through a dedicated development platform. MeVisLab provides a modular visual programming interface with a comprehensive suite of image processing and visualization tools. The linkage of ITK algorithms to MeVisLab is based on a two step process that consists of a generic XML description for each ITK algorithm and an automatic code generator to create new MeVisLab modules, which will be made publicly available within the free version of MeVisLab. Each module can handle different image types and data dimensions dynamically at runtime. Example applications using registration, segmentation, and visualization modules are presented in order to show the capabilities of the described integration concept.

Data

1 File (873Kb)

rexilius_miccaiWorkshop2005.pdf (873Kb) [view paper]

The PythonQt Project

SOURCEFORGE.NET

Main Page | Related Pages | Classes | Files

Introduction

PythonQt is a dynamic Python binding for the Qt framework. It offers an easy way to embed the Python scripting language into your C++ Qt applications. It makes heavy use of the QMetaObject system and thus requires Qt 4.x.

The focus of **PythonQt** is on embedding Python into an existing C++ application, not on writing the whole application completely in Python. If you want to write your whole application in Python, you should use PyQt or PySide instead.

If you are looking for a simple way to embed Python objects into your C++/Qt Application and to script parts of your application via Python, **PythonQt** is the way to go!

PythonQt is a stable library that was developed to make the Image Processing and Visualization platform MeVisLab scriptable from Python.

- **Features**
- **Download**
- **License**
- **Developer**
- **Building**
- **Examples**

---

eXtensible™ IMAGING PLATFORM

Getting Started

Source code for and releases of the XIP Host™, sample XIP™ applications and the XIP™ implementation of the DICOM Application Hosting standard are available on the XIP Host™ GForge site.

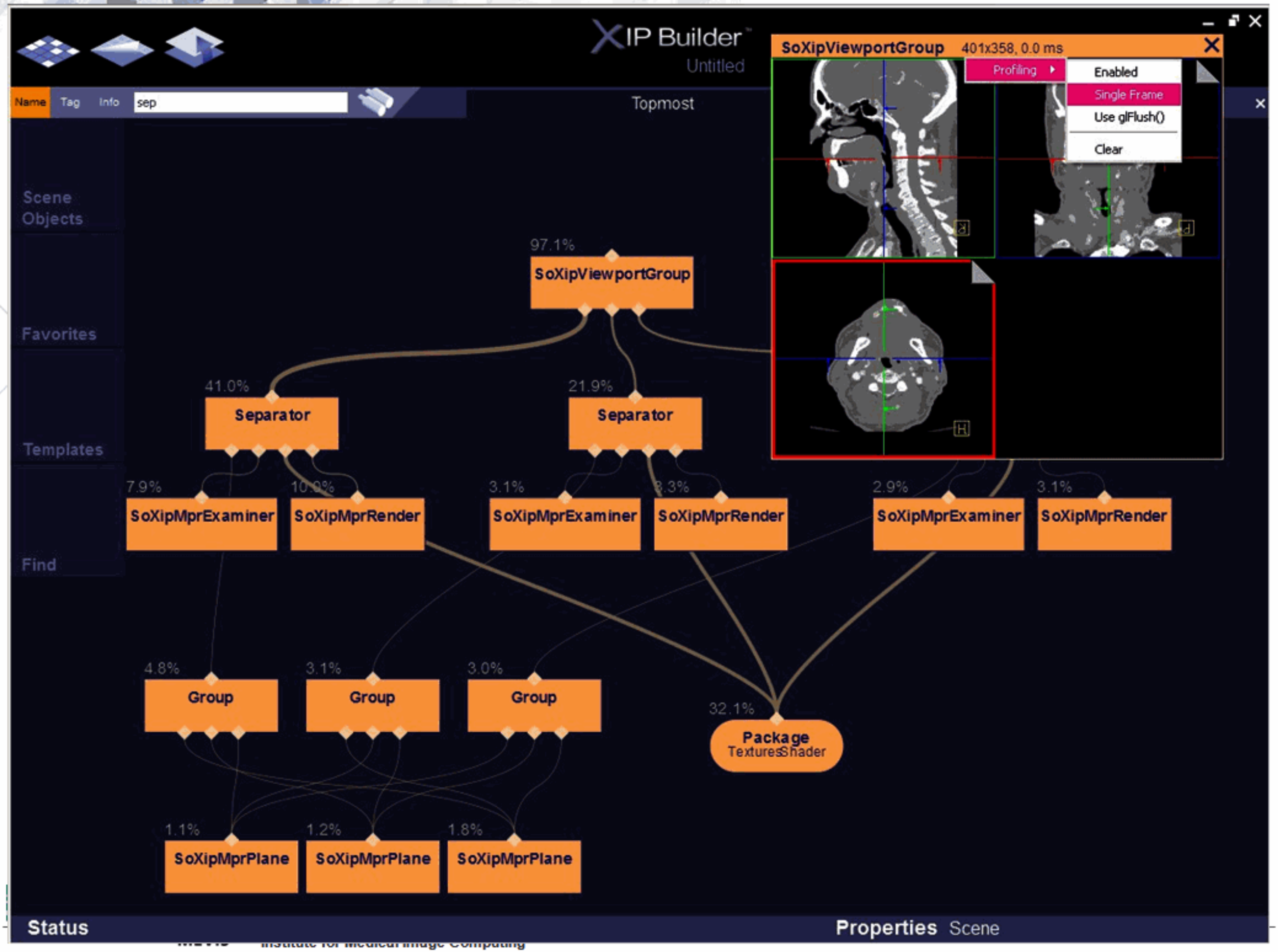
Source code for and releases of the XIP Libraries™, along with the binaries for the XIP Builder™ tool are available on the XIP Libraries™ GForge Site.

Additional information may be found on the XIP Wiki site.

NCI's Open Source Workstation

The eXtensible Imaging Platform™ (XIP™) project is an open source environment for rapidly developing medical imaging applications from an extensible set of modular elements. Researchers will be able to easily develop and evaluate new approaches to medical imaging problems, and use them in a translational research setting.

The applications developed with the XIP™ tools and libraries can either run stand-alone, or as Hosted Applications utilizing the DICOM Application Hosting interfaces being defined by DICOM WG-23. The XIP™ project includes an open source reference implementations of the those interfaces, as well as a clinical research oriented Hosting System for running such Hosted Applications.


XIP Builder
Untitled
Name
Tag
Info
sep
Topmost
Scene Objects
Favorites
Templates
Find
SoXipViewportGroup 401x358, 0.0 ms
Profiling
Enabled
Single Frame
Use glFlush()
Clear
97.1%
SoXipViewportGroup
41.0%
Separator
21.9%
Separator
7.9%
SoXipMprExaminer
10.9%
SoXipMprRender
3.1%
SoXipMprExaminer
8.3%
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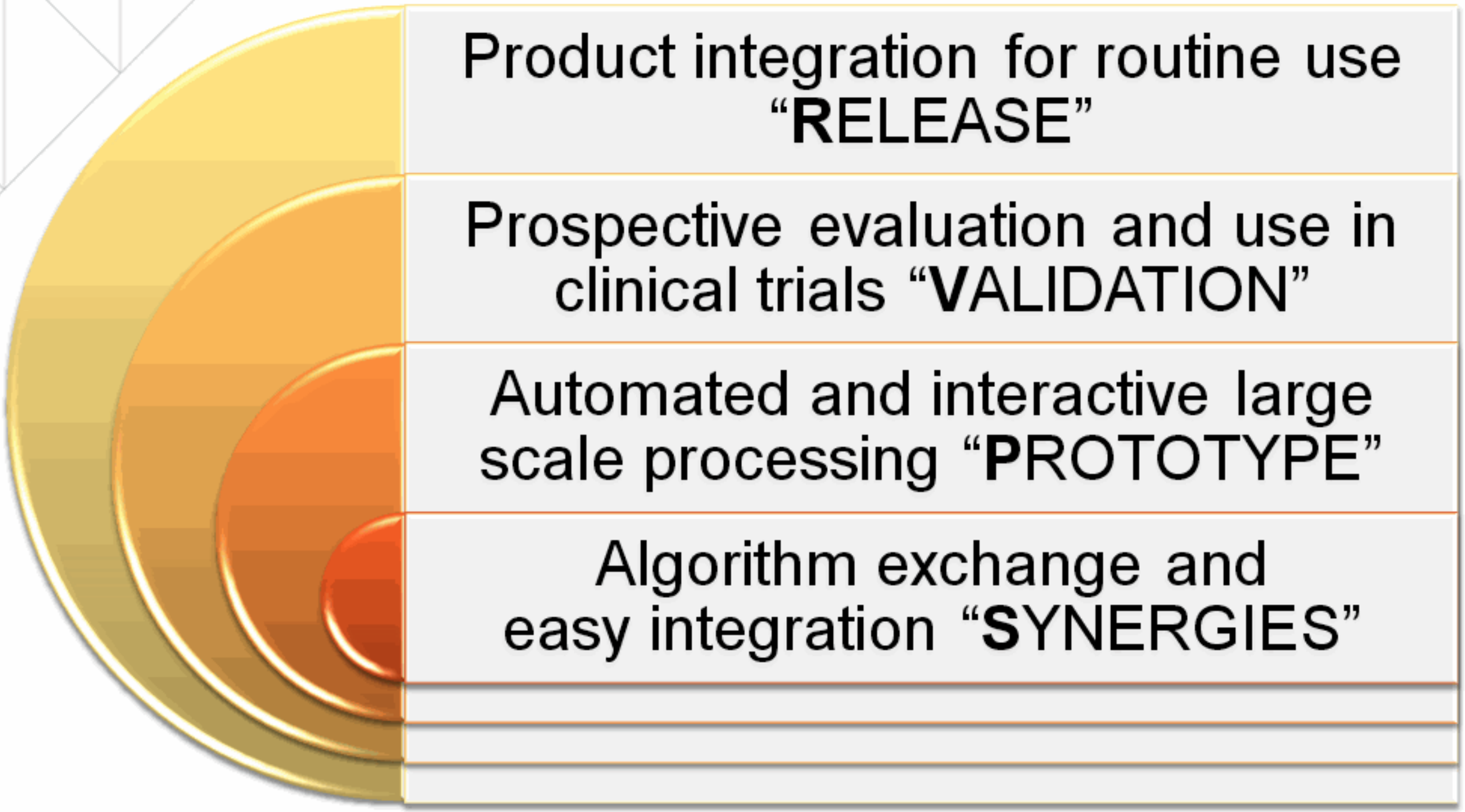
SoXipMprExaminer
3.1%
SoXipMprRender
4.8%
Group
3.1%
Group
3.0%
Group
32.1%
Package
Textures Shader
1.1%
SoXipMprPlane
1.2%
SoXipMprPlane
1.8%
SoXipMprPlane
Status
Properties Scene

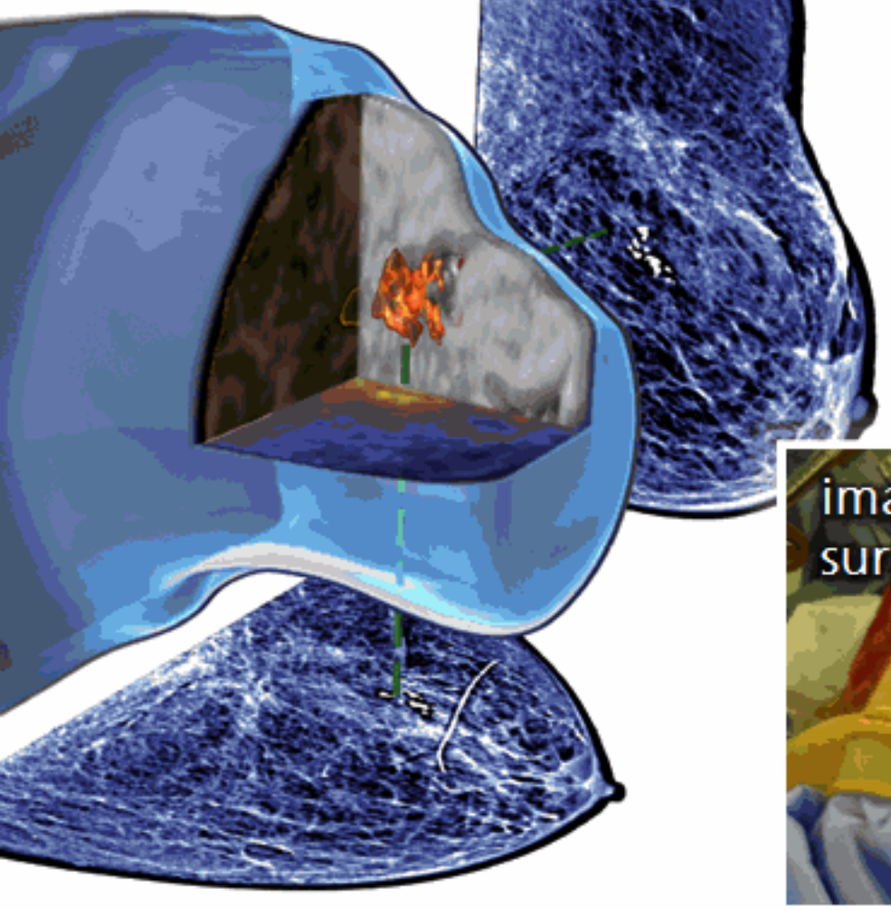
Four Major Challenges

from R&D to Productization "S-P-V-R"



Selected Research Topics

multimodal
breast imaging



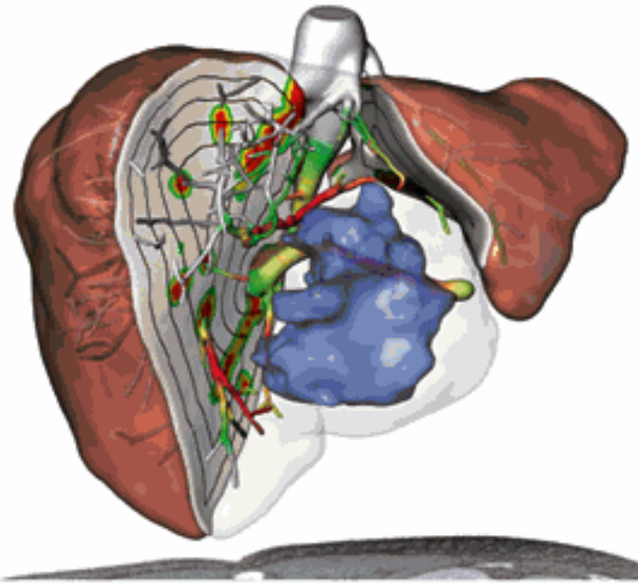
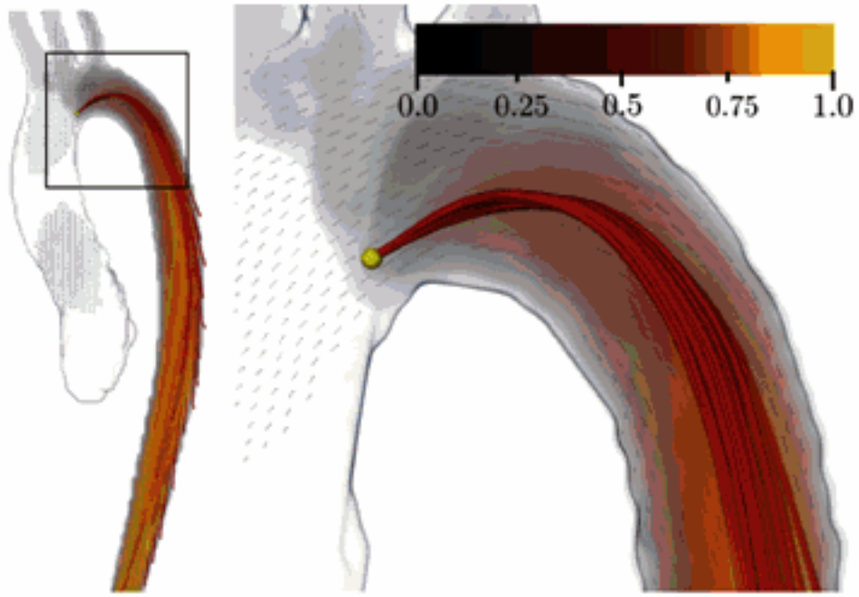
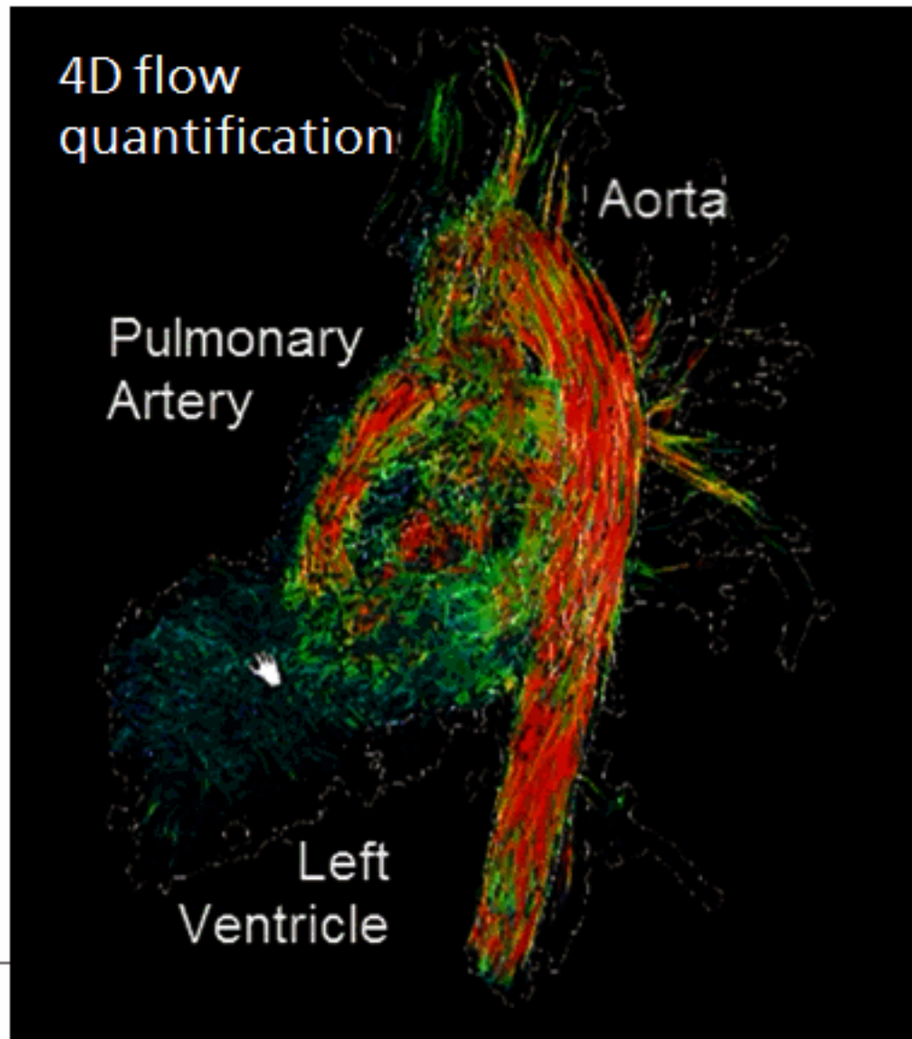
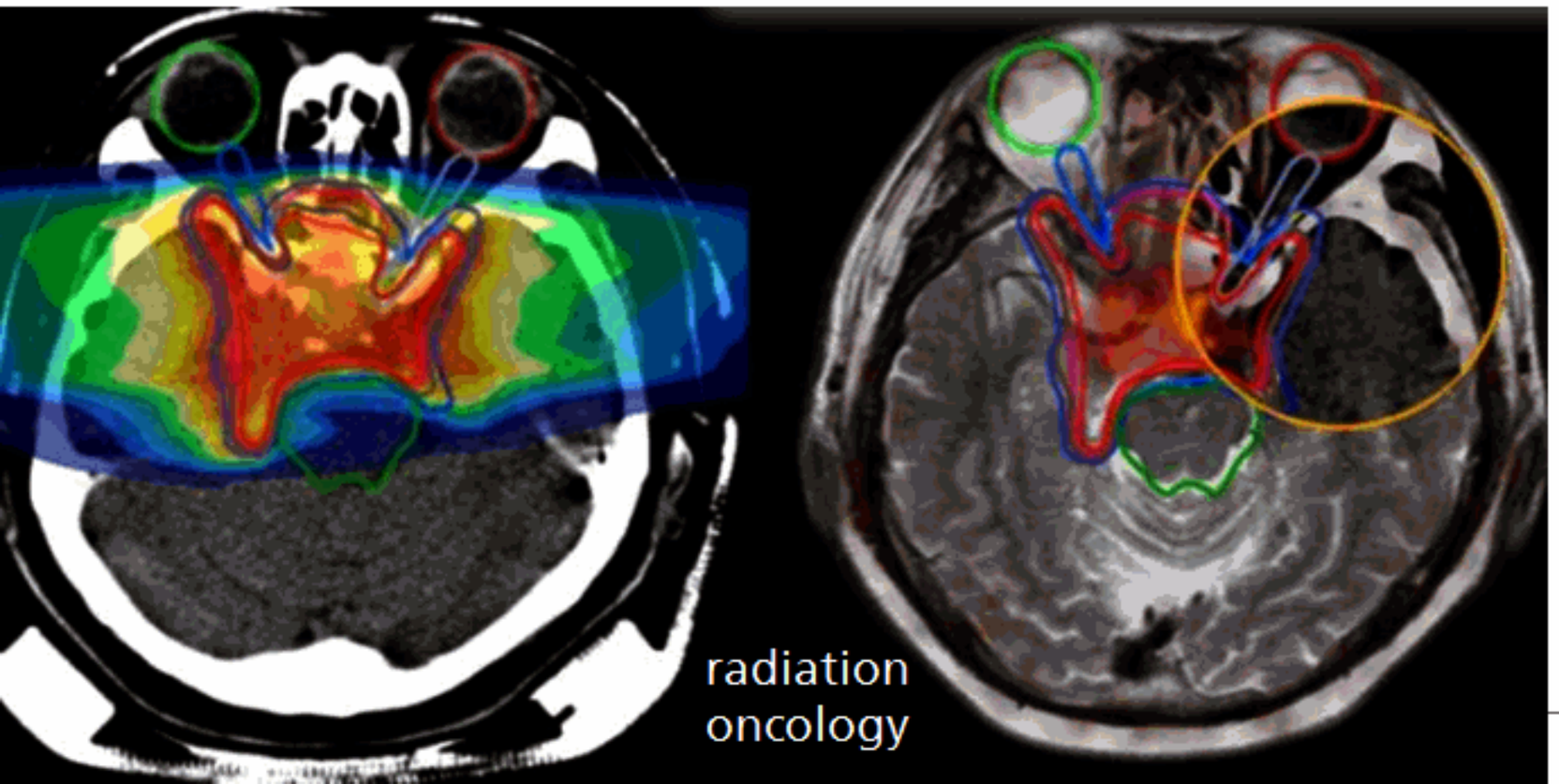


image guided
surgery



4D flow
quantification





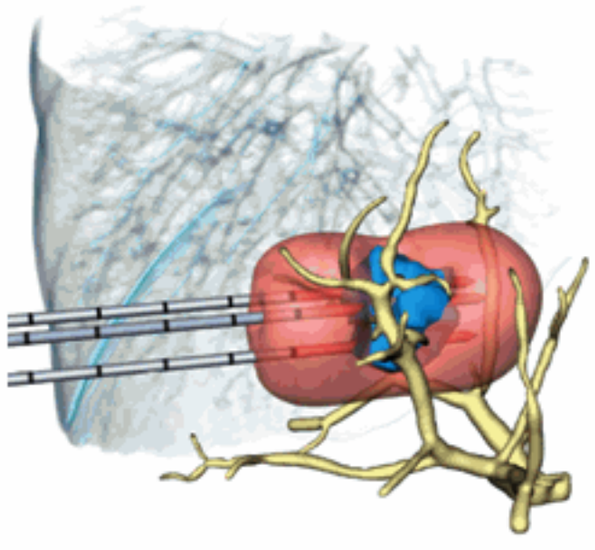
radiation
oncology

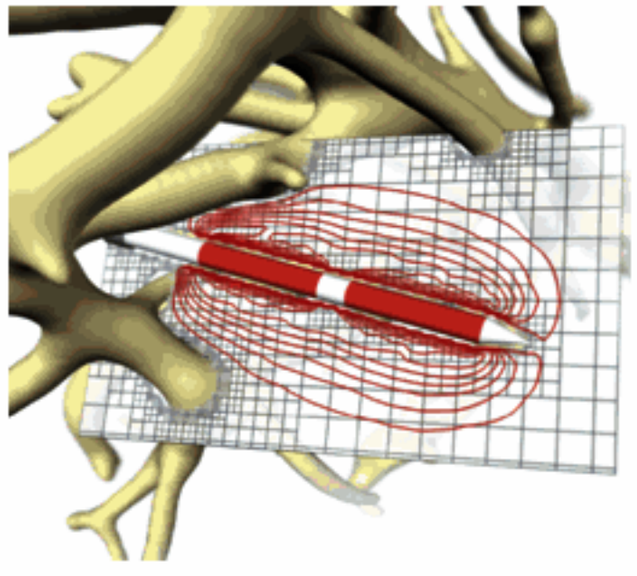
Modeling and Simulation

- Jacobs University Bremen
- Foundation professorship by Conrad and Lotti Naber
- Modeling of bio-physical processes for improved outcome prediction

Prof. Dr. Tobias Preußer

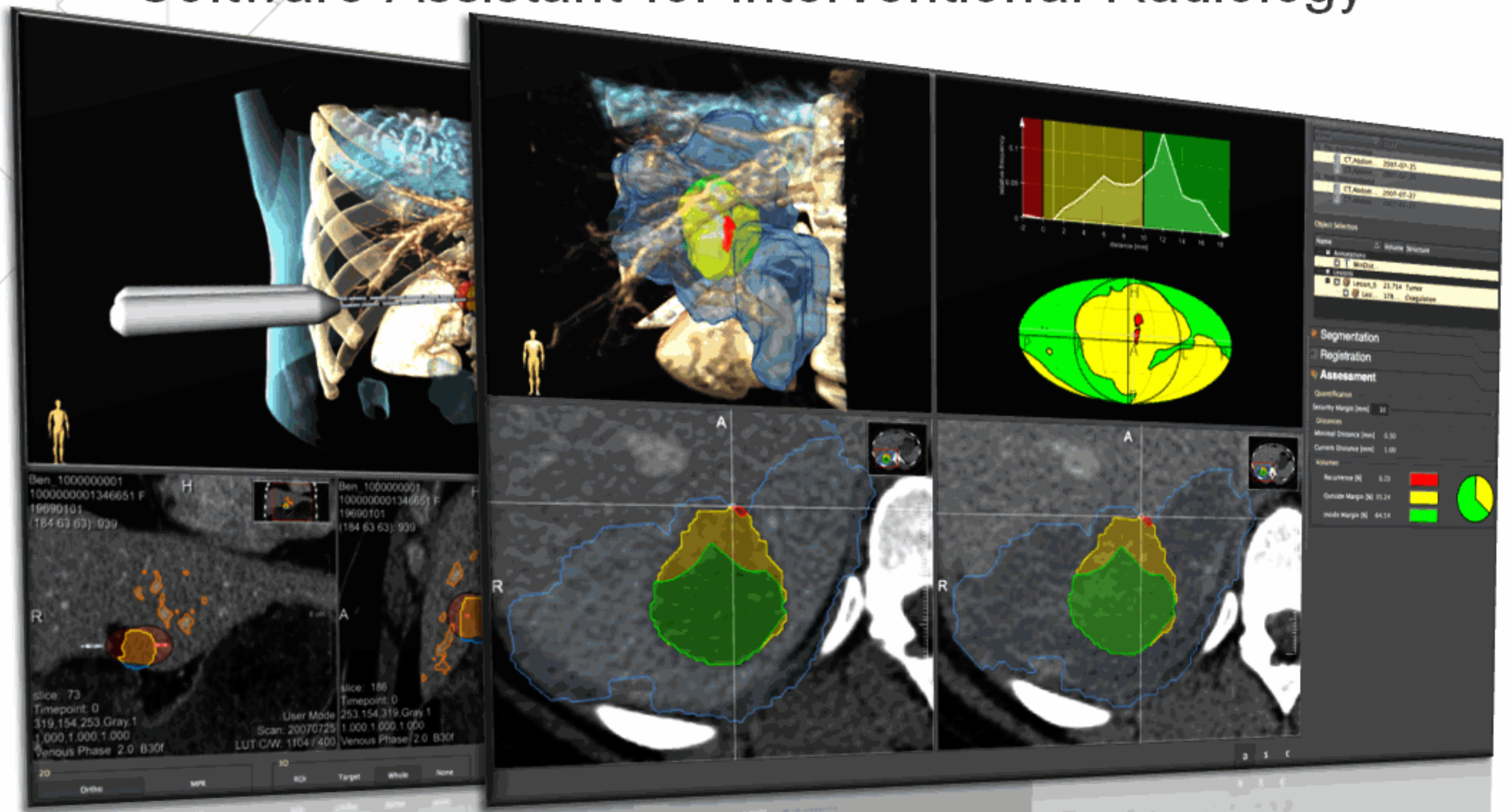
- Examples
  - RF ablation of liver tumors
  - Numerical flow simulation
  - stochastic PDEs





SAFIR

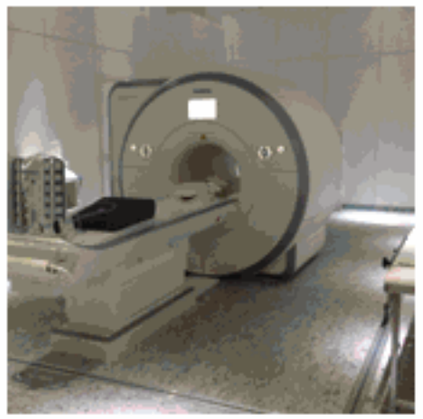
Software Assistant for Interventional Radiology



MR Imaging

- University Bremen – FB Physics
- Foundation professorship by Stiftung Bremer Wertpapierbörse
- Co-optimization of medical imaging
- Development of new sequences and imaging protocols
- Examples
  - Moving Table Diffusion Imaging
  - Arterial Spin-Label Imaging outside of the brain

Prof. Dr. Matthias Günther



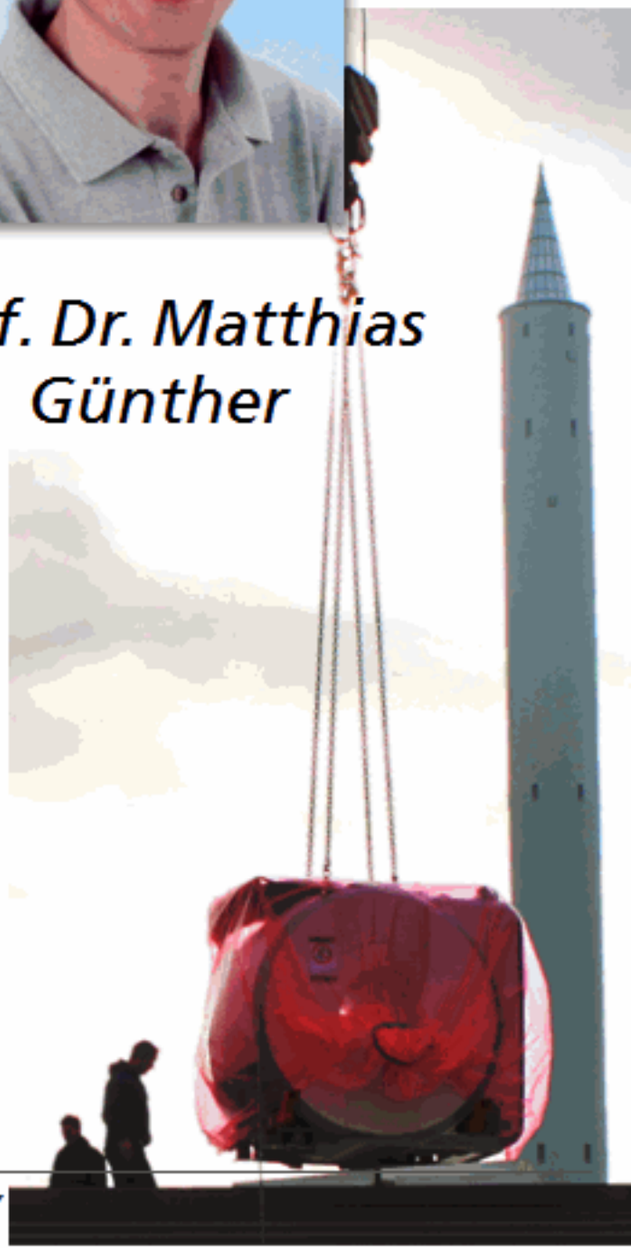


Image Registration

- Strategic collaboration
  Fraunhofer MEVIS – University Lübeck
- MEVIS Project Group Lübeck
  Basic funding by State Schleswig-Holstein
- Multimodal and temoral mapping and fusion of medical image data
- Examples
  - Discretize-then-optimize
  - Variational implementation of hard/soft constraints
  - Newton-type minimization methods
  - Normalized gradient fields, curvature regularization,…

Prof. Dr. Bernd Fischer
Prof. Dr. Jan Modersitzki

Image Registration

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- Multimodal and tem a
  and fusion of medic g
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  - Variational implementation of hard/soft constraints
  - Newton-type minimization methods
  - Normalized gradient fields, curvature regularization,…

Prof. Dr. Bernd Fischer
Prof. Dr. Jan Modersitzki

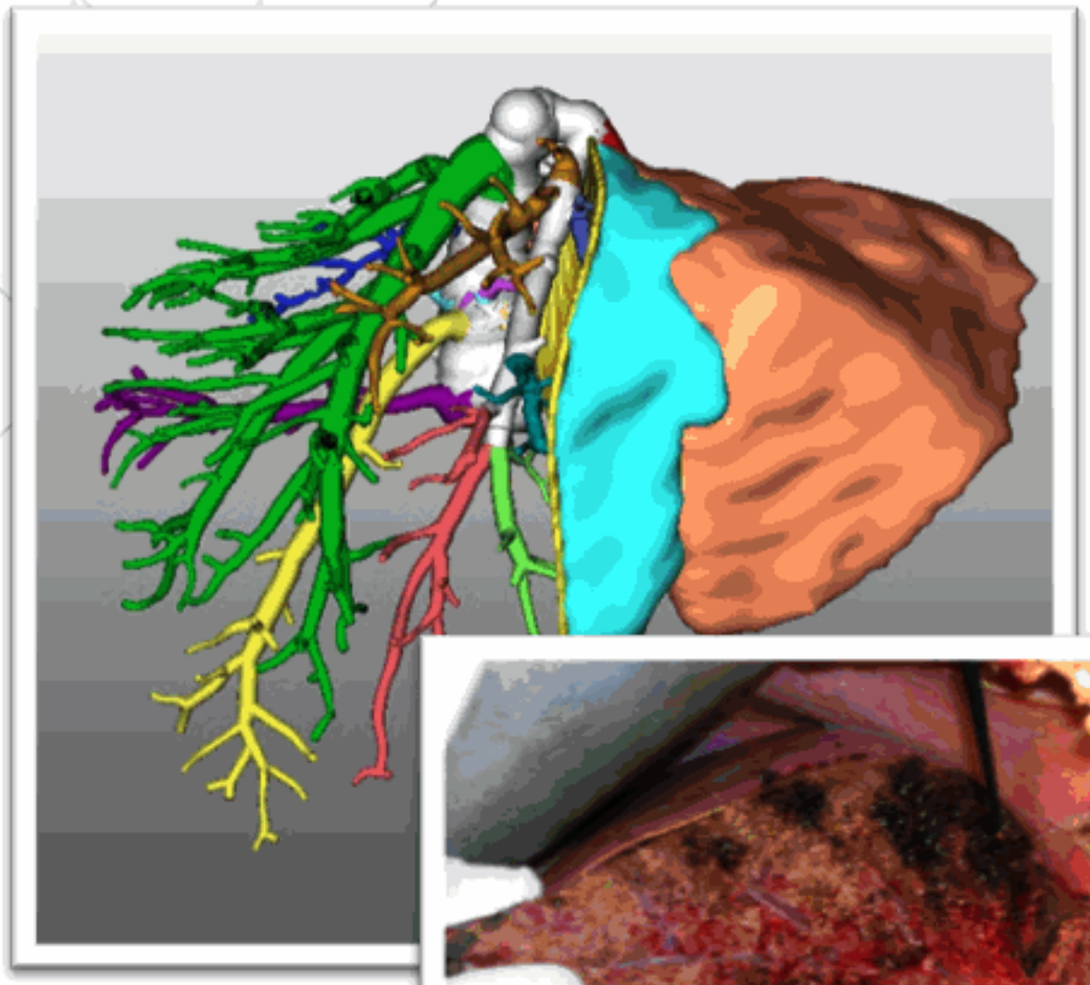
Computer Aided Diagnosis

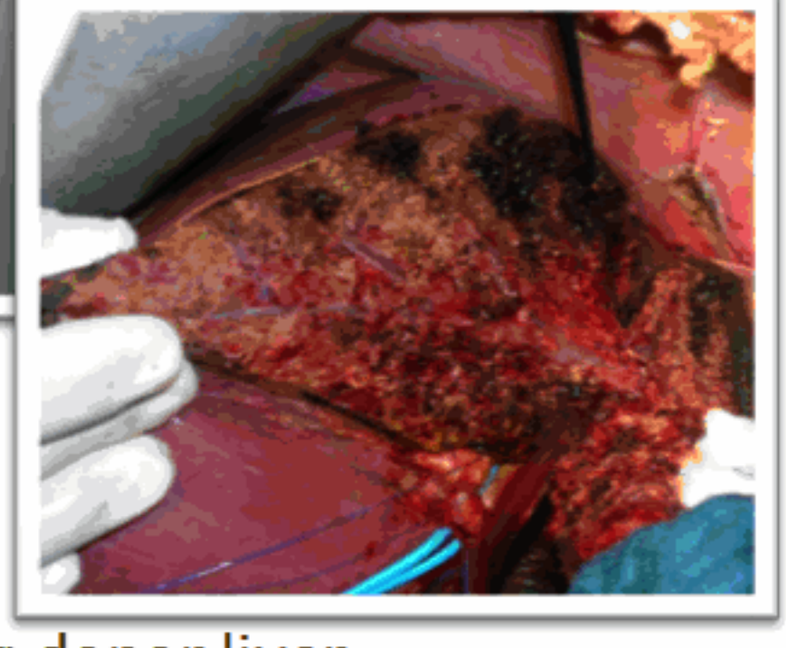
- Strategic collaboration Fraunhofer MEVIS – Radboud University Nijmegen Medical Center (NL)
- Computer Aided Detection
- Complexity Reduction of Diagnostic Processes
- Examples
  - Detection in breast cancer screening
  - Detection in lung cancer screening
  - Decision support in breast imaging

Prof. Dr. Nico Karssemeijer
Prof. Dr. Bram van Ginneken

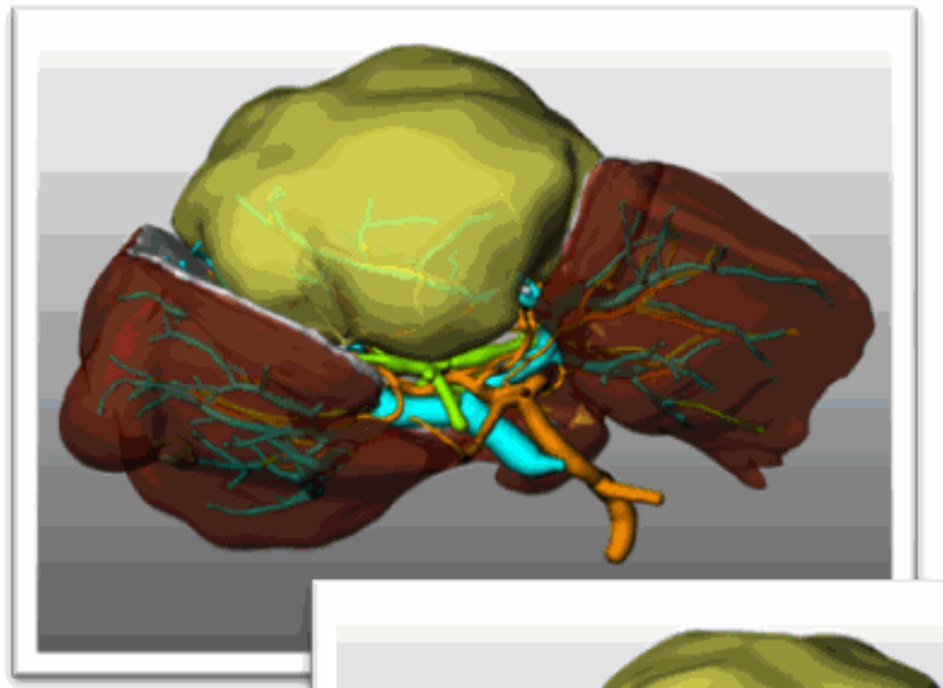

Visia LIVER-DS
Distant Service via Internet

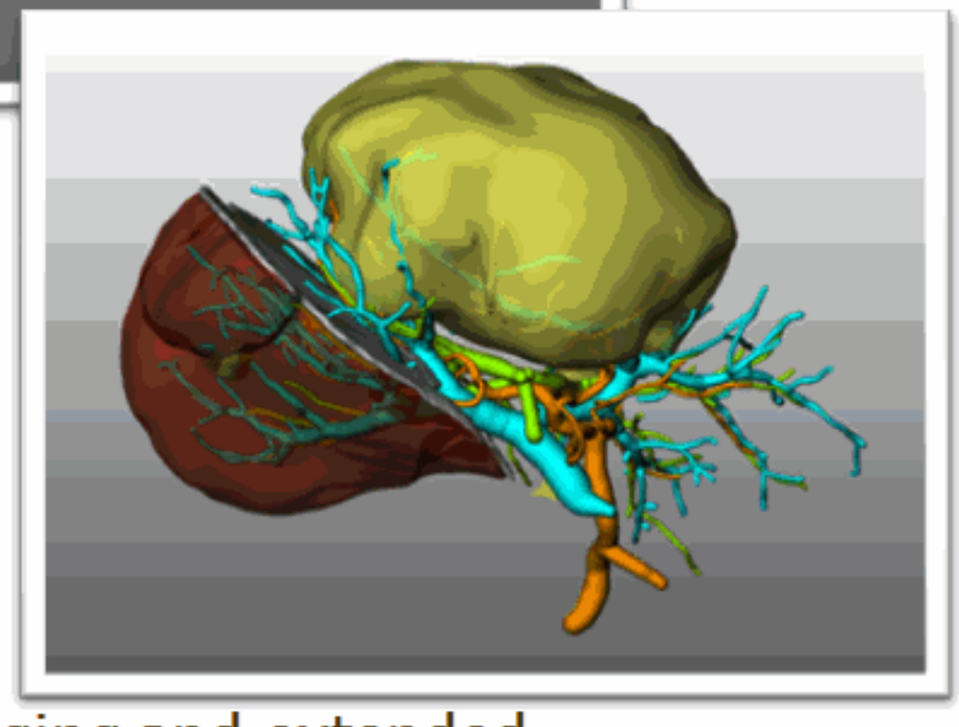
Main Types of Surgery for Service based Extended Risk Assessment





Living donor liver transplantations

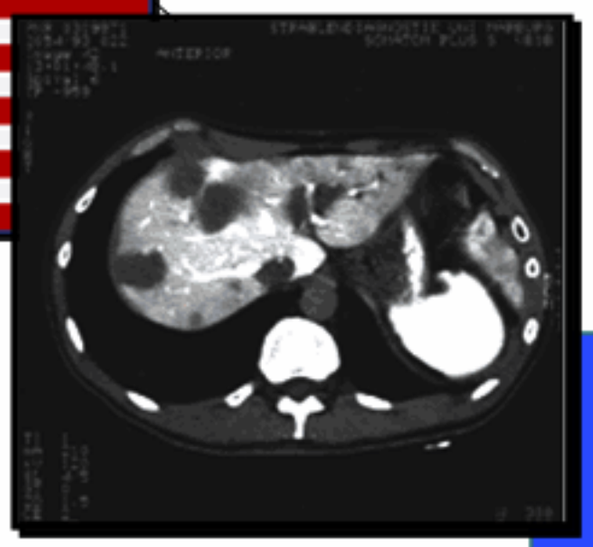




Challenging and extended tumor resections

3rd Success: Visia LIVER-DS
Distant Service via Internet

USA



Europe

Japan

Korea

Australia

Taiwan

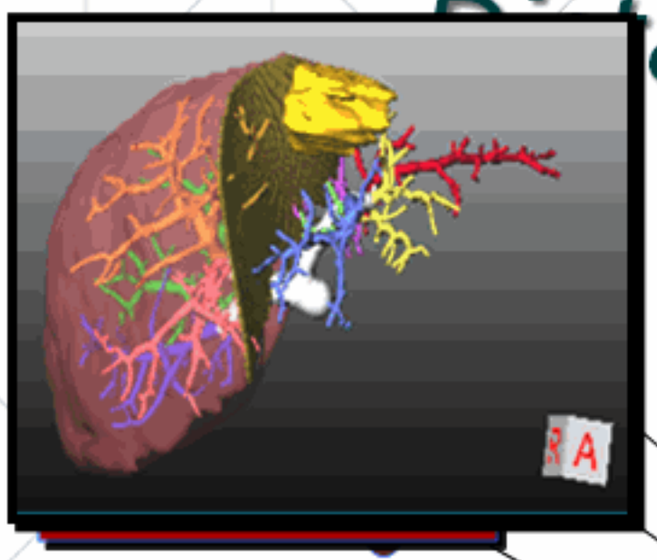
Egypt

China

Singapore

MeVis
MEDICAL SOLUTIONS

3rd Success: Visia LIVER-DS
Distant Service via Internet



Europe

MeVis
MEDICAL SOLUTIONS

Japan

Korea

Australia

Taiwan

Egypt

China

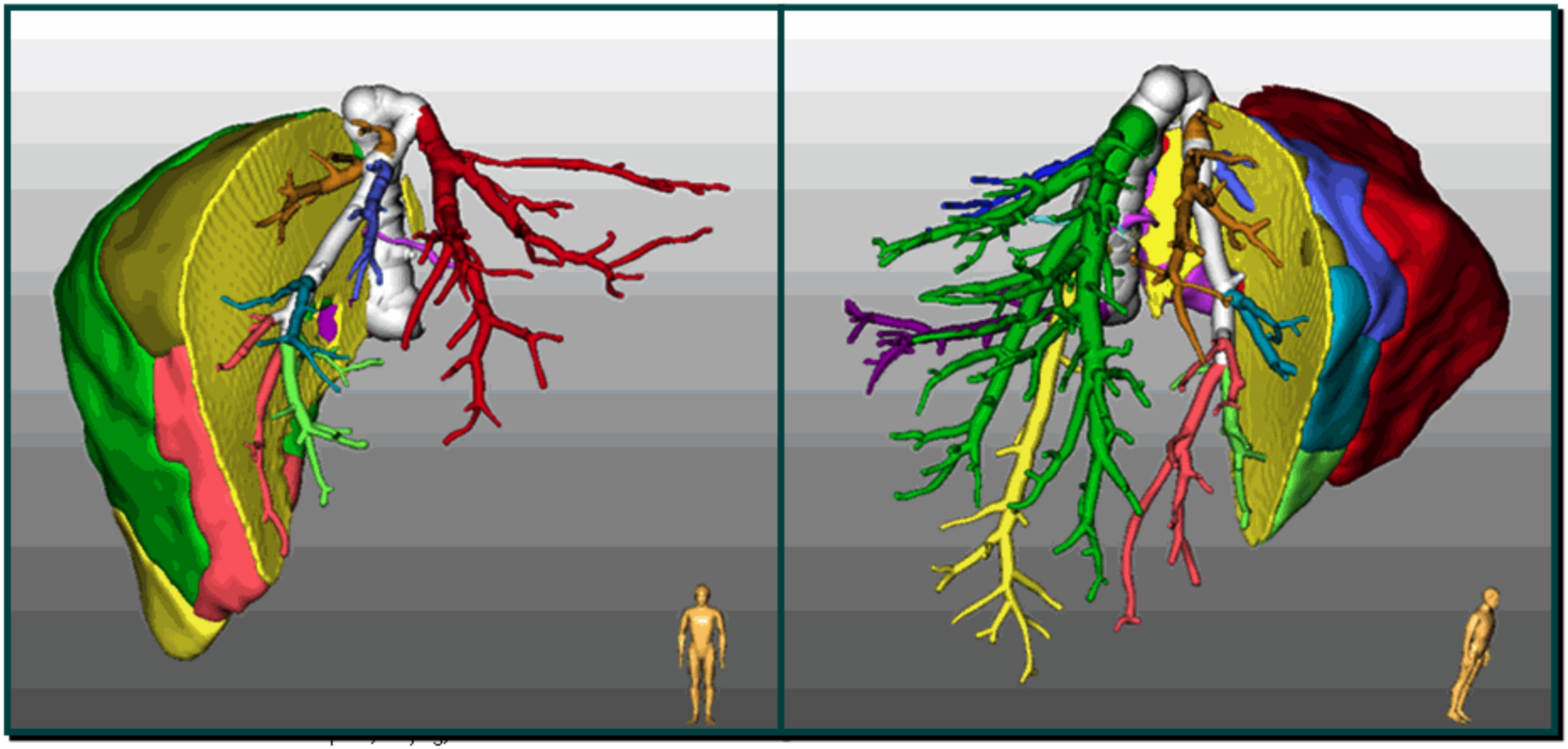
Singapore

FDA Certified

Clinical Partners/Clients (>200)

Kobe City General Hospital, Japan
Kyoto University Hospital, Japan
Nagoya University Hospital, Japan
Yokohama City University Medical School, Japan
Gleneagles Hospital, Singapore
Singapore General Hospital, Singapore
National University Hospital, Singapore
Samsung Medical Center, Seoul, South Korea
Kaohsiung University Hospital, Kaohsiung, Taiwan
Taipei National University Hospital, Taiwan

Charité Campus Benjamin Franklin, Berlin
Charité Campus Virchow-Klinikum, Berlin
Klinikum Bremen-Mitte, Bremen
Augusta Krankenanstalten, Bochum
Universitätsklinikum Bonn
Allgemeines Krankenhaus Celle
Klinikum Düsseldorf-Gerresheim
Universitätsklinikum Essen
Johann Wolfgang Goethe Universität Frankfurt
Chirurgische Universitätsklinik, Freiburg



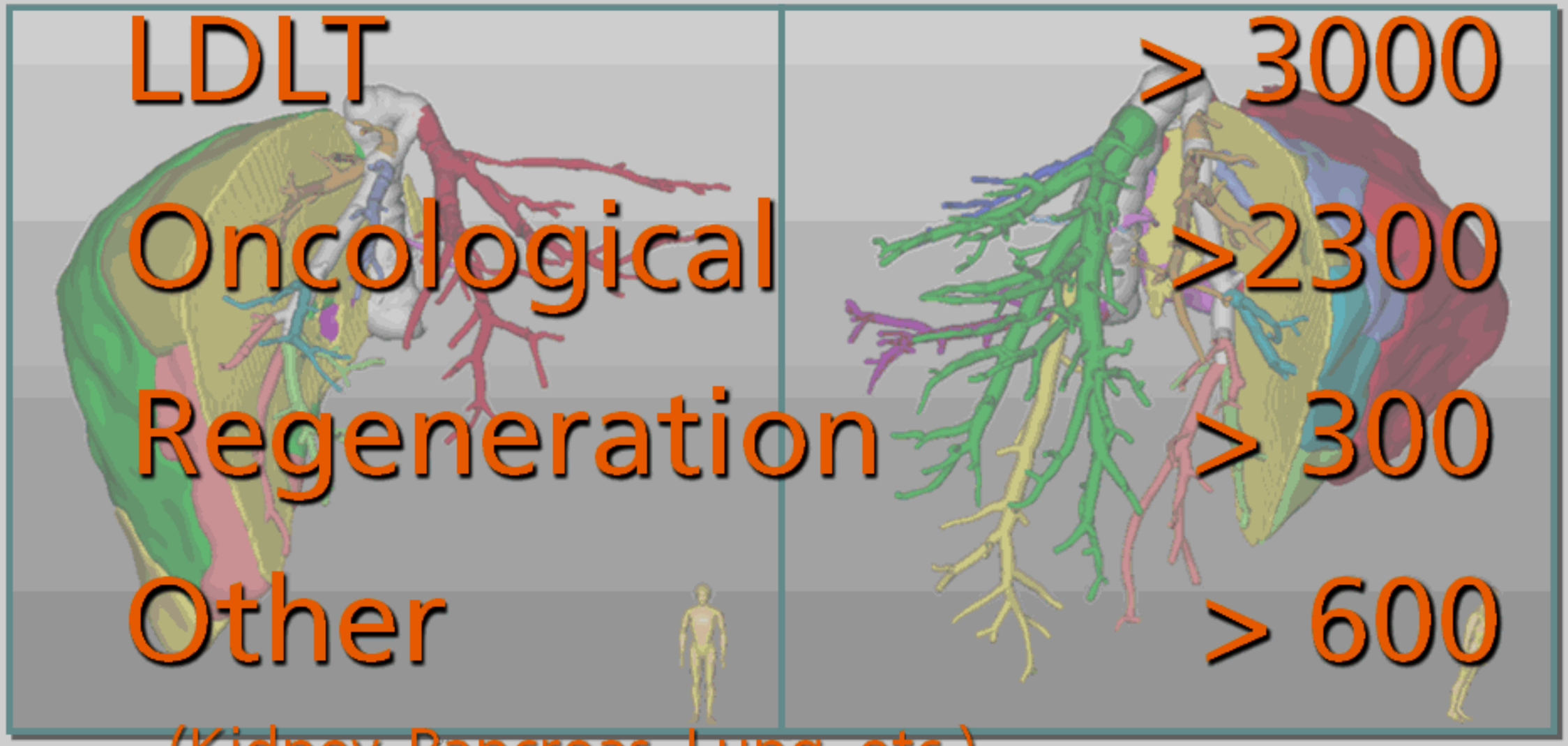
Eastern Hepatobiliary Surgery Hospital, Shanghai, China

Clinical Partners/Clients (>200)

Kobe City General Hospital, Japan
Kyoto University Hospital, Japan
Nagoya University Hospital, Japan
Yokohama City University Medical School, Japan
Gleneagles Hospital, Singapore
Singapore General Hospital, Singapore
National University Hospital, Singapore
Samsung Medical Center, Seoul, South Korea
Kaohsiung University Hospital, Kaohsiung, Taiwan
Taipei National University Hospital, Taiwan

Charité Campus Benjamin Franklin, Berlin
Charité Campus Virchow-Klinikum, Berlin
Klinikum Bremen-Mitte, Bremen
Augusta Krankenanstalten, Bochum
Universitätsklinikum Bonn
Allgemeines Krankenhaus
Klinikum Düsseldorf-Gerresheim
Universitätsklinikum Essen
Johann Wolfgang Goethe Universität Frankfurt
Chirurgische Universitätsklinik, Freiburg

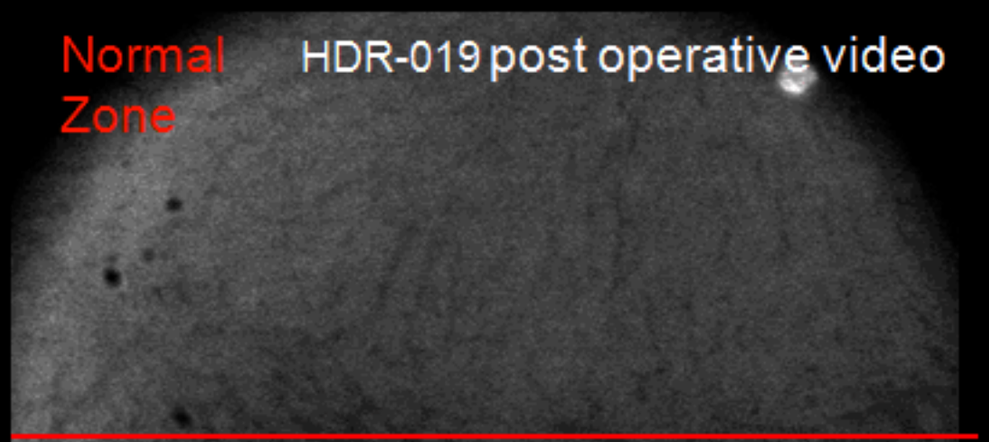
Total: > 6200

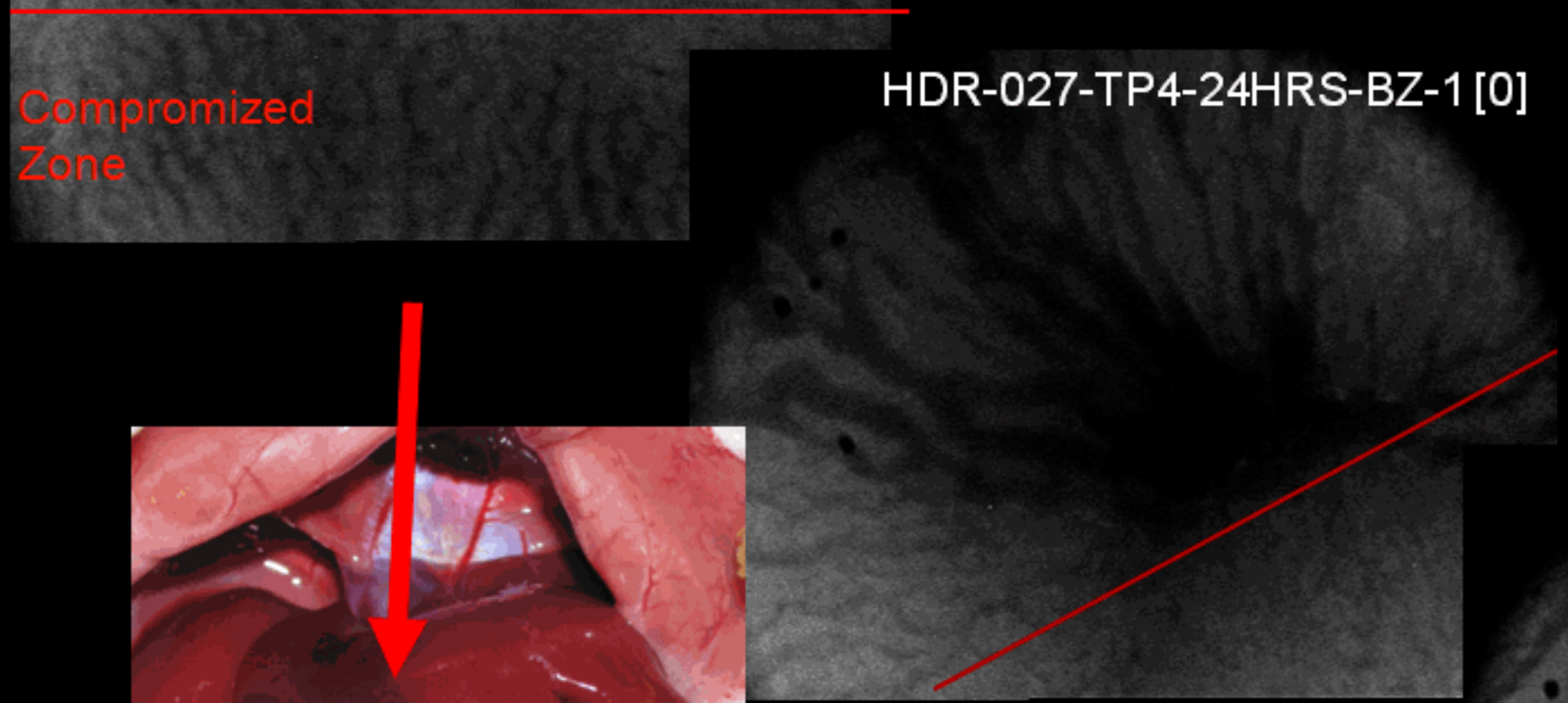


Eastern Hepatobiliary Surgery Hospital, Shanghai, China

Sinusoidal Remodeling

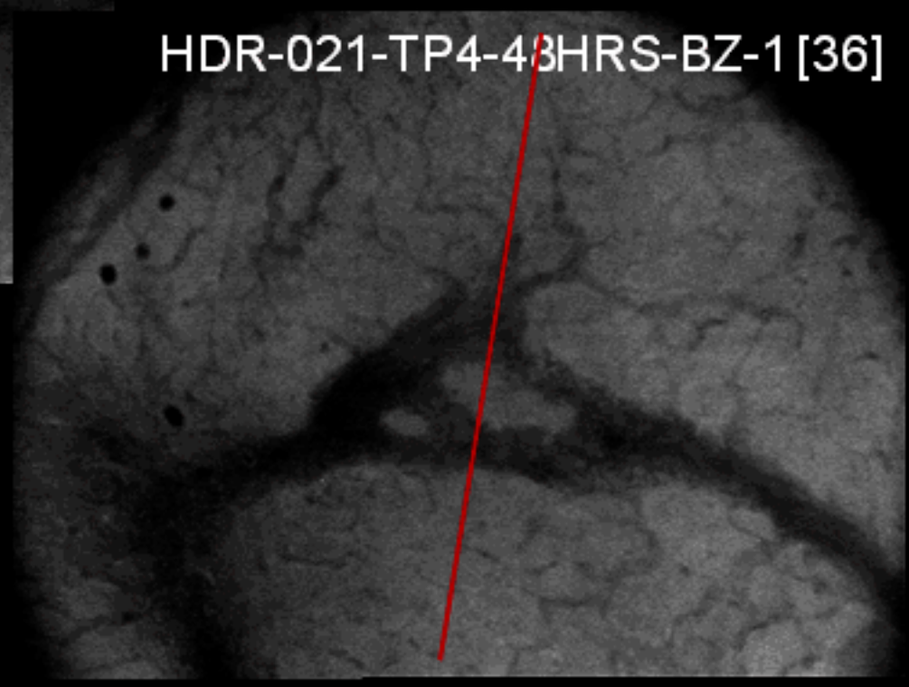
dilated vascularized sinusoidal canals connecting the obstruction zone with the normal zone





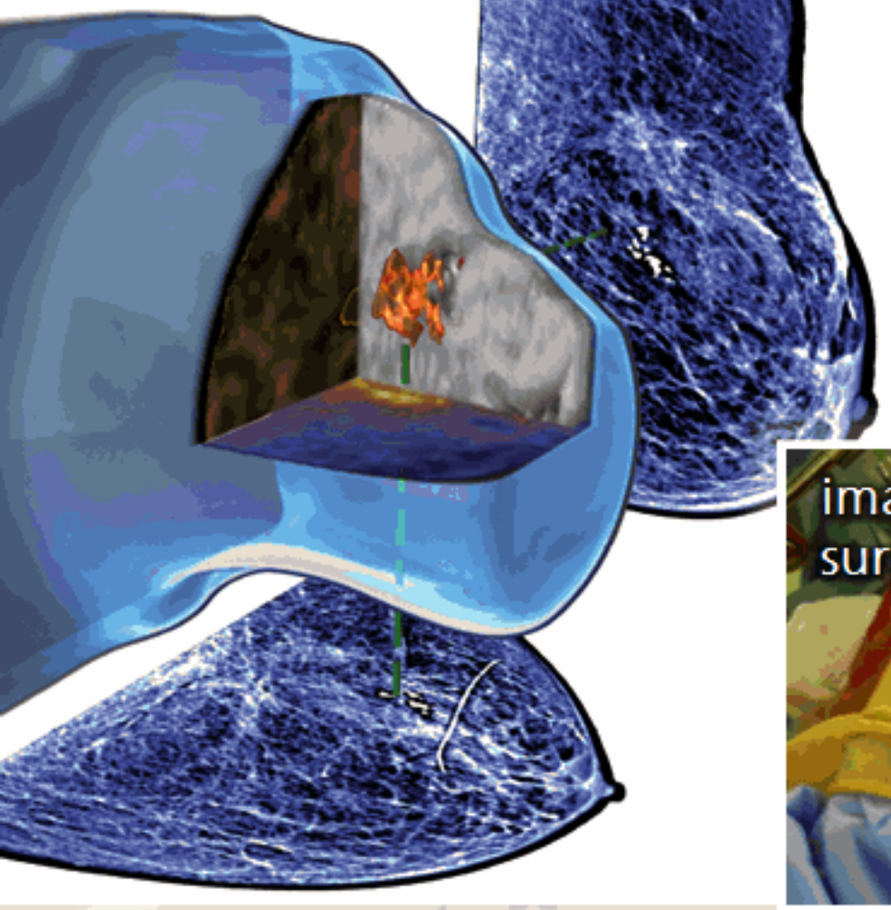
microcirculation visualized by orthogonal polarization spectroscopy

Dirsch Dahmen, Transplantation 2008



Selected Research Topics

multimodal
breast imaging



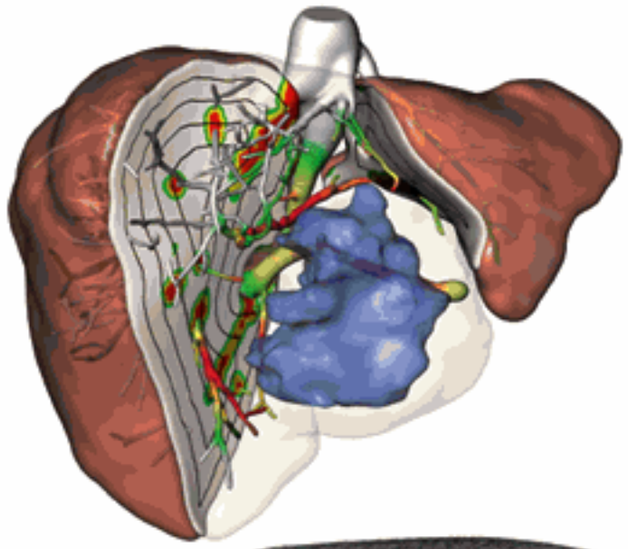
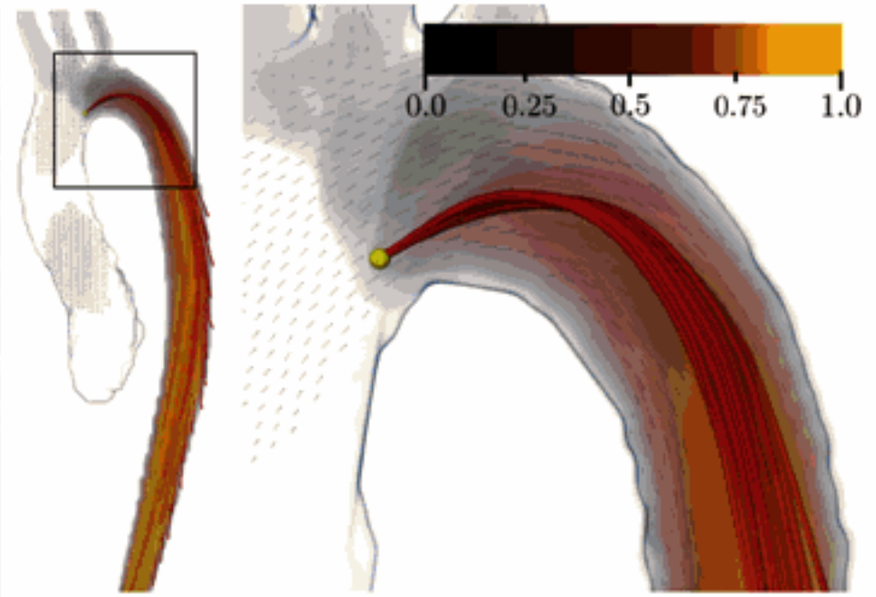
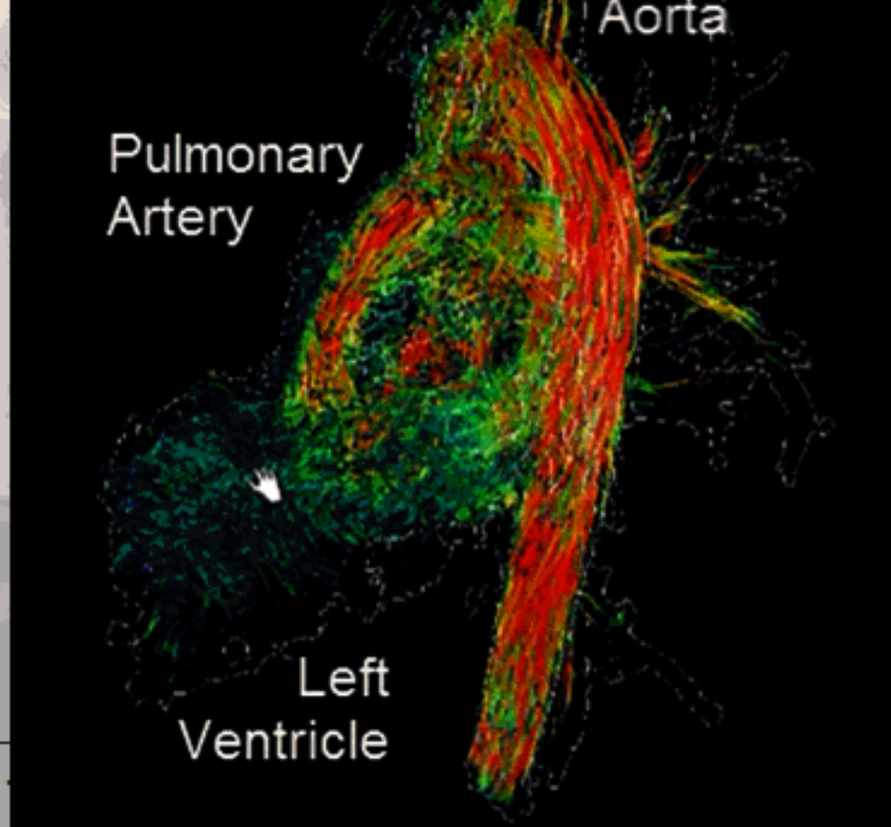
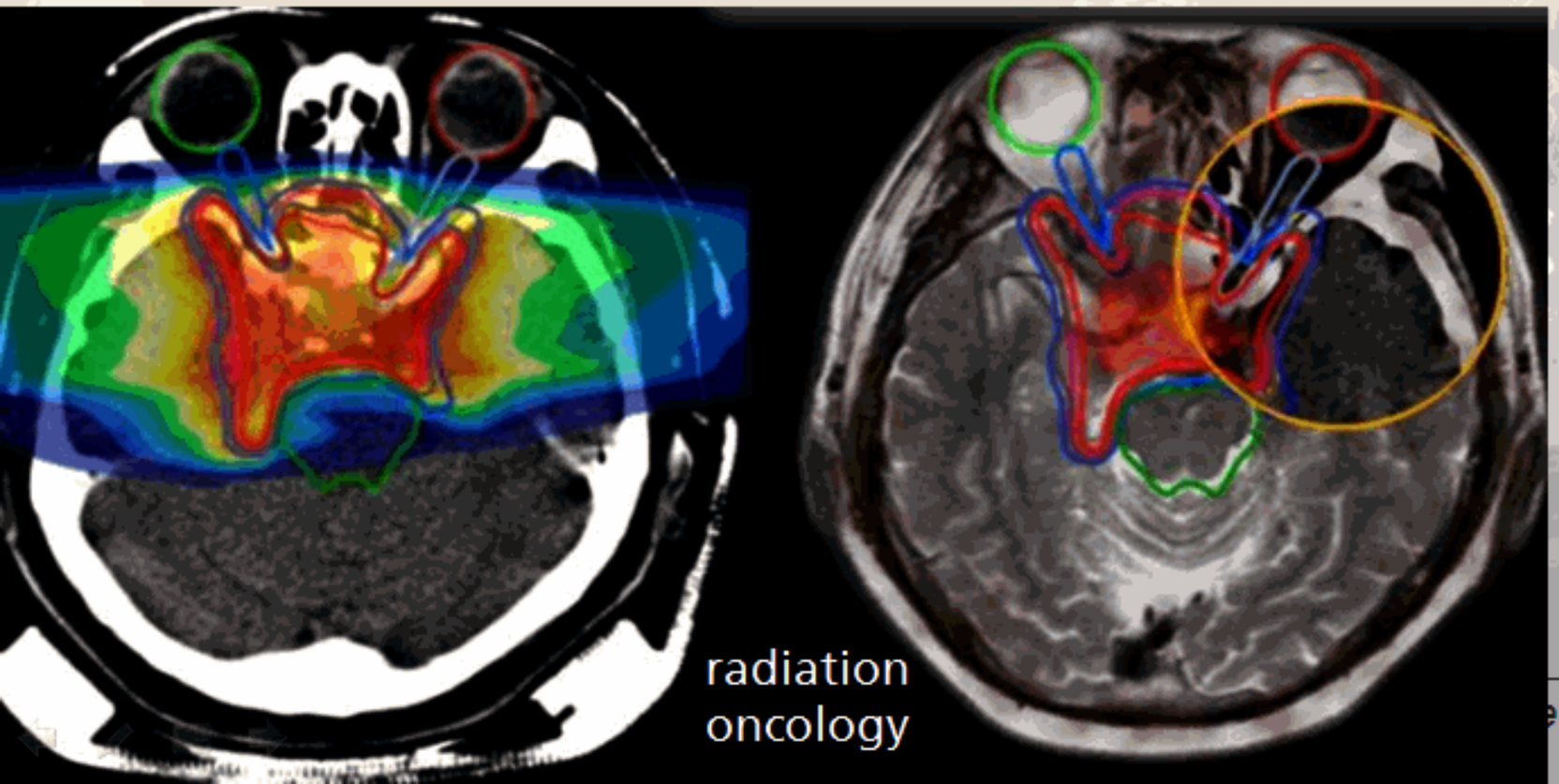


image guided
surgery



4D flow
quantification



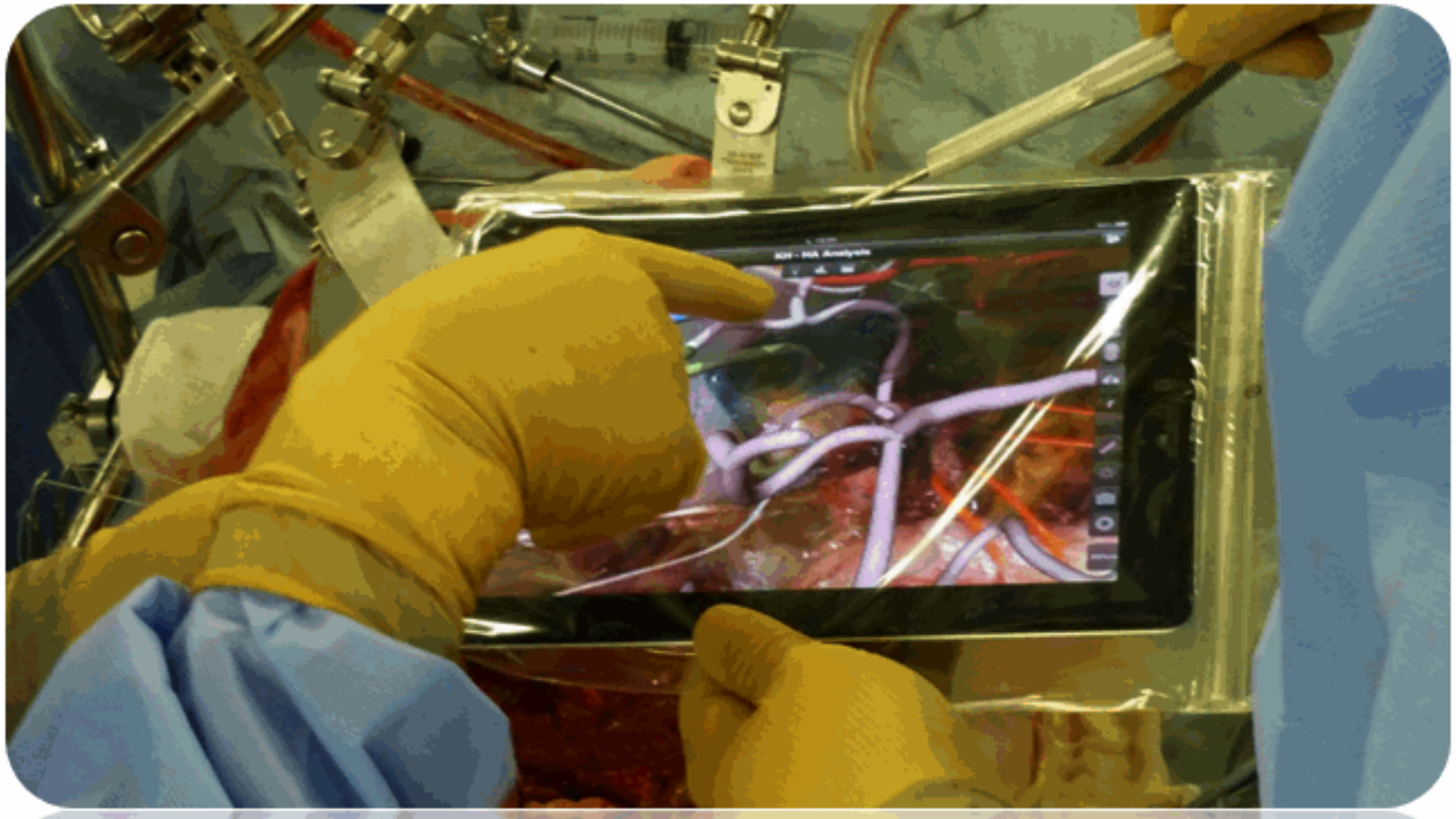


radiation
oncology

Mobile LiverExplorer

(Alexander Köhn Sep-Nov 2012, Yokohama)

Bringing the liver planning data into the operation room



Fraunhofer MEVIS

Mobile LiverExplorer

(Alexander Köhn Sep-Nov 2012, Yokohama)

Bringing the liver planning data into the operation room

"If we can use iPad software in our OR, intraoperative blood loss could be further reduced since the hepatic venous branches are the main source of intraoperative blood loss. […]

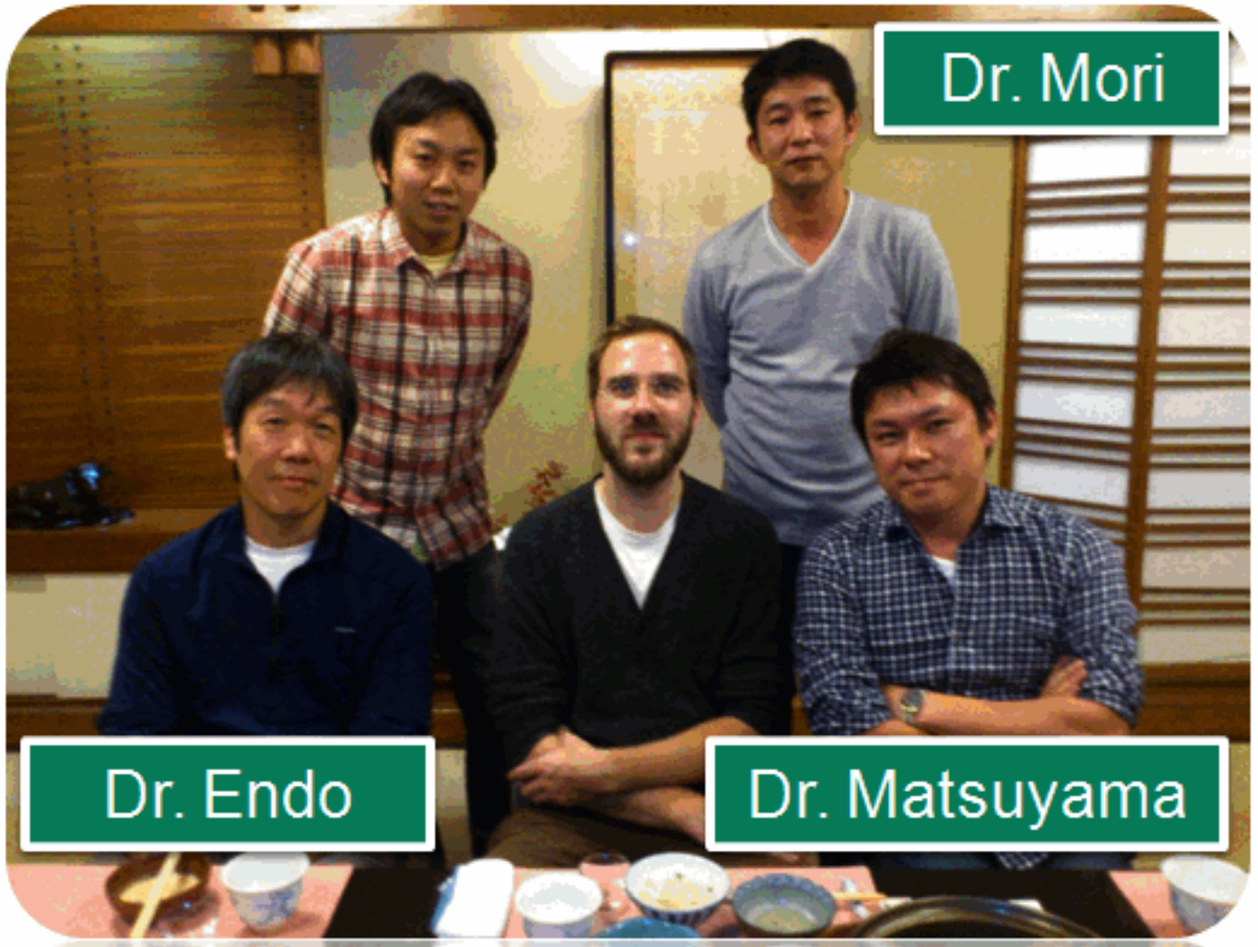
According to the reduction of the intraoperative blood loss, postoperative morbidity must be decreased, and thus, hospital stay may be shortened."

Dr. Itaru Endo MD PhD

だれと？**With whom?**

Yokohama City University Hospital

Department of Gastroenterological Surgery



- First demo at Fraunhofer Tokyo (Laptop based, March 2012:
  „When can we have this?!“ – „Christmas this year?“

Fraunhofer MEVIS

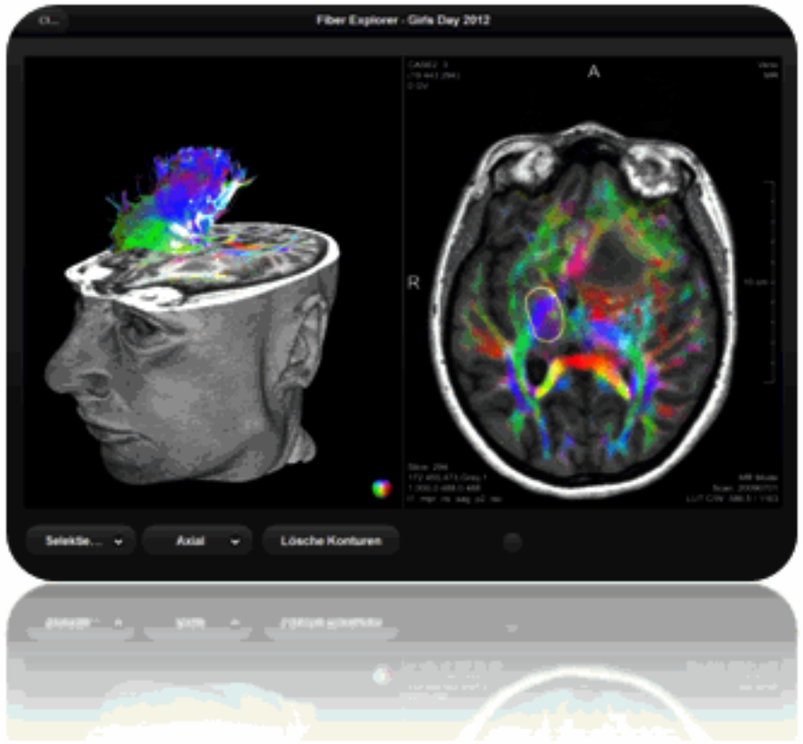

保温庫
保冷庫
保冷庫
保冷庫

iOS MeVisLab Remote Library

MeVisLab can power Webapplications

Used this for the Neuro GirlsDay 2012 iPad Application (via phoneGap)

→ Image update not fast enough



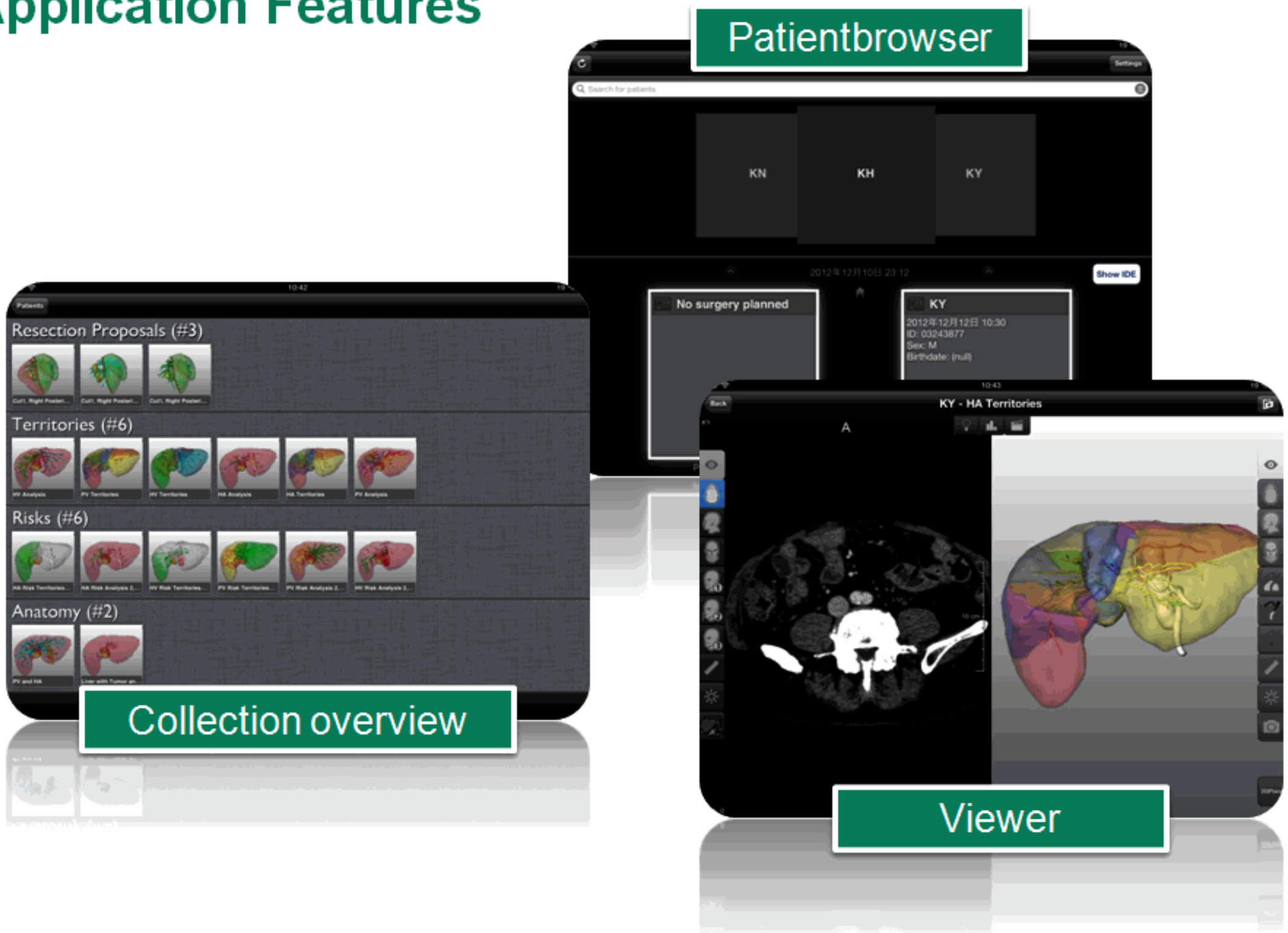
Needed a native, binary implementation of the remote protocol

(instead of Websocket based one)

Simon Benten implemented big part of the protocol, thanks Simon!

Fraunhofer MEVIS

Application Features

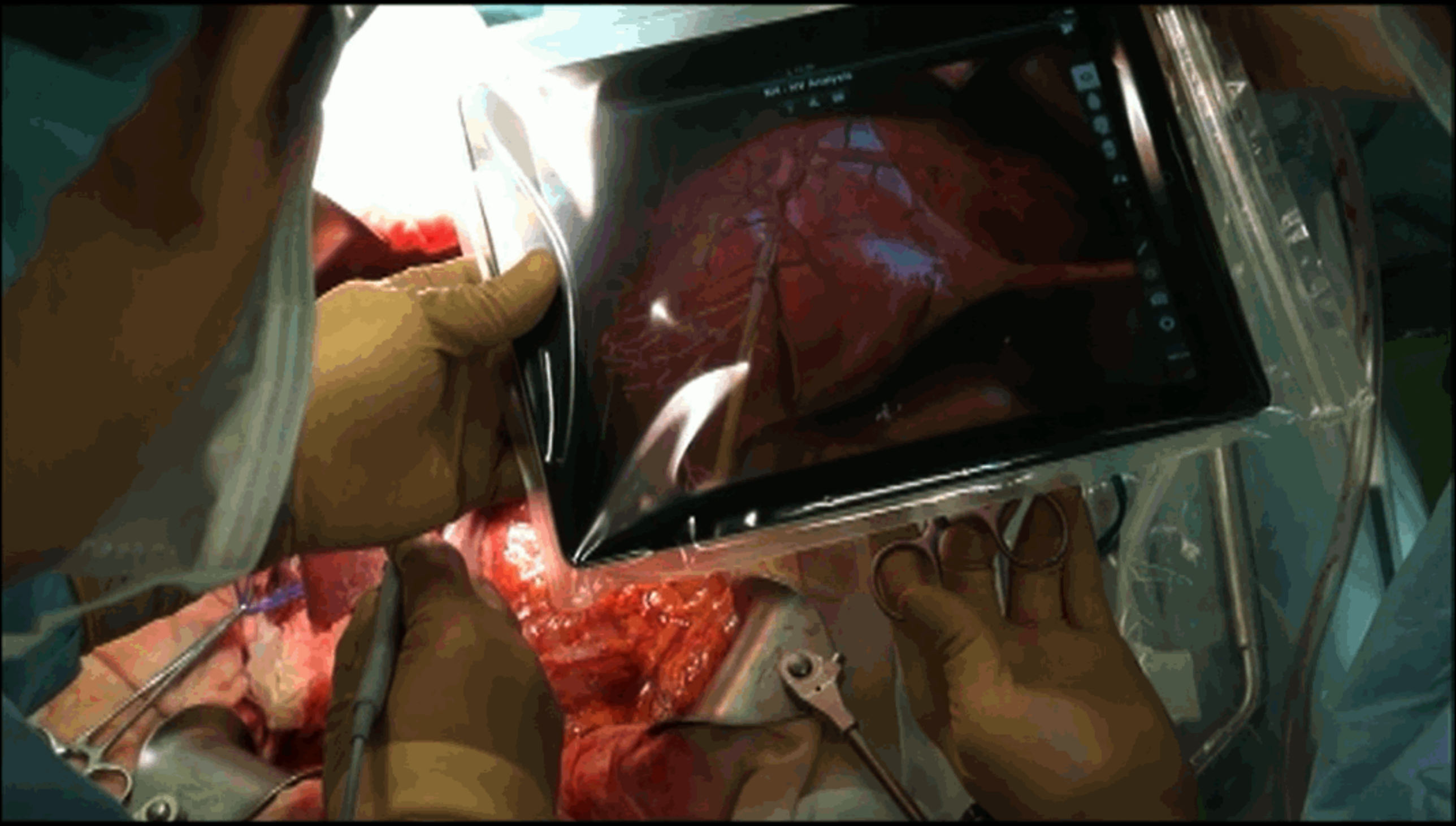


Fraunhofer MEVIS

iPad in the OR

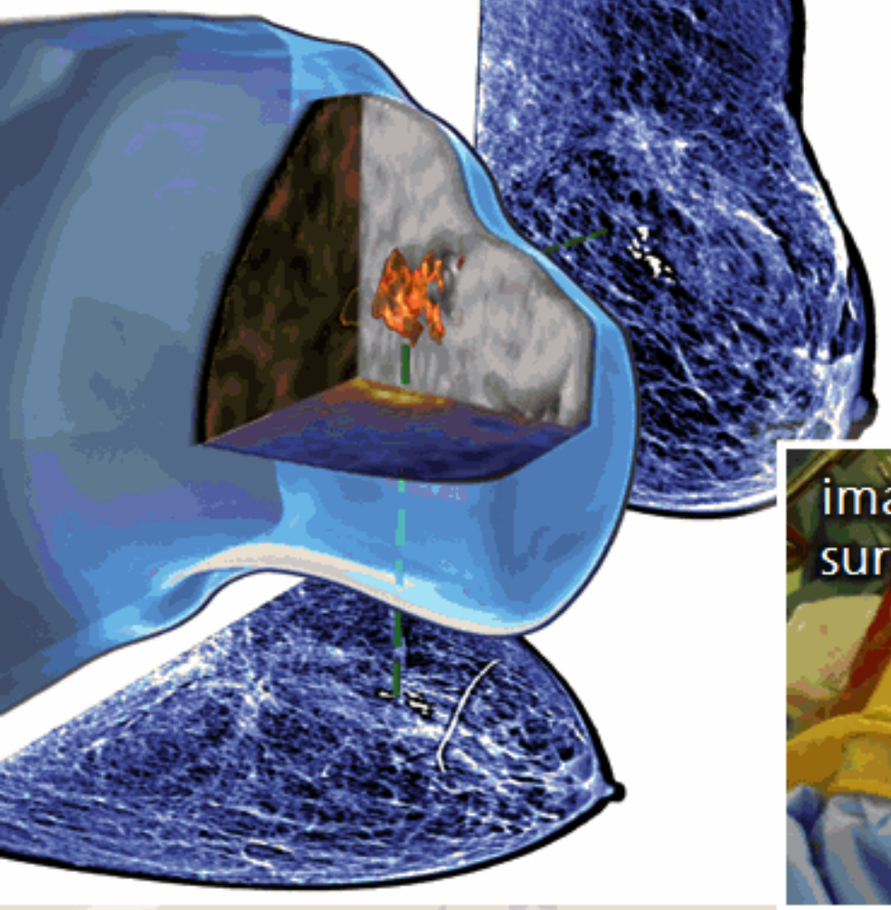
Alexander Köhn

Fraunhofer MEVIS



Selected Research Topics

multimodal
breast imaging



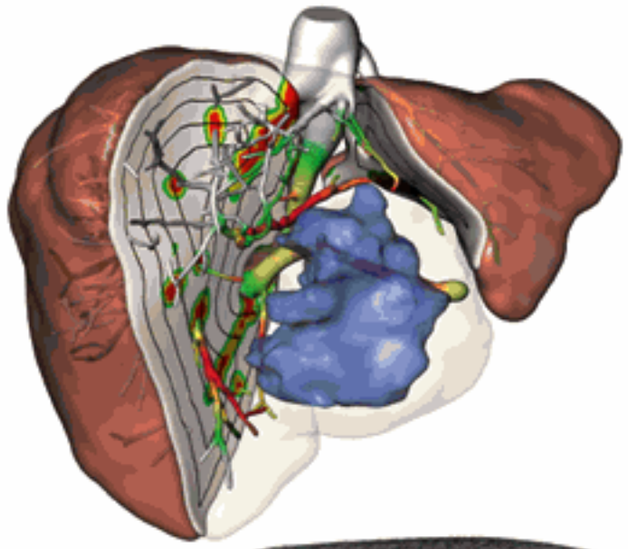
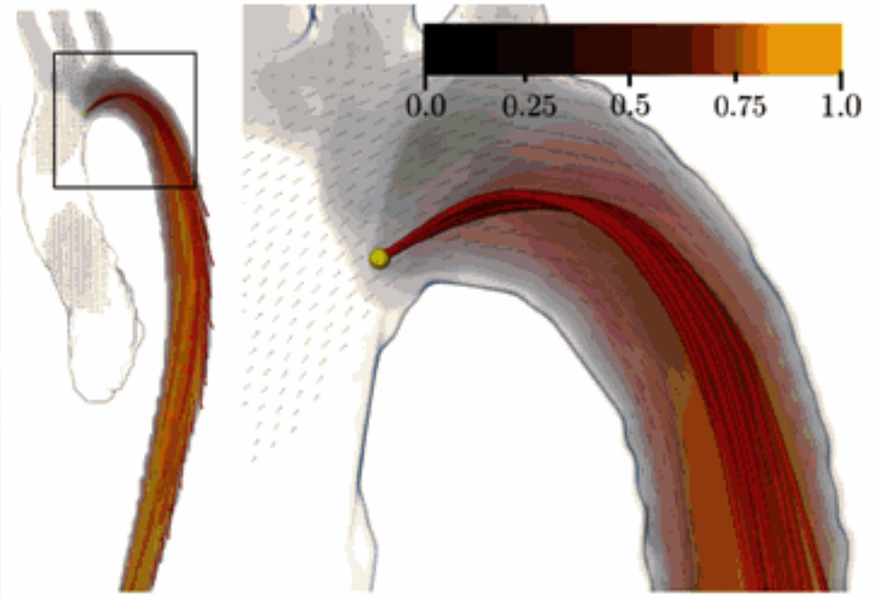
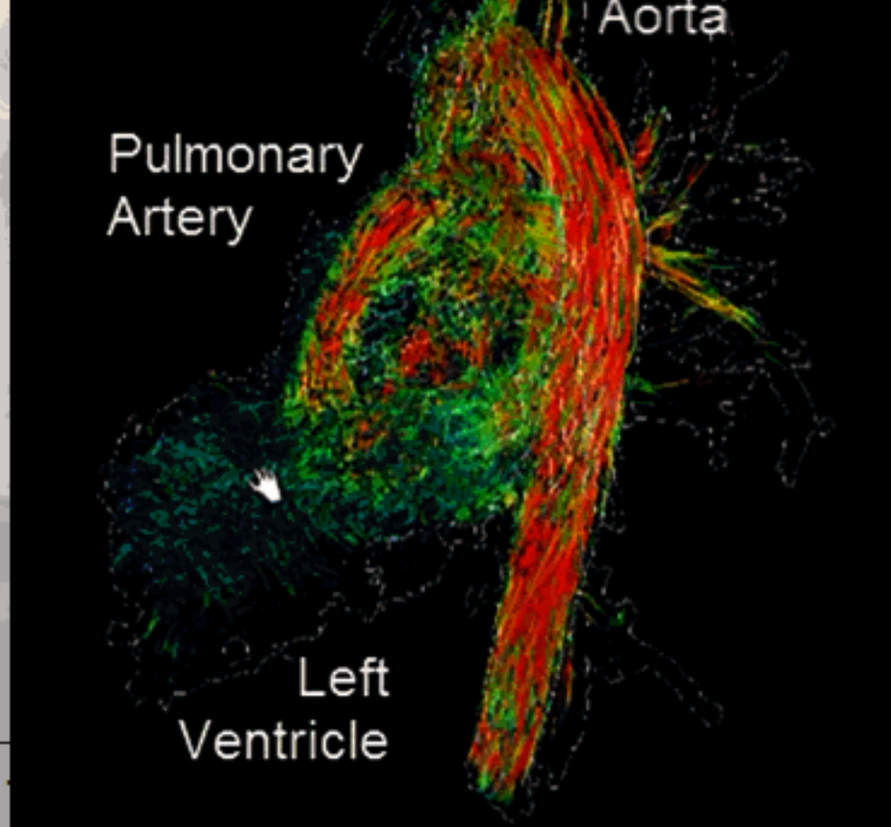
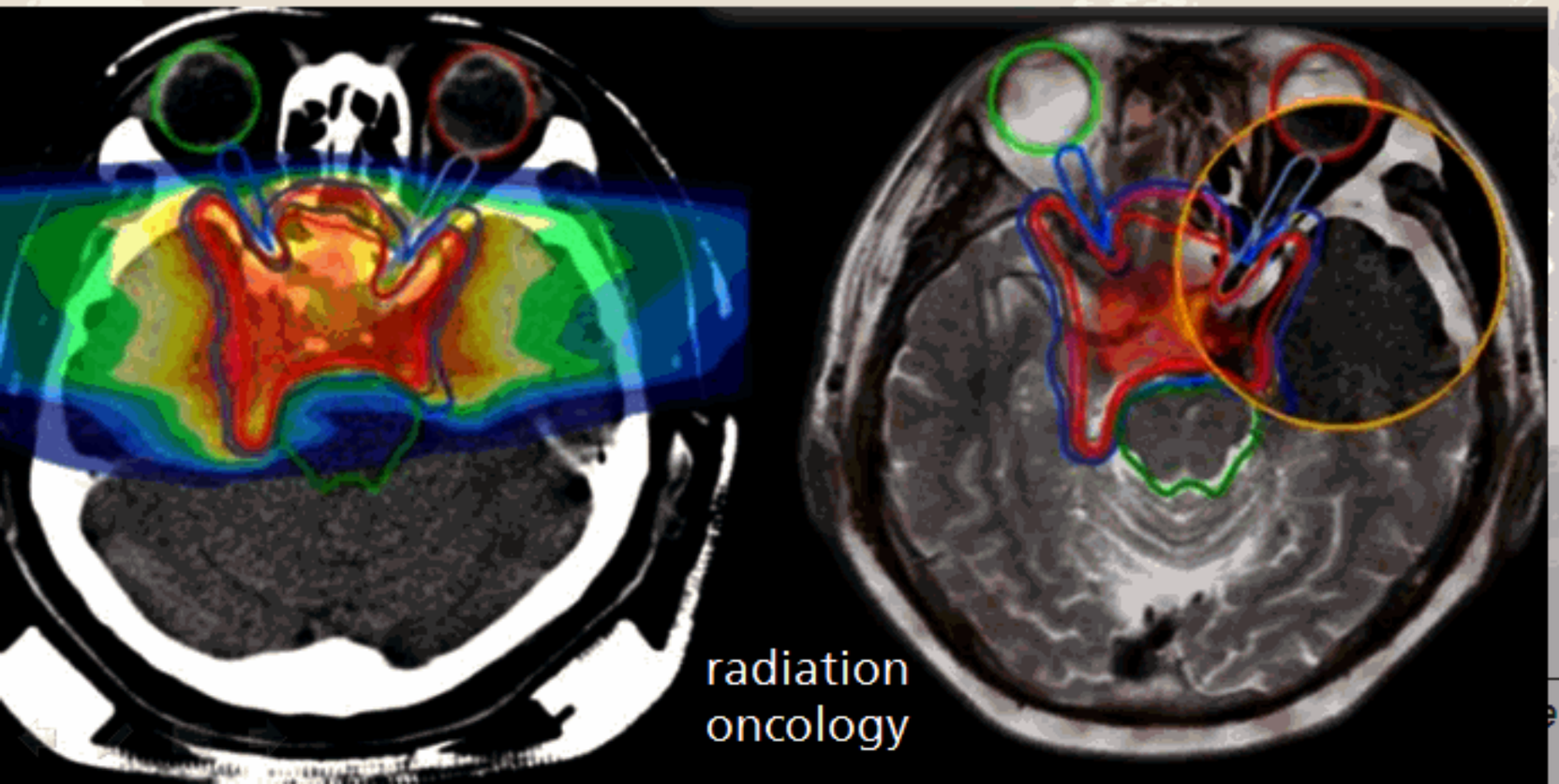


image guided
surgery



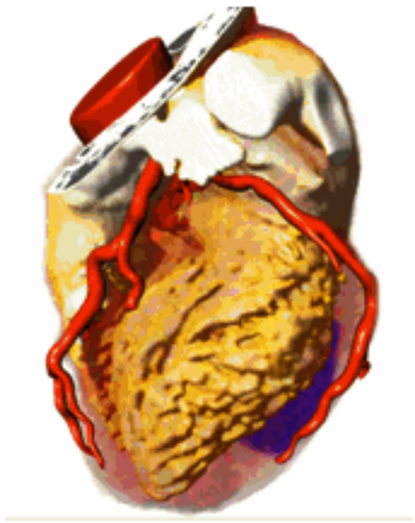
4D flow
quantification

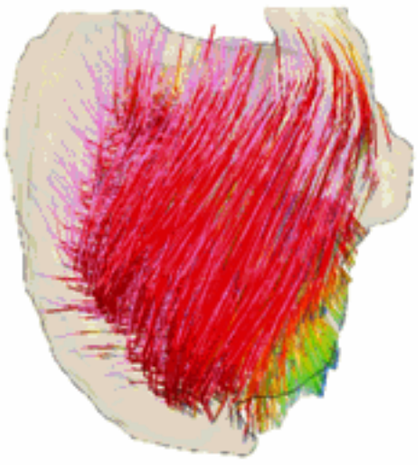




radiation
oncology

MeVisLab in Cardiovascular Applications

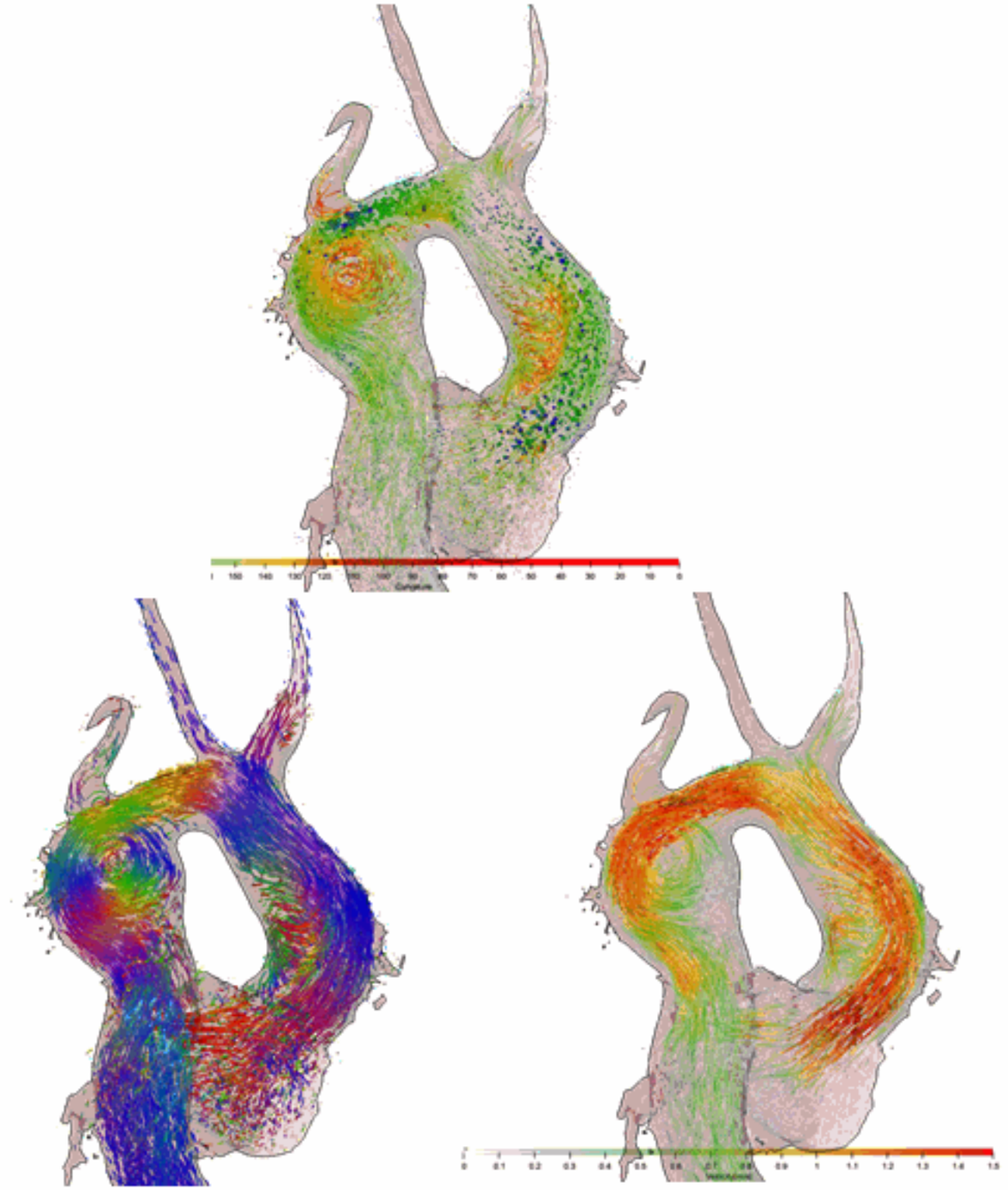




Fraunhofer MEVIS

Flow Visualization

- Fast GPU-based flow visualization
- Streamlines and pathlines
- Different coloring options
  - direction
  - velocity
  - angles
  - anatomic region



Hennemuth et al., SPIE 2011

Flow Visualization

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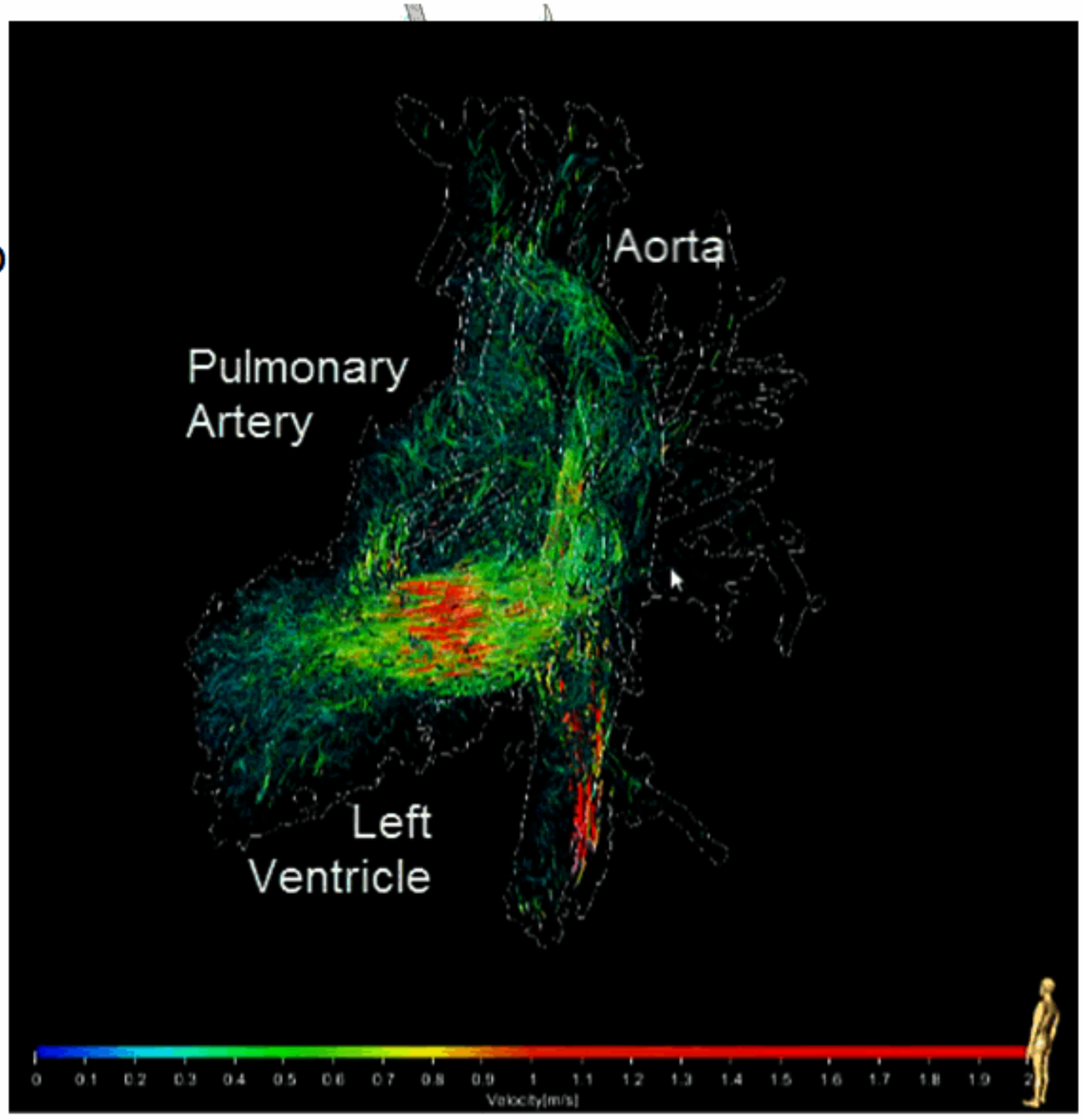
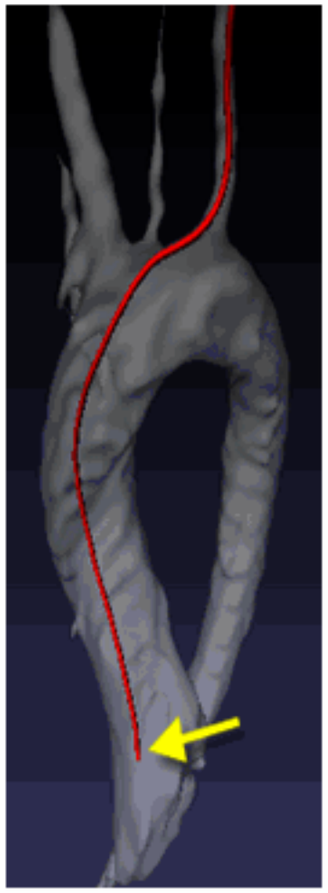


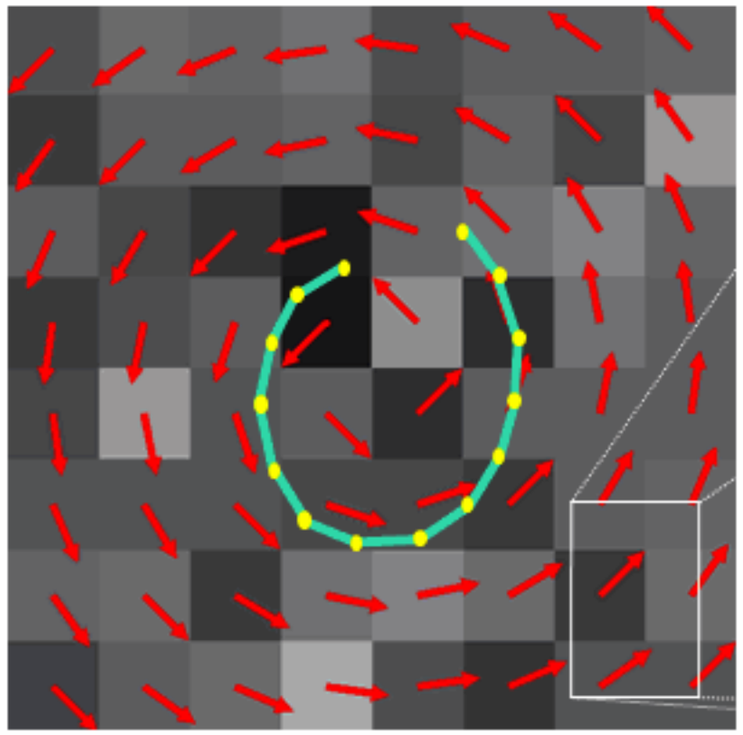
Hennemuth et al., SPIE 2011

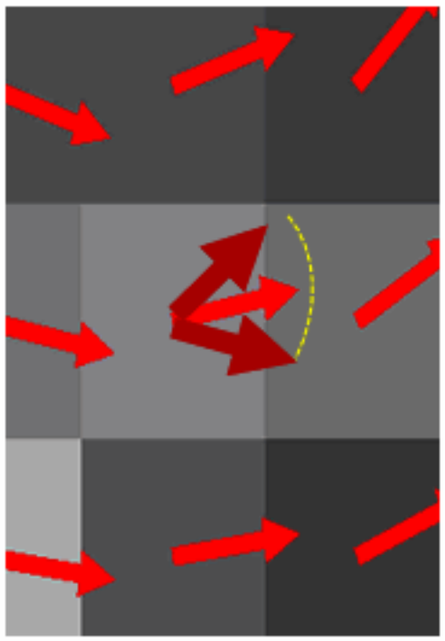
Fraunhofer MEVIS

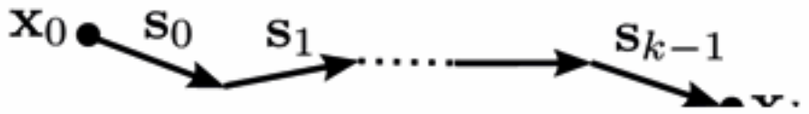
Probabilistic Tracking

Conventional streamline









$$\mathbf{s}_k = \mathbf{f}\left(\mathbf{x}_k, \mathbb{V}; T\right)$$

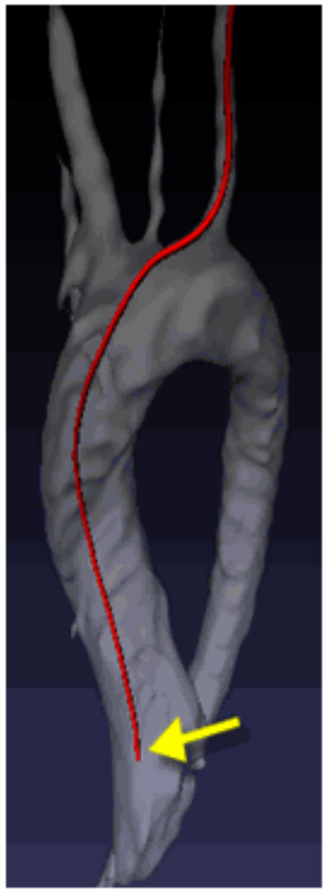
Vector field Step length

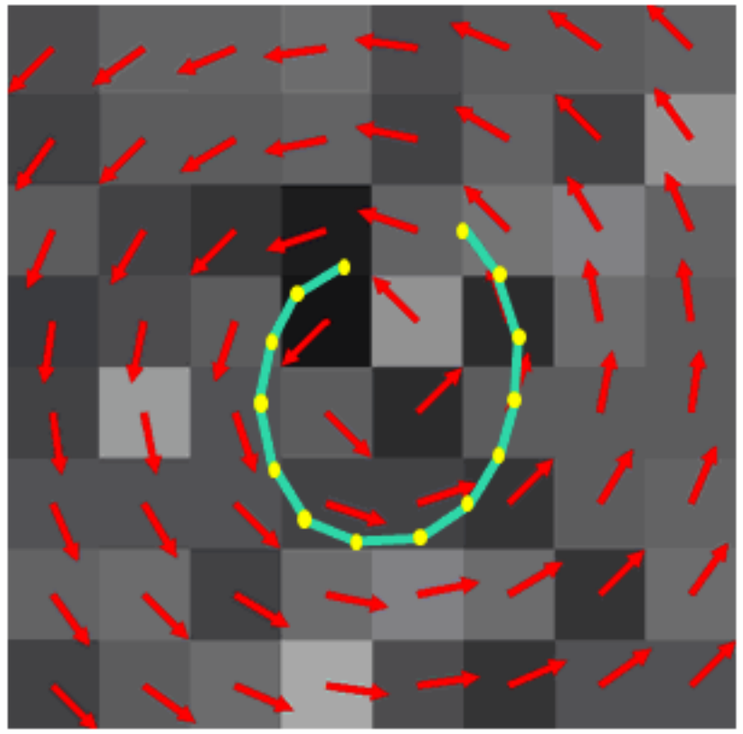
$$\mathbf{x}_k = \mathbf{x}_0 + \sum_{j=0}^{k-1} \mathbf{s}_j$$

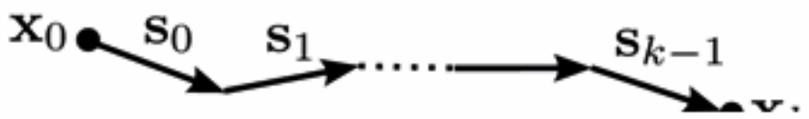
Fraunhofer MEVIS

Probabilistic Tracking

Conventional streamline



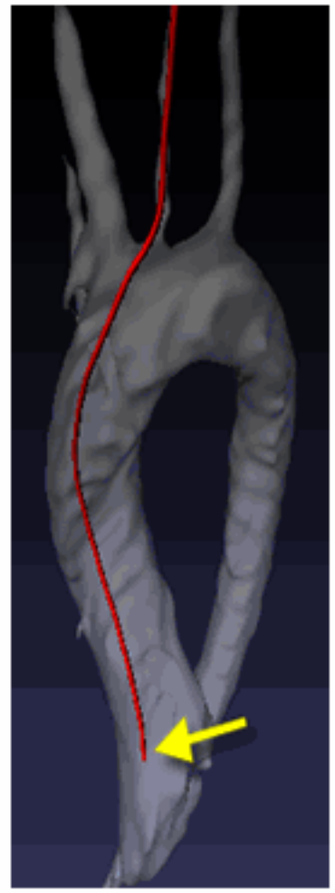




$$\mathbf{s}_k = \mathbf{f}\left(\mathbf{x}_k, \mathbb{V}; T\right)$$

Vector field Step length

Alternative trajectories?



$$\mathbf{x}_k = \mathbf{x}_0 + \sum_{j=0}^{k-1} \mathbf{s}_j$$

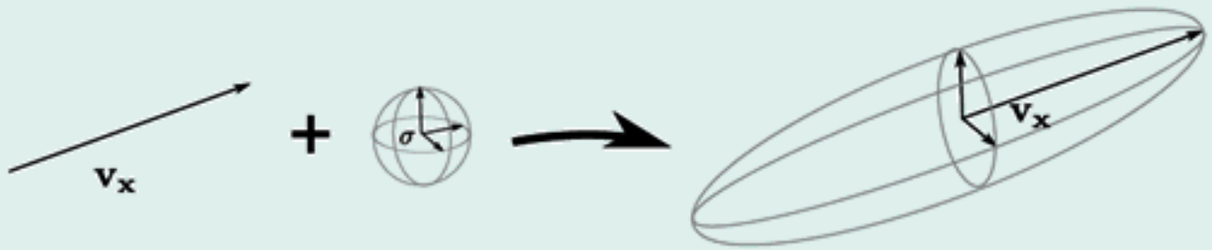
$$p(\mathbf{x}_k) = p(\mathbf{s}_0, \ldots, \mathbf{s}_{k-1})$$

Fraunhofer MEVIS

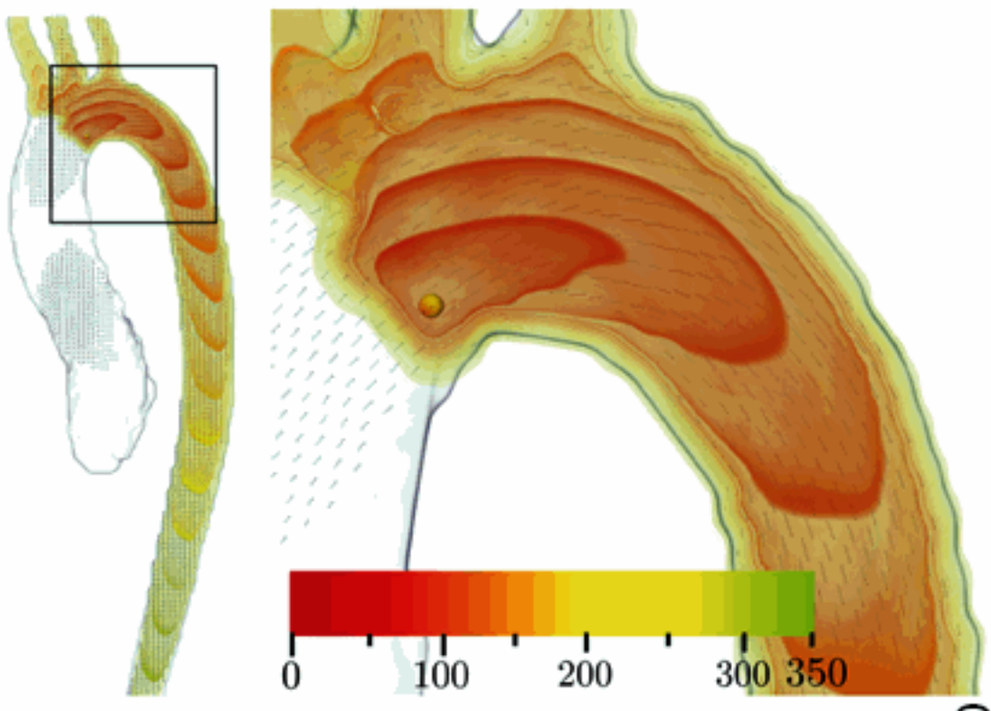
Probabilistic Bloodflow Analysis 2

Incorporation of measurement uncertainty

- trajectories as minimal paths in tensor field based on PC-MRI flow field



- tensor field as metric for anisotropic Fast Marching
  + restriction of direction for propagation in the Fast Marching



Distance map

Schwenke et al., MICCAI 2011

Fraunhofer MEVIS

Probabilistic Bloodflow Analysis 2

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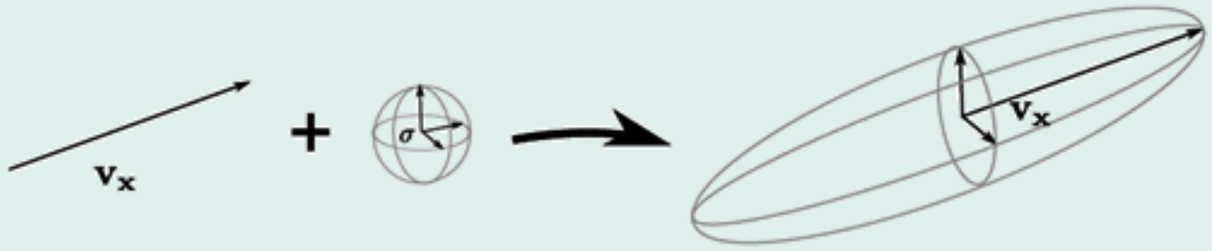

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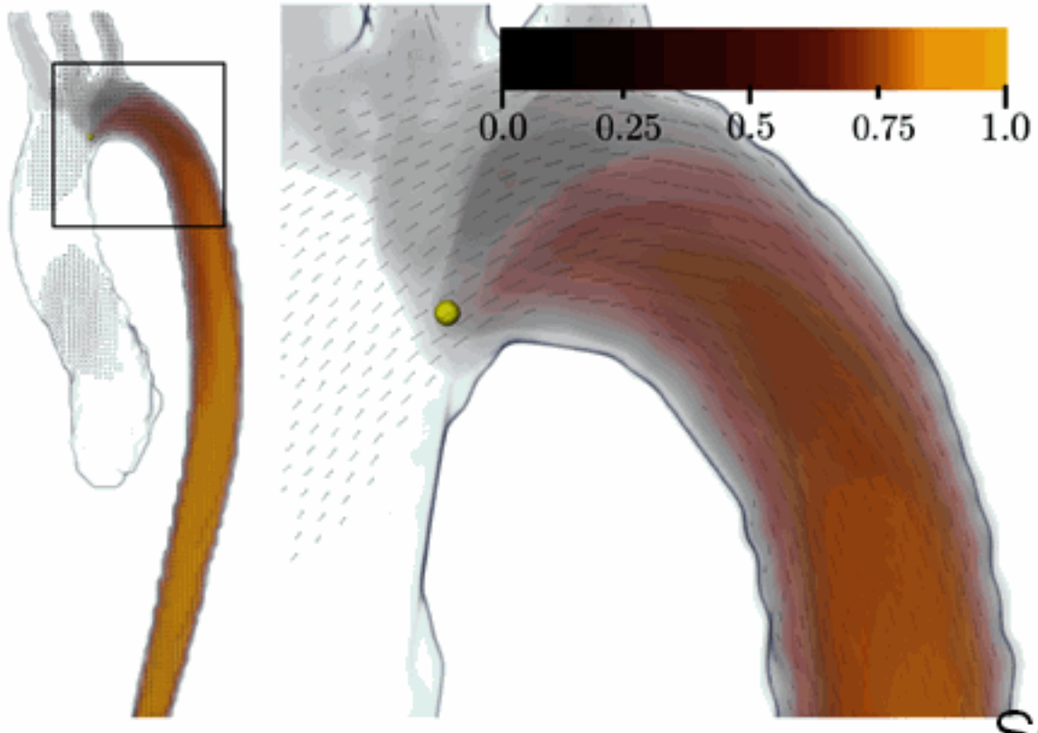

Connectivity map

Schwenke et al., MICCAI 2011

Fraunhofer MEVIS

Probabilistic Bloodflow Analysis 2

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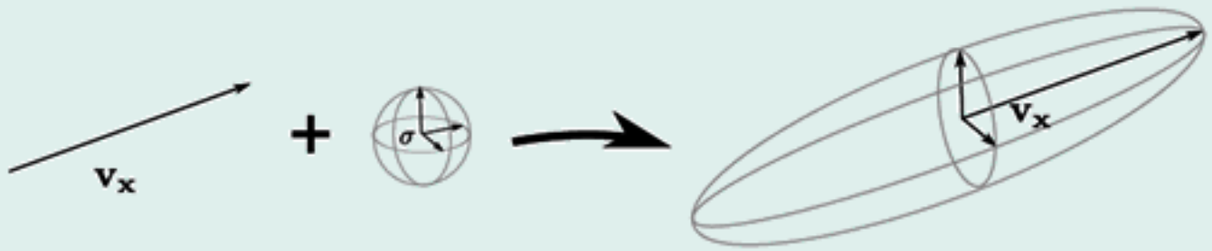

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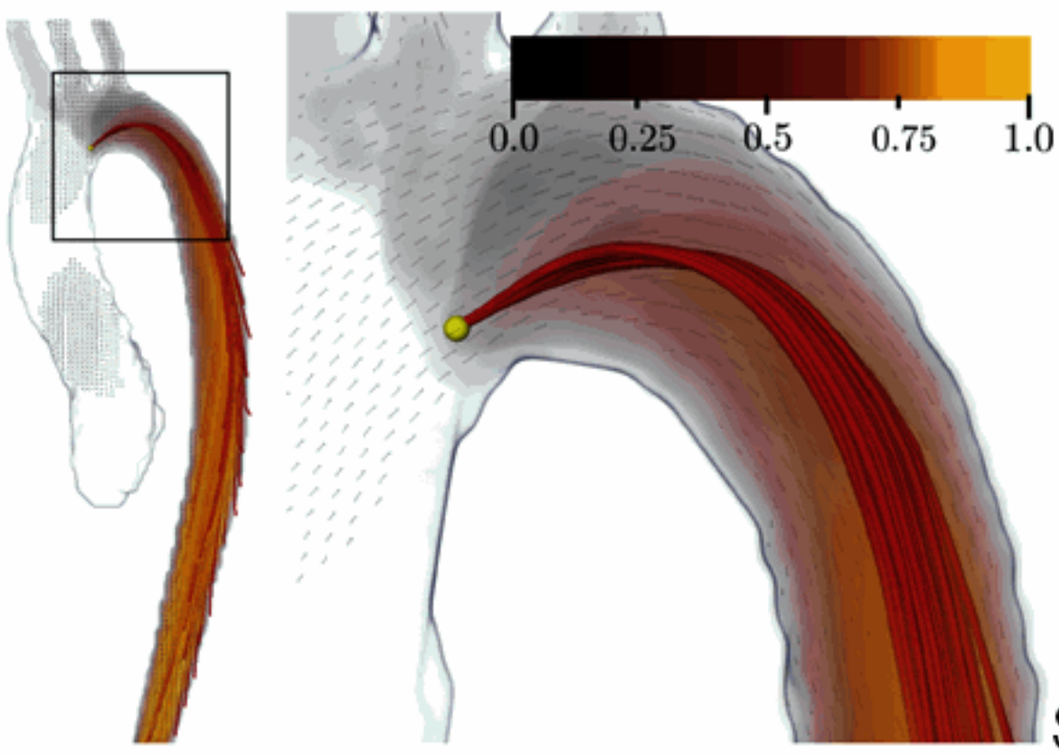
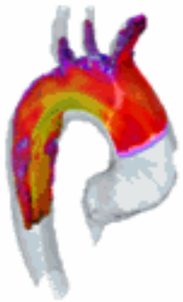


Most likely trajectories

Schwenke et al., MICCAI 2011

Fraunhofer MEVIS

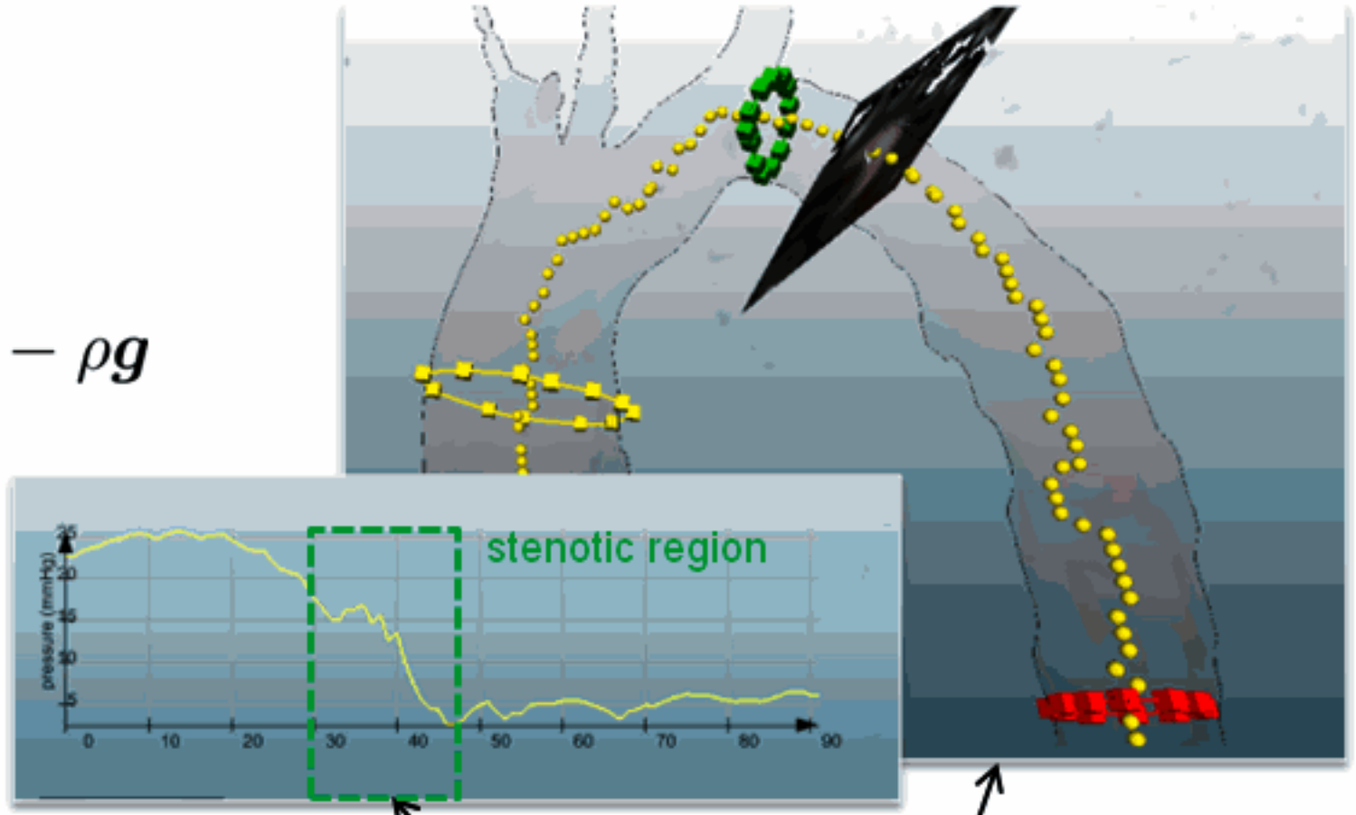


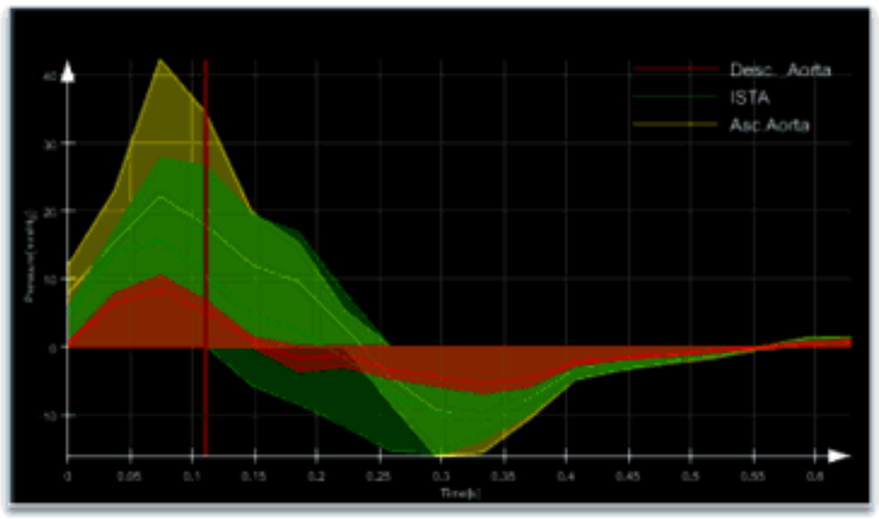
Pressure difference mapping

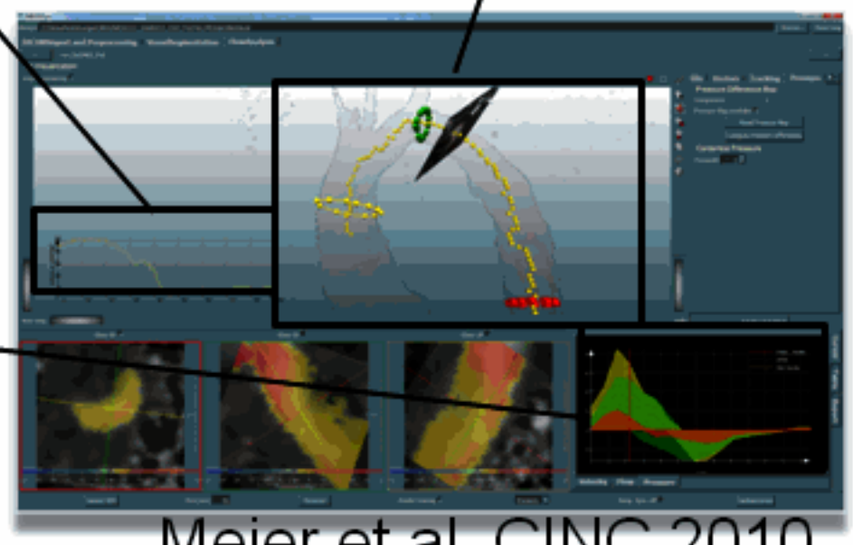
- Navier-Stokes-based 3D pressure difference maps

$$-\nabla p = \rho\frac{\partial \mathbf{v}}{\partial t} + \rho\mathbf{v}\cdot\nabla\mathbf{v} + \eta\nabla^2 v - \rho\boldsymbol{g}$$

- pressure differences over time
- interactive pressure curves over selected vessels



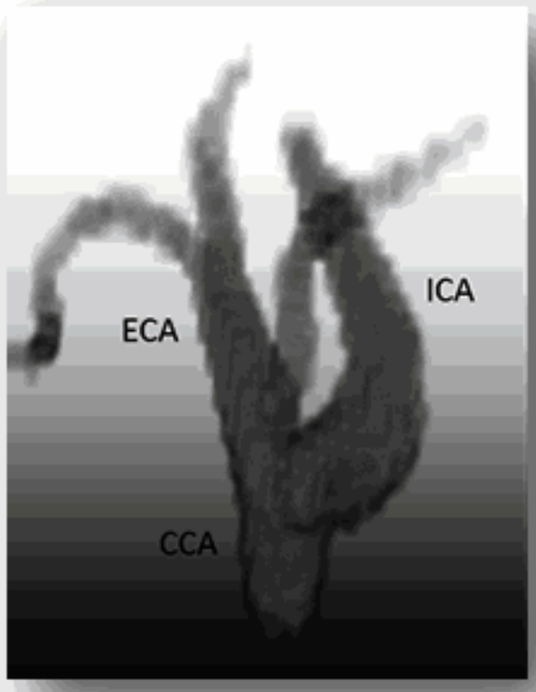




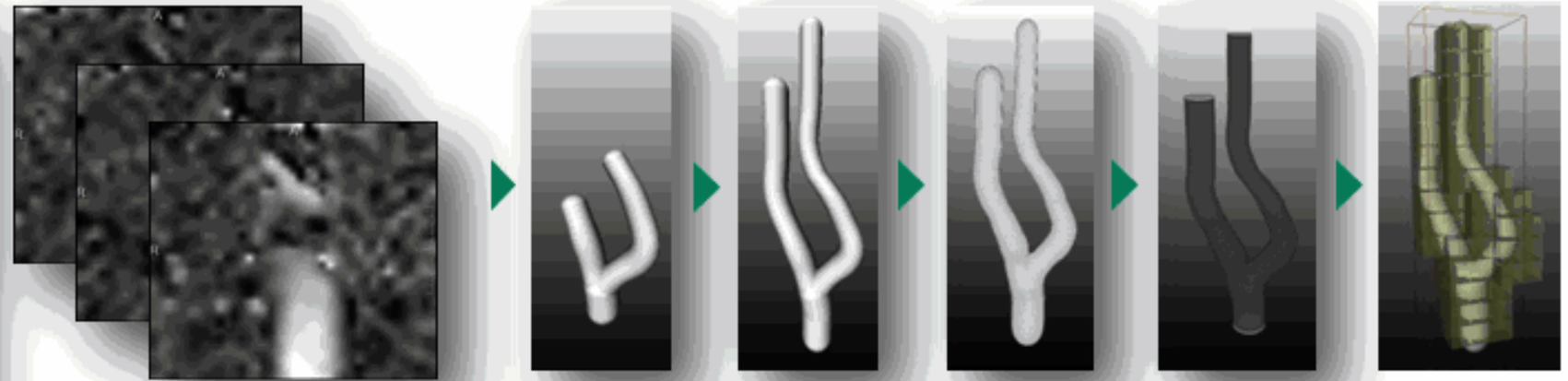
Meier et al. CINC 2010

Fraunhofer MEVIS

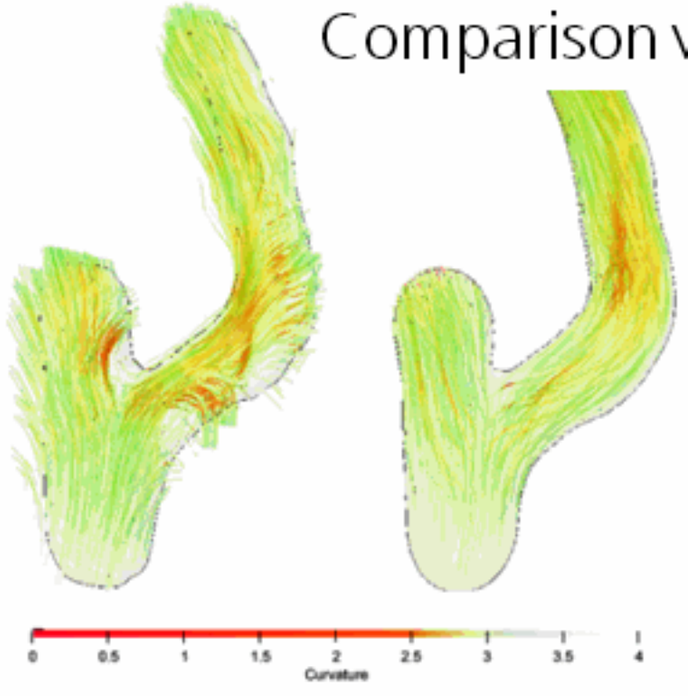
Bloodflow simulation

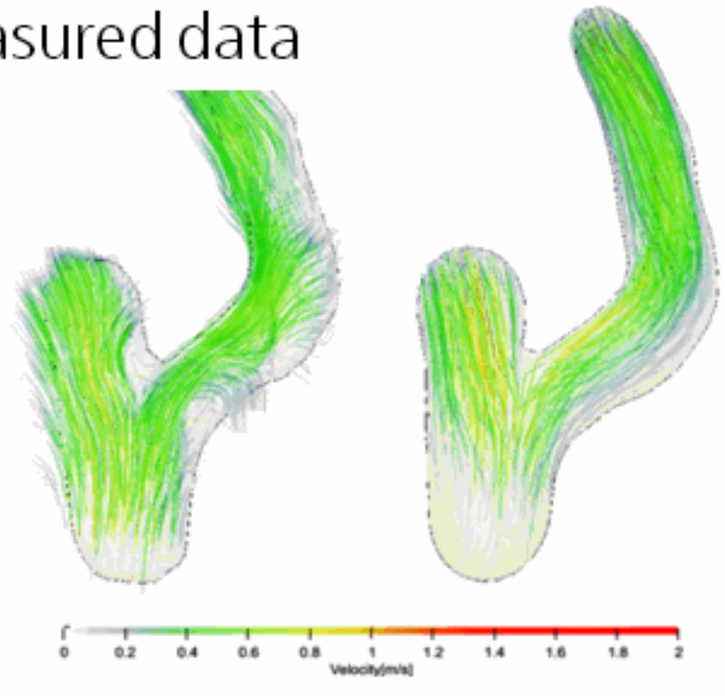


Support of therapy planning through flow simulation



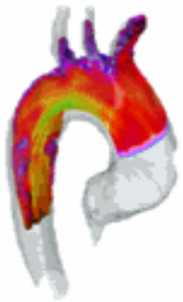
Comparison with measured data





Meier et al., GI Workshop ETM 2011

Fraunhofer MEVIS



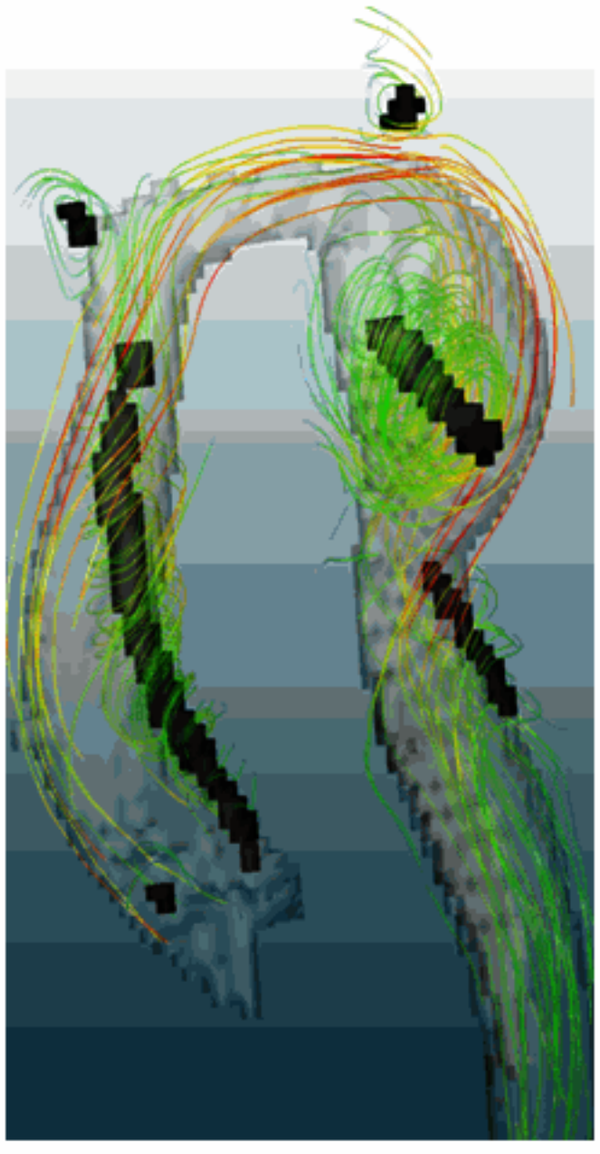
Flow pattern analysis

Goal: Quantitative assessment of flow features

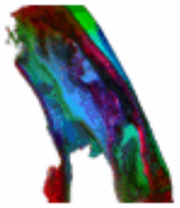
Problems: Classical Approaches amplify noise and are resolution-sensitive → limited applicability to PC MRI data

Solution: Adaptive Vector Pattern Matching

Pattern	Top view	Cut view
Vortex		
Swirl (right hand)		
Swirl (left hand)		
Converging		
Diverging		
Parallel flow		



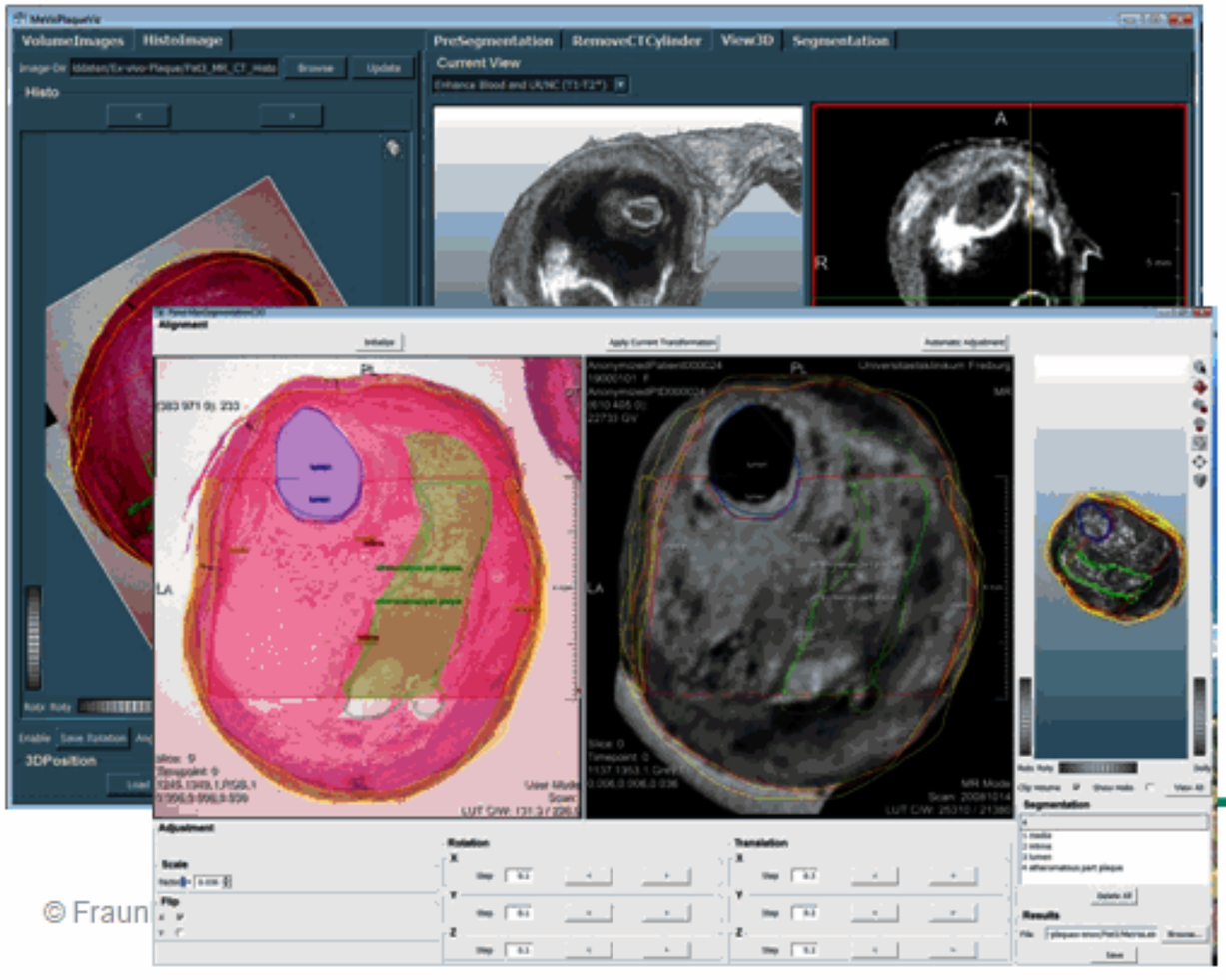
Drexl et al., submitted to ISBI 2013

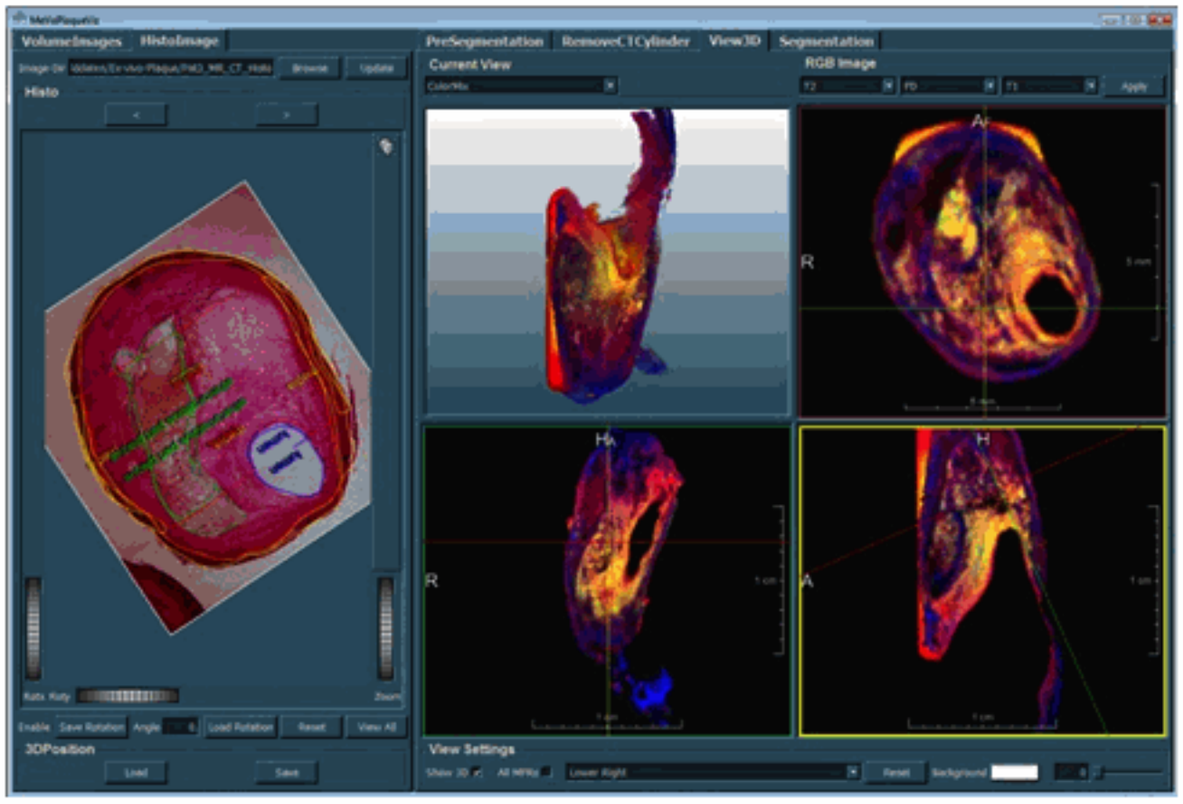


Comparison with ground truth for multispectral plaque MRI

Segmentation and fusion of MR contrasts

Alignment of histological slice

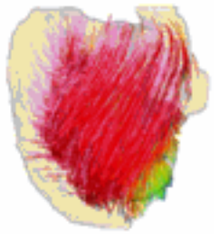




- Joint 3D color images of different contrasts
- Arithmetic combinations of different contrasts

Images courtesy of PD Dr. Marin, PD Dr. Harlo

Fraunhofer MEVIS



CAIPI: A research tool for cardiac image analysis

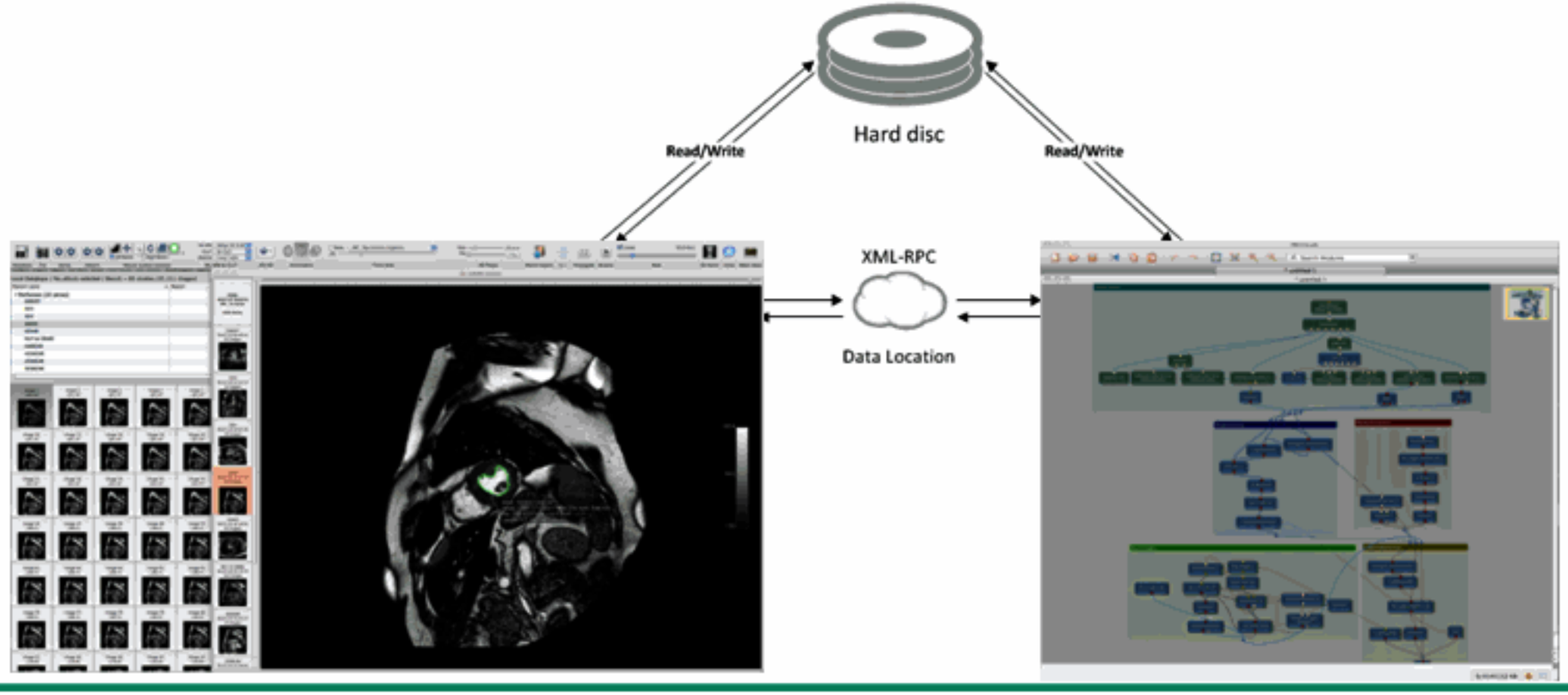
Plug-in for OsiriX

OsiriX

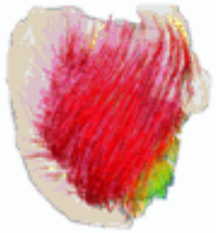
- DICOM PACS workstation
- Integrated data management
- Distributed under Open Source Licensing
- Extendable by plugin-architecture
- Established tool for cardiovascular image analysis

MeVisLab

- Modular cross-platform framework for medical image processing and visualization.
- Extendable by visual rapid prototyping.
- Support of large n-dimensional volumes by page-based image processing.



Fraunhofer MEVIS

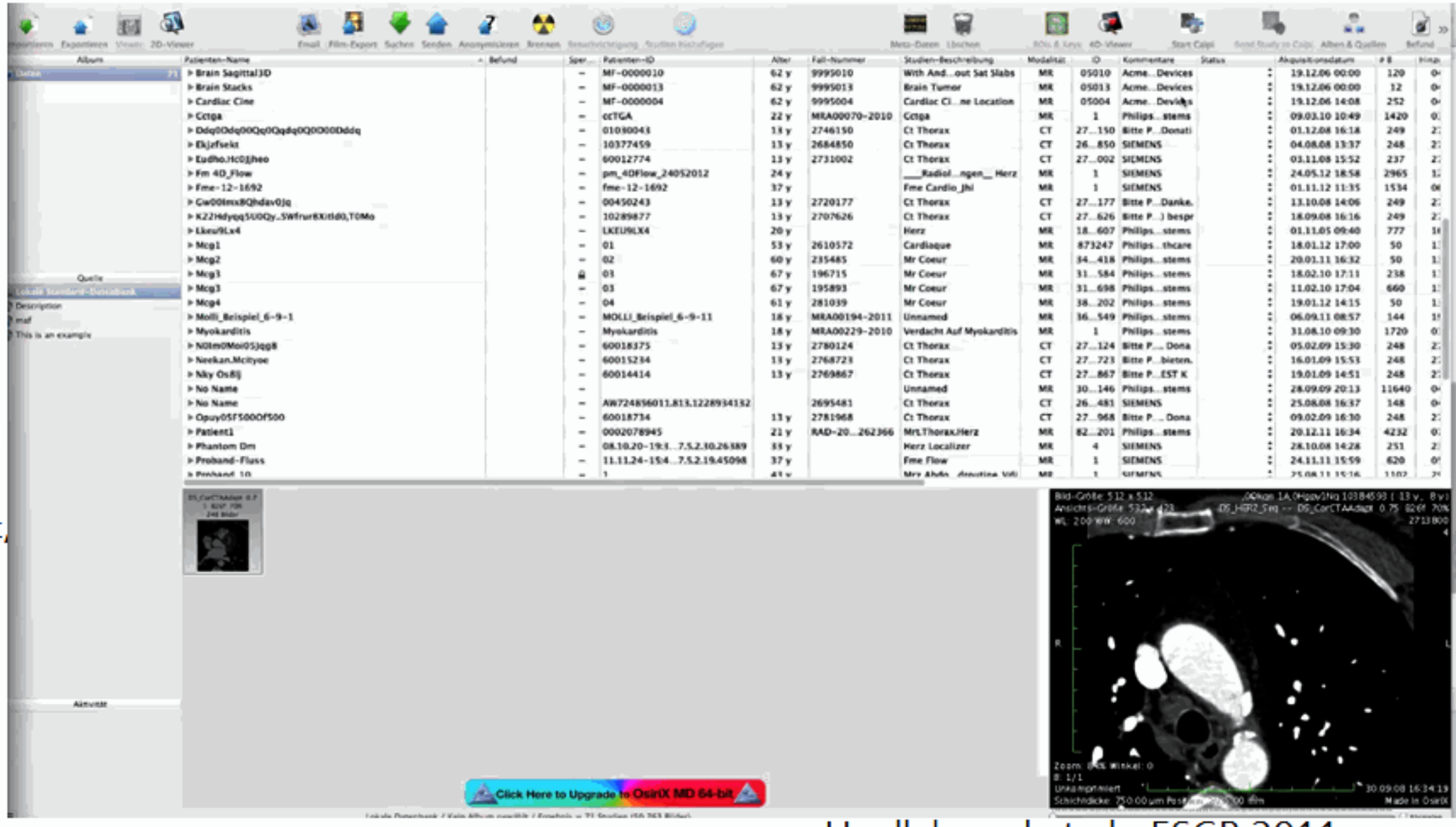


CAIPI: A research tool for cardiac image analysis

Plug-in for OsiriX

Synchronized Analysis of Cardiac Image Data

- Cardiac Function
- Bloodflow
- Tissue Characterization
  - T1-Mapping
  - T2*-Mapping
  - Late Enhancement,



Huellebrand et al., ESCR 2011

Fraunhofer MEVIS

Highly Accurate Breast Cancer Diagnosis through Integration of Biomedical Knowledge, Novel Imaging Modalities and Modelling

HAMAM

FP7 ICT – **Virtual Physiological Human** Call

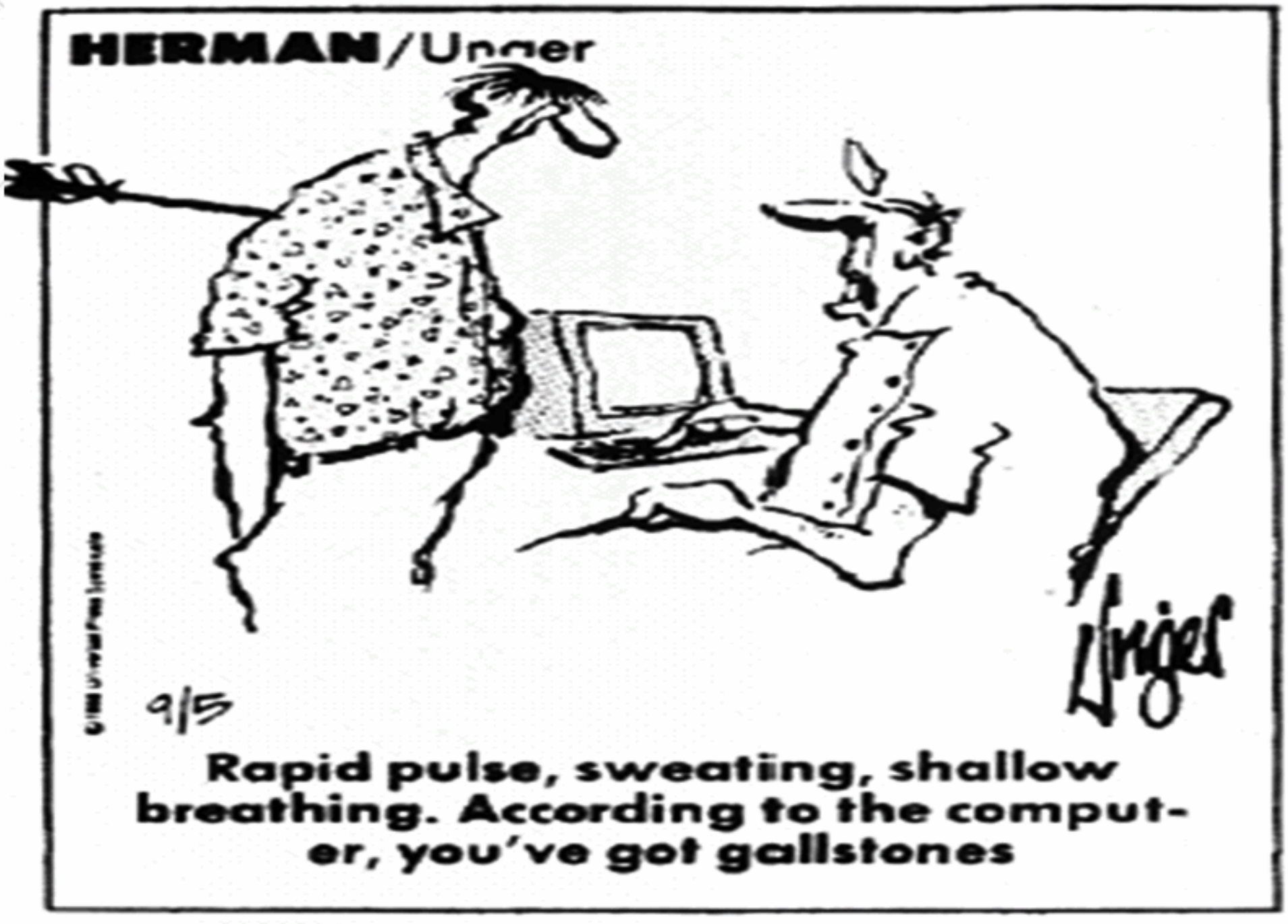
- Specific Targeted Research Project (STREP)
- medium sized

Duration: 9/08 – 2/12

EIBIR – European Institute for Biomedical Imaging Research (Coordinator; AT)
Fraunhofer MEVIS, Bremen (Scientific Coordinator; DE)
MeVis Medical Solutions, Bremen (DE)
University College London (UK)
Swiss Federal Institute of Technology, Zuerich (CH)
Radboud University Medical Centre, Nijmegen (NL)
University of Dundee (UK)
Charité Medical University Berlin (DE)
Boca Raton Regional Hospital (USA)

Fraunhofer MEVIS

Long Way Towards Knowledge Based Medicine and CAD



1. CAD system development
2. data and knowledge annotation
3. clinical validation
4. product integration

Fraunhofer MEVIS

CAD Required for Extended Imaging Protocols?

Here: Fast Breast MRI

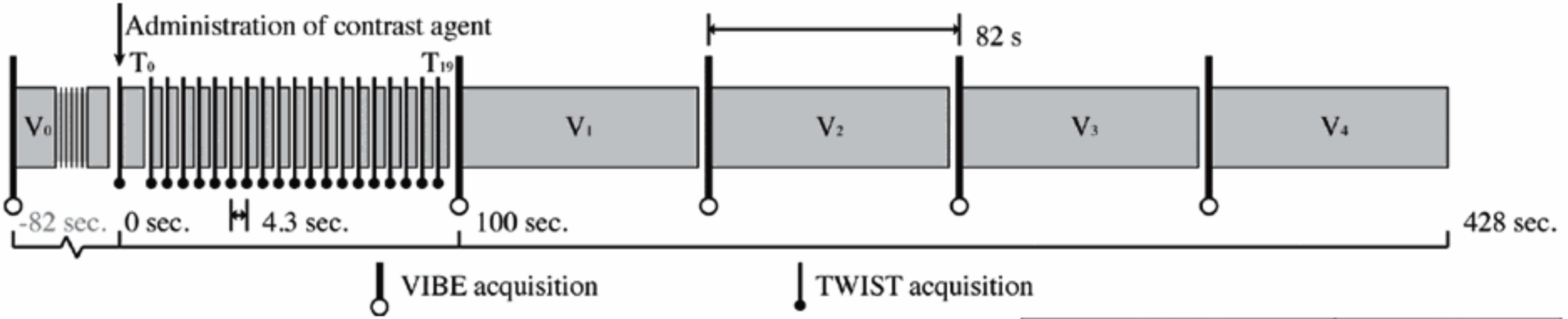
with work by B. Platel et al.

Fraunhofer MEVIS

High Temporal and High Spatial Resolution MRI (TWIST vs. VIBE)

- 154 lesions (71 benign,83 malignant)
- 20 timepoints TWIST
  with 4.3 sec temporal resolution
  and 0.9x0.9x2.5 mm³ voxel size
- 1+4 pre/post-con VIBE volumes
  with 82 sec temporal resolution
  and 0.8x0.8x1.0 mm³ voxel size

	Pathology	Occurrence	
Benign	FA	36	71
	Lymph Node	12	
	Adenosis	7	
	Nodular fasciitis	2	
	Other	14	
Malignant	IDC	56	83
	ILC	14	
	DCIS	10	
	Other	3	

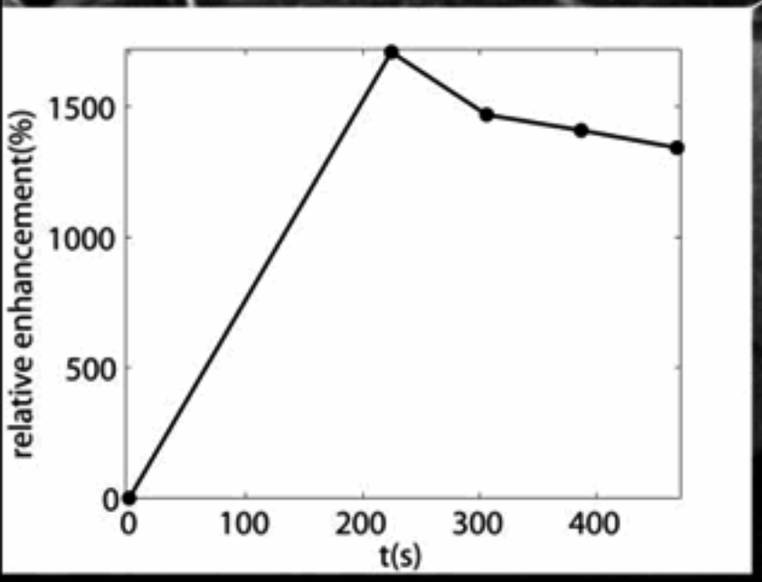


B. Platel et al.

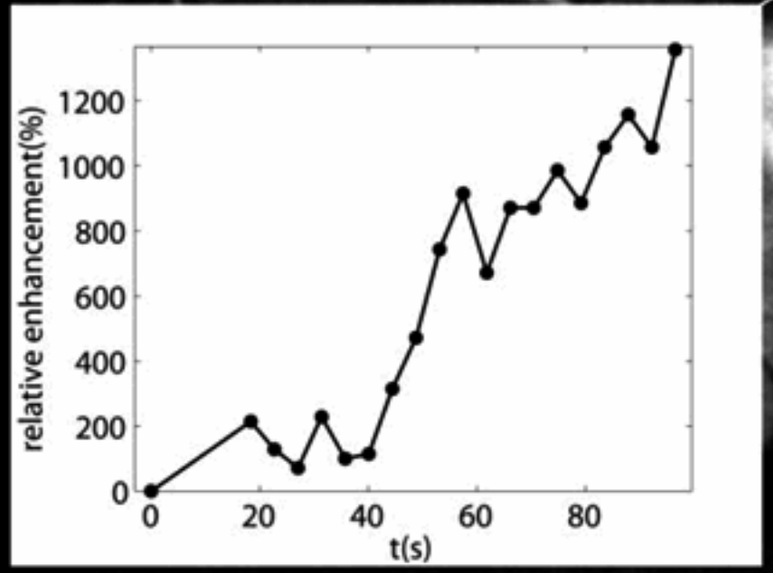
	TWIST	VIBE
voxelsize	0.9*0.9*2.5 mm	0.8*0.8*1.0 mm
TE	2.02 ms	1.71ms
TR	3.96 ms	5.50 ms
flip angle	20°	20°
FOV	360 mm	360 mm
parallel imaging acceleration factor	3	3
temporal resolution	4.3 sec	82 sec
size region A	15% of k-space points	
sampling density region B	10% per image volume	

Fraunhofer MEVIS

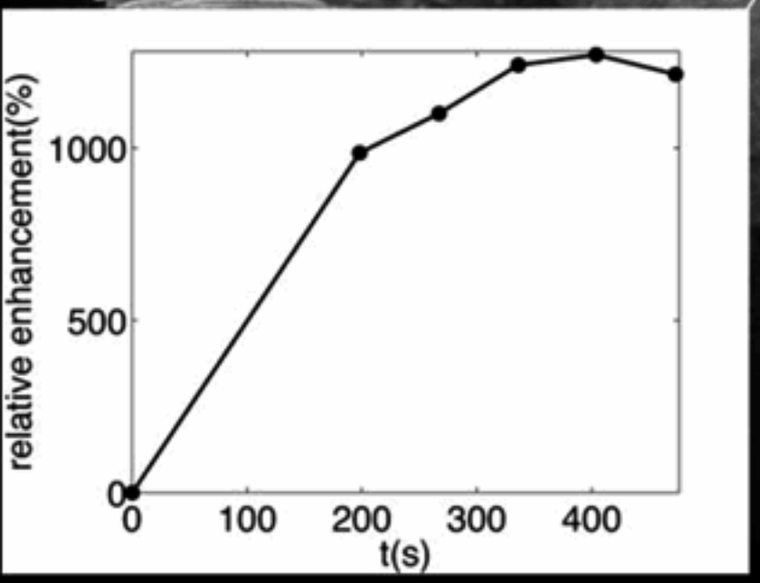
VIBE


relative enhancement(%)
1500
1000
500
0
0
100
200
300
400
t(s)

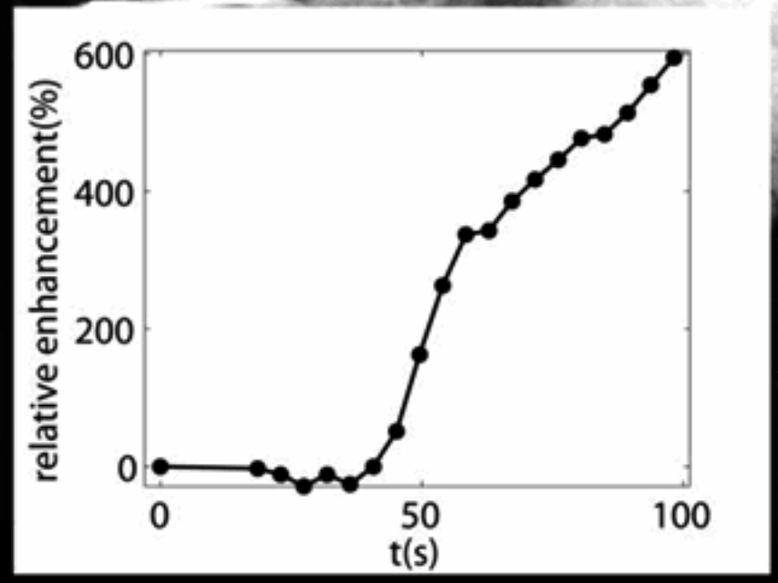
TWIST


relative enhancement(%)
1200
1000
800
600
400
200
0
0
20
40
60
80
t(s)

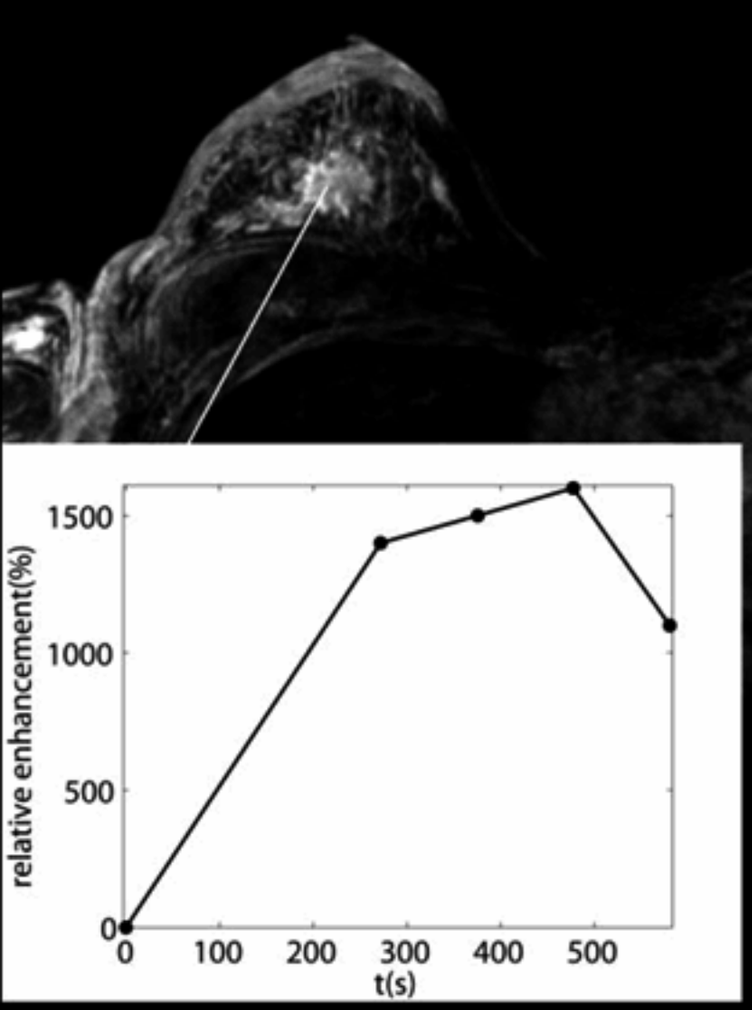
VIBE


relative enhancement(%)
1000
500
0
0
100
200
300
400
t(s)

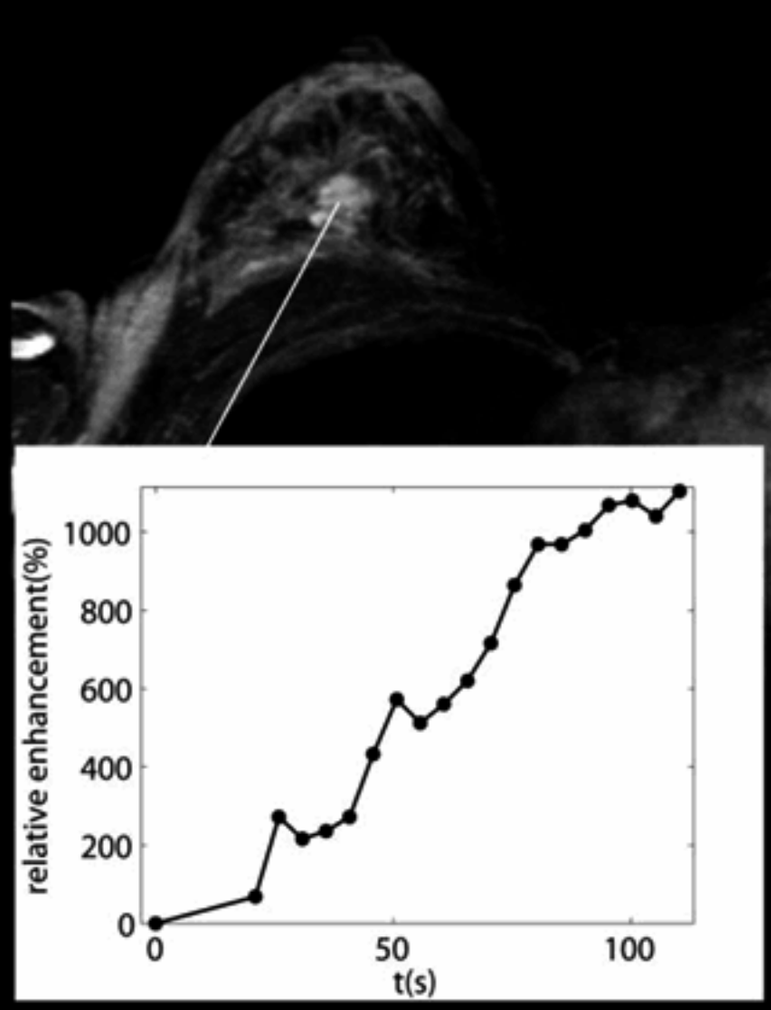
TWIST


600
400
200
0
relative enhancement(%)
0
50
100
t(s)

VIBE


relative enhancement(%)
1500
1000
500
0
0
100
200
300
400
500
t(s)

TWIST

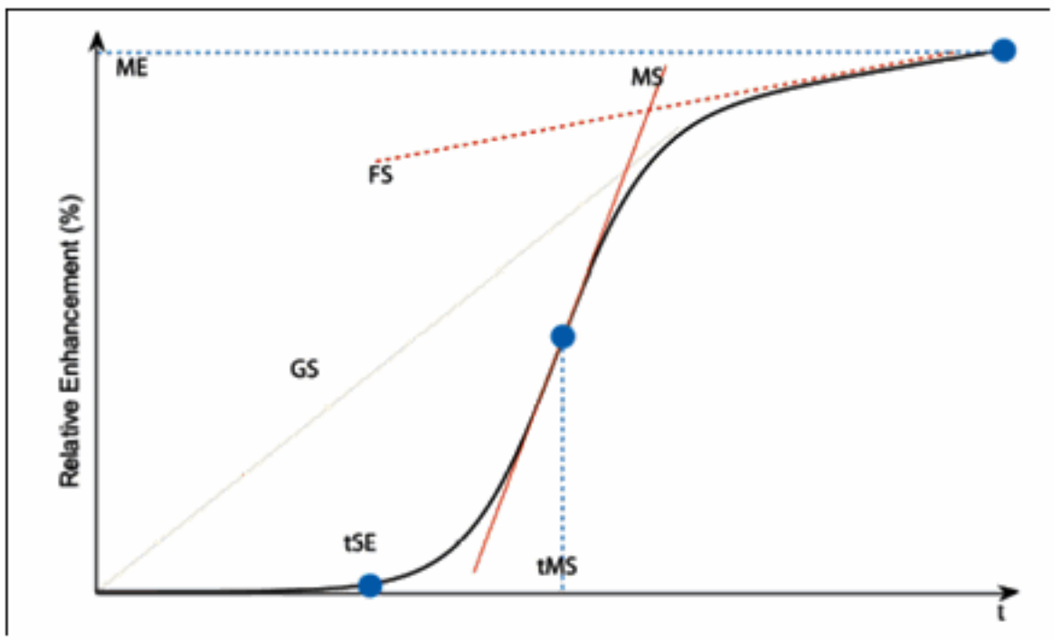

relative enhancement(%)
1000
800
600
400
200
0
0
50
100
t(s)

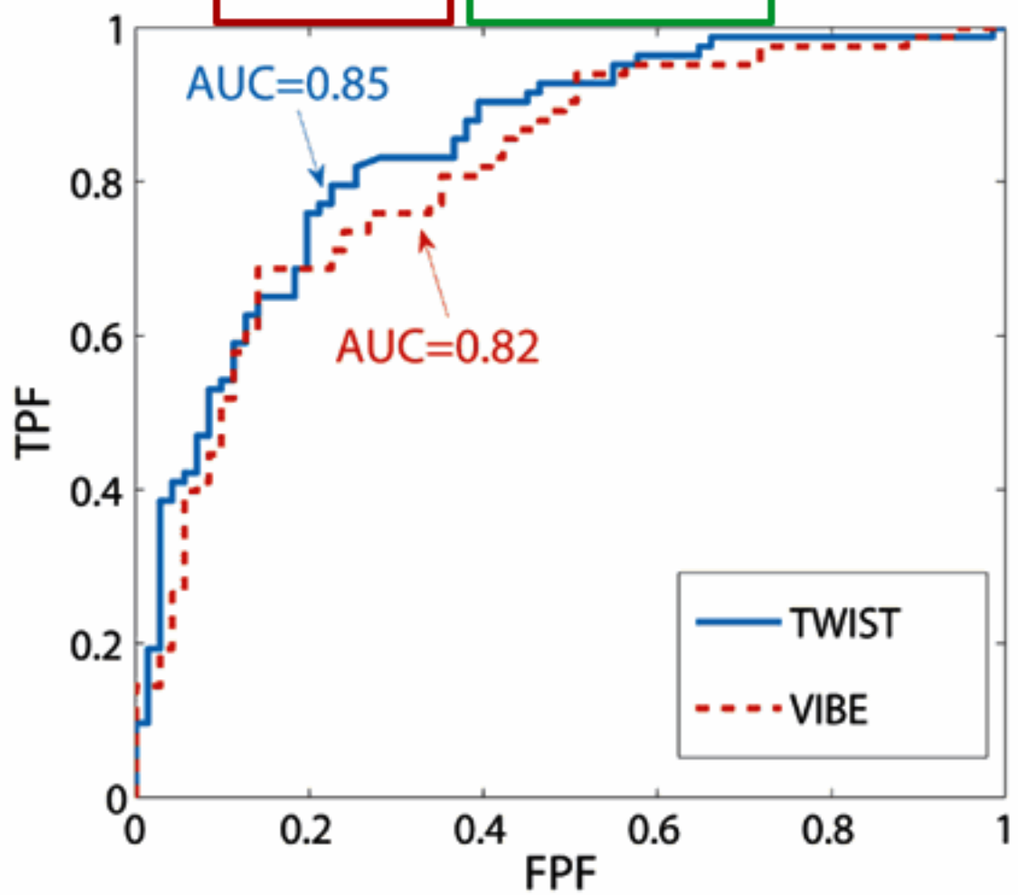
Results
TWIST vs VIBE

- kinetic parameters:
  TWIST superior to VIBE
- morphological paramters:
  similar for TWIST and VIBE

		kinetic	morphological	both
LDA	VIBE	0.77	0.79	0.82
	TWIST	0.82	0.78	0.81
	significance	-	-	-
kNN	VIBE	0.70	0.78	0.78
	TWIST	0.82	0.78	0.81
	significance	$p = 0.012$	-	-
SVM-poly	VIBE	0.70	0.74	0.73
	TWIST	0.79	0.73	0.80
	significance	$p = 0.006$	-	$p = 0.012$
SVM-RBF	VIBE	0.74	0.79	0.82
	TWIST	0.82	0.79	0.85
	significance	$p = 0.042$	-	-
GB	VIBE	0.67	0.74	0.73
	TWIST	0.86	0.79	0.86
	significance	$p < 0.001$	-	$p < 0.001$

B. Platel et al.





Fraunhofer MEVIS

What About Multimodal CAD?

with results of HAMAM and Medical Valley

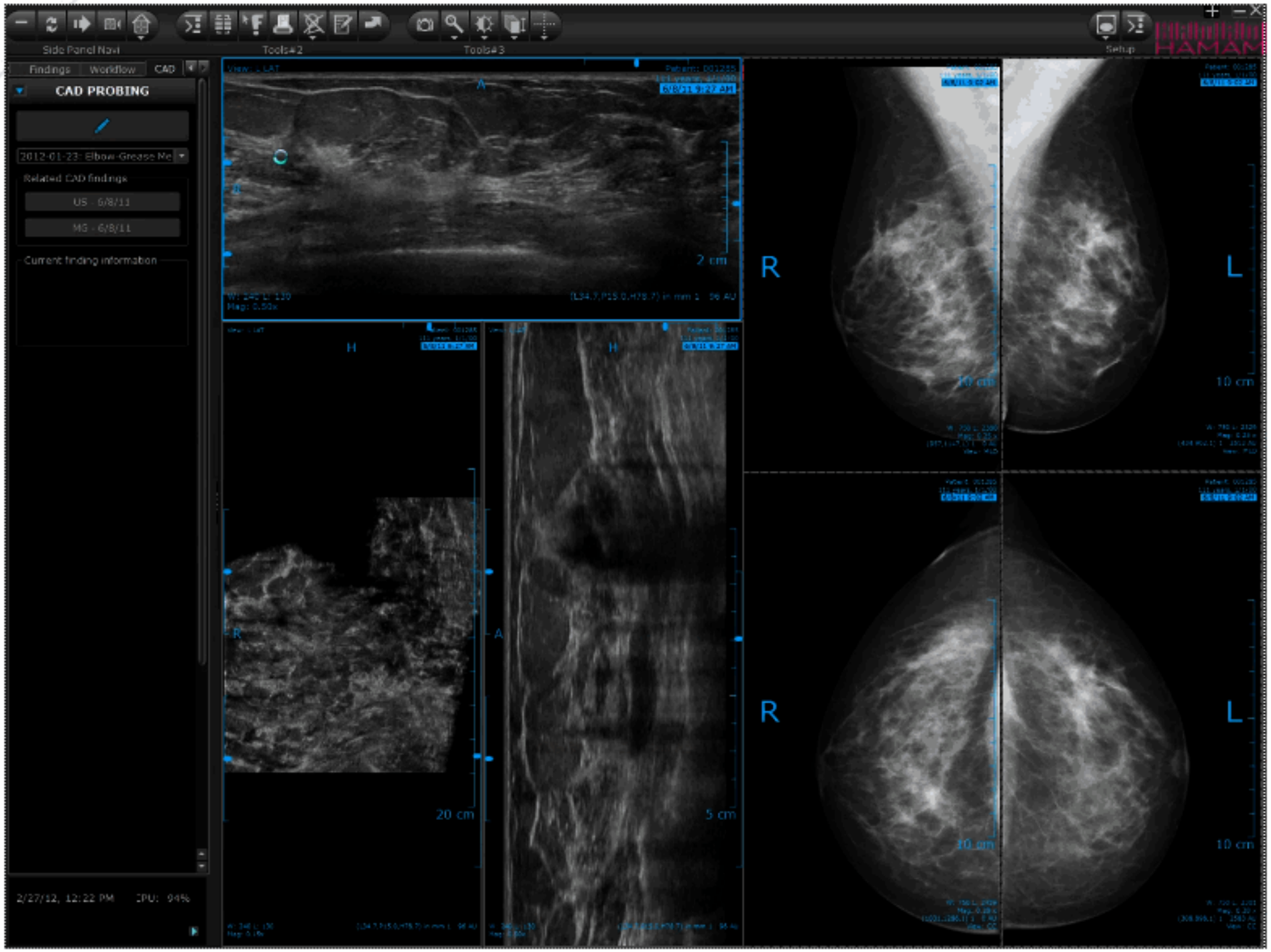
HAMAM

MEDICAL VALLEY
Europäische Metropolregion Nürnberg

Fraunhofer
MEVIS

HAMAM Workstation: Interactive CAD

(here: ABUS – MG)



Fraunhofer MEVIS

Side Panel Navi | Tools#2 | Tools#3 | Setup

Findings | Workflow | CAD

CAD PROBING

2012-01-23: Elbow-Grease Me

Related CAD findings

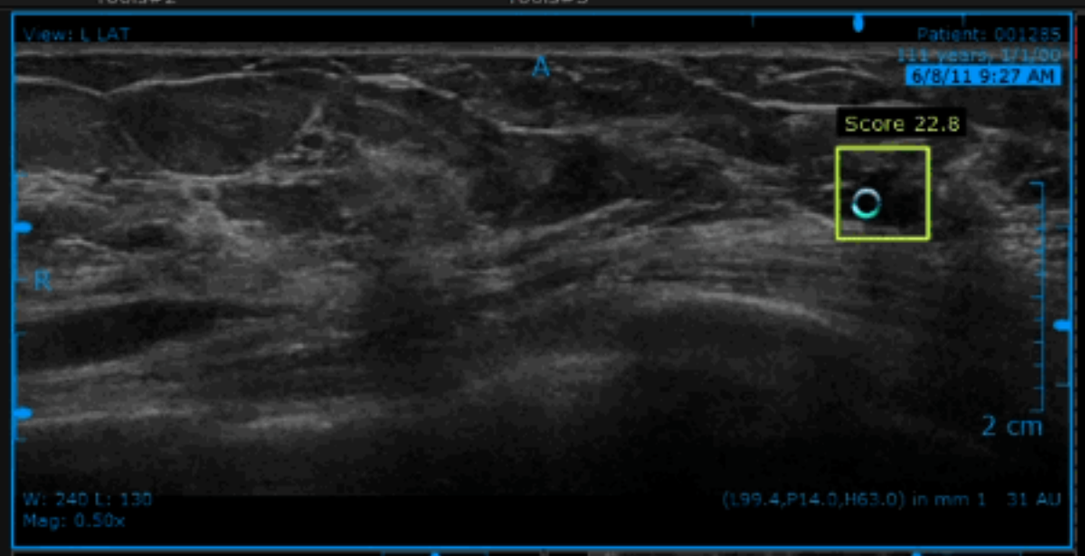
US - 6/8/11: Linked: 1

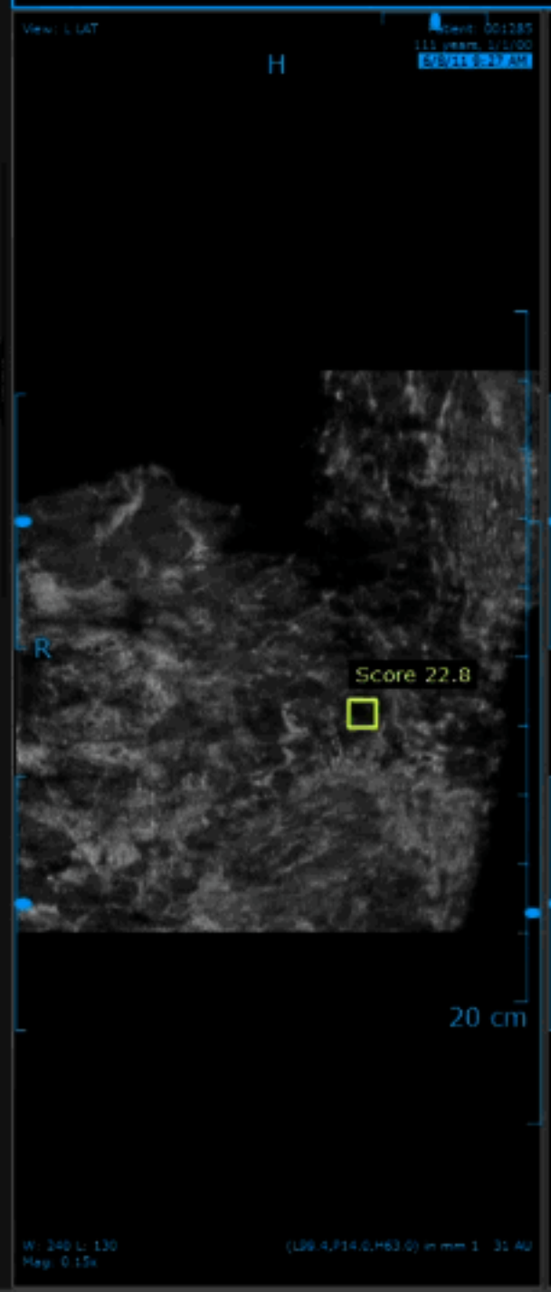
MG - 6/8/11: Linked: 1

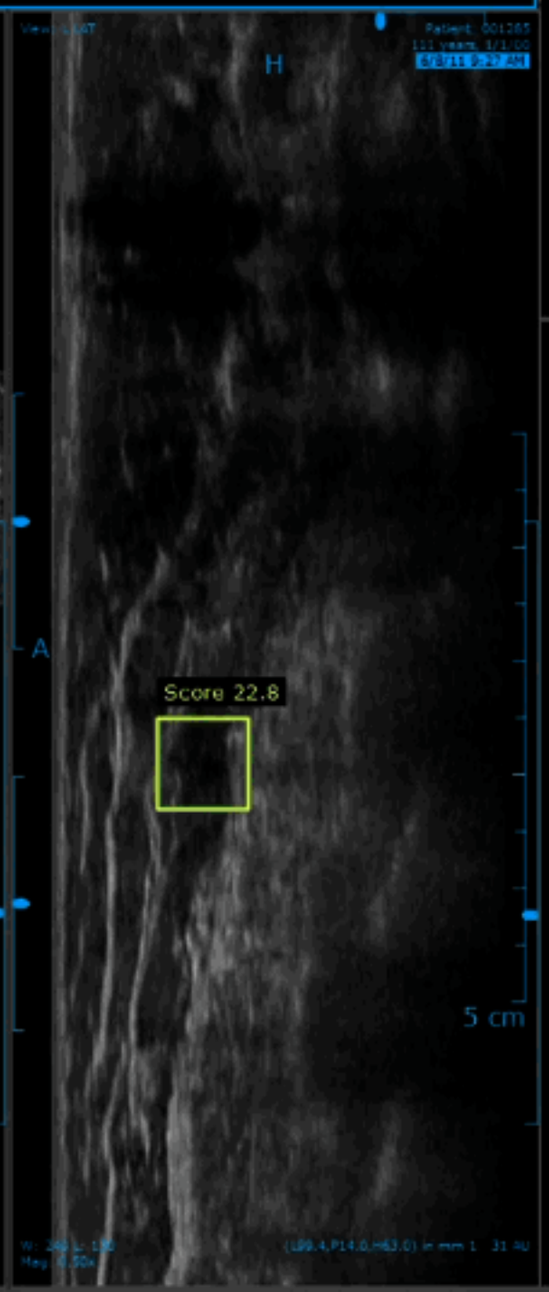
Current finding information

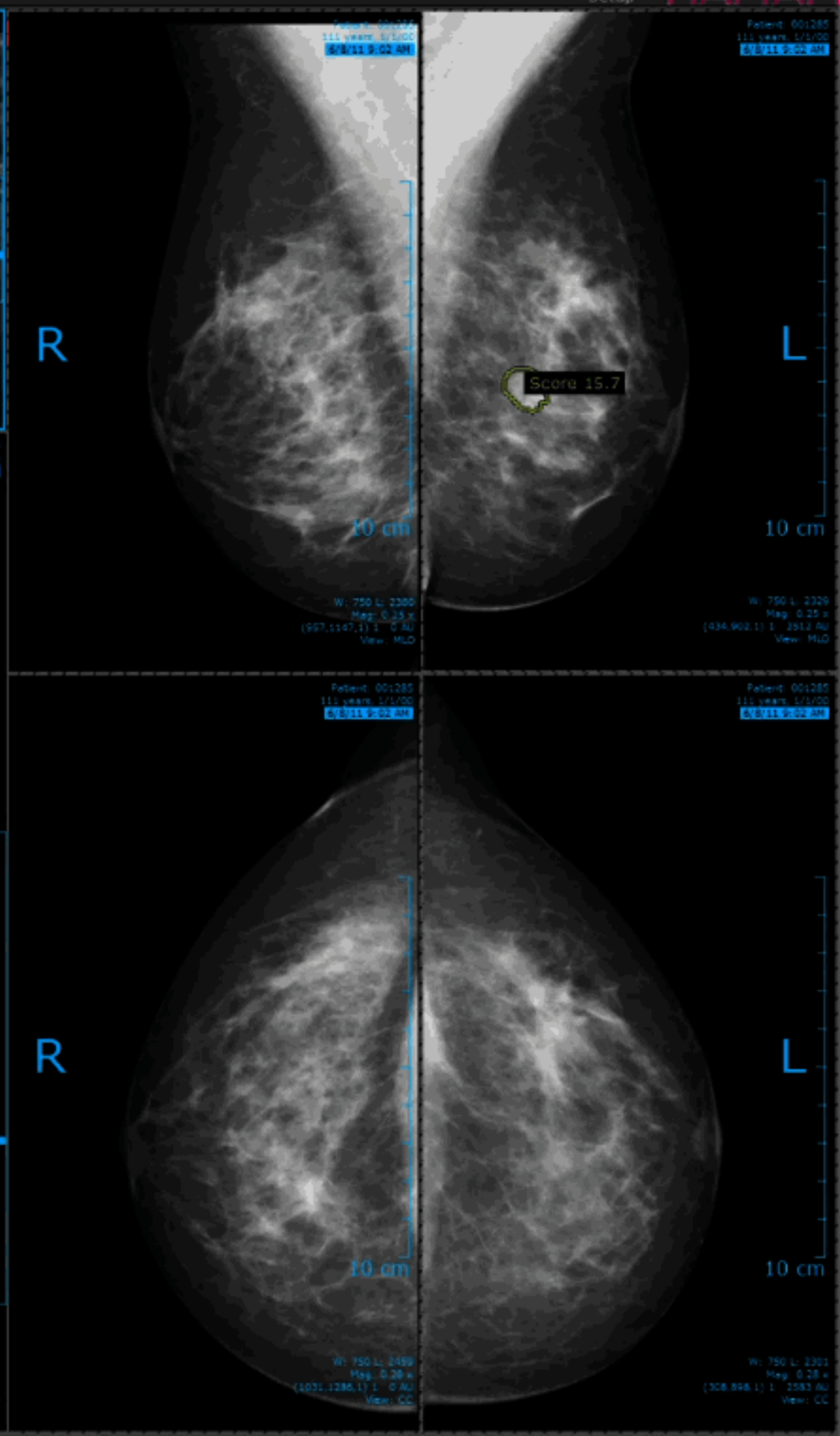
Confidence: 1
Confidence: 0

2/27/12, 12:22 PM CPU: 93%



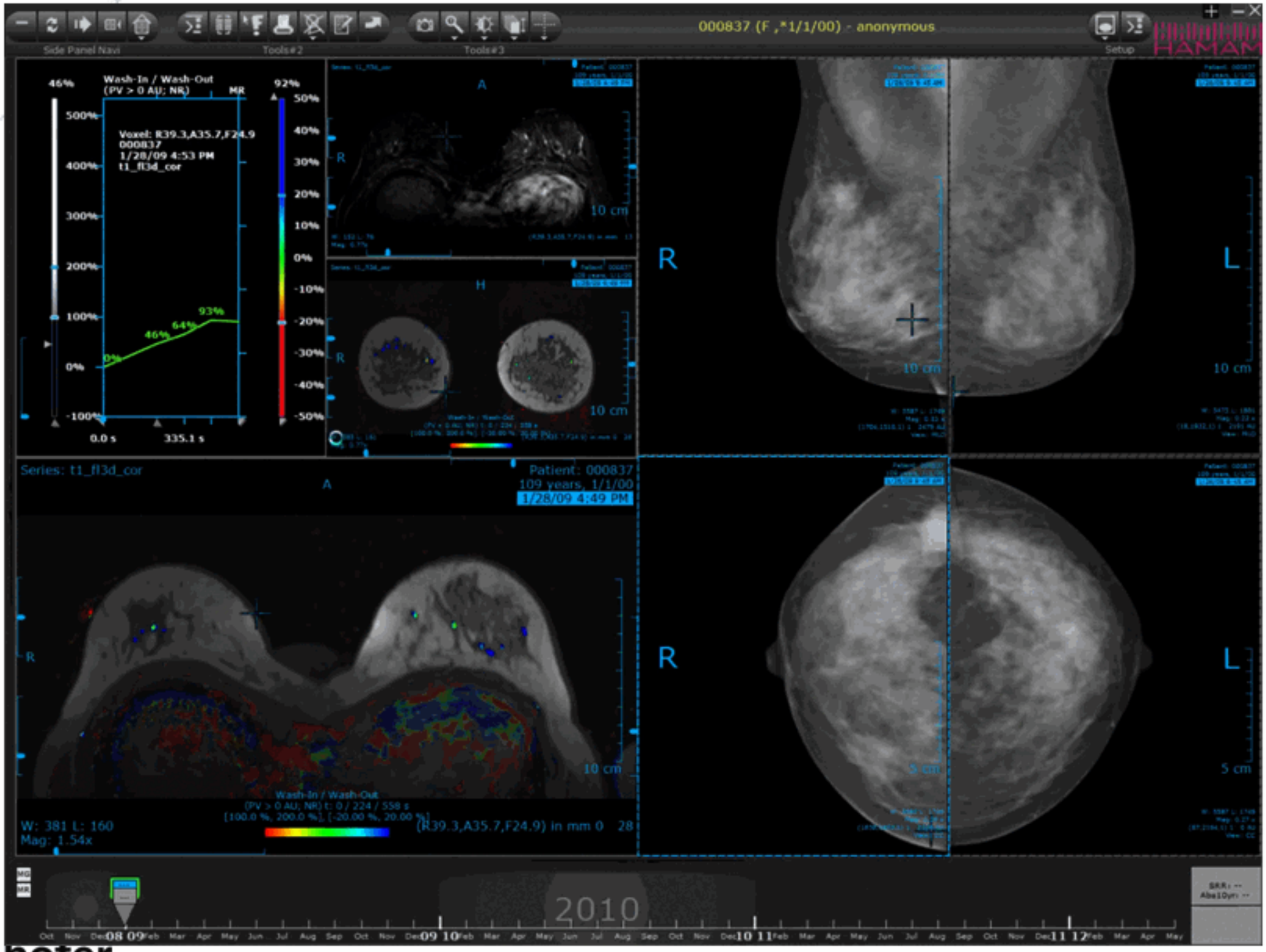




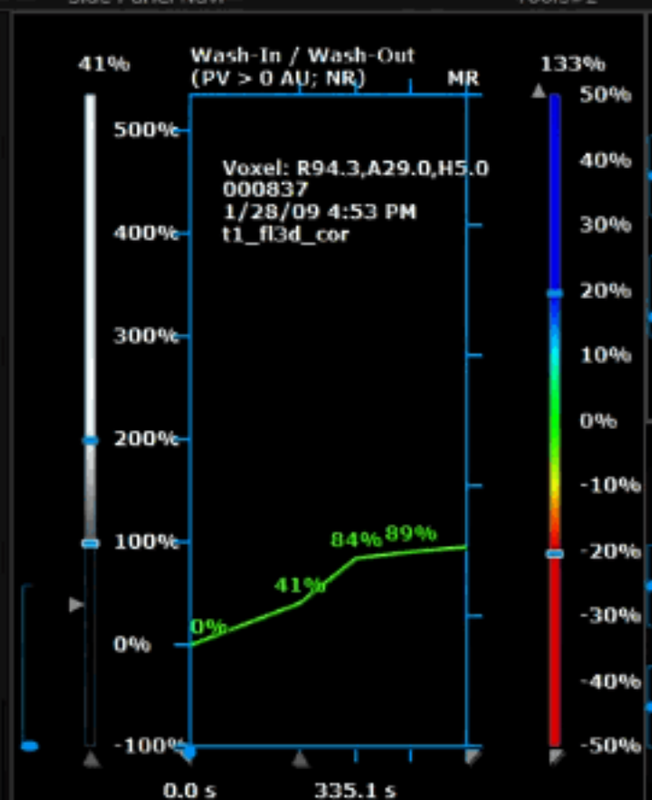


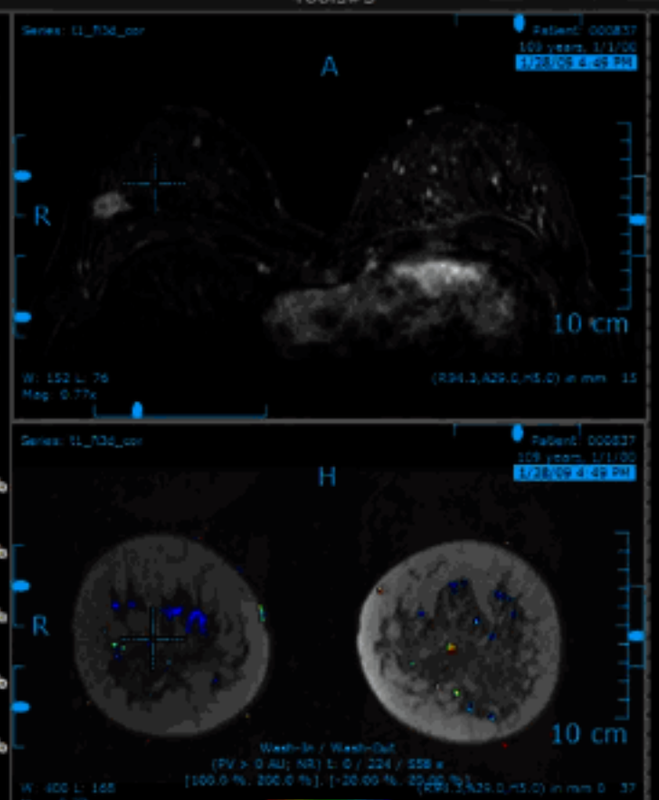
HAMAM Workstation: Fuzzy Cursor

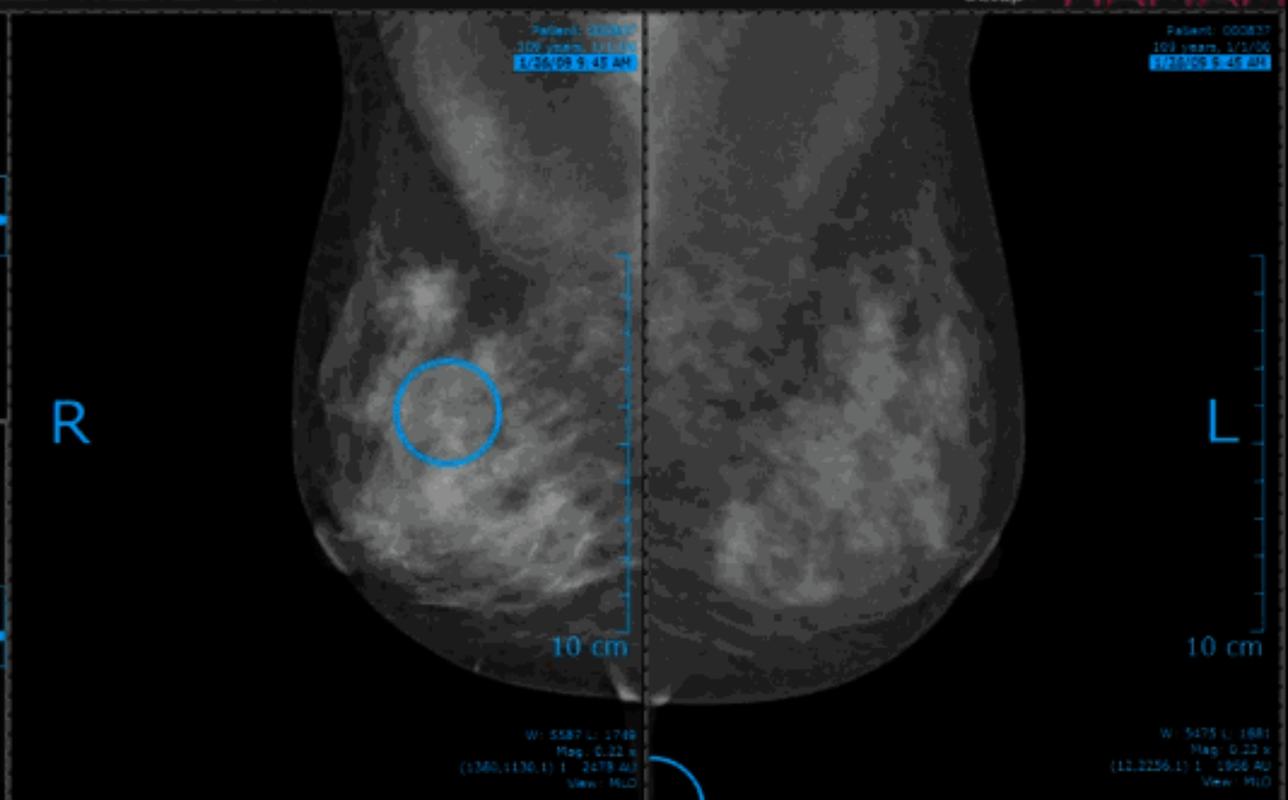
(here: MRI – MG)

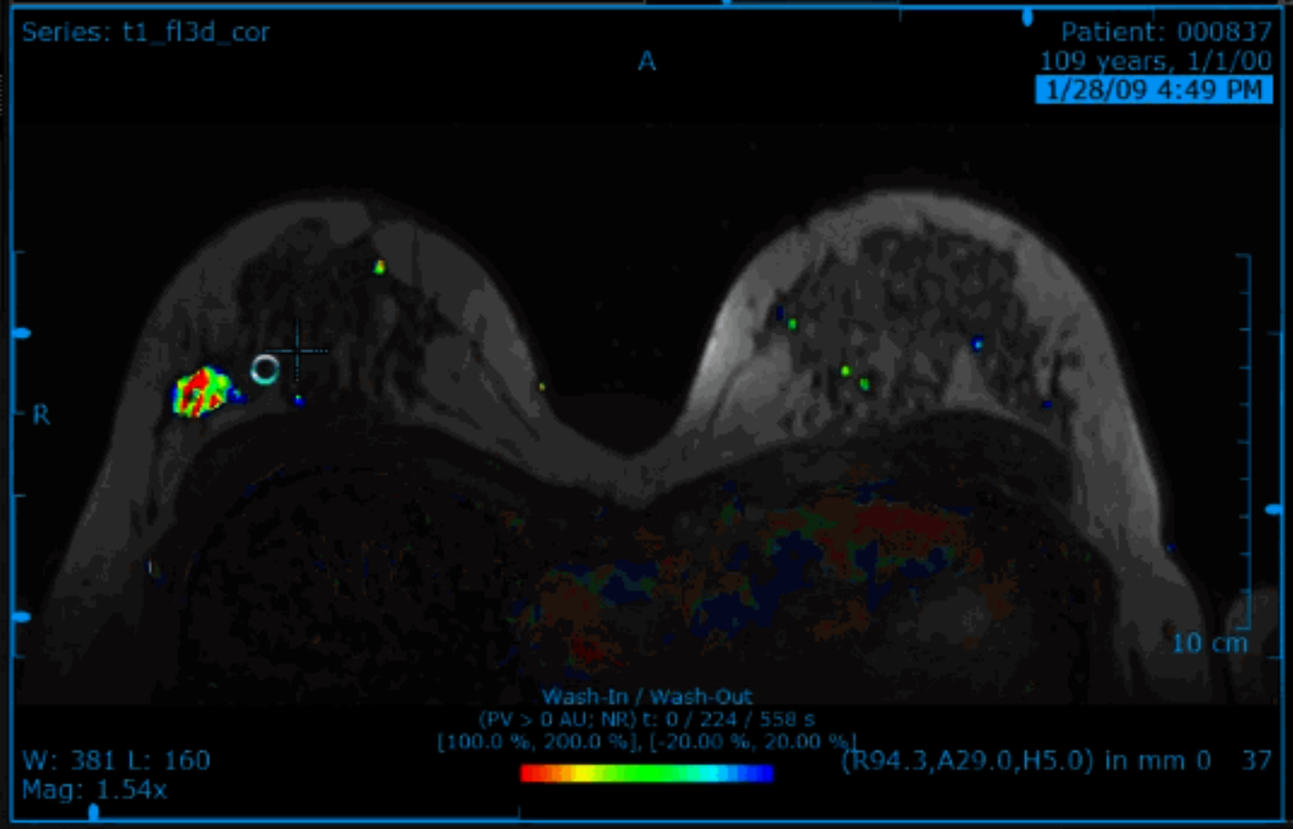


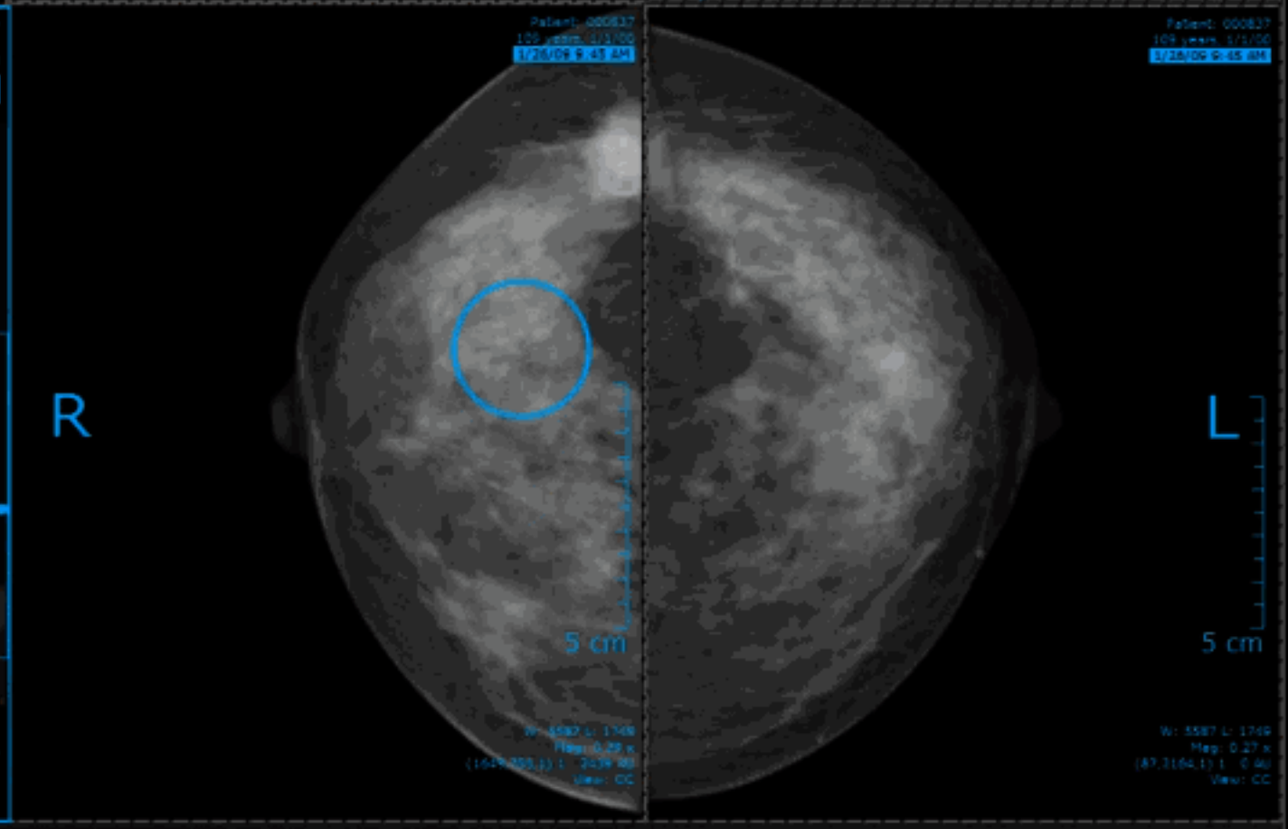
Fraunhofer MEVIS


Wash-In / Wash-Out
(PV > 0 AU; NR)
MR
41%
133%
500%
400%
300%
200%
100%
0%
-100%
50%
40%
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
Voxel: R94.3,A29.0,H5.0
000837
1/28/09 4:53 PM
t1_fl3d_cor
0%
41%
84%
89%
0.0 s
335.1 s


A
R
10 cm
H
R
10 cm

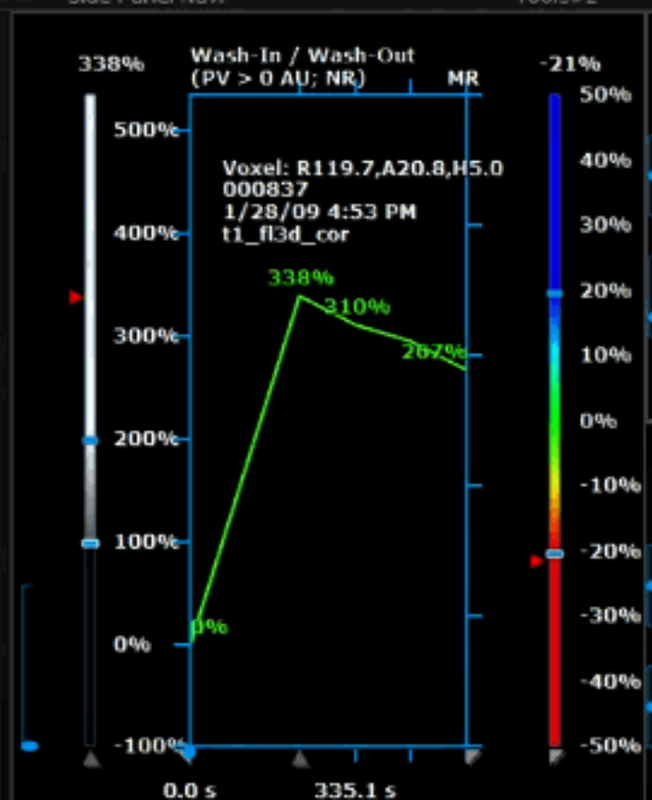

R
10 cm
L
10 cm

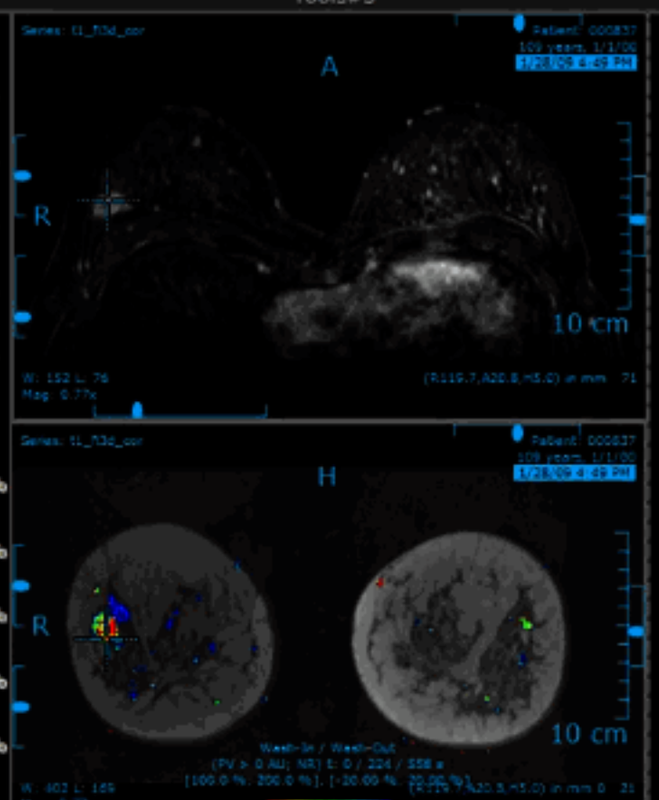

Series: t1_fl3d_cor
A
Patient: 000837
109 years, 1/1/00
1/28/09 4:49 PM
R
10 cm
Wash-In / Wash-Out
(PV > 0 AU; NR) t: 0 / 224 / 558 s
[100.0 %, 200.0 %], [-20.00 %, 20.00 %]
W: 381 L: 160
Mag: 1.54x
(R94.3,A29.0,H5.0) in mm 0 37

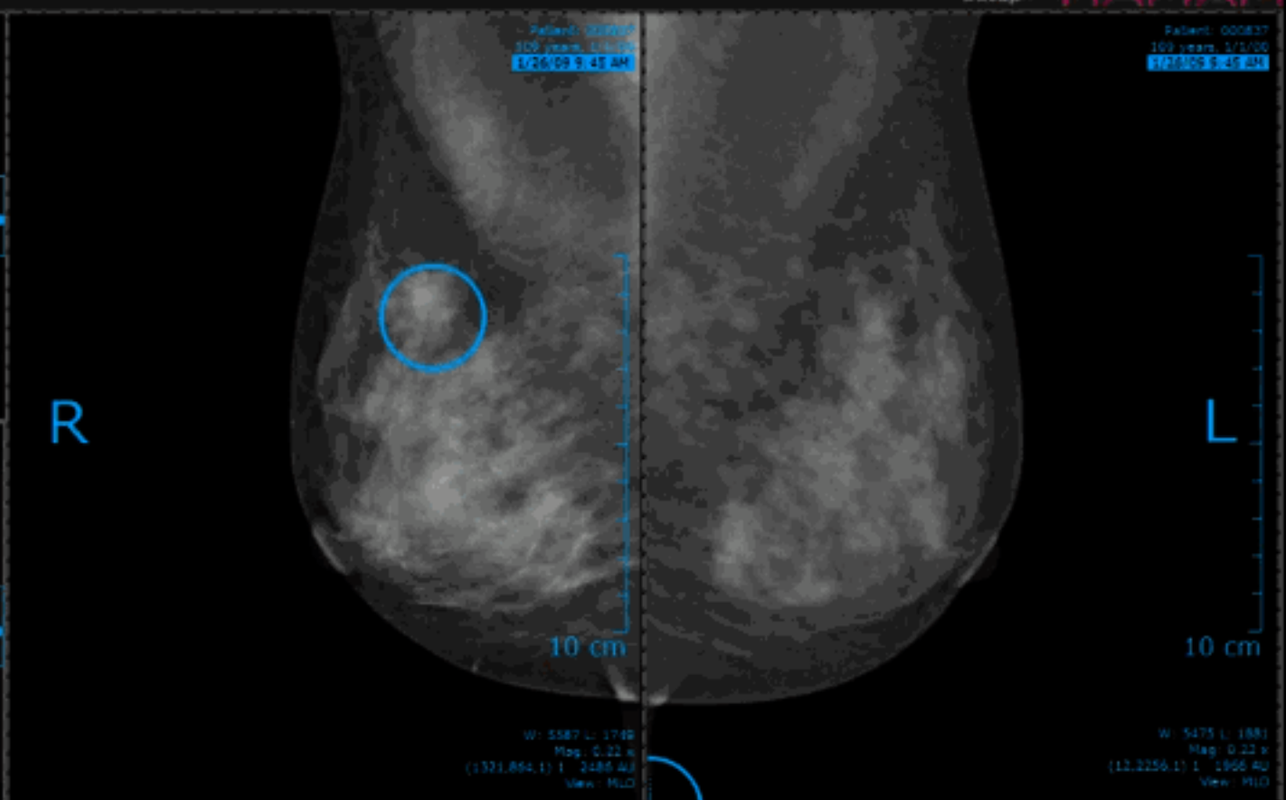

R
5 cm
L
5 cm

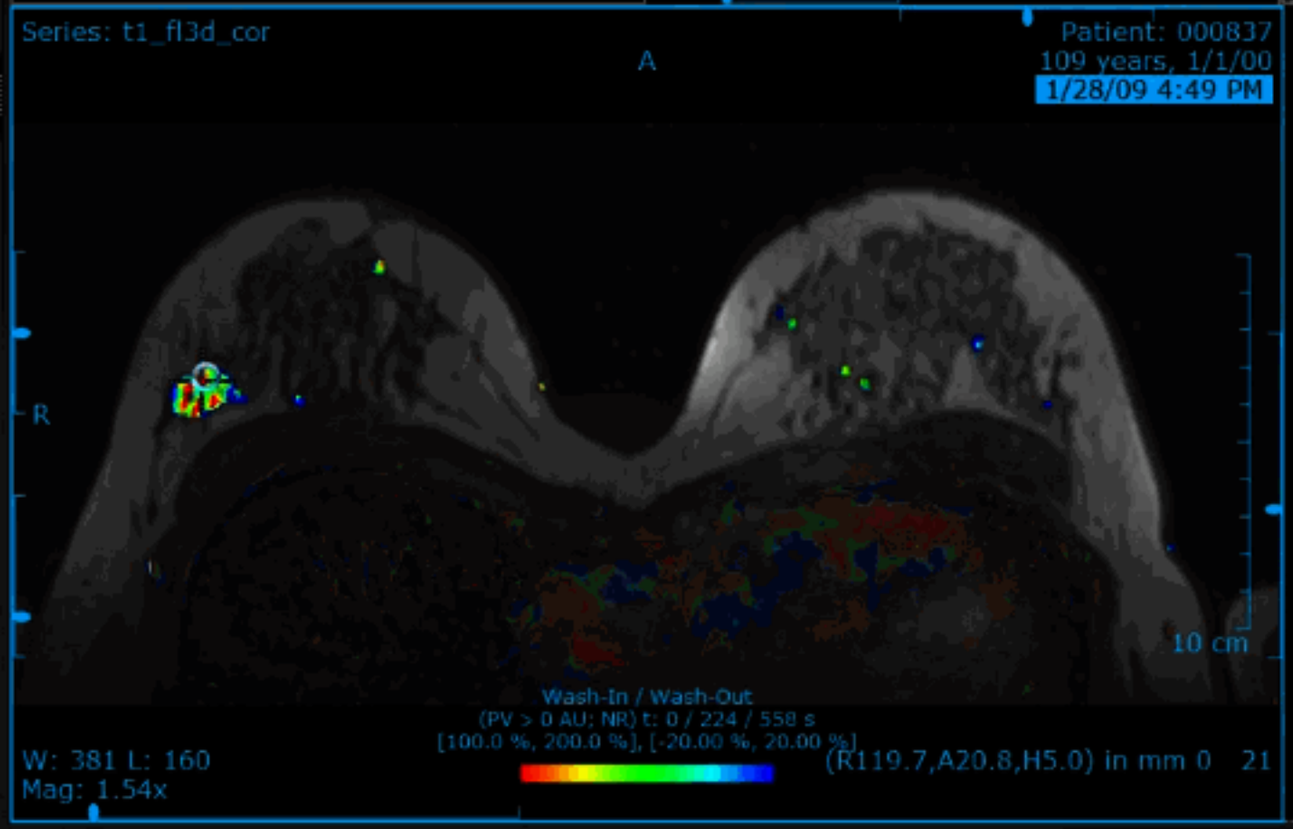

MG
MR
2010
Oct Nov Dec 08 09 Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 09 10 Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 10 11 Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 11 12 Feb Mar Apr May
SRR: --
Abs10yr: --

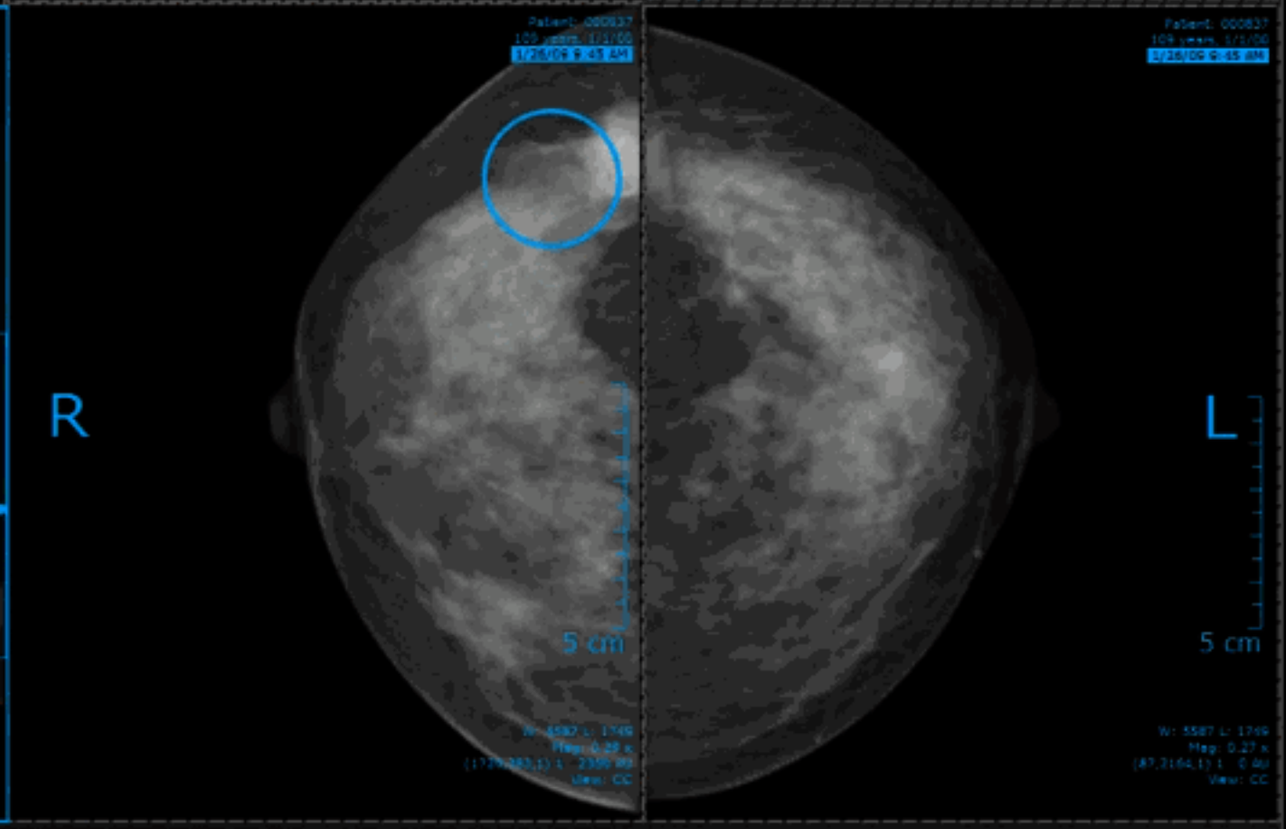
Side Panel Navi | Tools#2 | Tools#3 | 000837 (F ,*1/1/00) - anonymous | Setup

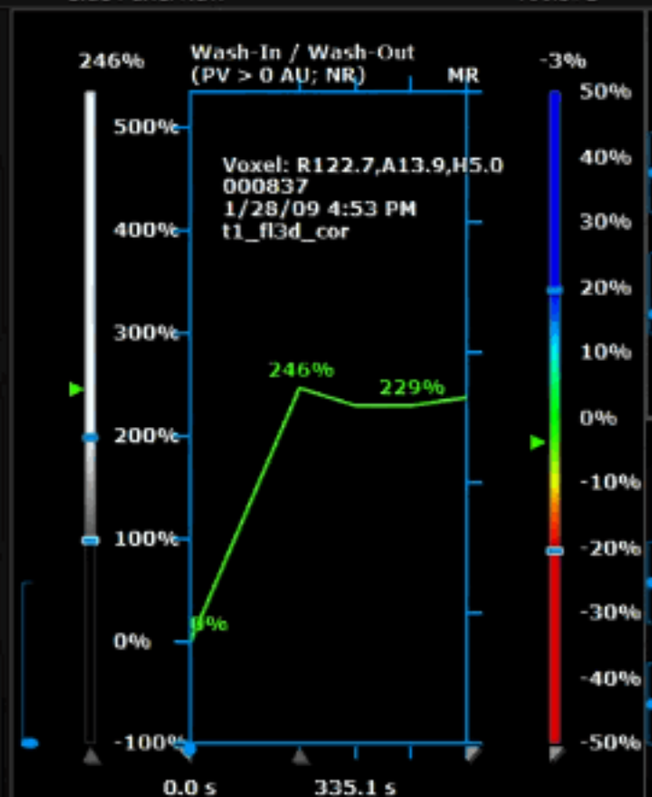


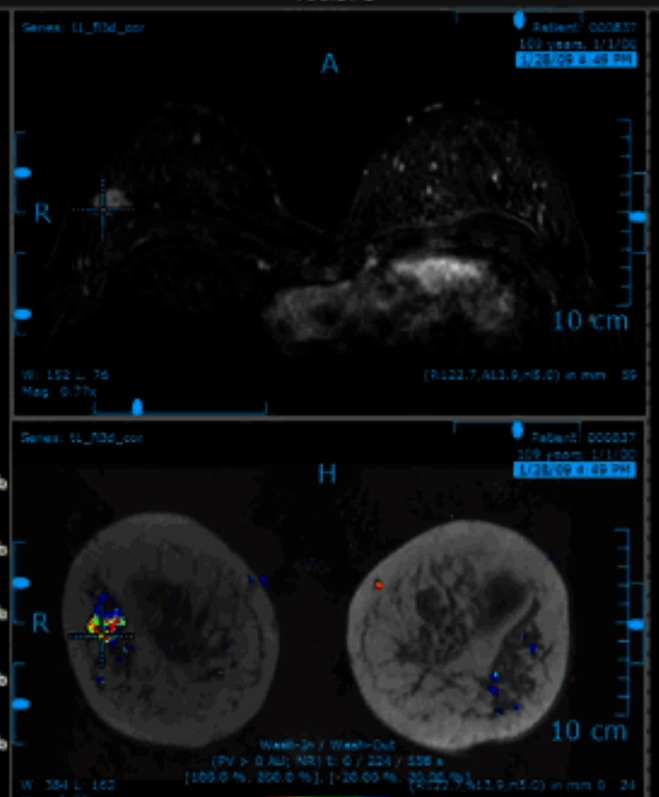


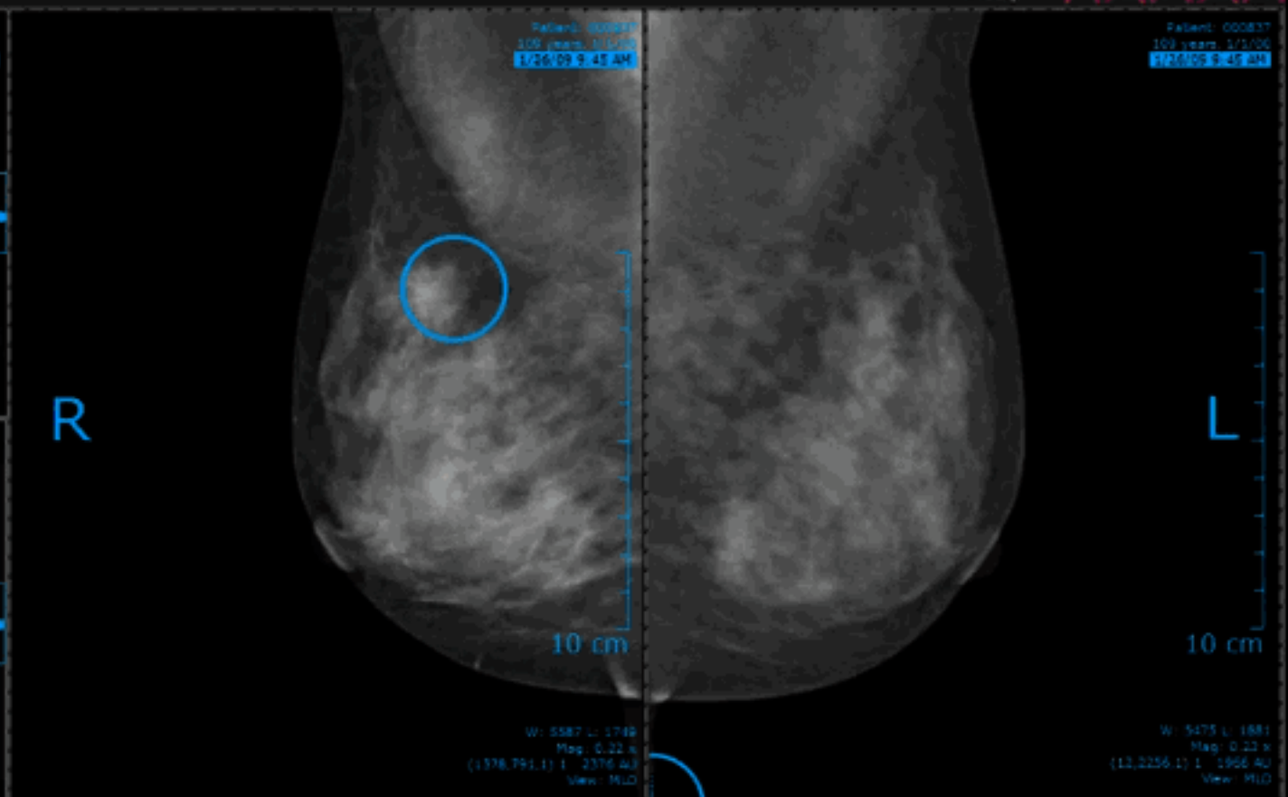


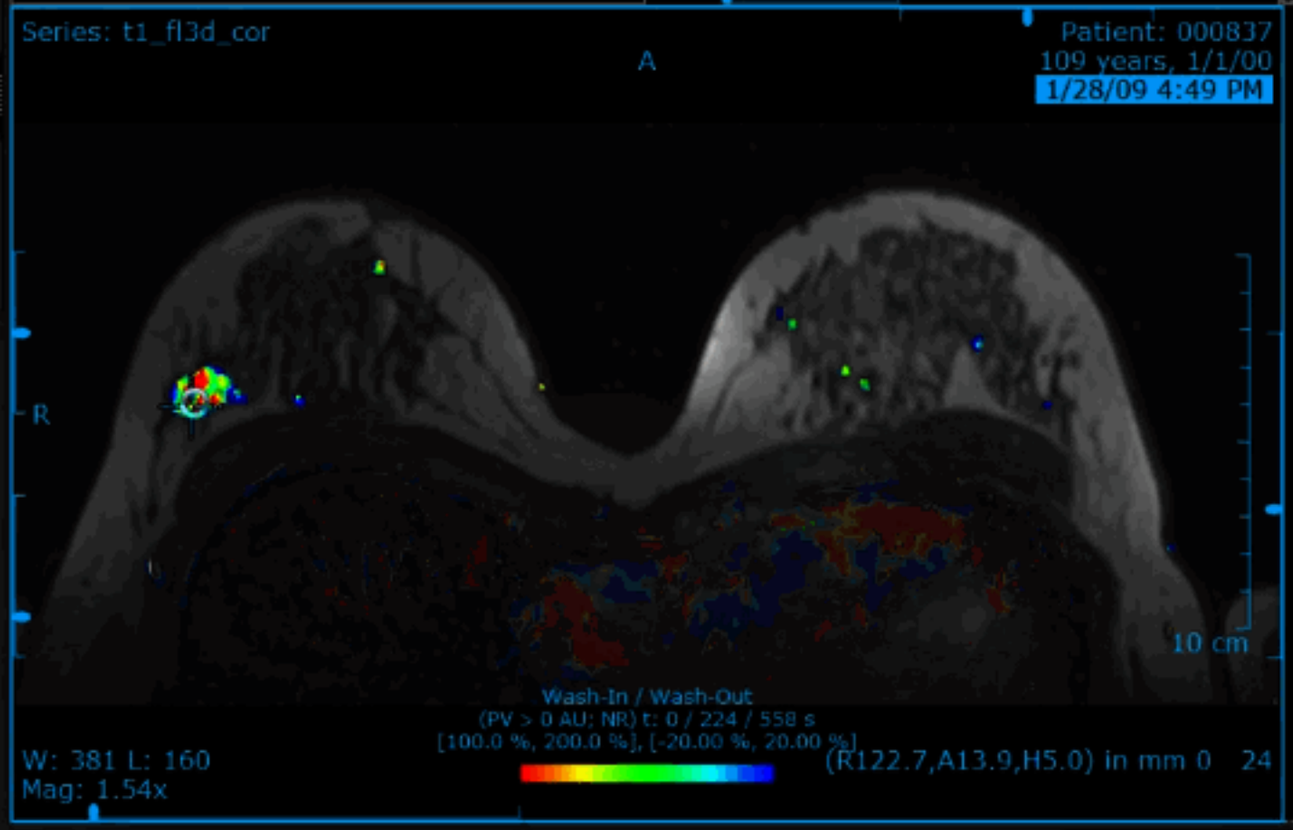


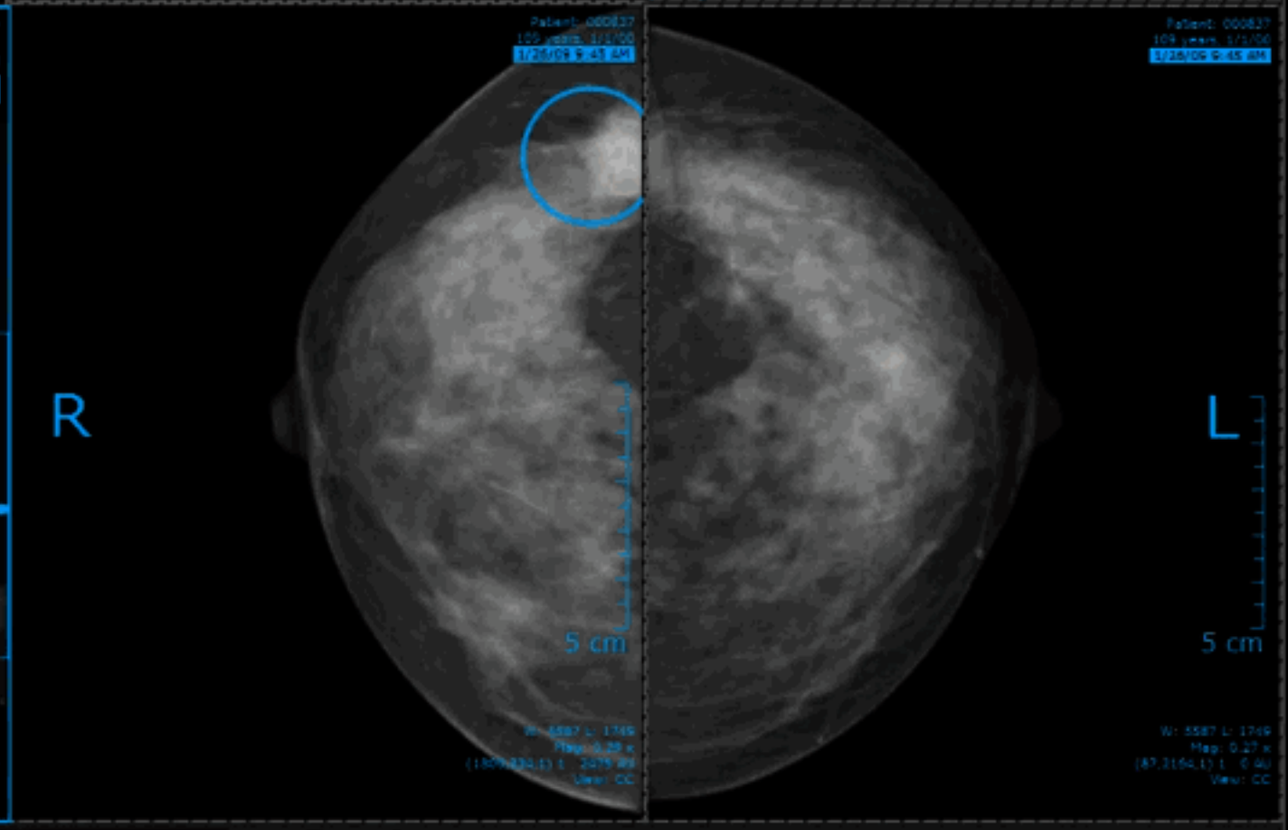



Wash-In / Wash-Out
(PV > 0 AU; NR)
MR
246%
-3%
500%
400%
300%
200%
100%
0%
-100%
50%
40%
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
Voxel: R122.7,A13.9,H5.0
000837
1/28/09 4:53 PM
t1_fl3d_cor
246%
229%
0%
0.0 s
335.1 s


A
R
10 cm
H
R
10 cm

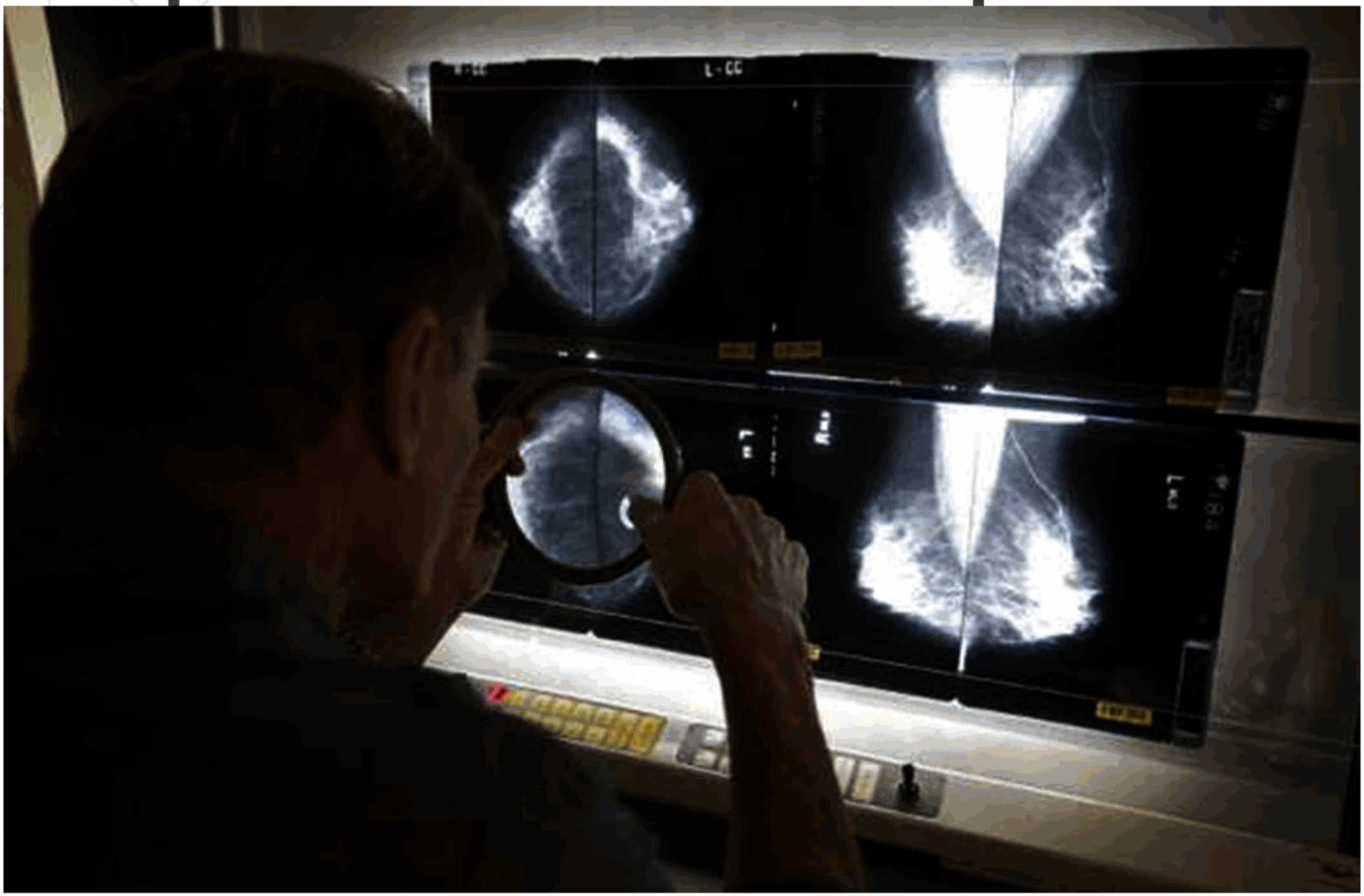

R
10 cm
L
10 cm


Series: t1_fl3d_cor
A
Patient: 000837
109 years, 1/1/00
1/28/09 4:49 PM
R
10 cm
Wash-In / Wash-Out
(PV > 0 AU; NR) t: 0 / 224 / 558 s
[100.0 %, 200.0 %], [-20.00 %, 20.00 %]
W: 381 L: 160
Mag: 1.54x
(R122.7,A13.9,H5.0) in mm 0 24


R
5 cm
L
5 cm


MG
MR
2010
Oct Nov Dec 08 09 Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 09 10 Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 10 11 Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 11 12 Feb Mar Apr May
SRR: --
Abs10yr: --

Comparison of current and prior scans



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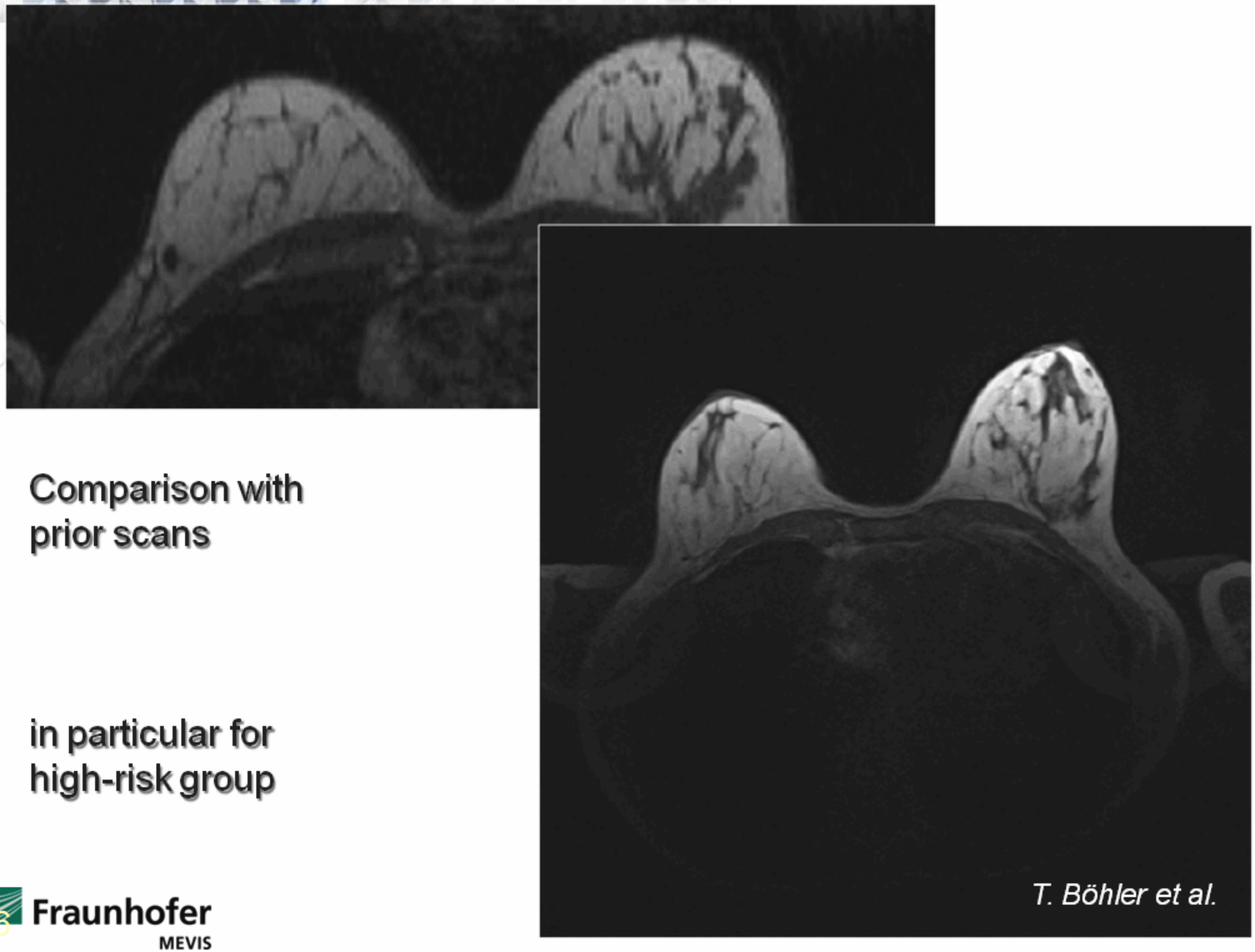
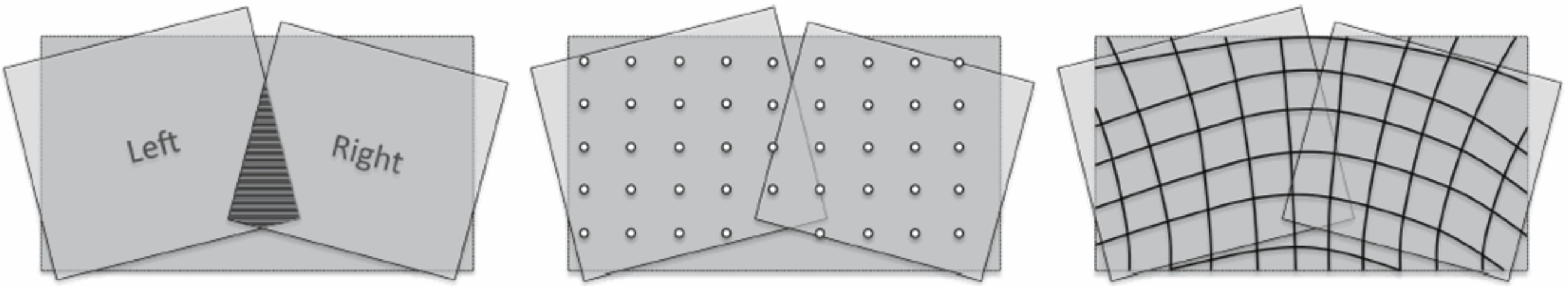


Comparison with prior scans

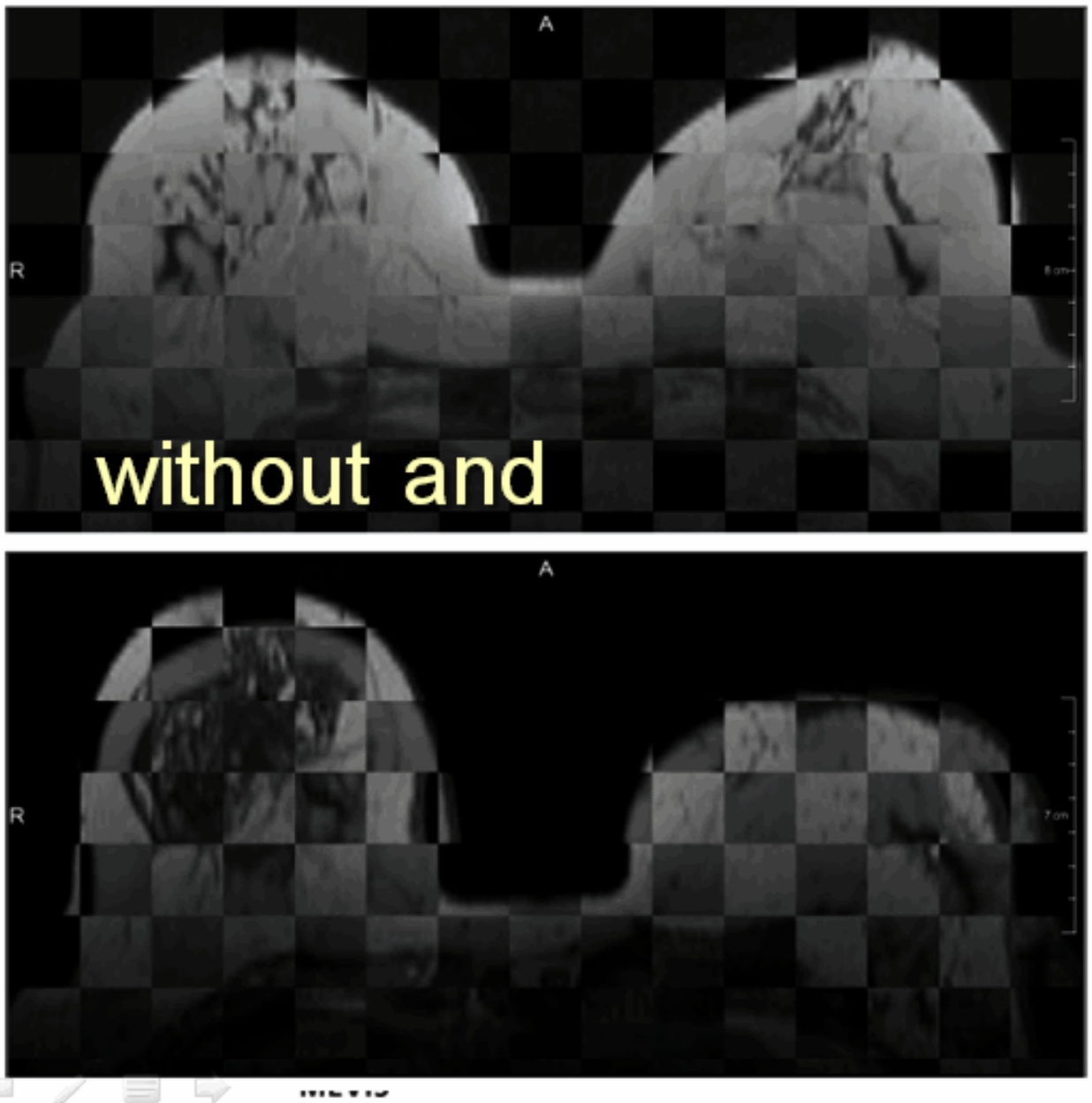
in particular for high-risk group

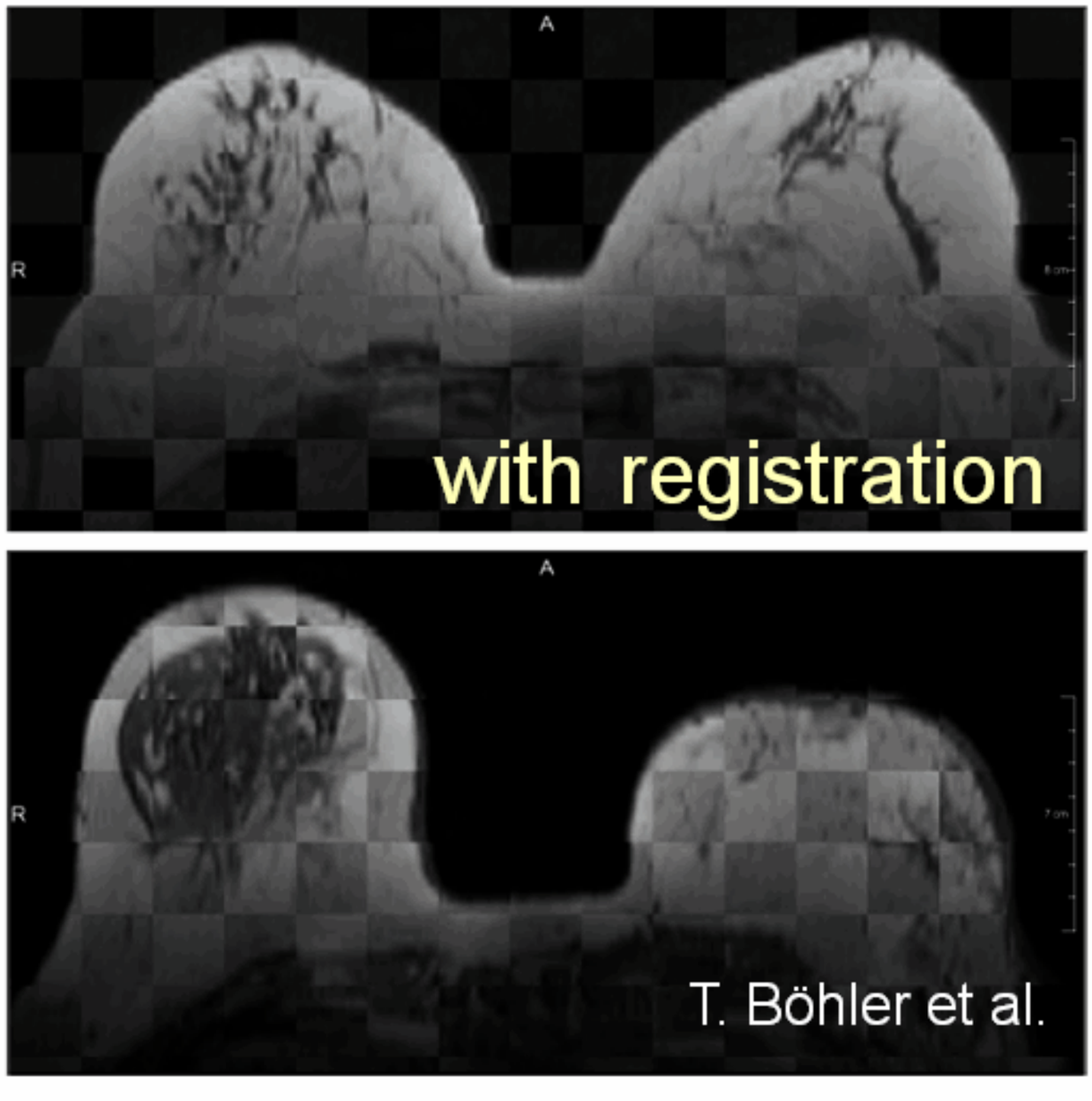
T. Böhler et al.

Fraunhofer MEVIS



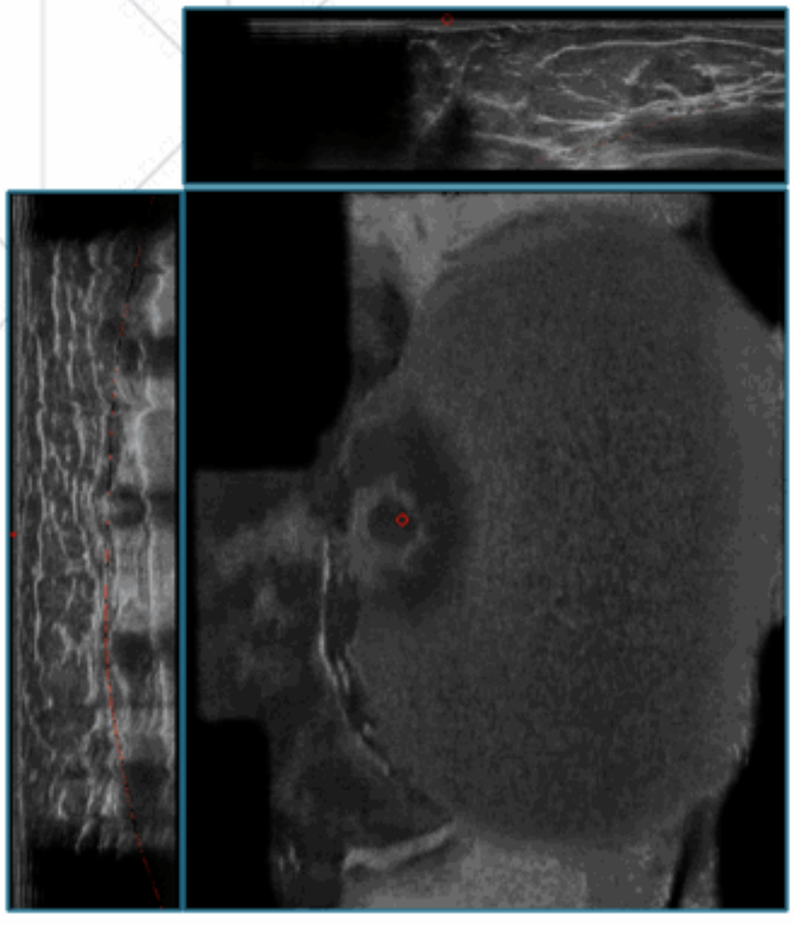
Elastic Prior-Current Image Registration



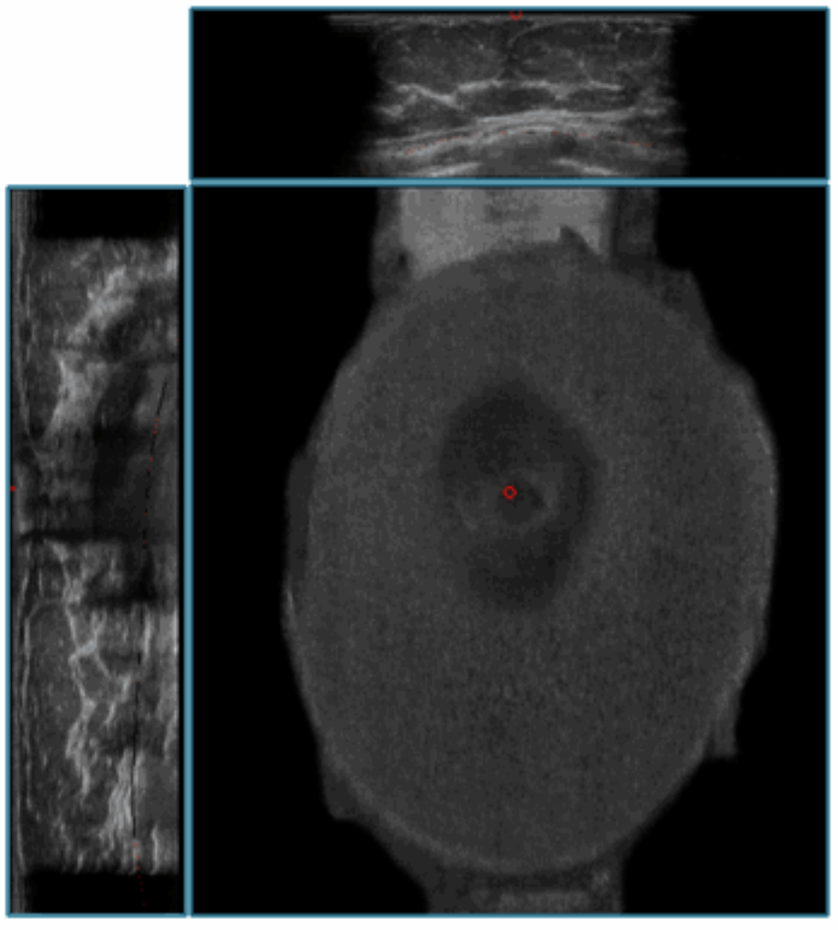


MEDICAL VALLEY
Europäische Metropolregion Nürnberg

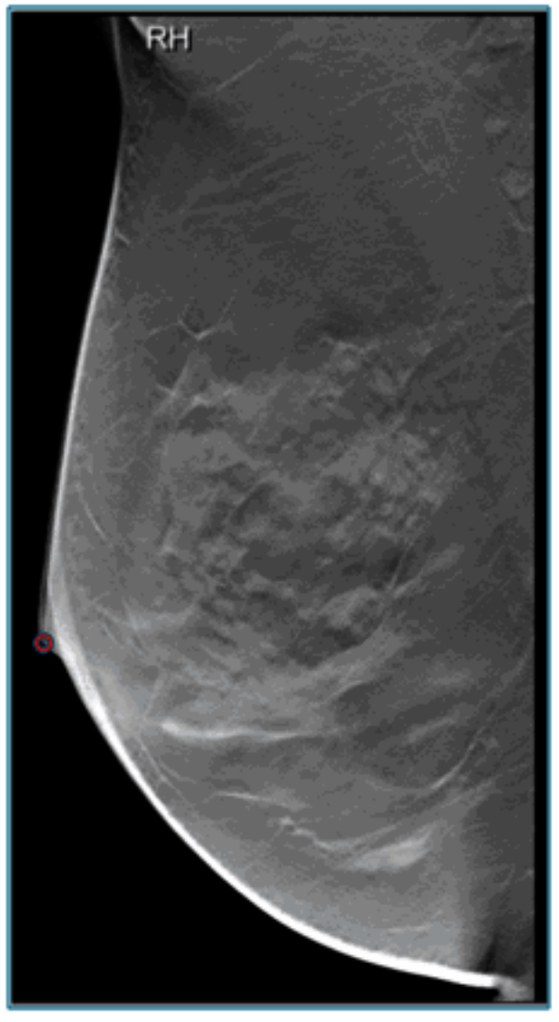
Spatial Correlation of Automated 3D US and Tomosynthesis



ABUS MED



ABUS AP



Tomosynthesis

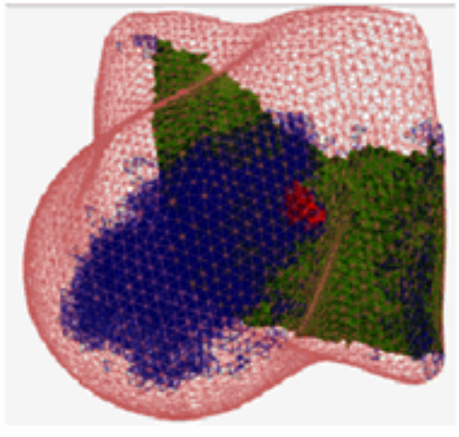
SIEMENS

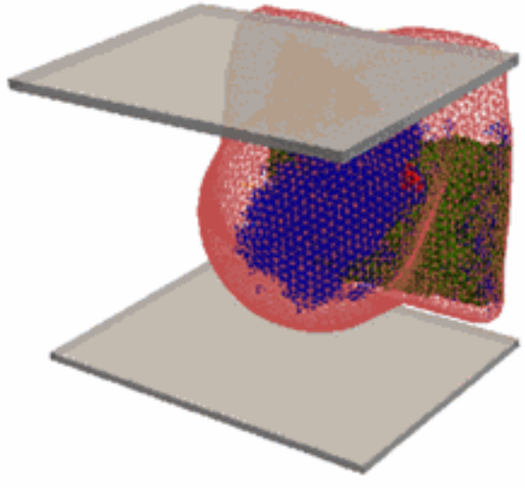
Fraunhofer

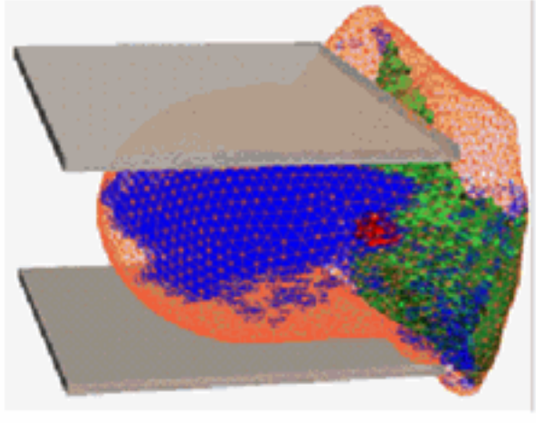
Universitätsklinikum Erlangen

Fraunhofer MEVIS

Compression Simulation







L. Han et al.

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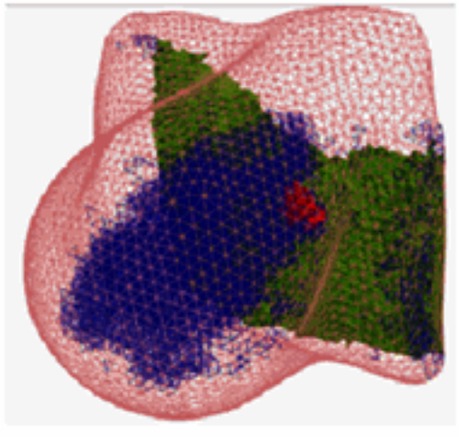
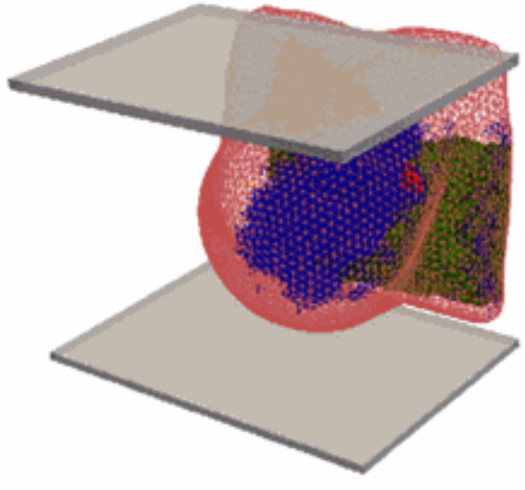
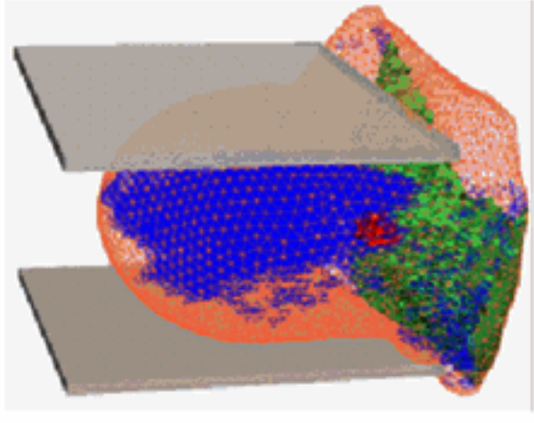
Compression Simulation



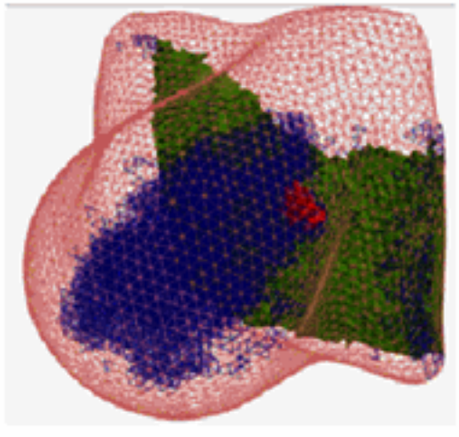


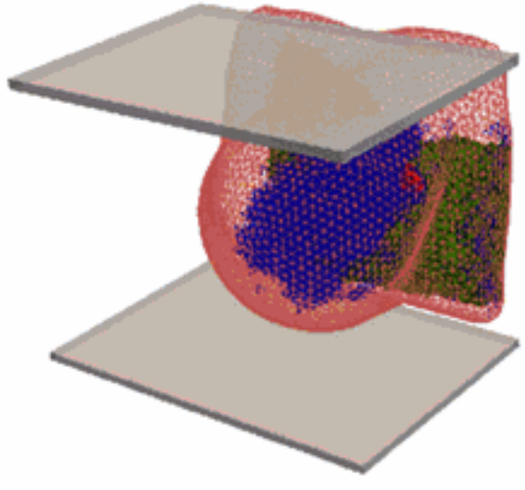


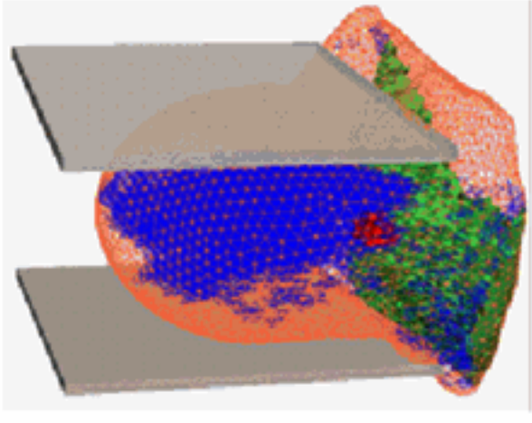
Fraunhofer MEVIS

L. Han et al.

Compression Simulation



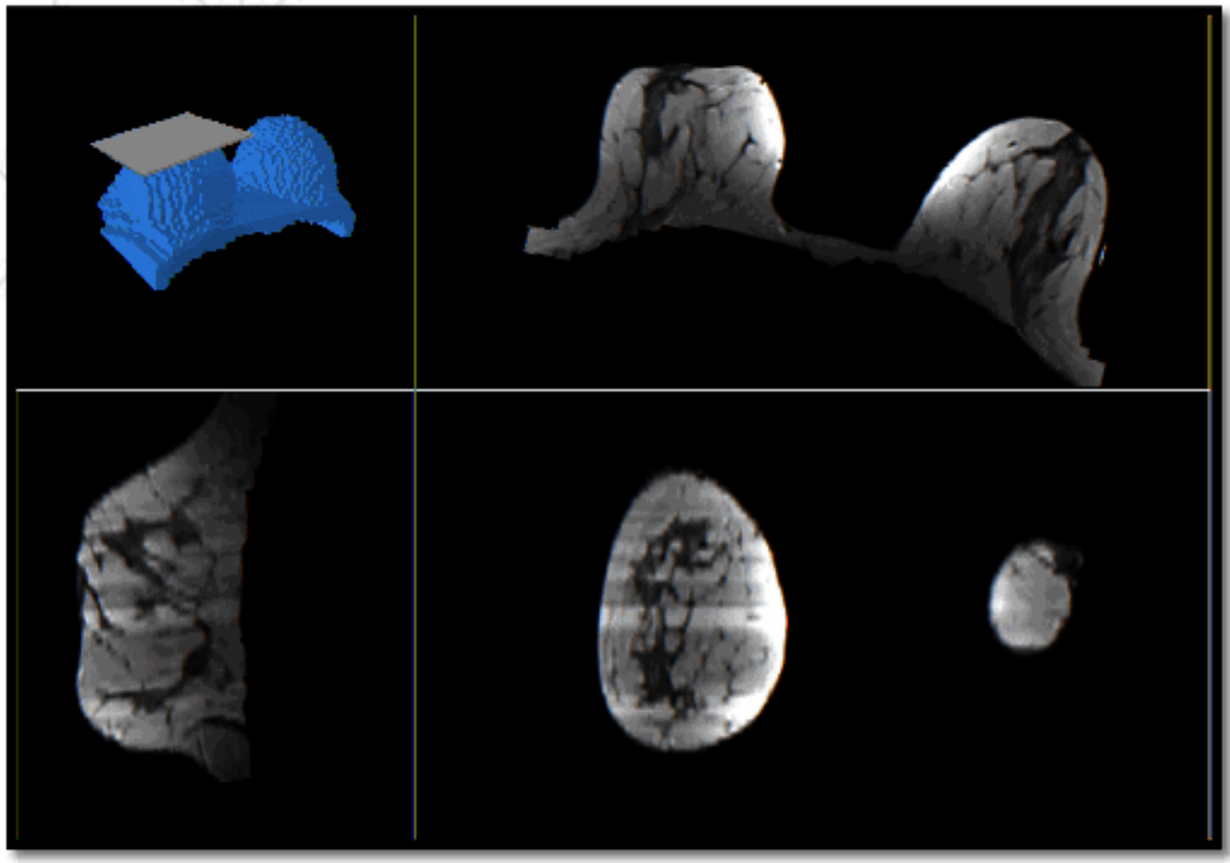




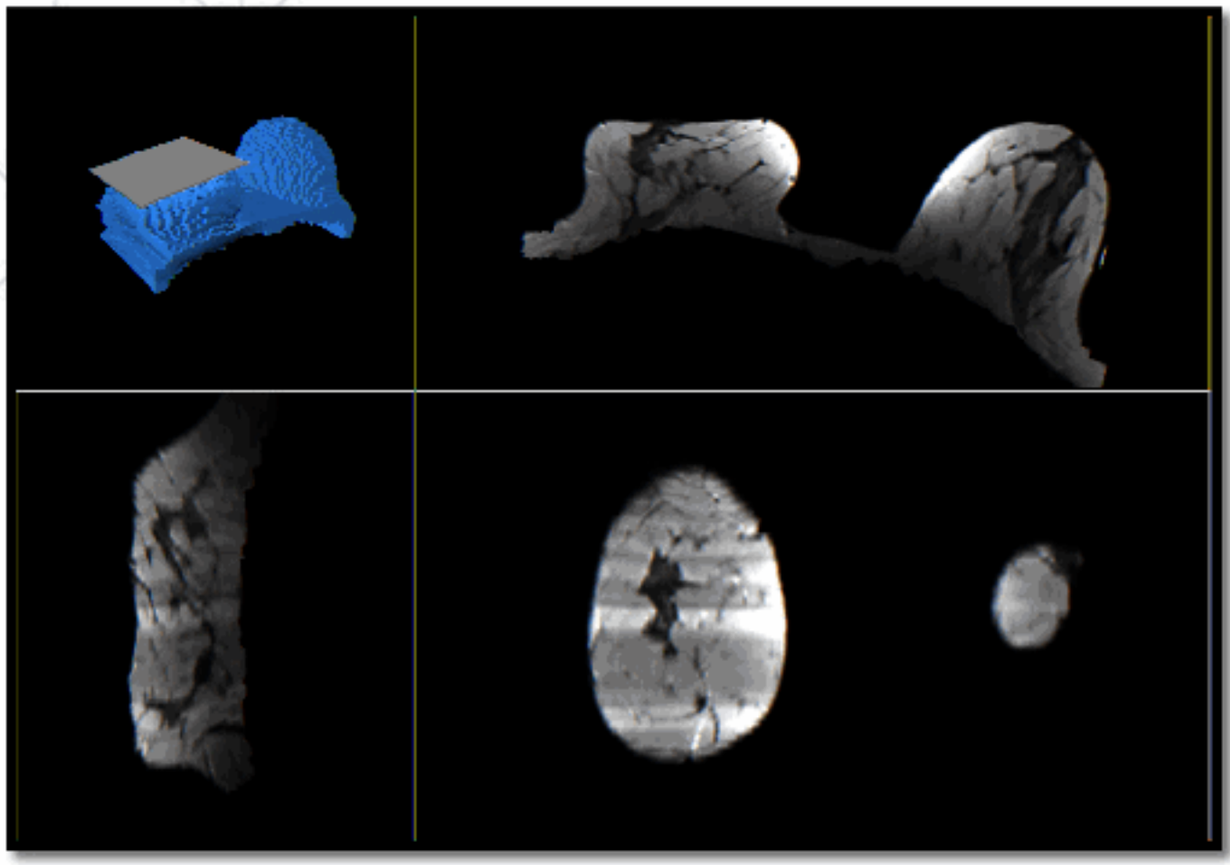
Fraunhofer MEVIS

L. Han et al.

Compression Simulation



Compression Simulation



Screening:
Patient individual protocol optimization
Cost-efficient patient stratification

ASSURE

Adapting Breast Cancer **S**creening **S**trategy **U**sing Personalised **R**isk **E**stimation

Radboud University Nijmegen Medical Centre

Fraunhofer MEVIS

Universitat de Girona

University Medical Center Utrecht

The University of Manchester

matakina technology™

mediri medical imaging research institute

BIOMEDIQ

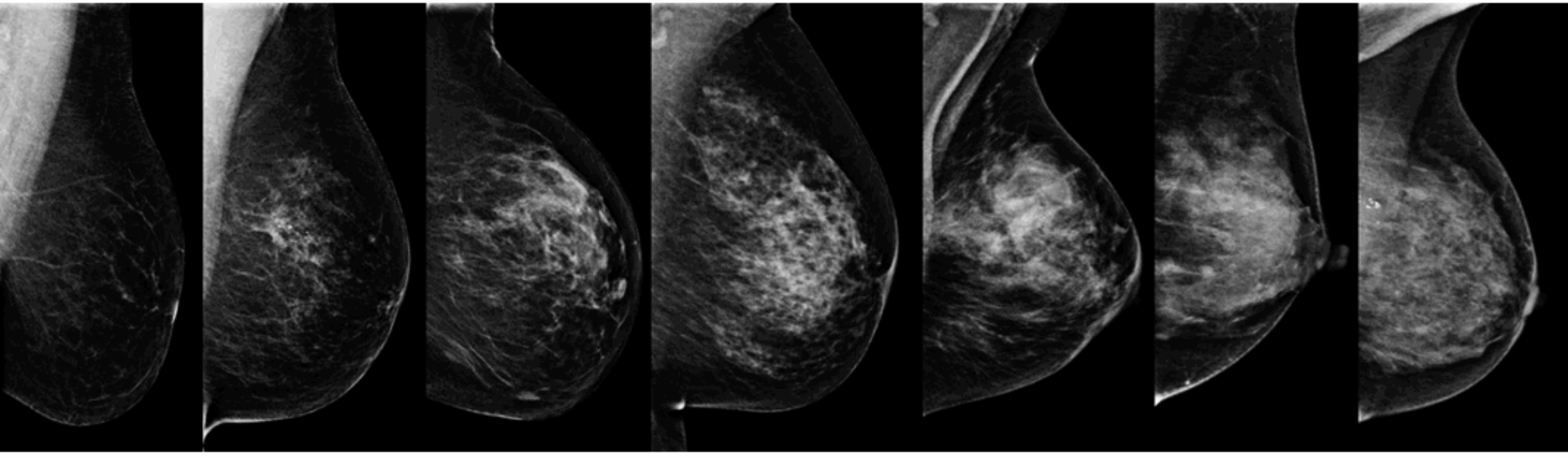
MeVis MEDICAL SOLUTIONS

Fraunhofer MEVIS

Breast Density and Breast Cancer Risk

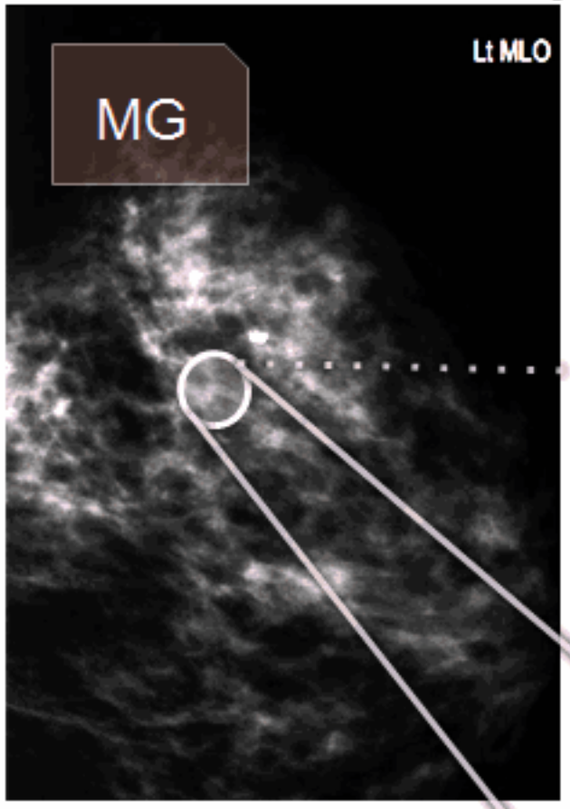
Two types of risk associated with breast density:

- ***Increased incidence:*** *Risk of developing a new cancer*
- ***Masking risk:*** *Risk of missing a cancer due to difficult conditions*



Fraunhofer MEVIS

Multimodal spatial and histo-pathological correlation
(new EC FP7 project VPH-PRISM)



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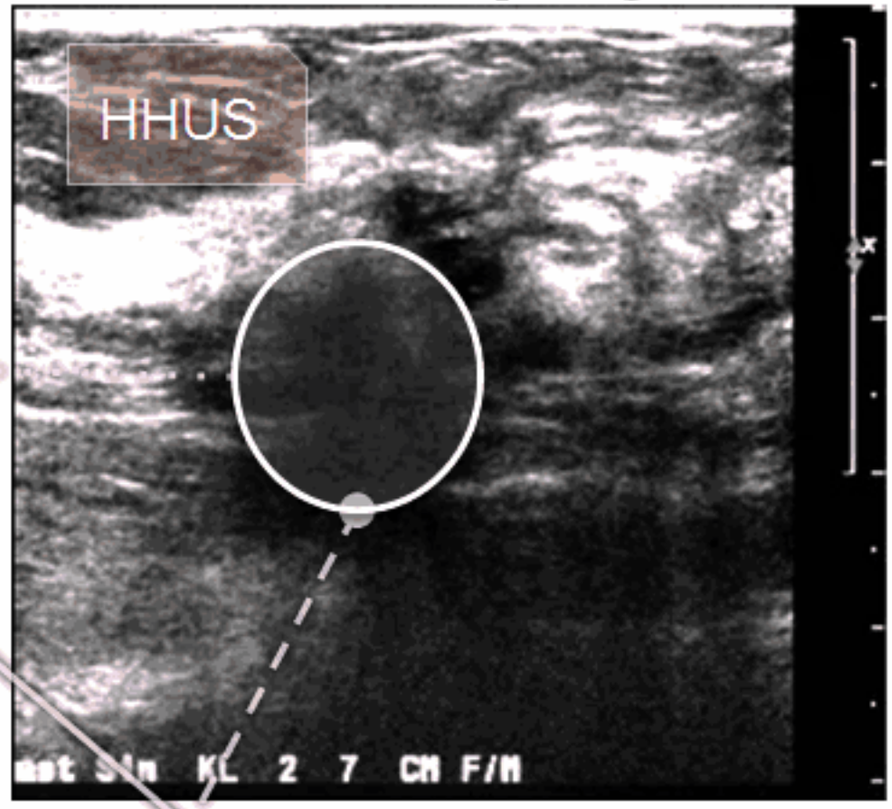

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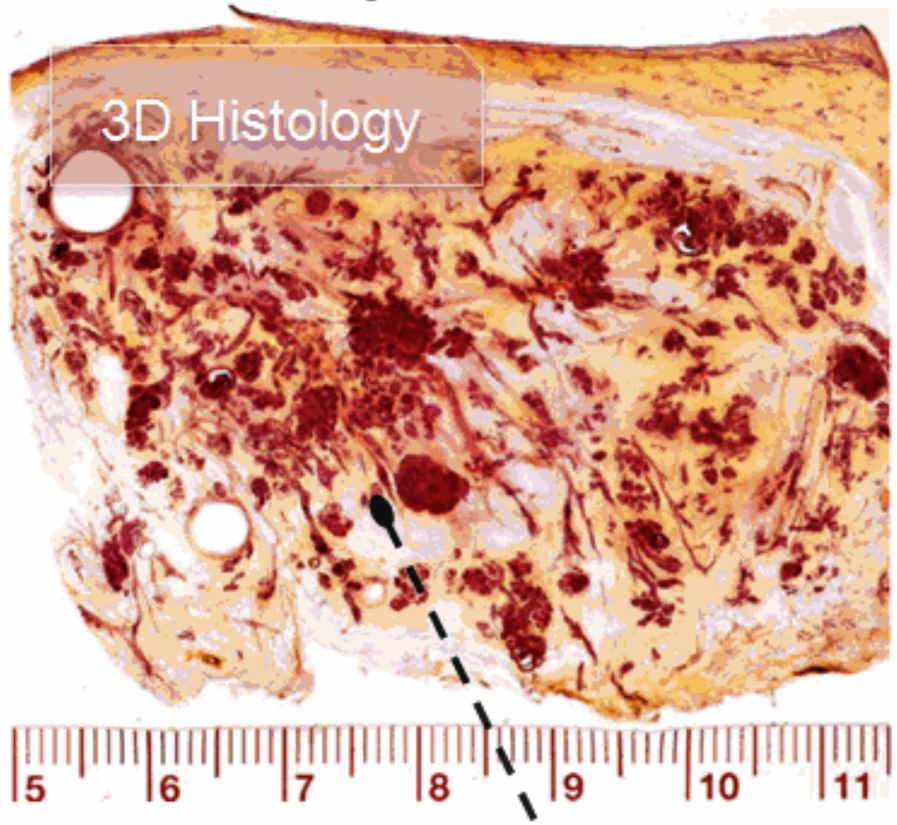

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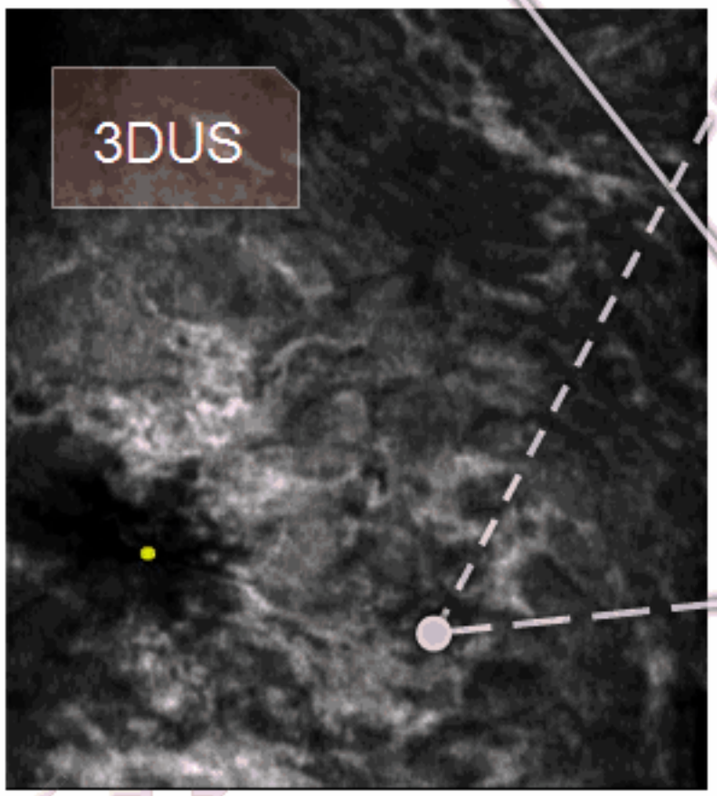

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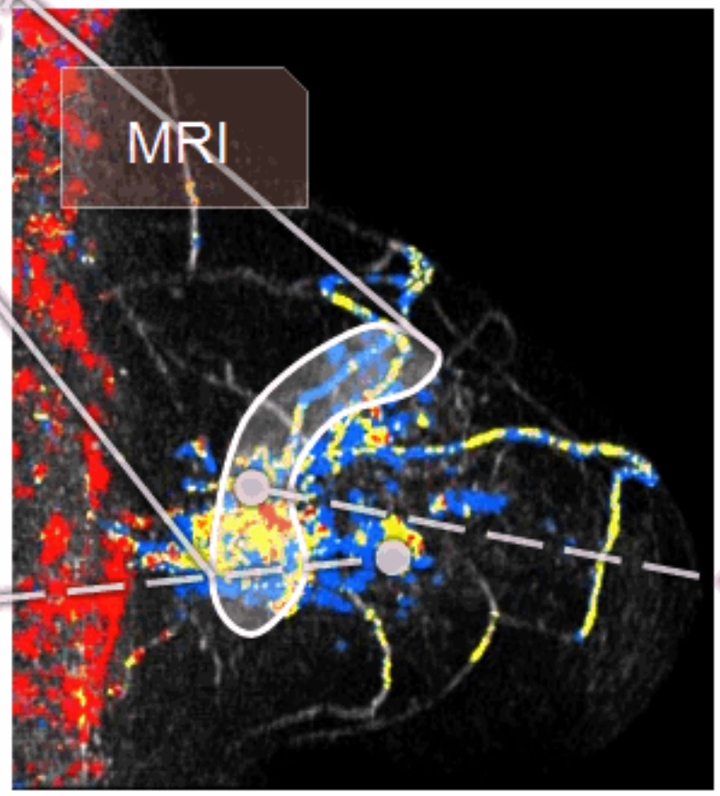
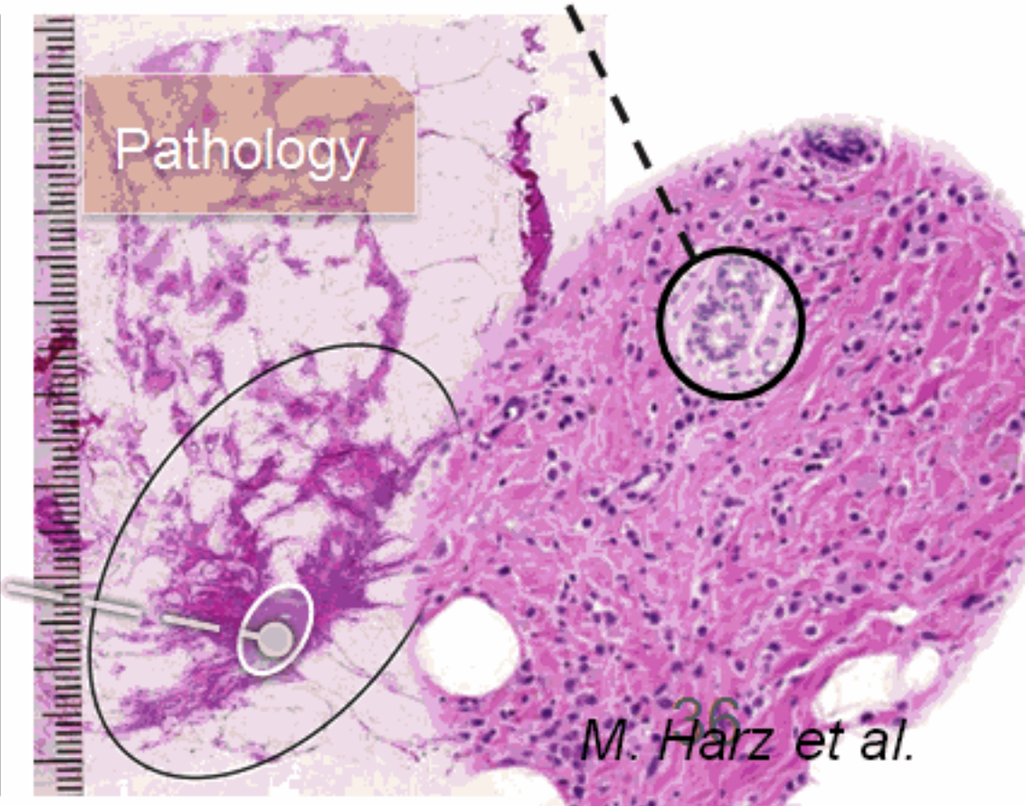


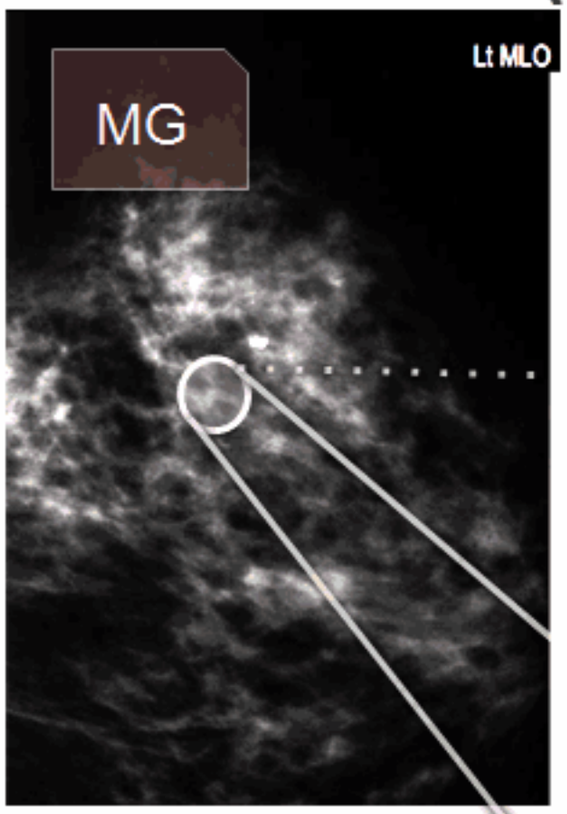
MRI

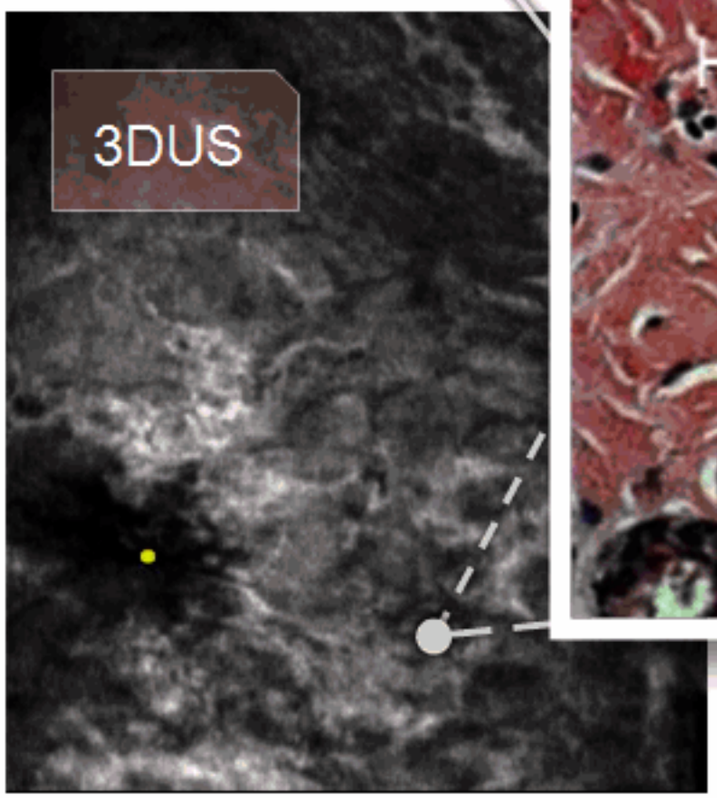


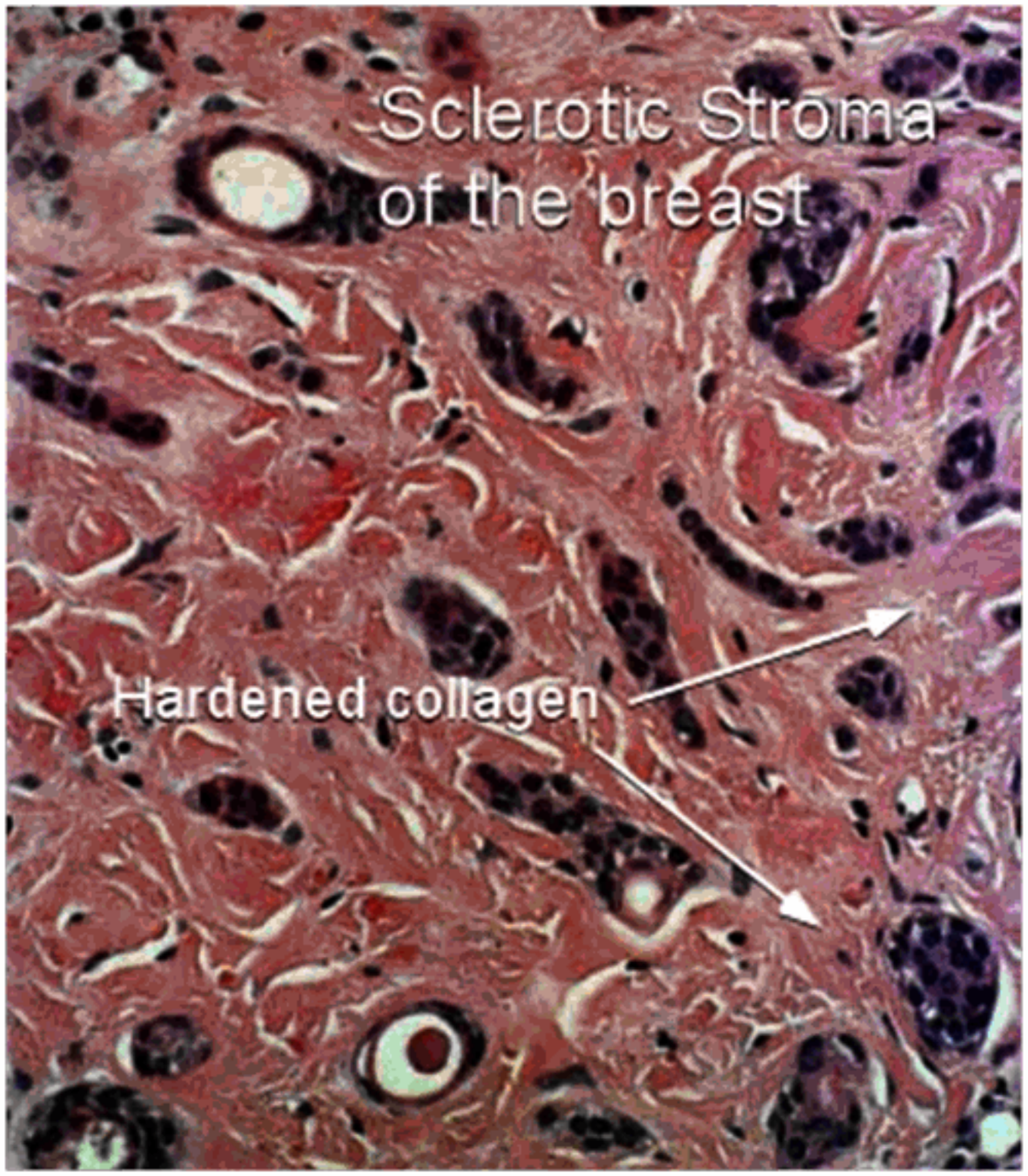
Pathology

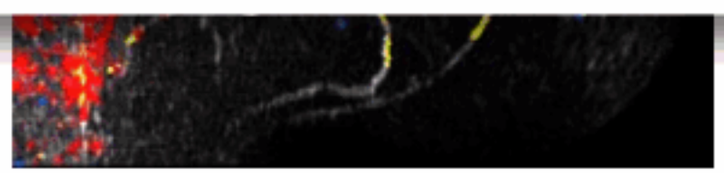
M. Harz et al.

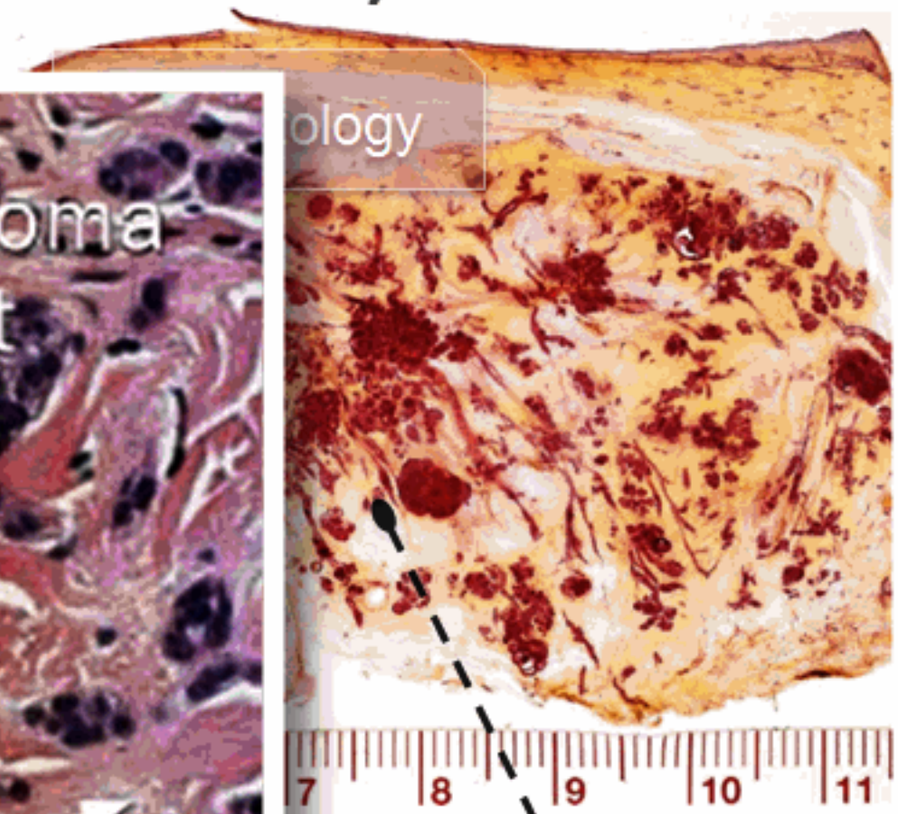
Multimodal spatial and histo-pathological correlation
(new EC FP7 project VPH-PRISM)

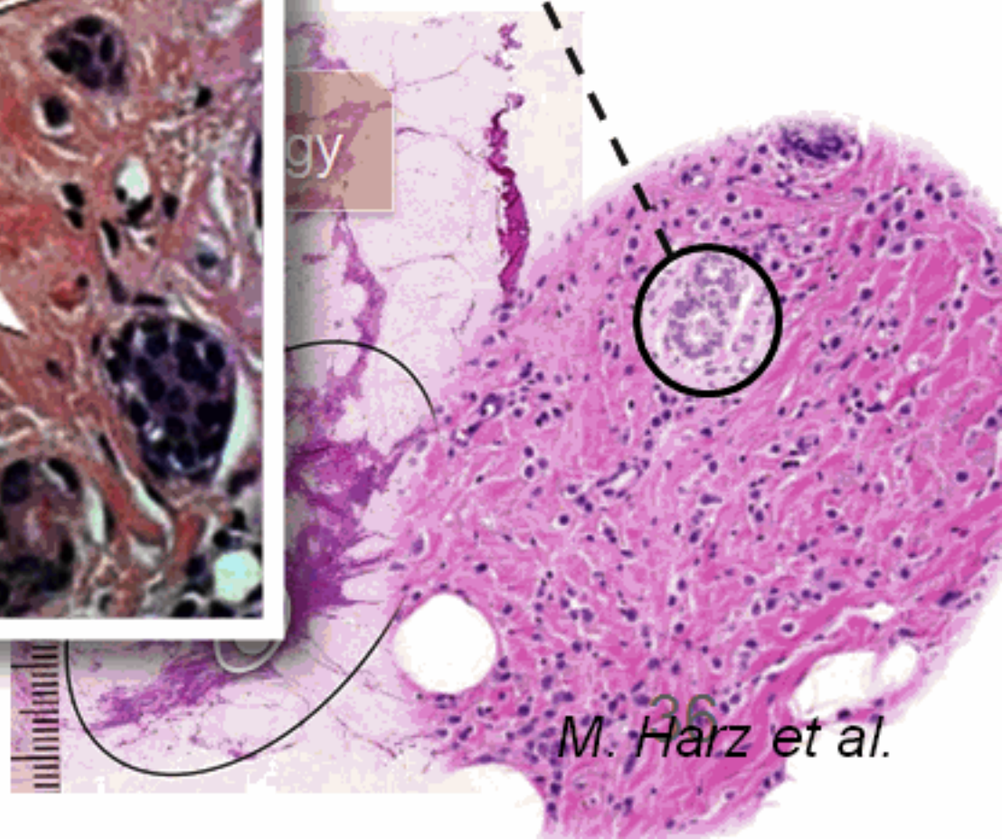




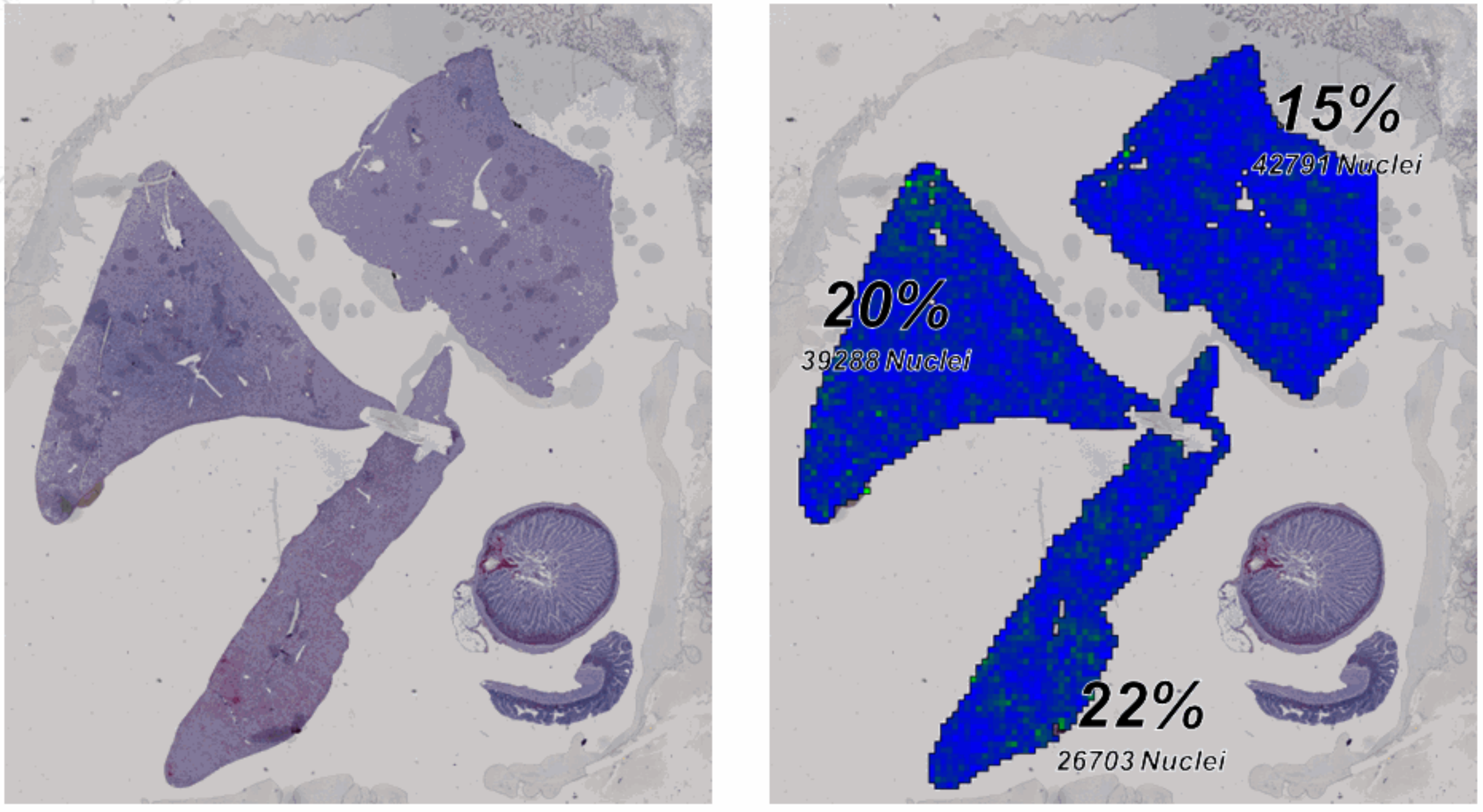








Quantification of Proliferation



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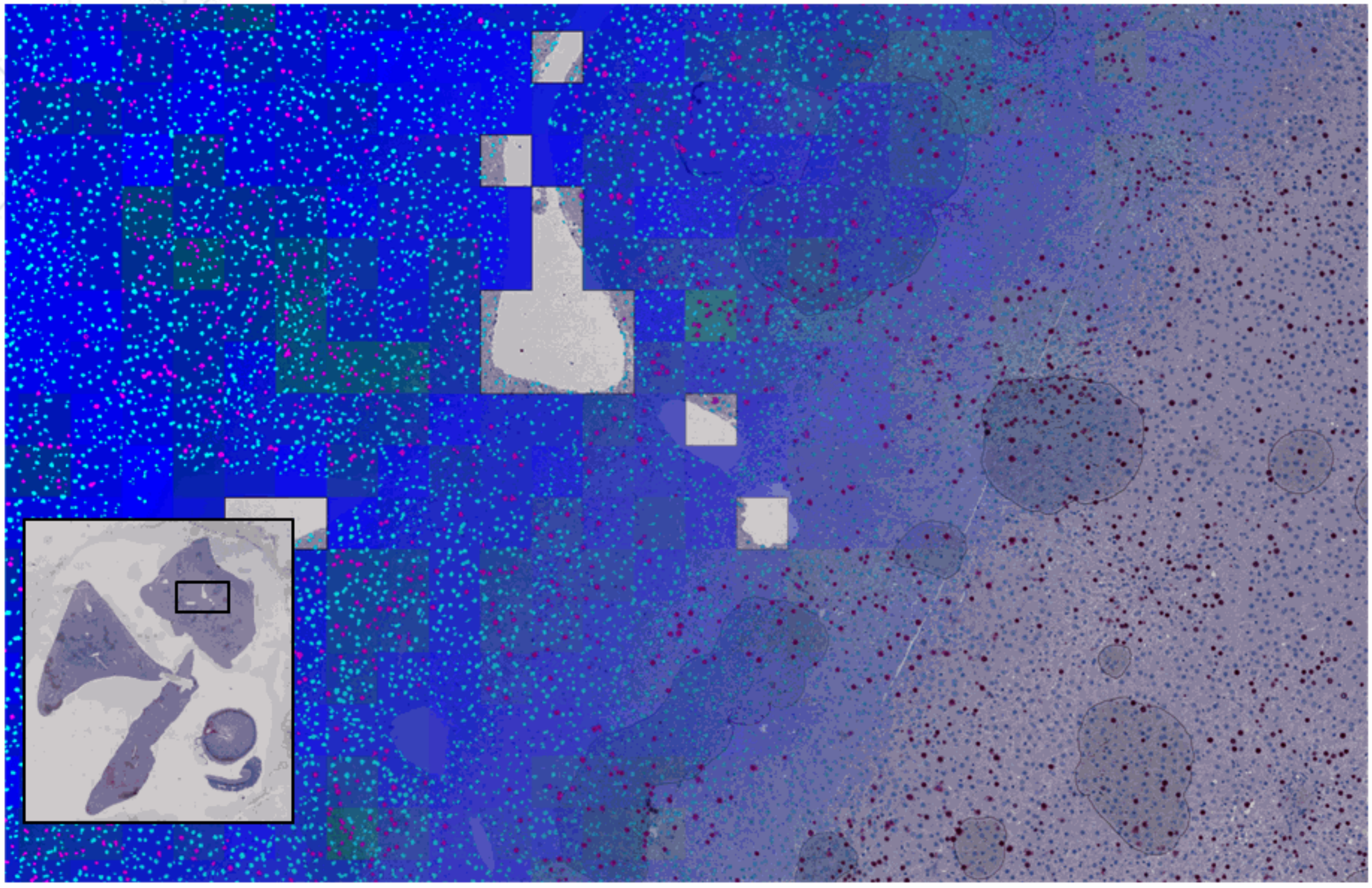
A. Homeyer et al.

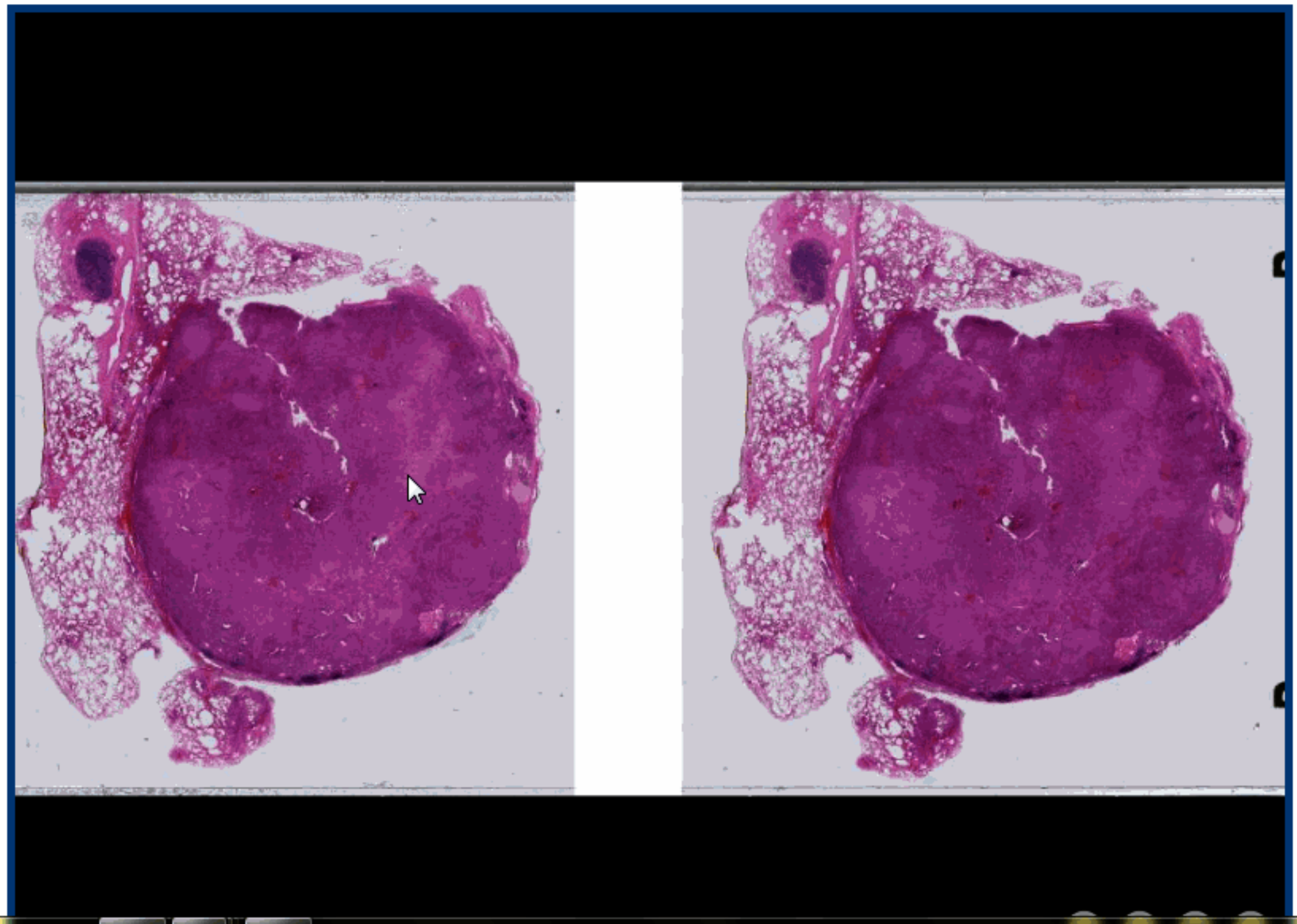
Quantification of Proliferation



A. Homeyer et al.

Fall 2

22-jähriger Patient, Tumor rechter Lungenoberlappen, klinisch bestehen multiple unterschiedlich große Knoten im Bereich der rechten Lunge



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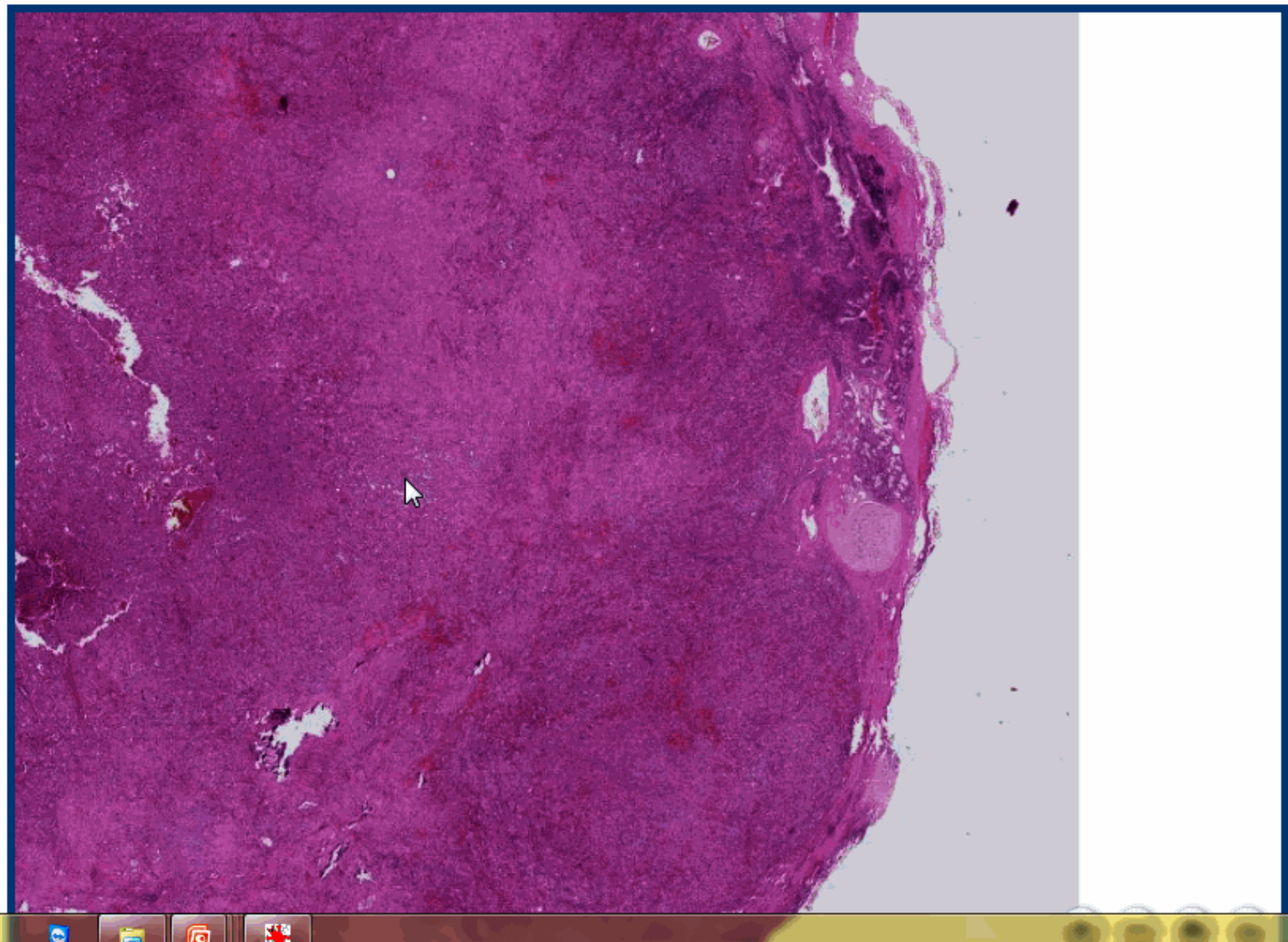

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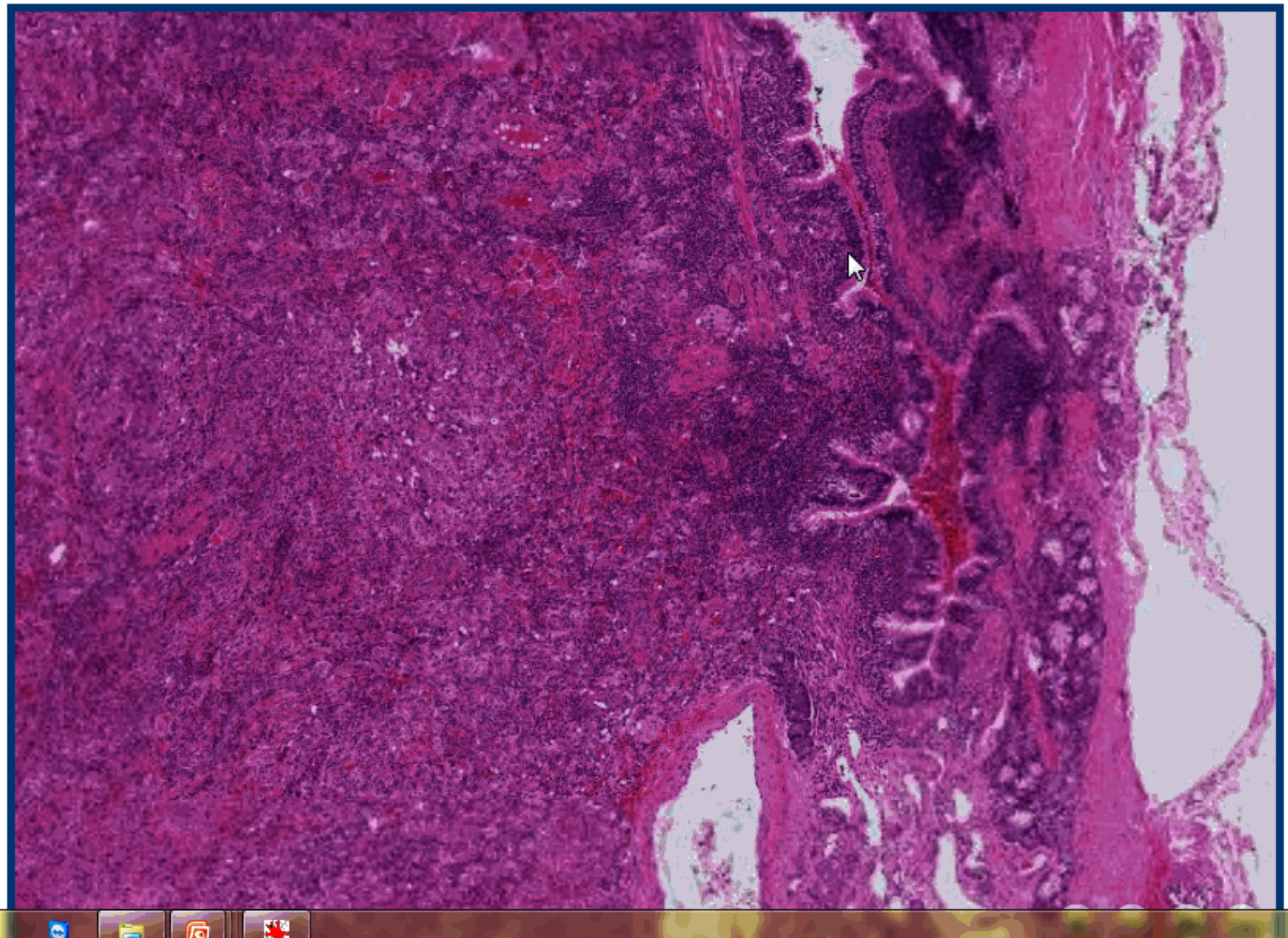

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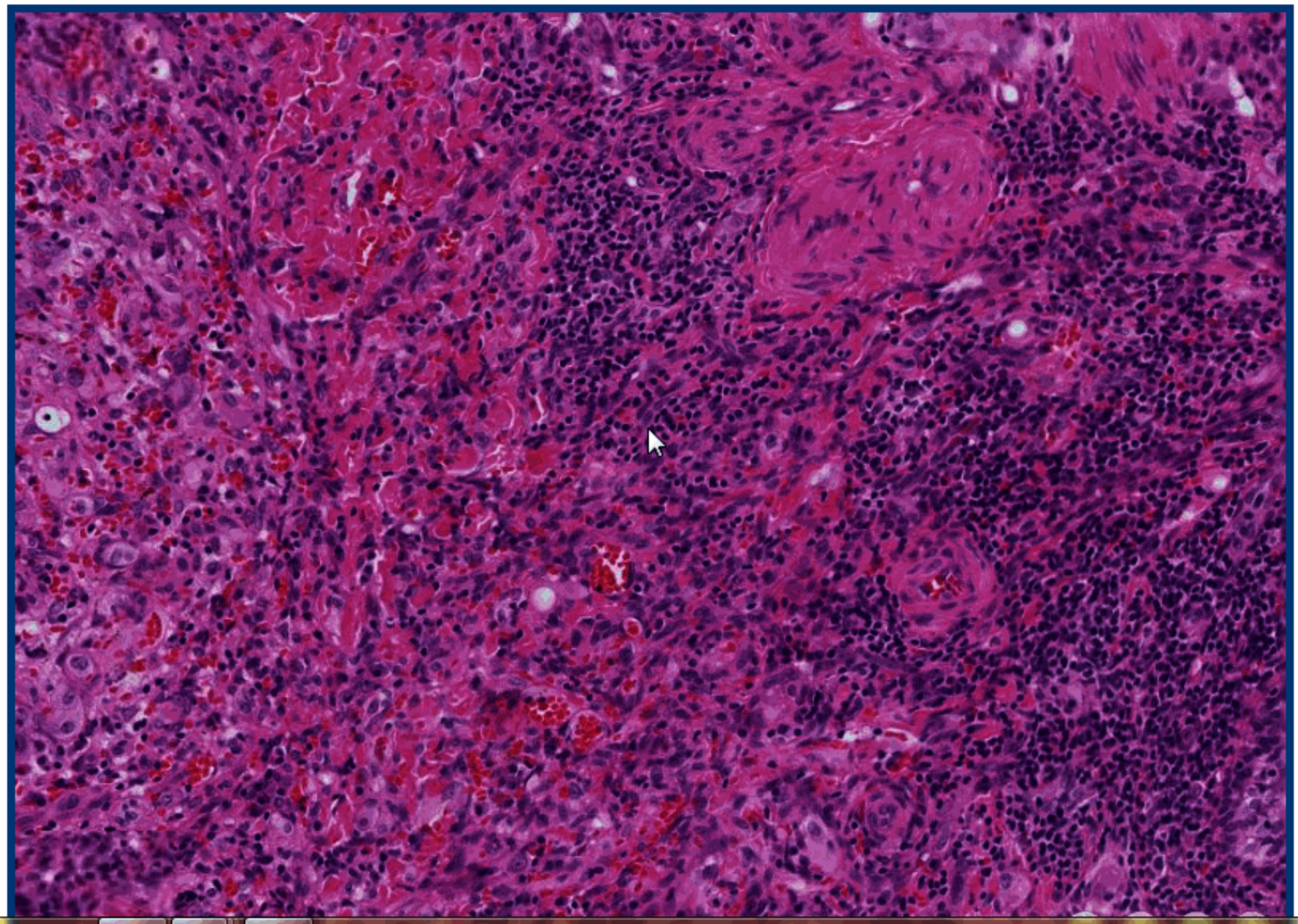

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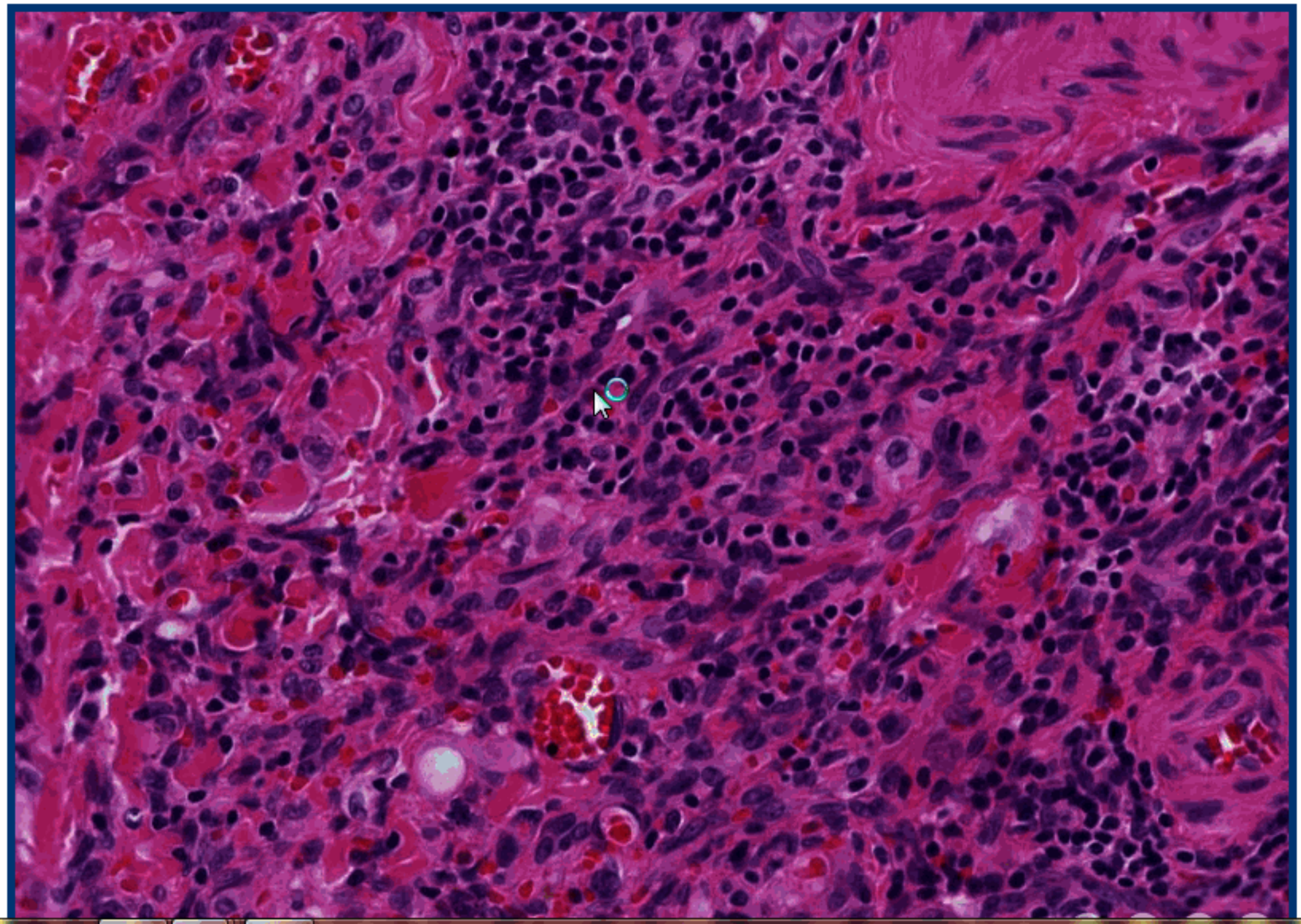

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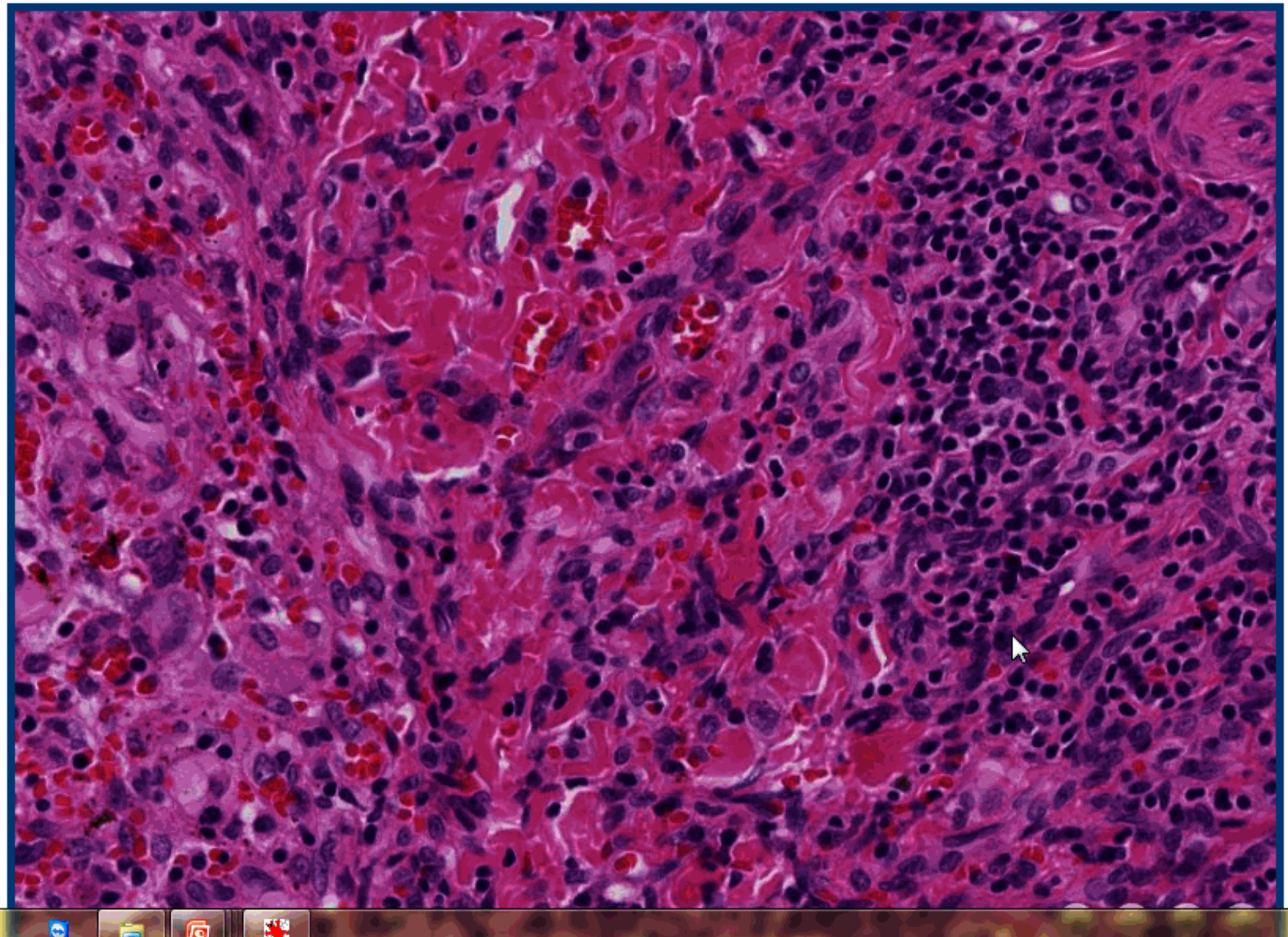

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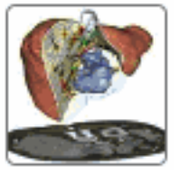
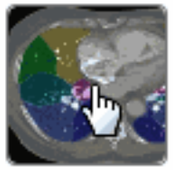
Web Applications



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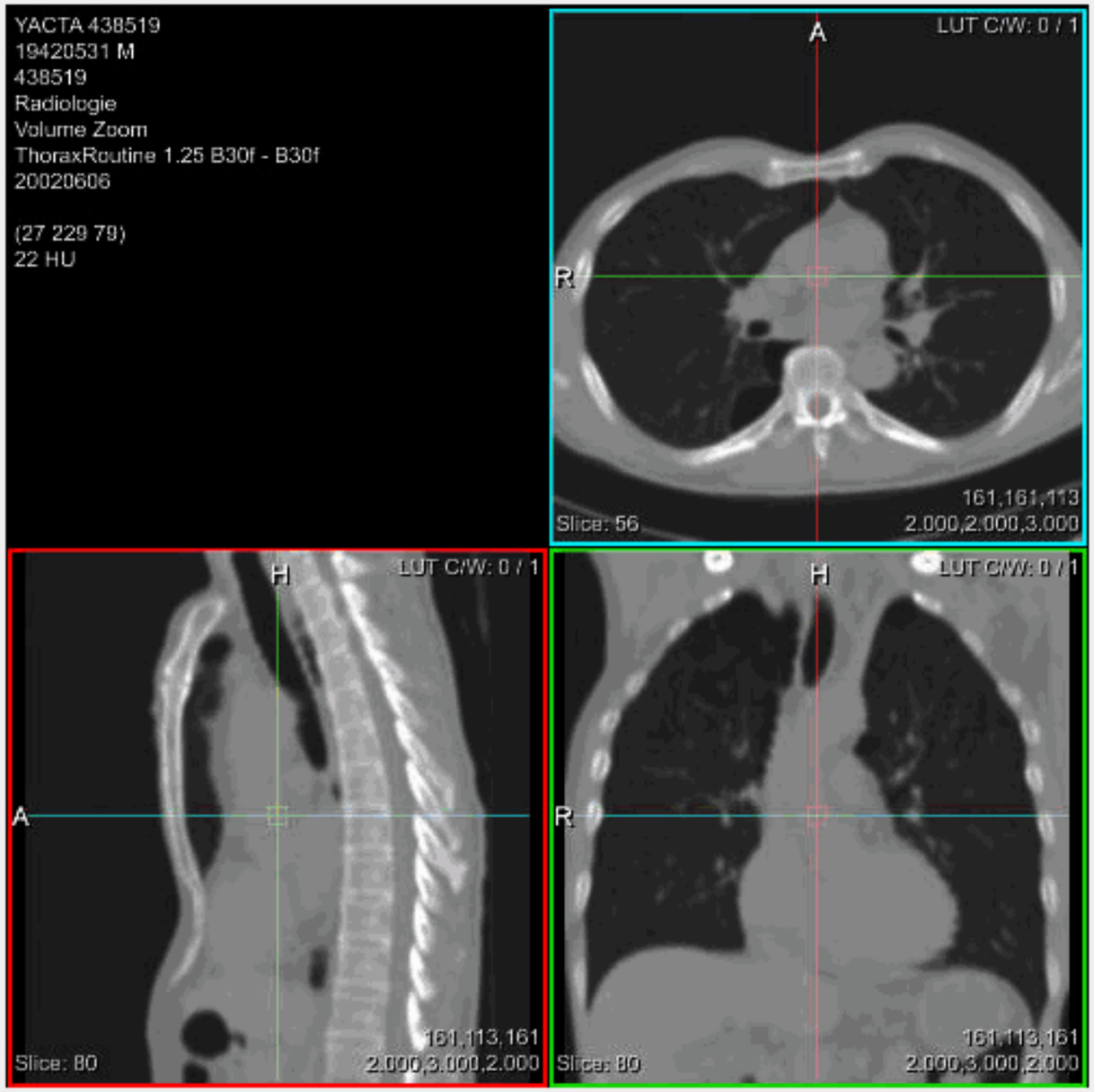
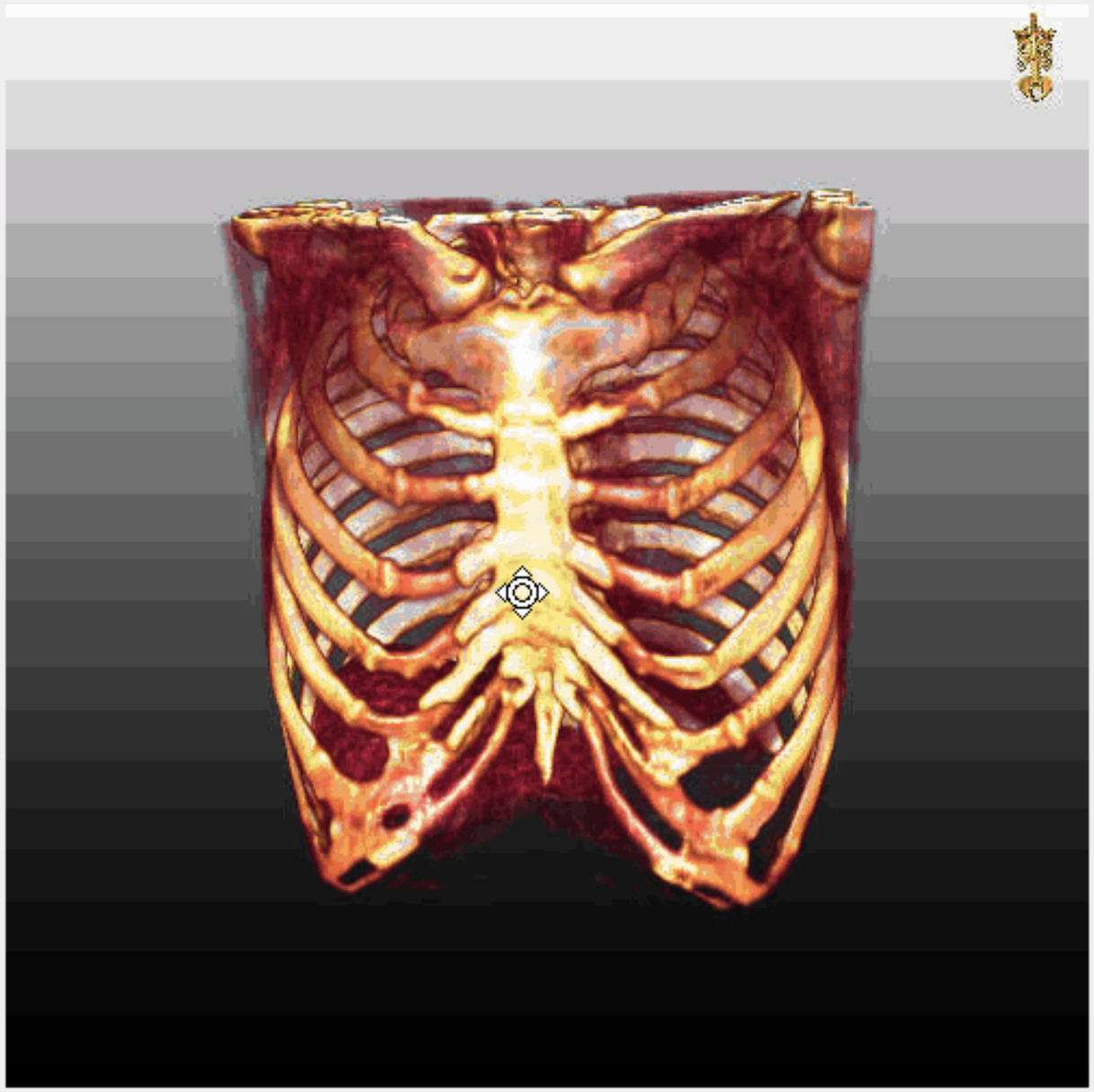
Lung Parenchyma Analysis





Include LAV Cluster Analysis

Start Processing

Dataset loaded.

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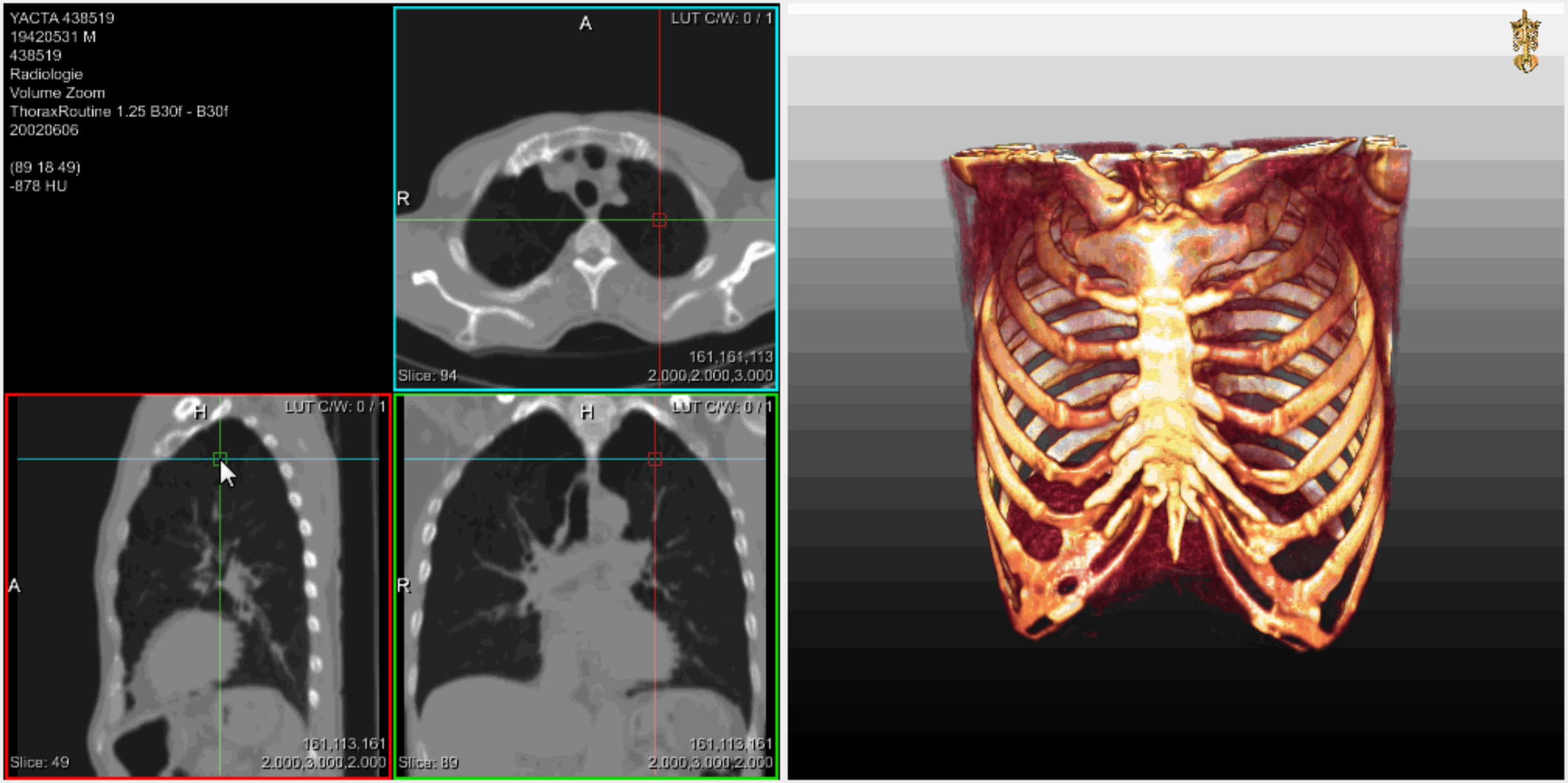
Lung Parenchyma Analysis



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Dataset loaded.

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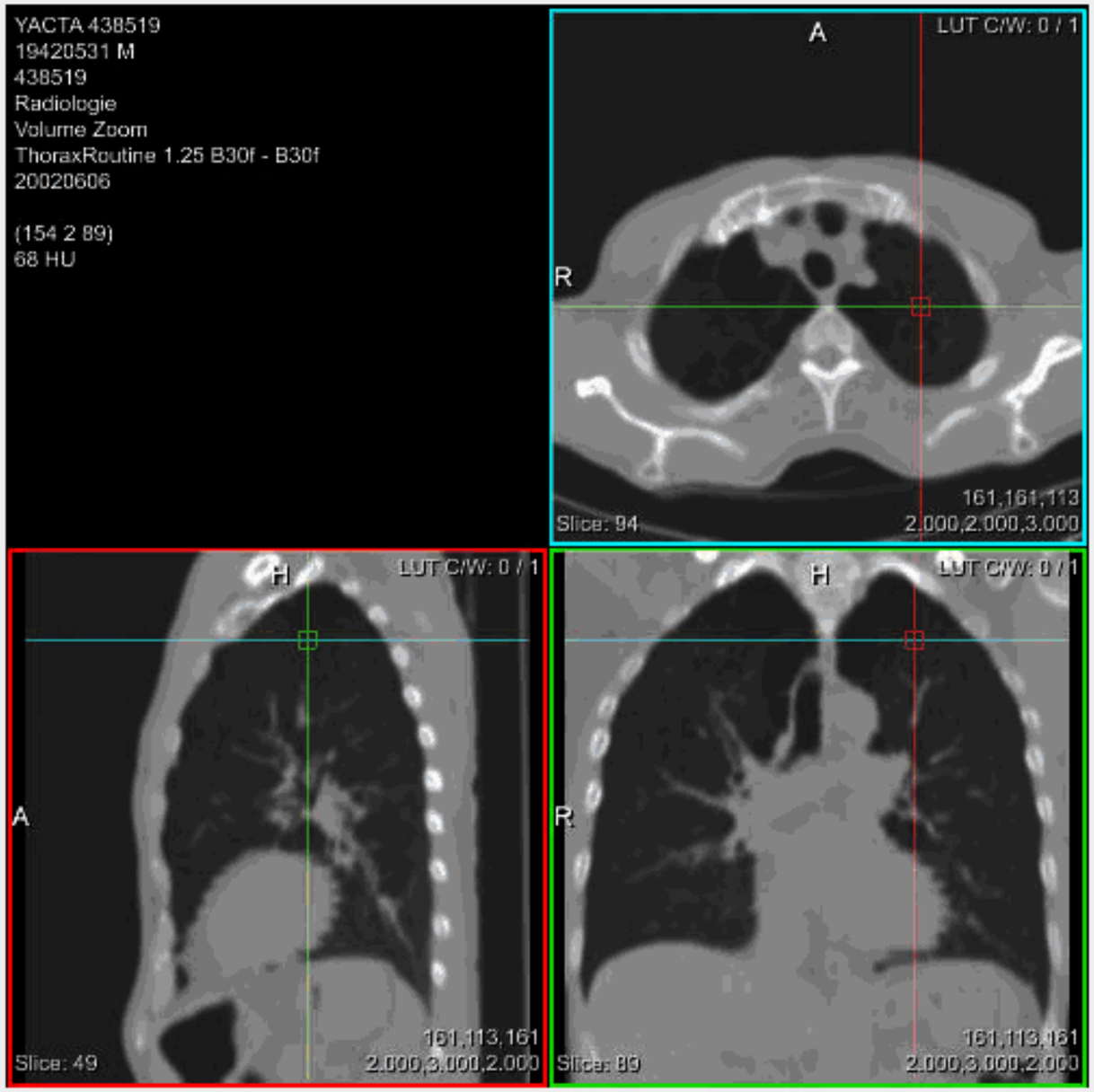
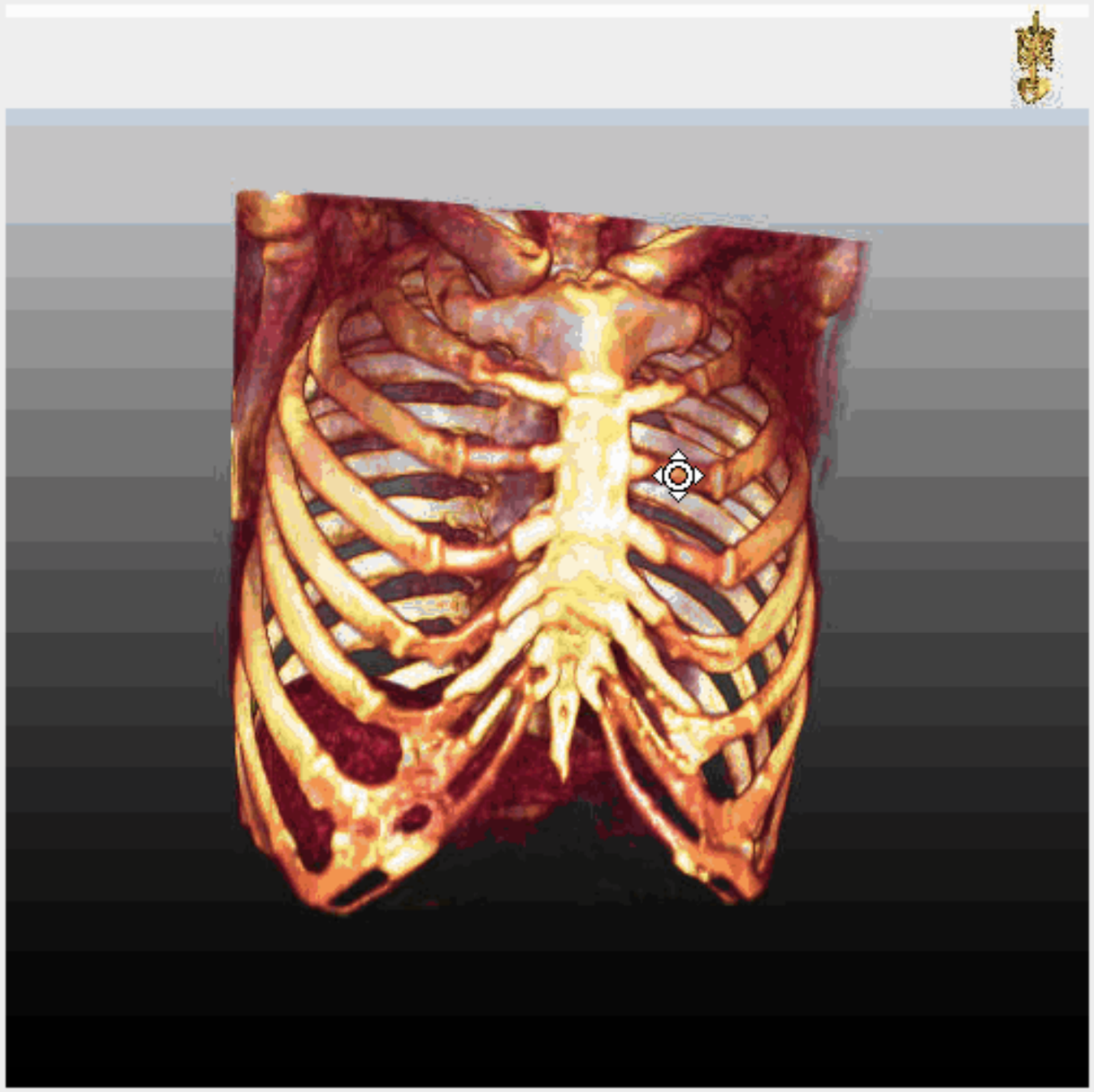
Lung Parenchyma Analysis





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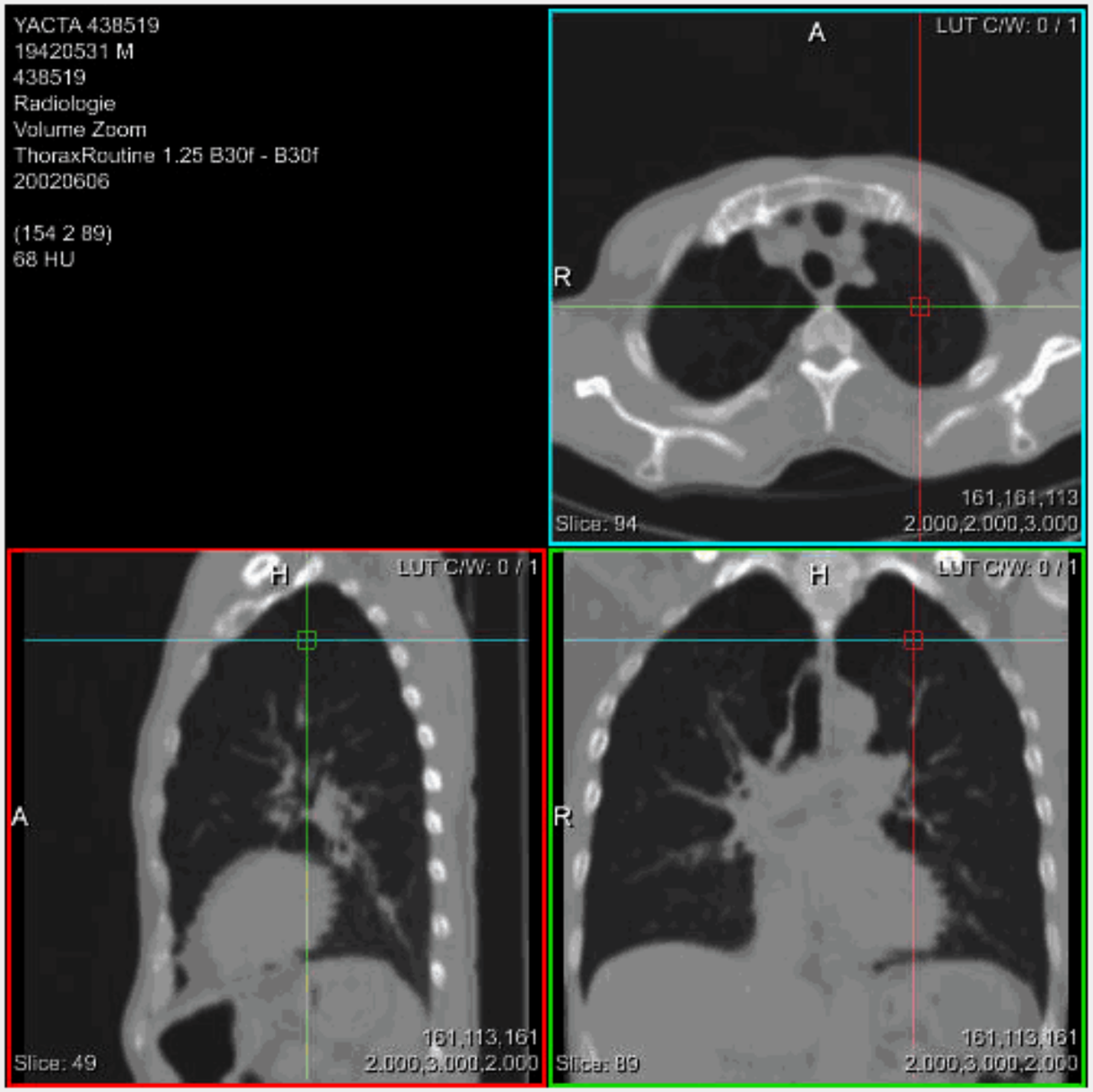
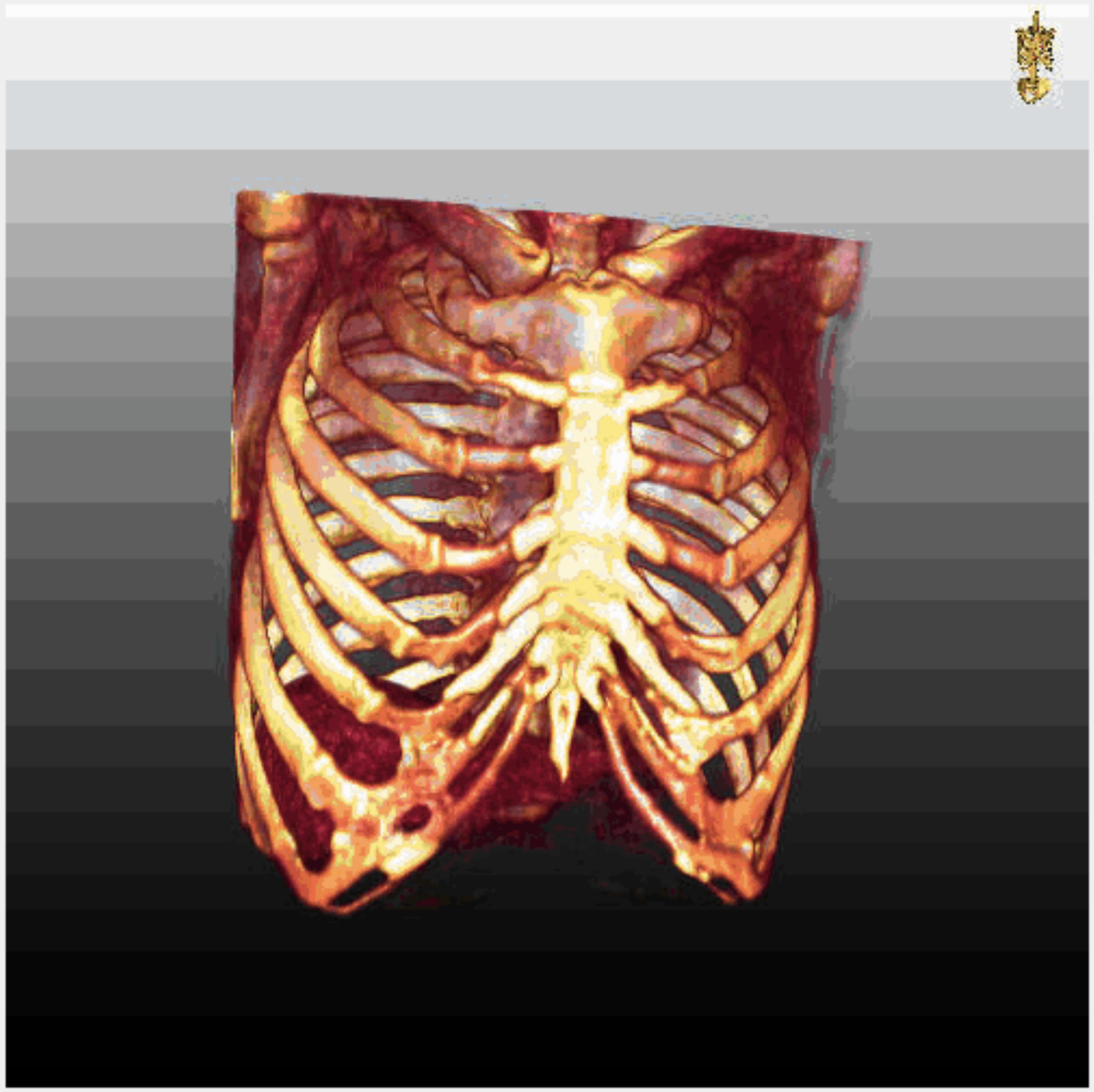
Lung Parenchyma Analysis





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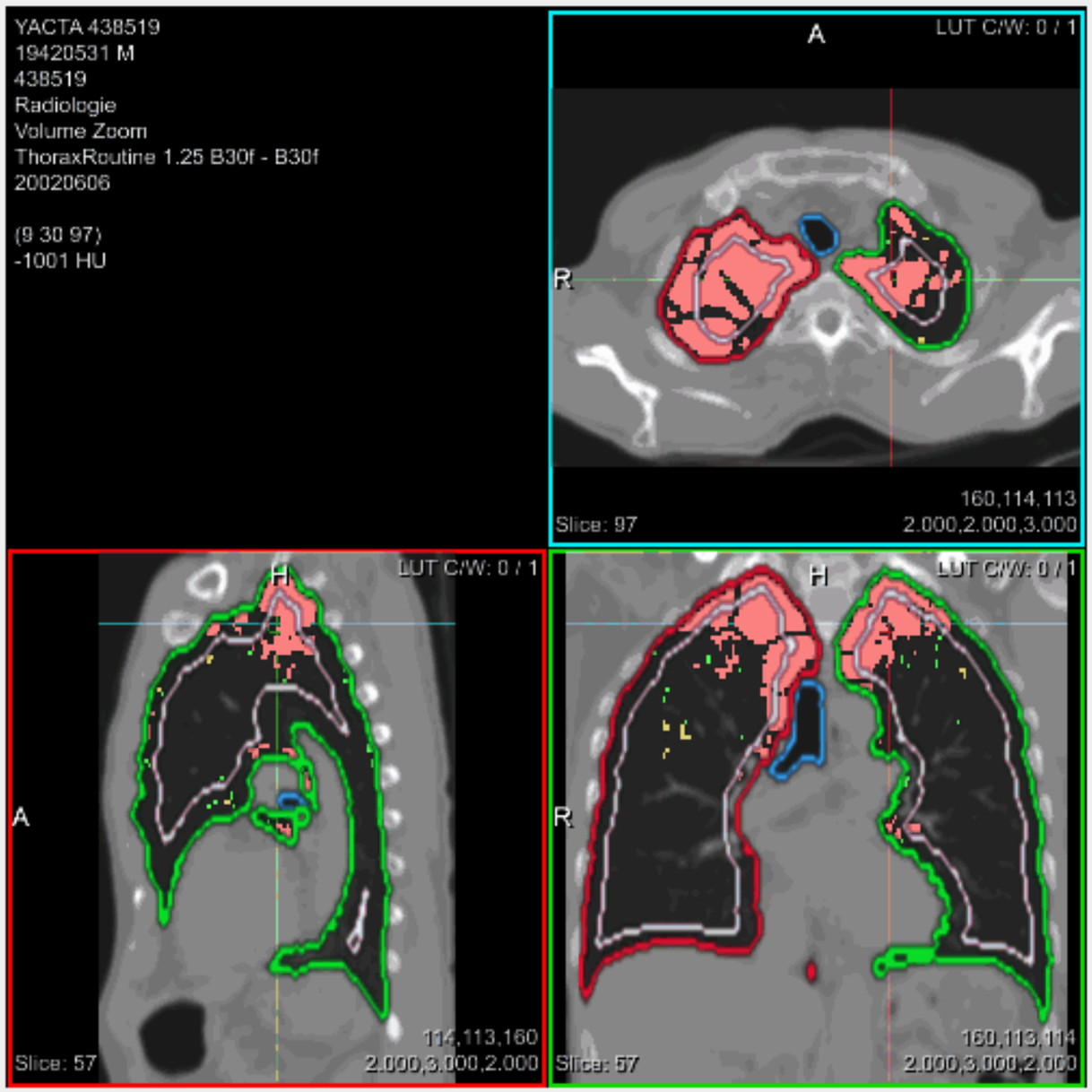

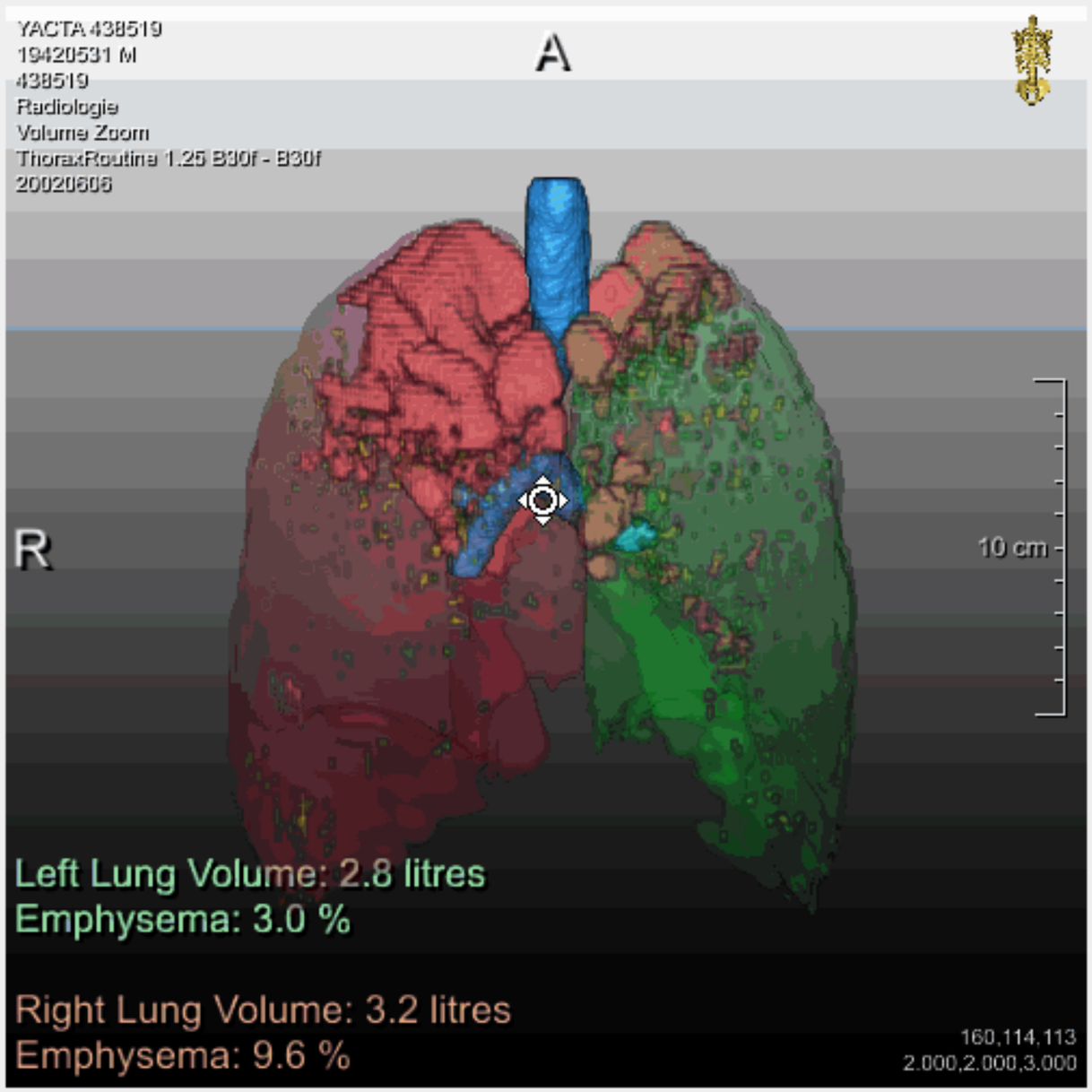

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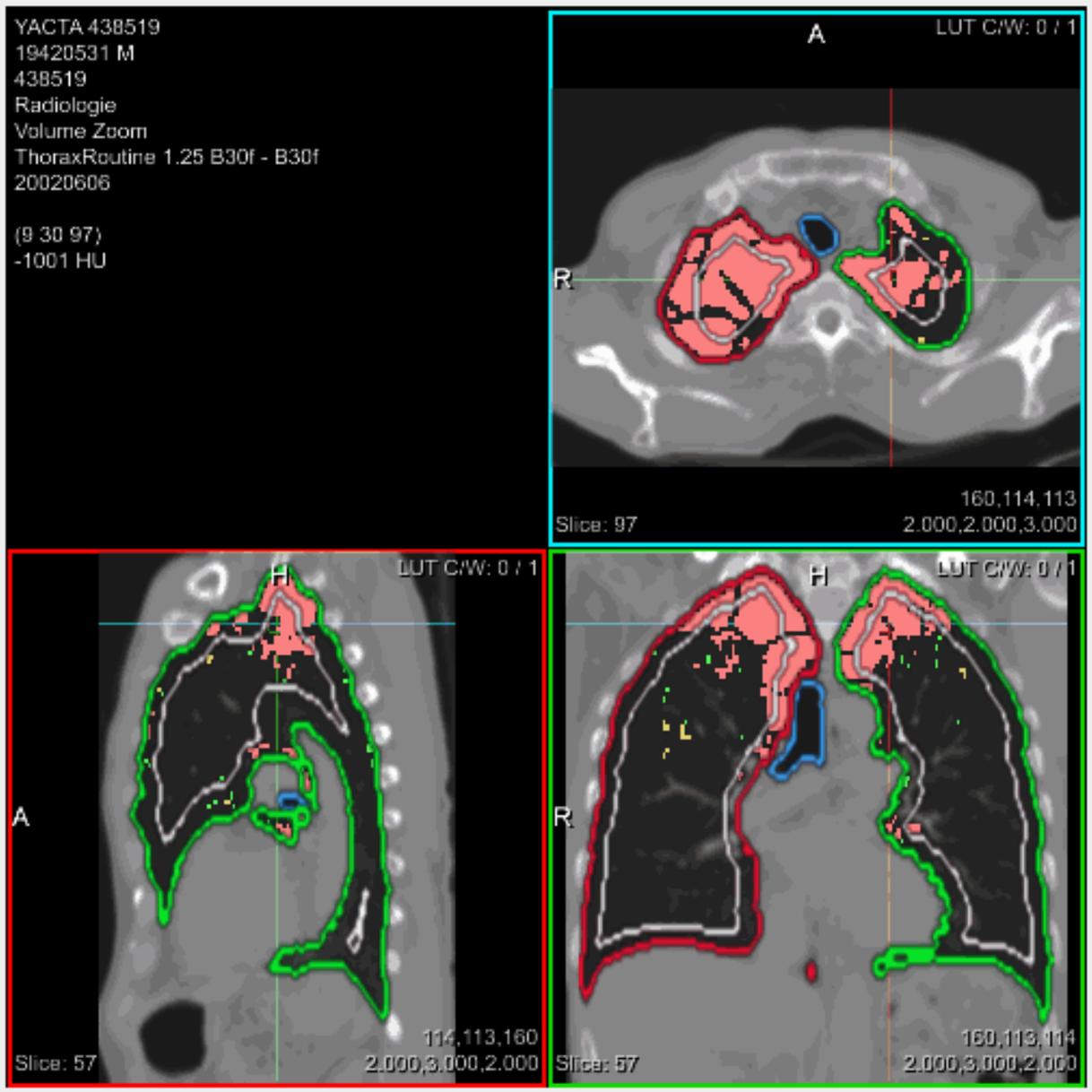
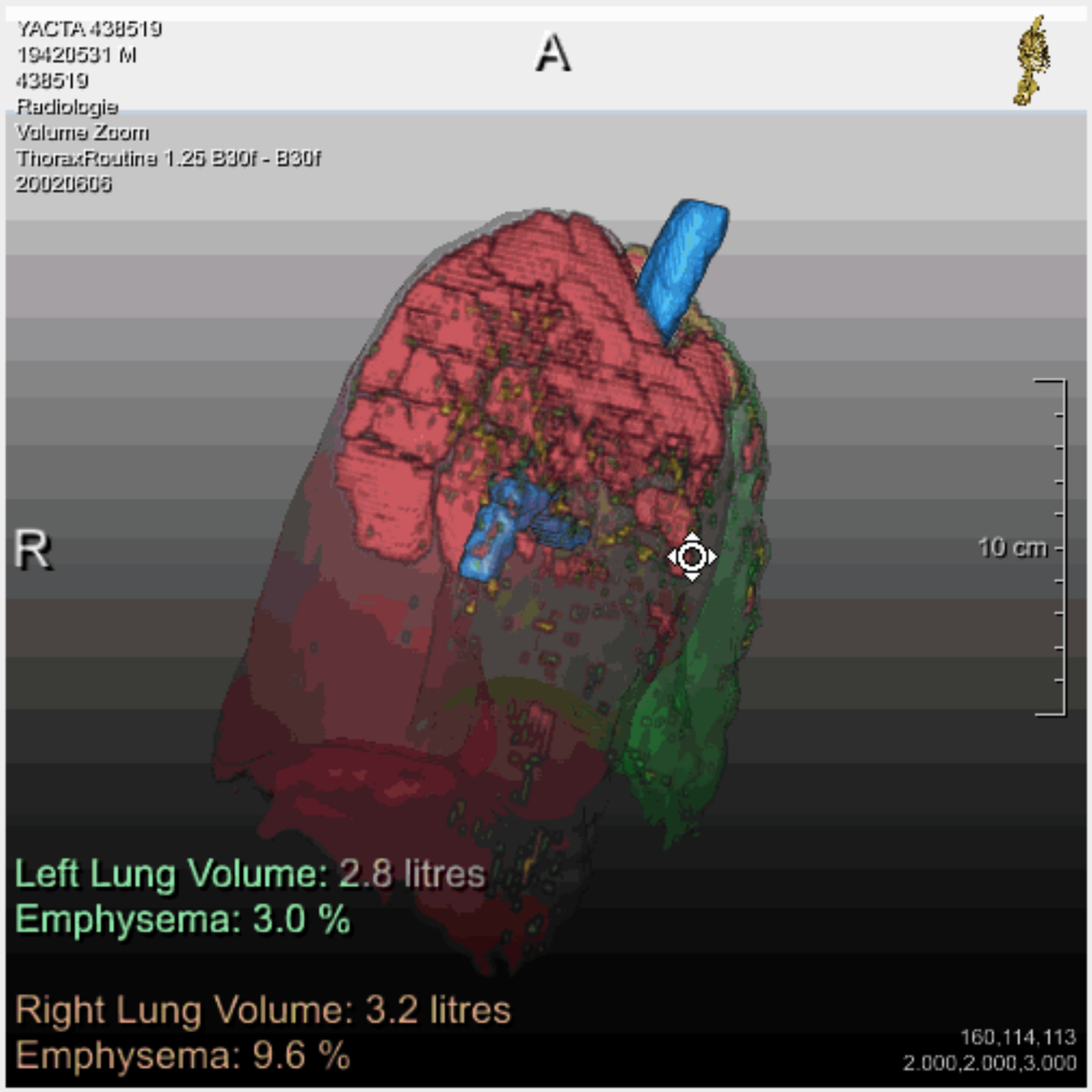
Lung Parenchyma Analysis





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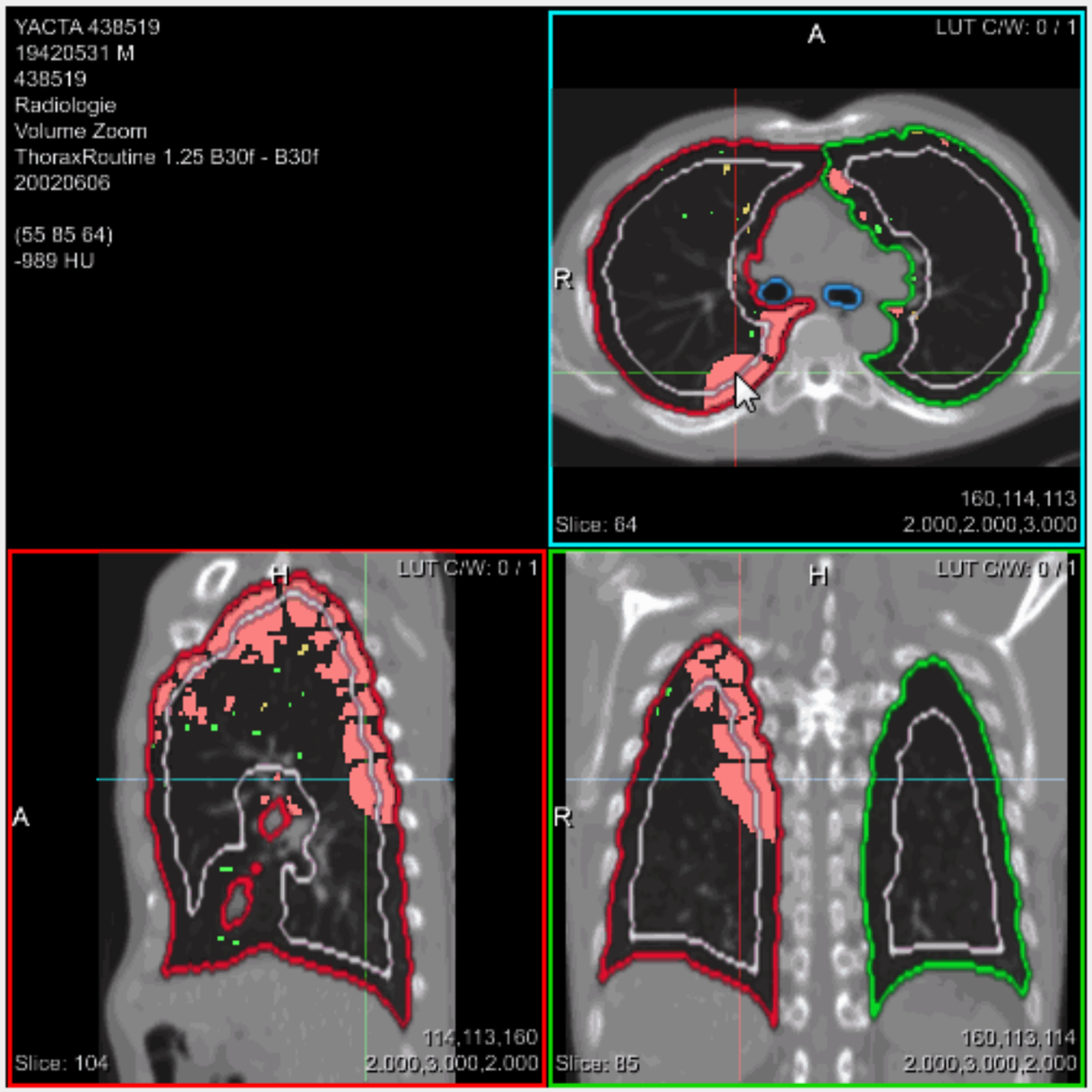
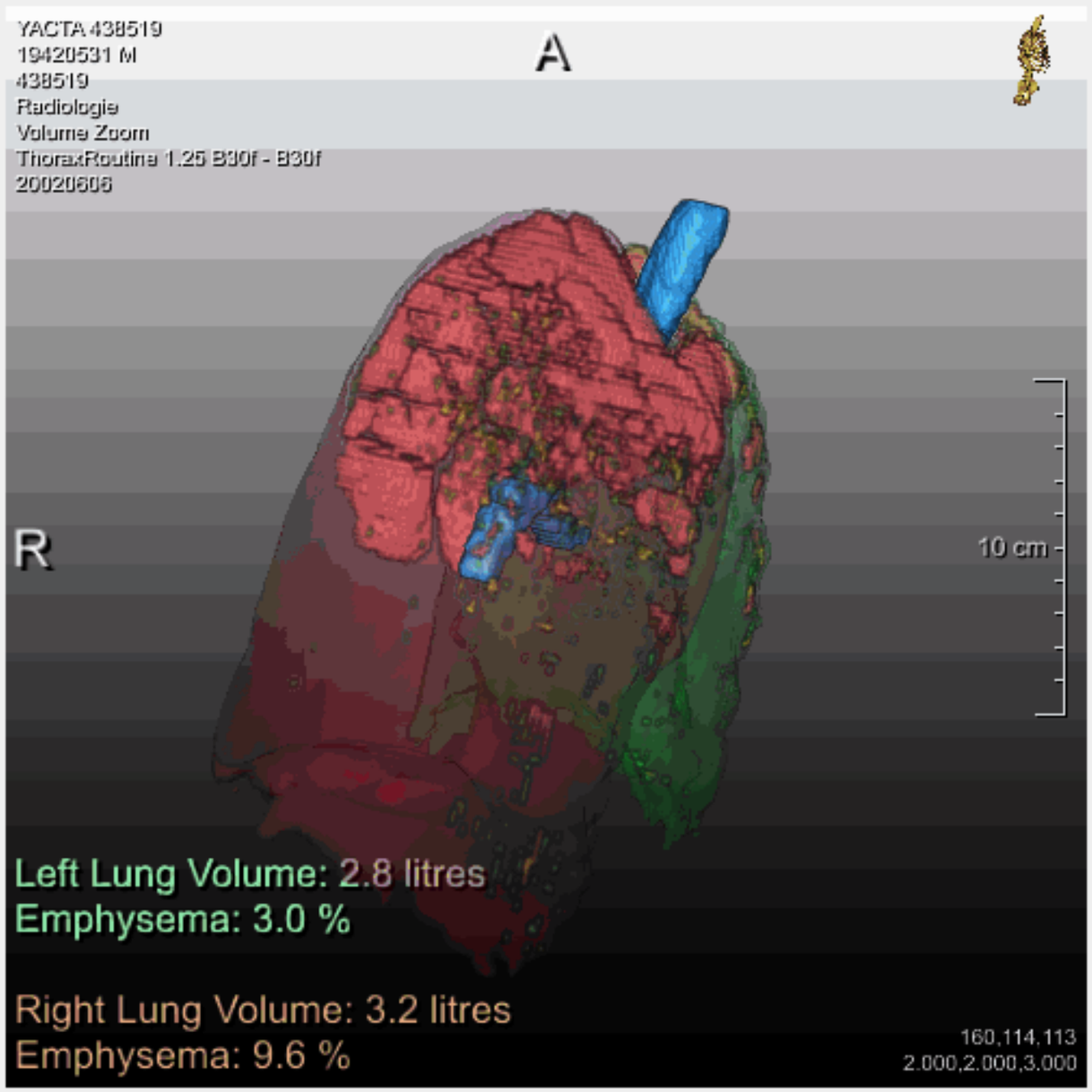
Lung Parenchyma Analysis





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Done.

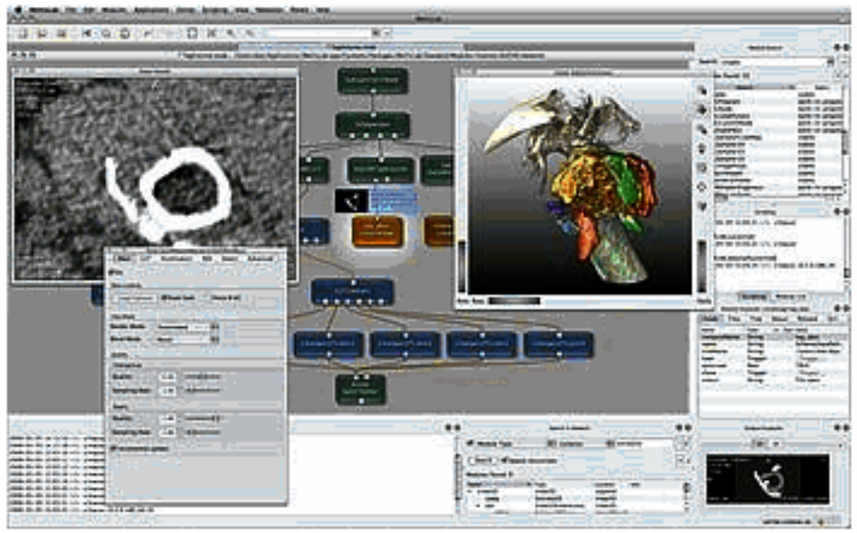
MeVisLab

medical image processing and visualization

Welcome to the home of the MeVisLab development environment for medical image processing and visualization.

MeVisLab represents a powerful, modular framework for the development of image processing algorithms and visualization and interaction methods, with a special focus on medical imaging.

Besides basic image processing and visualization modules, MeVisLab includes advanced medical imaging algorithms for segmentation, registration, and quantitative morphological and functional image analysis.



The MeVisLab Development Environment

MeVisLab is being developed and used by MeVis Medical Solutions AG and Fraunhofer MEVIS (formerly MeVis Research GmbH) in Bremen, Germany. MeVis Medical Solutions and Fraunhofer MEVIS develop scientific methods and software for computer assistance in medicine in general and radiology in particular, including computer aided diagnosis, therapy planning and monitoring, and computer aided teaching and training.

Recent News

2-10-12

MeVisLab 2.3.1 Bugfix Release Available

MeVis Medical Solutions and Fraunhofer MEVIS announce the MeVisLab 2.3.1 Bugfix Release [read more]

19-07-12

MeVisLab 2.3 Stable Release

MeVis Medical Solutions and Fraunhofer MEVIS announce the MeVisLab 2.3 Stable Release [read more]

26-06-12

MeVisLab 2.3 Release Candidate

MeVis Medical Solutions and Fraunhofer MEVIS announce the MeVisLab 2.3 Release Candidate [read more]

7-09-11

MeVisLab 2.2.1 Bugfix Release Available

MeVis Medical Solutions and Fraunhofer MEVIS announce the MeVisLab 2.2.1 Bugfix Release [read more]

28-06-11

MeVis MEDICAL SOLUTIONS

MeVisLab

medical image processing and visualization

Documentation

Please refer to the following documents to learn about the features of MeVisLab.

Getting Started

- Getting Started Tutorial gives an introduction to the MeVisLab user interface and explains first steps
- MeVisLab Reference Manual lists all details of the MeVisLab user interface and IDE
- Movies showing MeVisLab in action

SDK Documentation

- The MeVisLab SDK Documentation Index provides detailed information on the documentation for module development and scripting.

Opens external link in new window

Toolkit AddOns

- ITK AddOn provides information on the ITK modules.
- VTK AddOn provides information on the VTK modules.

Release Notes

- MeVisLab Release Notes include information on current and past releases.

Read more on the following pages...

- SDK
- ITK AddOn
- VTK AddOn
- Open Inventor
- Publications

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MeVisLab Help Resources | COMIC - about

MeVisLab Help Resources

Using MeVisLab

MeVisLab Reference Manual PDF
Getting Started PDF

This Version

New in MeVisLab 2.3 PDF
New in MeVisLab 2.2 PDF
New in MeVisLab 2.1 PDF
New in MeVisLab 2.0 PDF
Release Notes PDF

SDK General Help

Tool Runner PDF
MDL (Panel/GUI) Reference PDF
Scripting Reference (Python/JavaScript)
Package Structure PDF
TestCenter Manual PDF
TestCenter Reference

SDK C++ Help and References

QMake PDF
The ML Guide PDF
Kernel Programming PDF
ML Reference
ToolBox Reference
Open Inventor Reference

External Library References

C++
Python 2.6.4
NumPy 1.3.x
Itk
Vtk
Qt 4.8

Overviews

CSO Overview
GLSL shader framework
Giga Voxel Renderer
LUT Functions
MLImageFormat
Open Inventor
SoView2DExtensions

What's New in MeVisLab 2.2?

Table of Contents

List of Figures

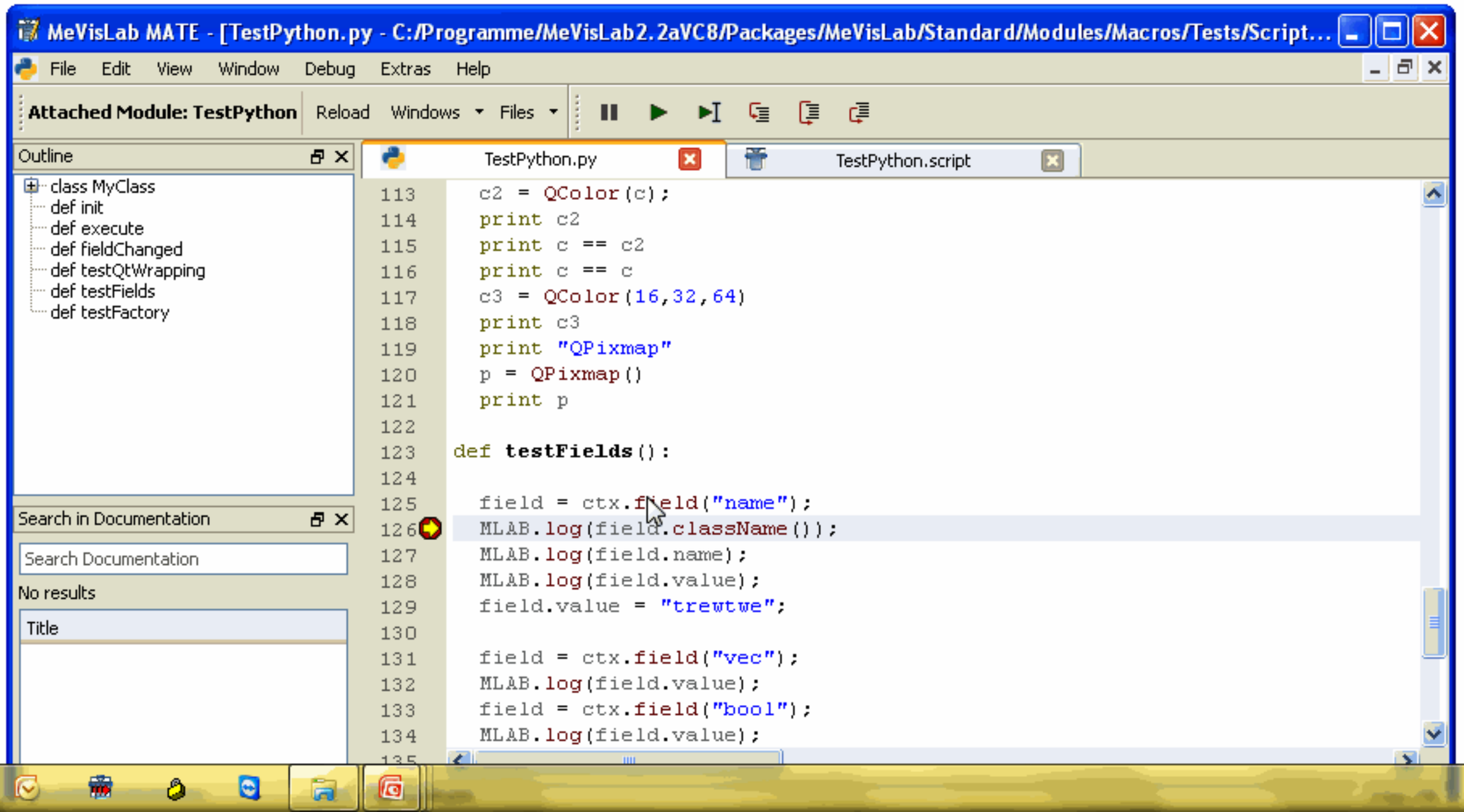
Firefox

1.2. Integrated Python Debugger | COMIC - about

1.2. Integrated Python Debugger

- MATE now contains a GUI front-end for MeVisLab's integrated Python debugger.
- The debugger supports:
  - Breakpoints in Python code and on exceptions
  - Conditional breakpoints
  - Introspection of the stack frames including all local variables
  - Breaking into running Python code
- Tedious setup of external debugger is no longer needed.

Figure 1.1. Python Debugger



1.4. Profiling Improvements

- Profiling now supports function profiling and offers a call graph view.
- The call graph now includes: FieldListeners, MDL commands, Python calls and MeVisLab API/Qt calls.
- Function details view shows calling and called functions overview.

Figure 1.3. Profiling Call Graph

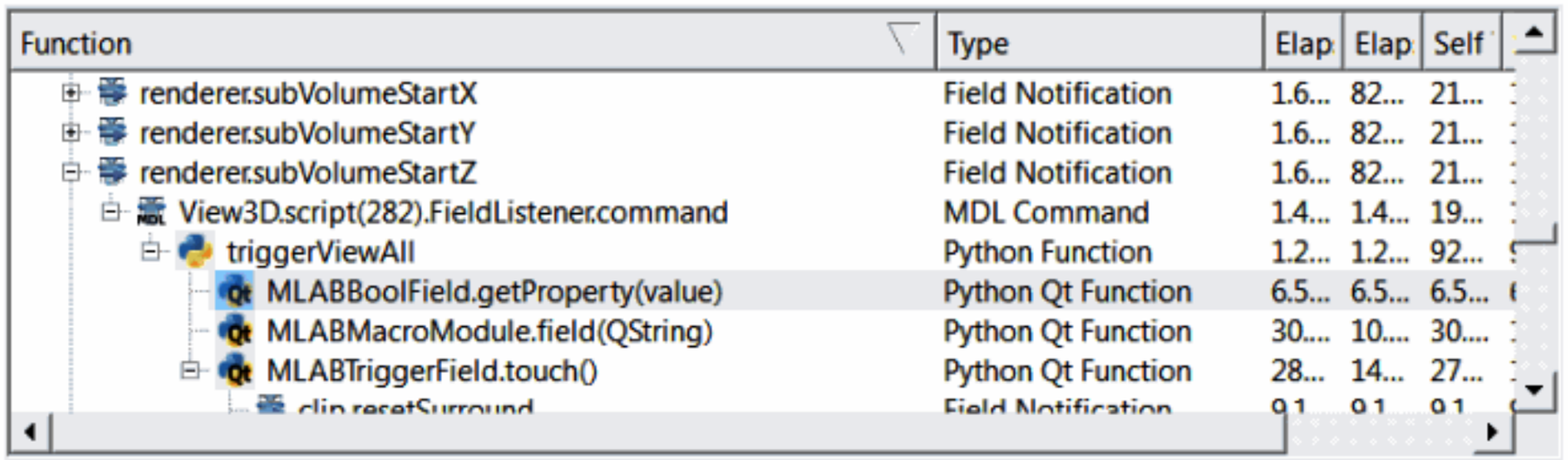
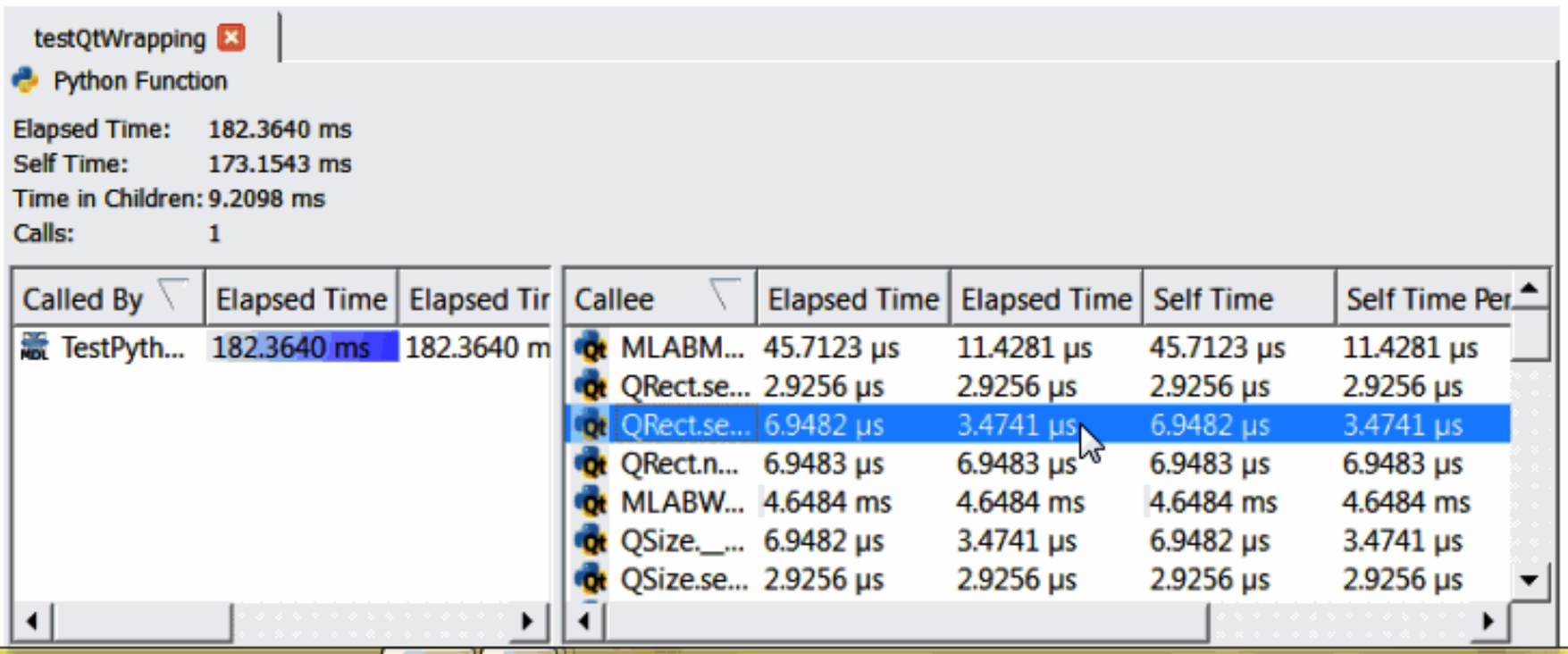


Figure 1.4. Profiling Function Details



1.1. Open Inventor Renovation and New Modules

- Renovated the Open Inventor core by using vertex arrays and VBO to enhance efficiency of renderings.
- Added new class SoIndexedTriangleSet to further enhance speed.
- Added modules to render screen space ambient occlusion, and cascaded shadow mapping and soft-shadows (PCSS).
  - SoScreenSpaceAmbientOcclusion
  - SoShadowMapping
- Added SoRenderSurfaceIntersection to render 3D surface intersections on 2D slices.
  - SoRenderSurfaceIntersection
- Added SoFixedFunctionShader to extent the fixed function Open GL pipeline with user shaders.
  - SoFixedFunctionShader
- Supporting MSAA (multisample anti-aliasing) in SoExaminerViewer, SoFramebufferSampler2D, and OffscreenRenderer.
- Module SoDiagram2D replaces Diagram2D and offers extension modules for rendering curves.
  - SoDiagram2D

Figure 1.1. Open Inventor scene without any SSAO or shadow mapping.

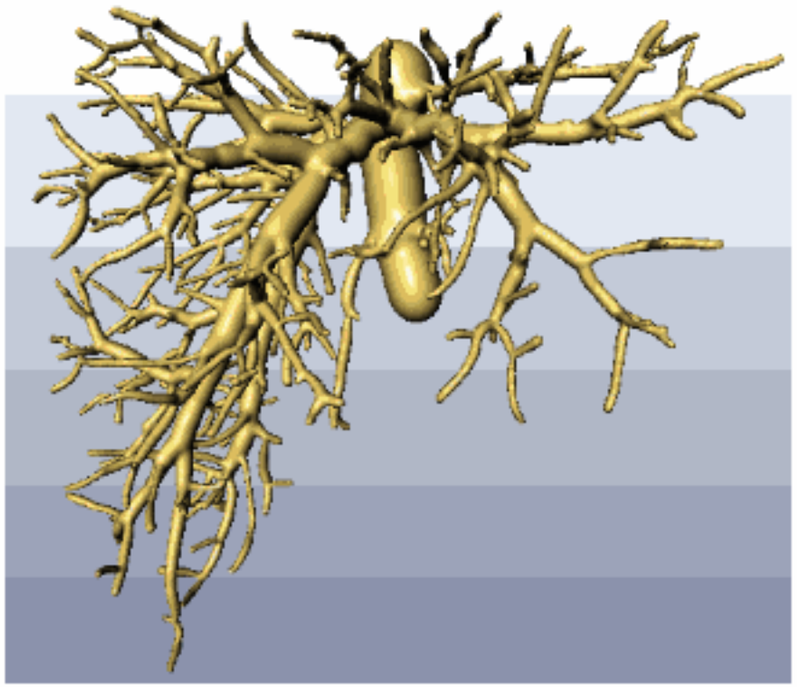


Figure 1.2. Open Inventor scene with screen space ambient occlusion.

Figure 1.3. Open Inventor scene with soft shadows.

Figure 1.4. Open Inventor scene with SSAO and soft shadows.

Figure 1.5. Polygonal surfaces cut and filled on a 2D viewer.

1.2. New GVR Modules

- Added module for local ambient occlusion (LAO) and deep shadow map rendering.
  - GVRAmbientOcclusion
  - GVRDeepShadowMapping

Figure 1.6. GVR rendering without any LAO or shadows.

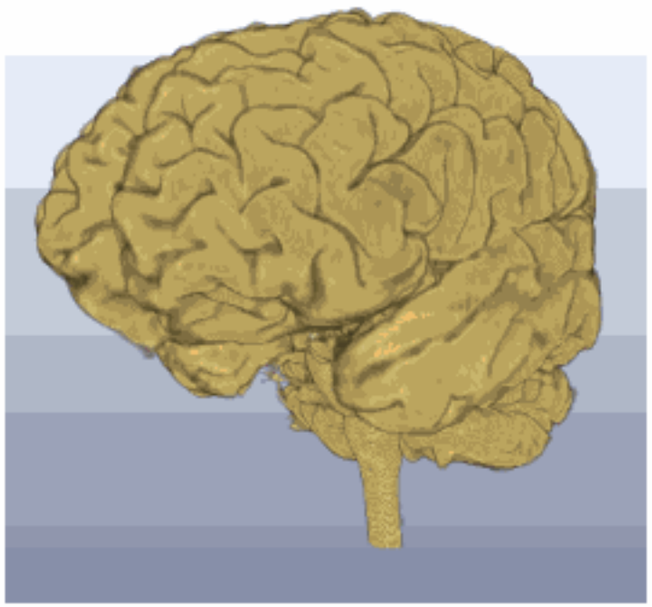


Figure 1.7. GVR rendering with local ambient occlusion.

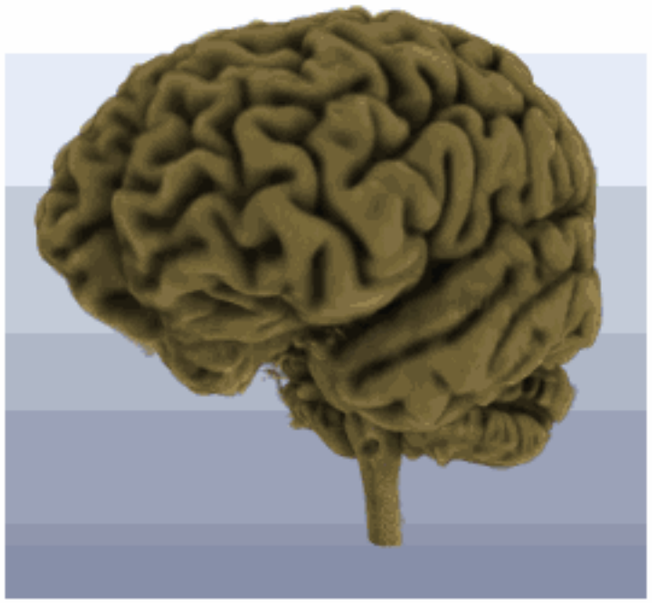


Figure 1.7. GVR rendering with local ambient occlusion.

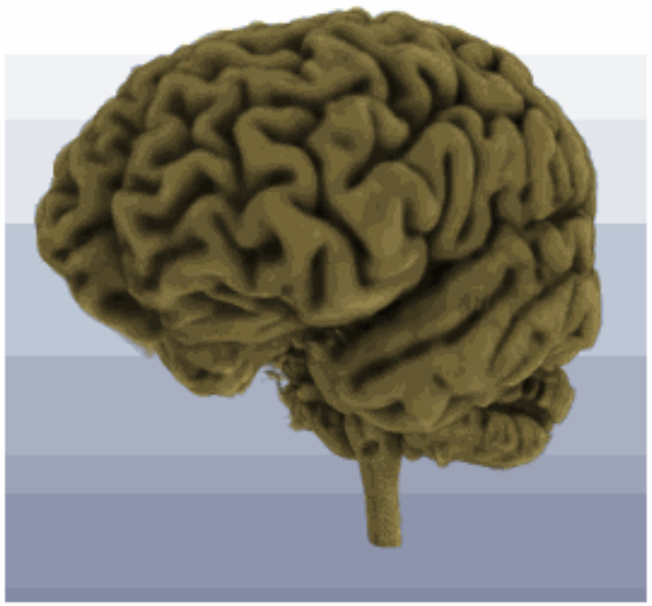
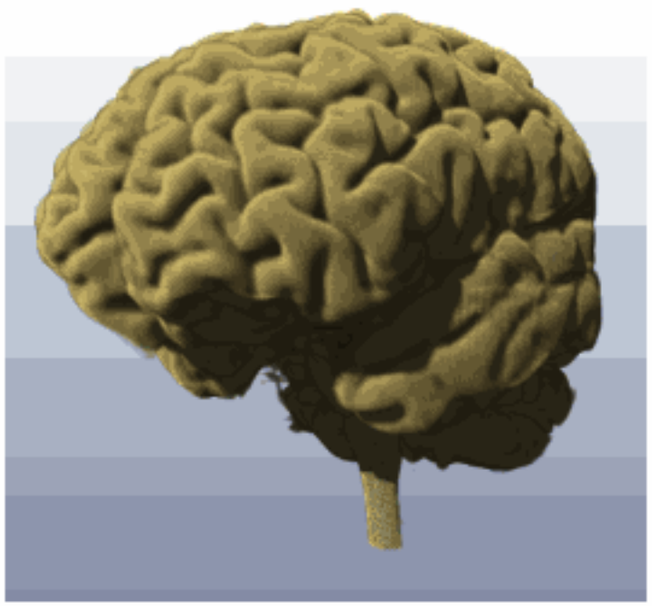


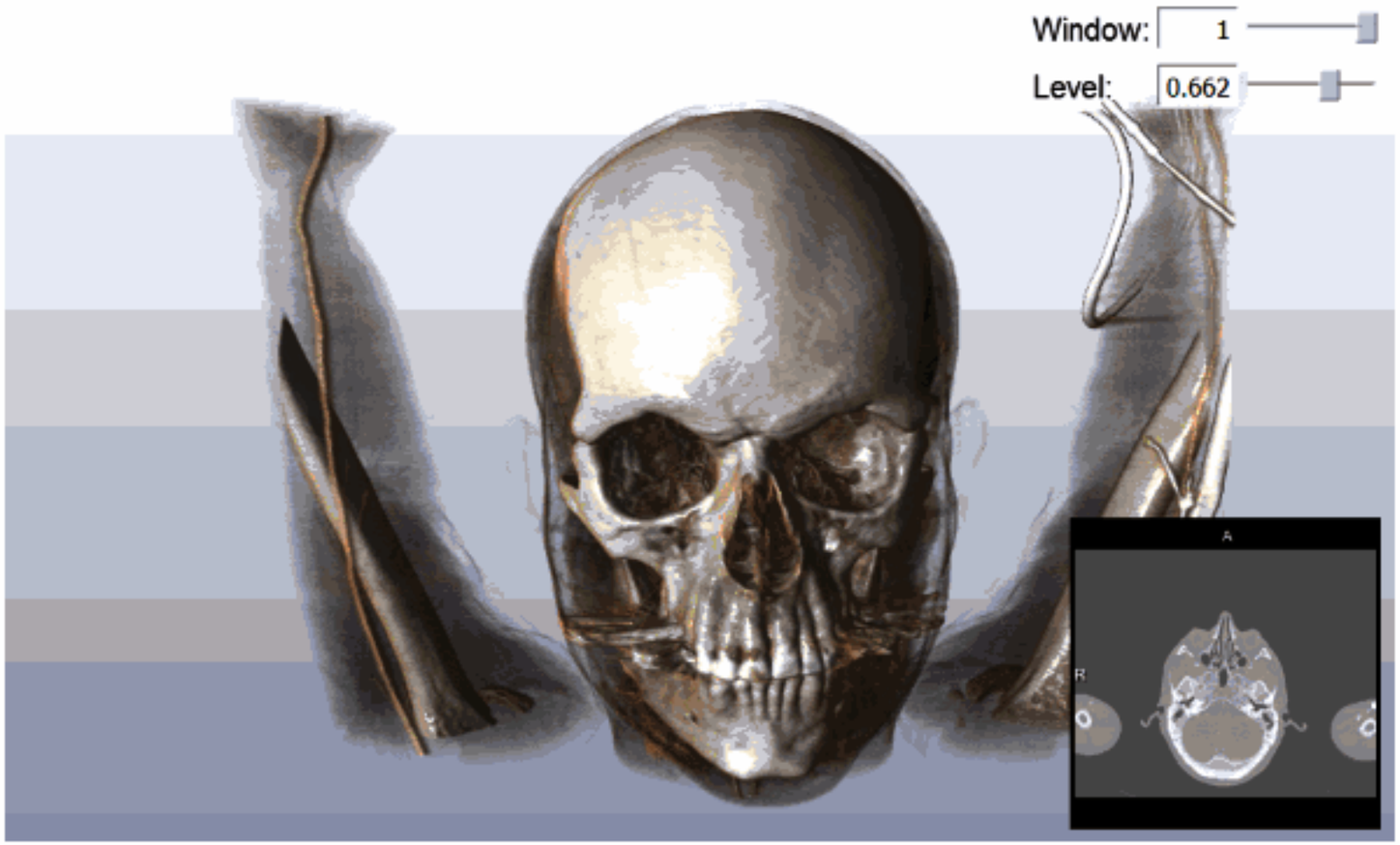
Figure 1.8. GVR rendering with deep shadow mapping.



1.5. MDL Control GraphicsView

- The QGraphicsView is now available as an MDL control to mix Open GL renderings with MDL controls.
  The GraphicsView features:
  - Supports arbitrary item layout, layering, and animations.
  - Fully scriptable via Python.
  - It offers support for:
    - Inventor render areas,
    - MDL panels,
    - Line, Pixmap, Polygon, Rect, Ellipse items,
    - WebKit WebView, and
    - HotAreas with transitions.
  - Have a look at the macro module GraphicsViewPresentation that is itself implemented using a GraphicsView.

Figure 1.11. Viewer implemented with GraphicsView showing a GVR rendering with an MDL control and a 2D viewer overlayed.



The GraphicsView

New user interface possibilities

Florian Link

MeVis Medical Solutions AG

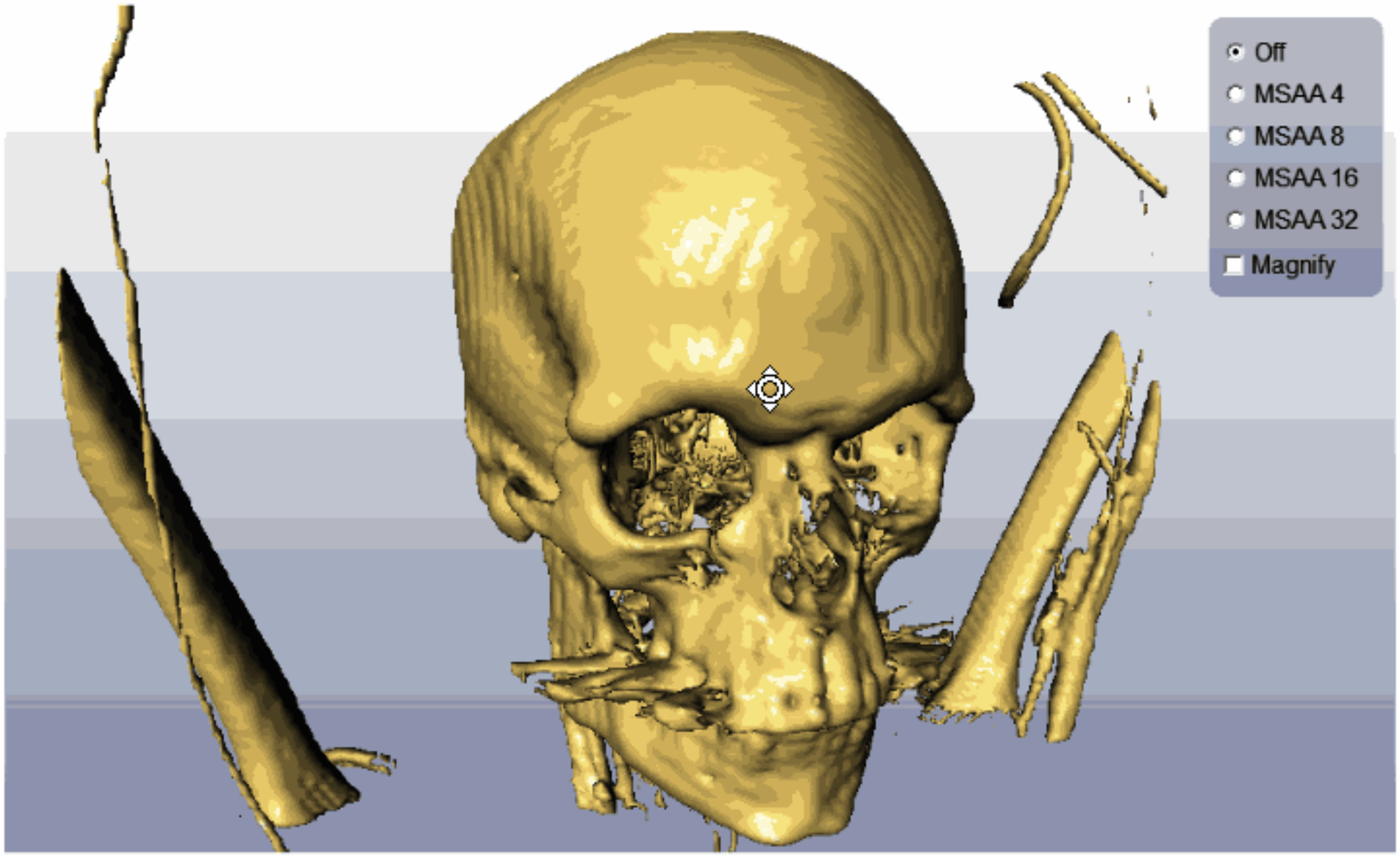
Introduction

- **GraphicsView** is a new MDL control
- It is scriptable via Python
- Items can be:
  - layouted arbitrarily
  - overlayed with transparent background and alpha
  - animated

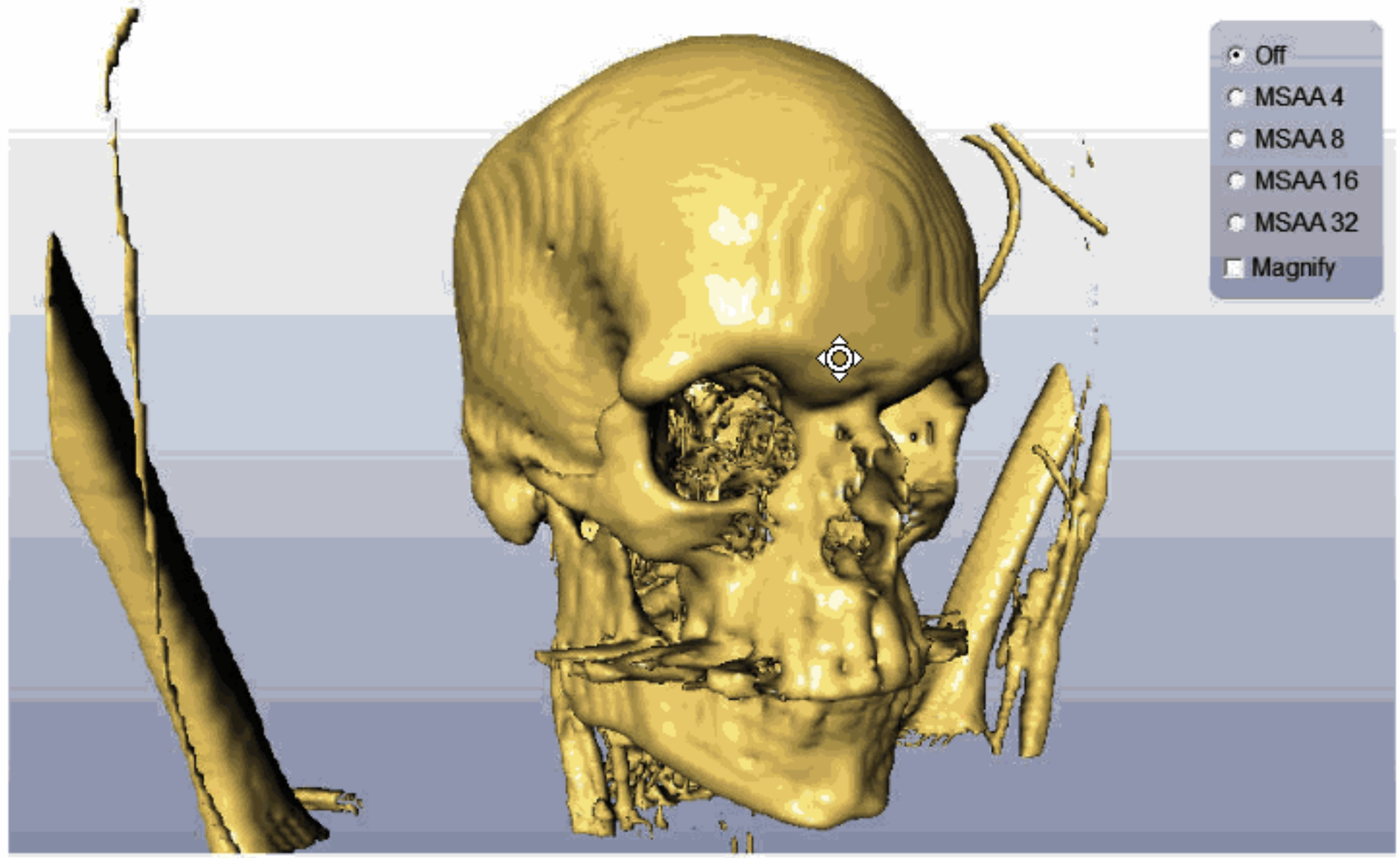
Available Items

- Offered items:
  - Graphics items (Lines, Pixmaps, RichText, ...)
  - Inventor Render Areas
  - MDL Panels
  - WebKit HTML
  - Vertical, Horizontal, Grid and Anchor layouts
  - HotArea layout with HotAreas
  - Frame with gradient or box image
  - MouseArea for interaction

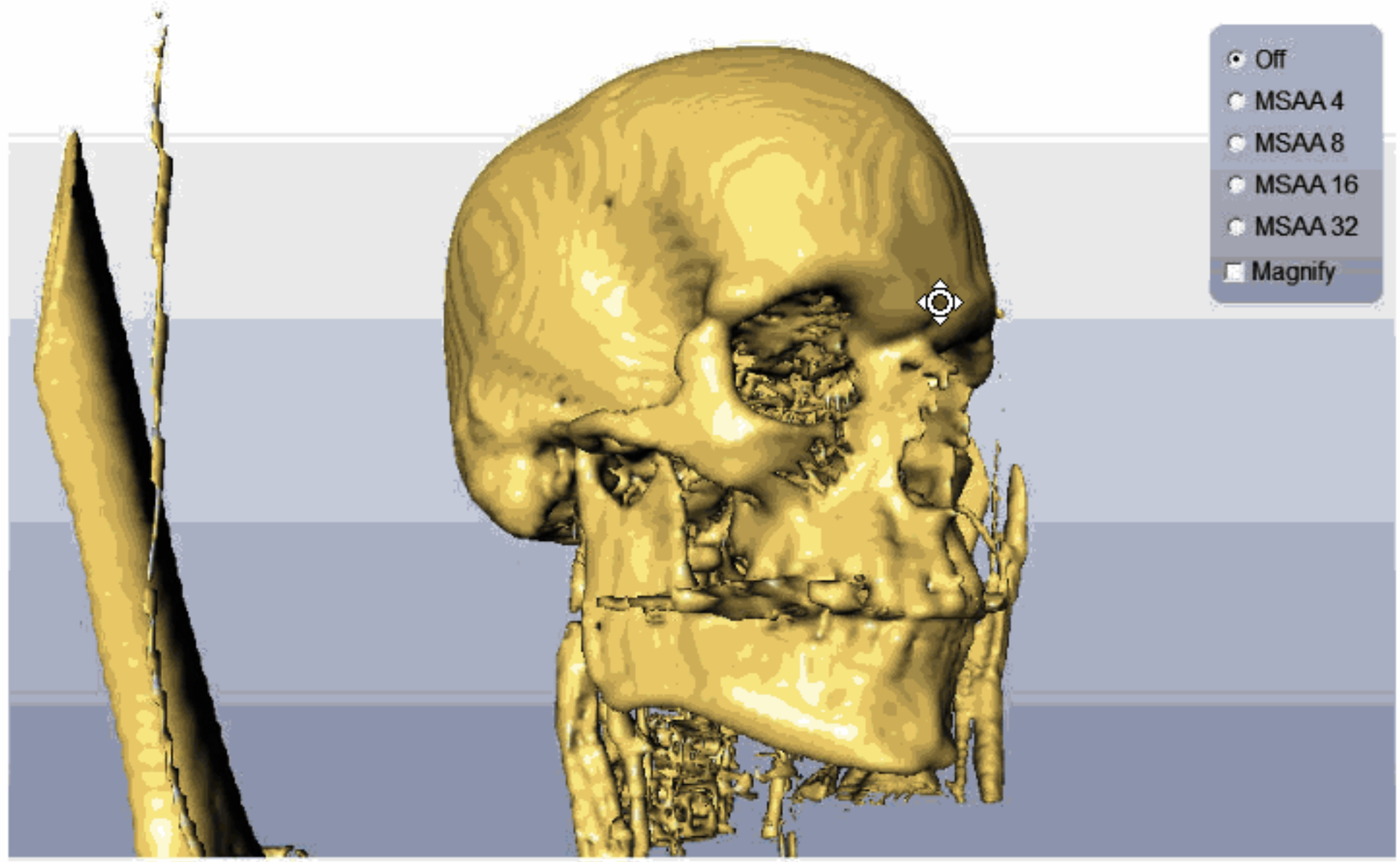
MSAA Example



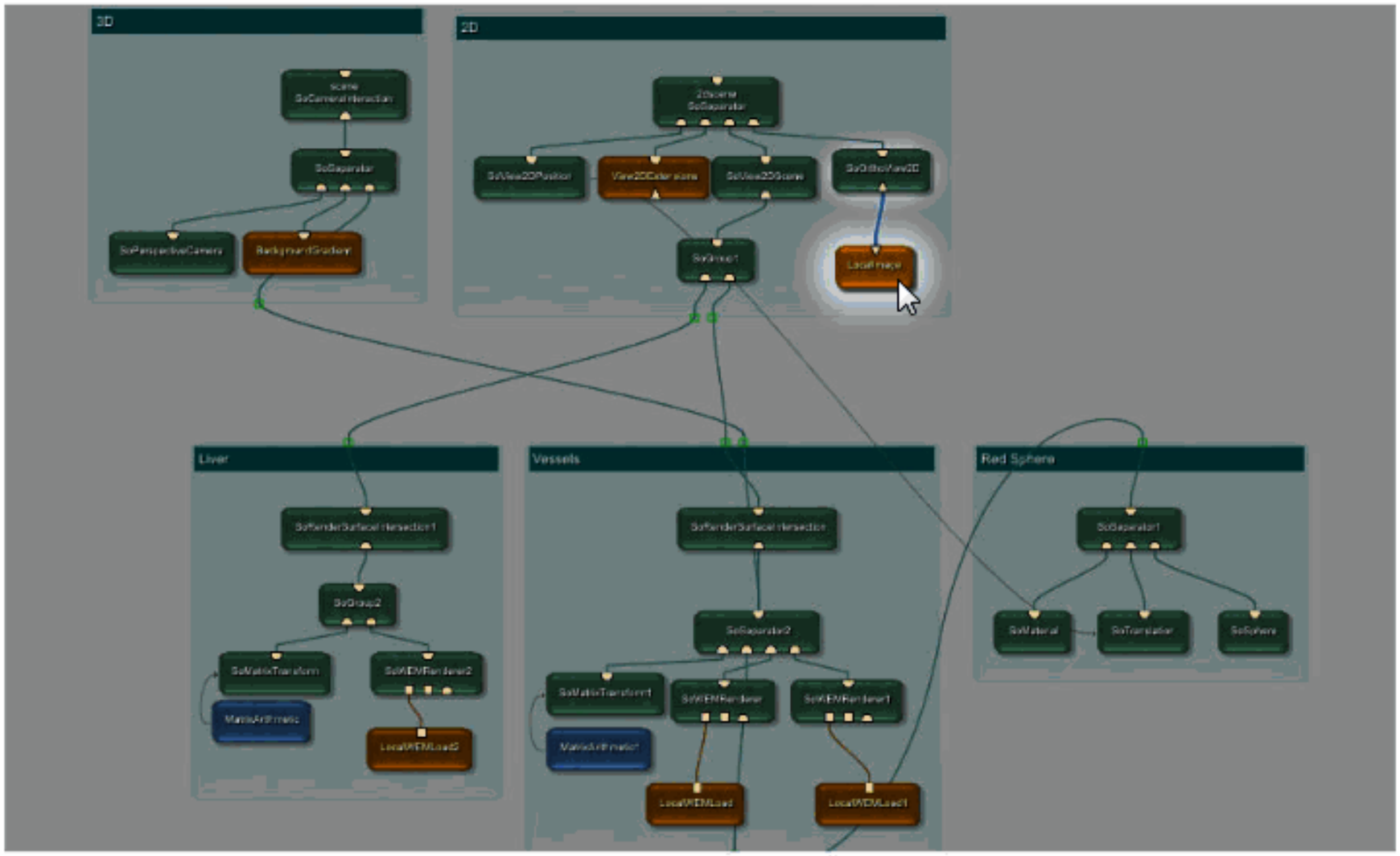
MSAA Example



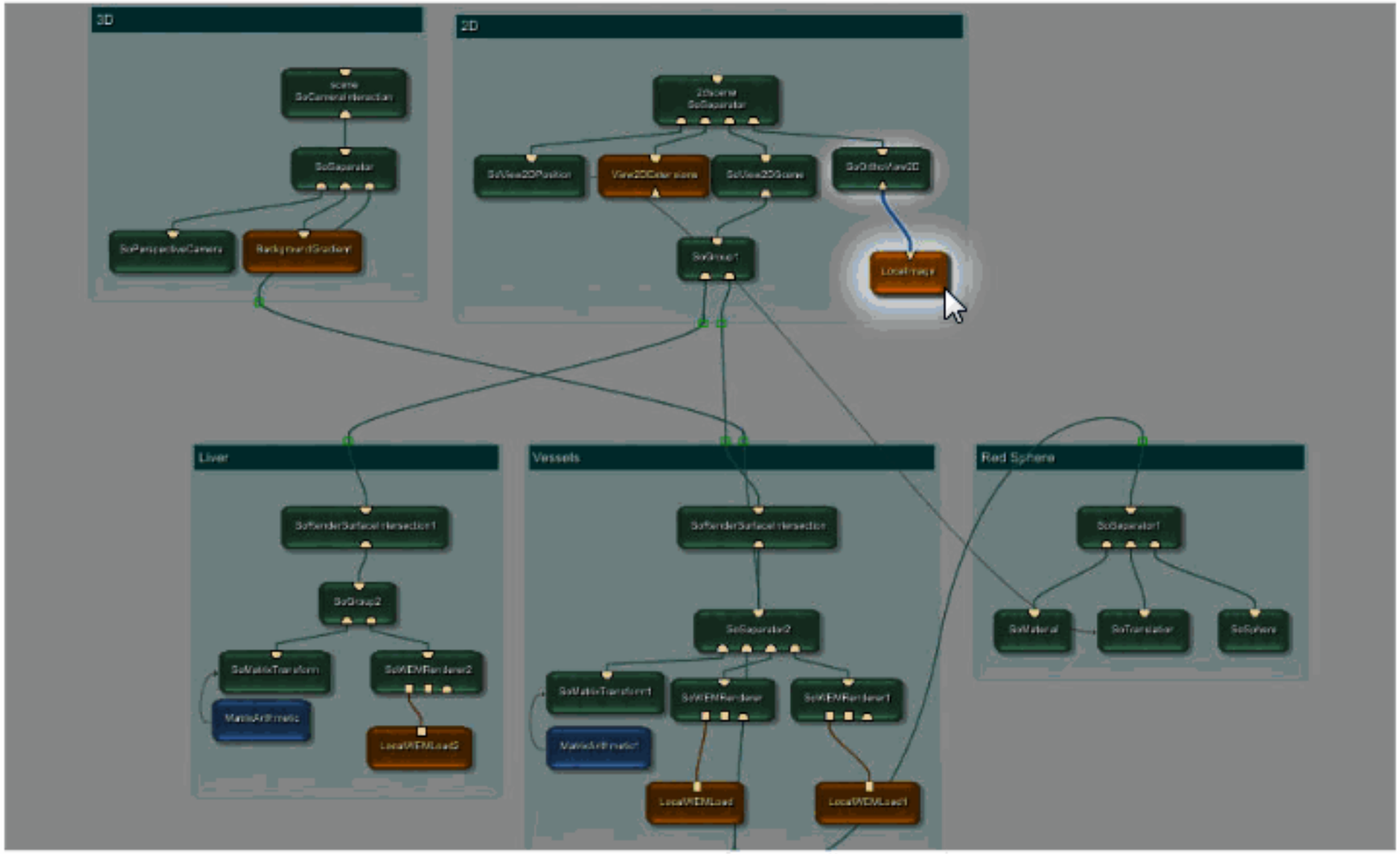
MSAA Example



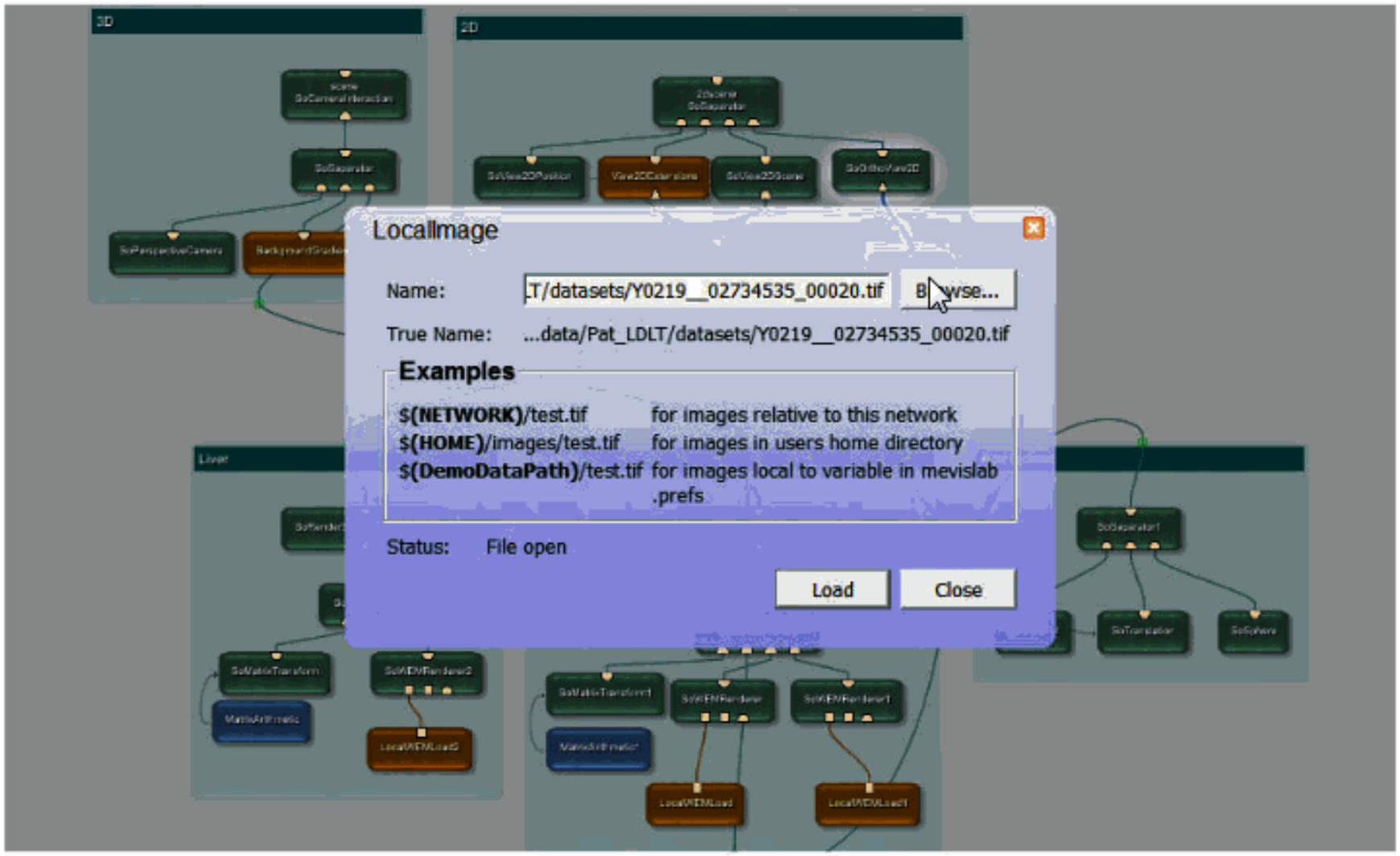
Surface Intersection



Surface Intersection

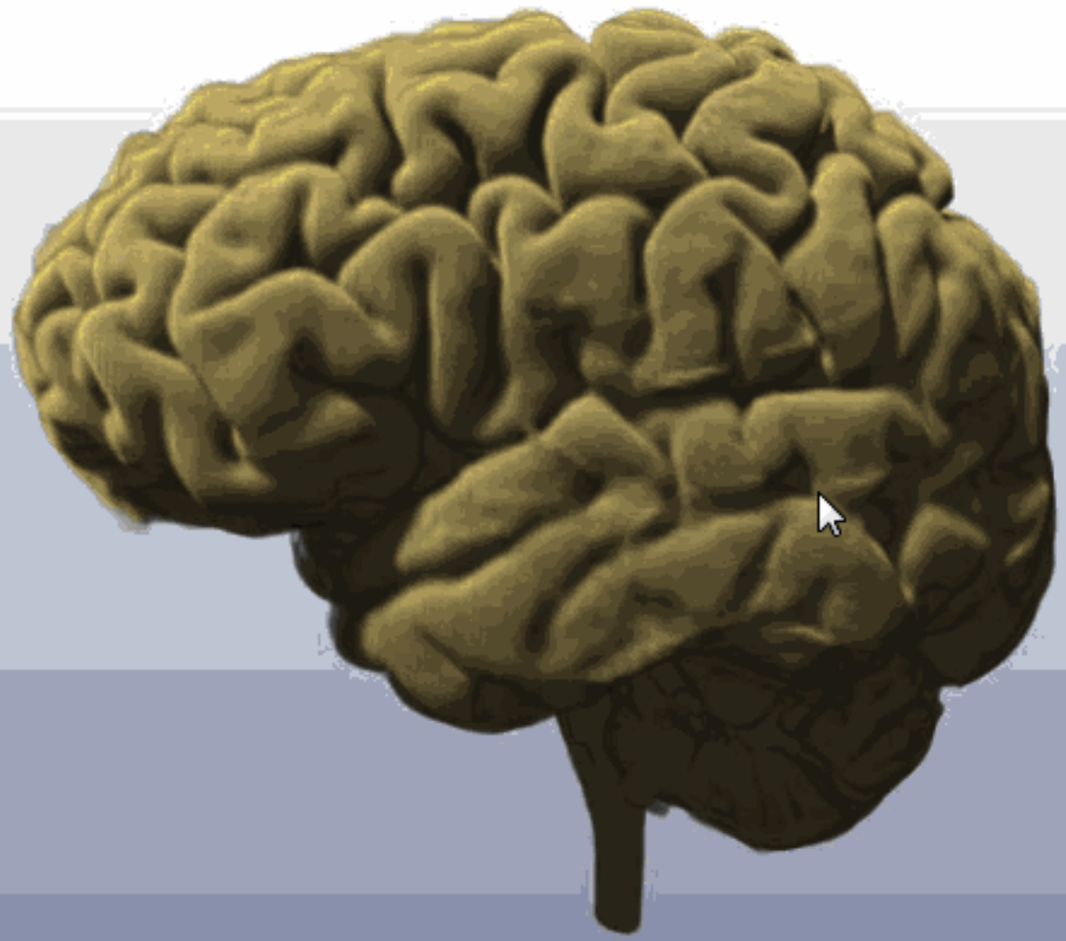


Surface Intersection

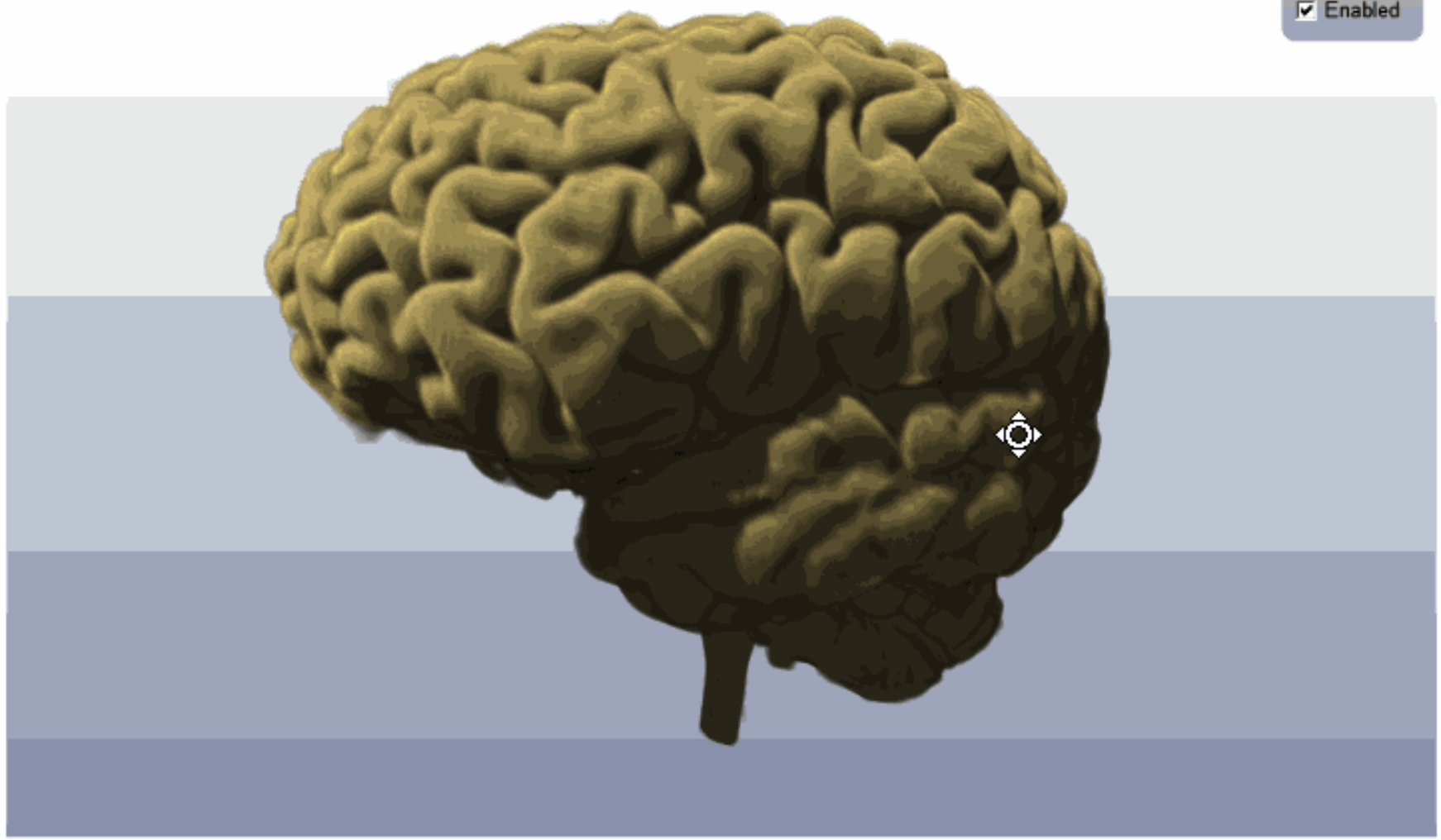


Deep Shadow Mapping

Enabled

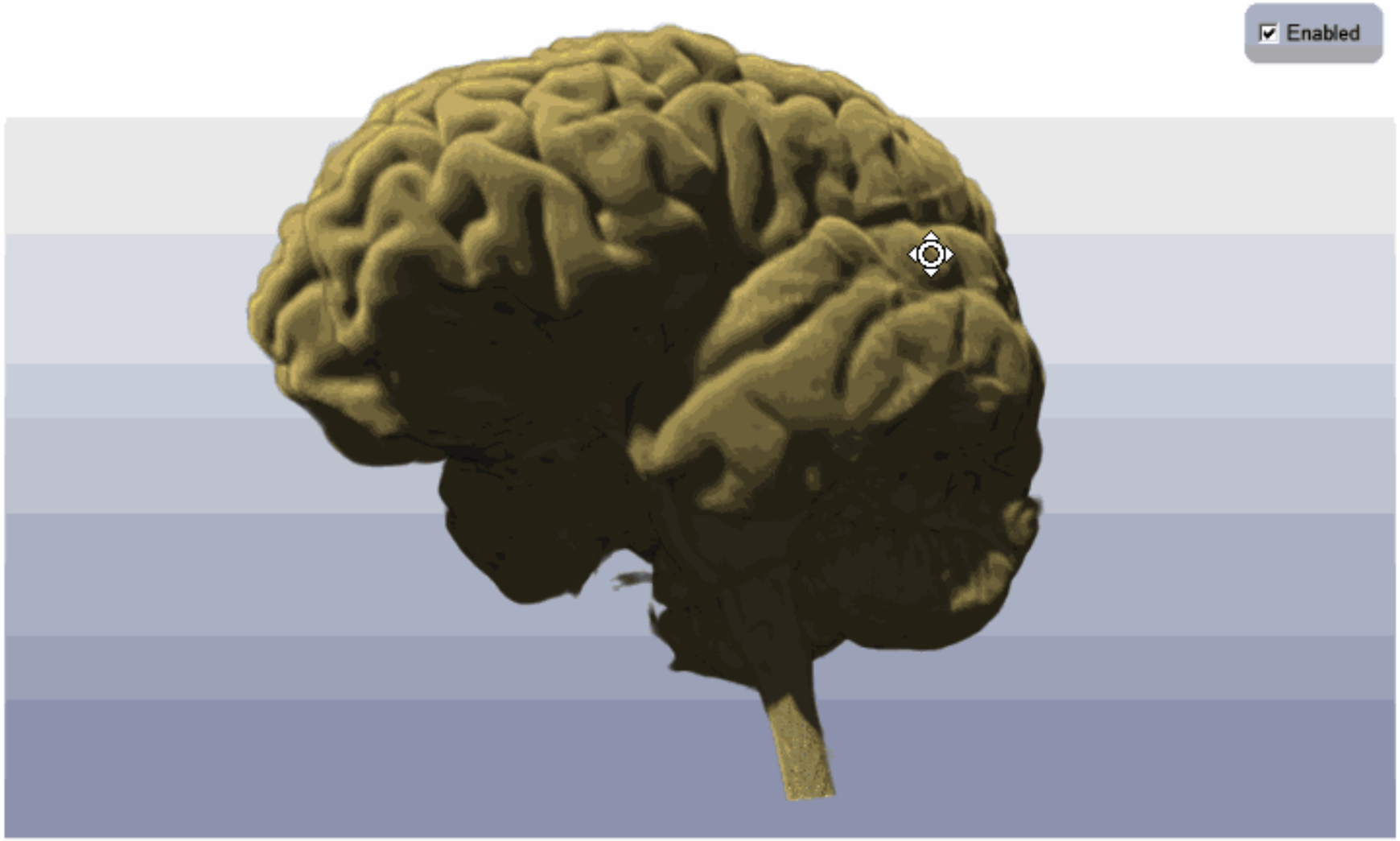


Deep Shadow Mapping



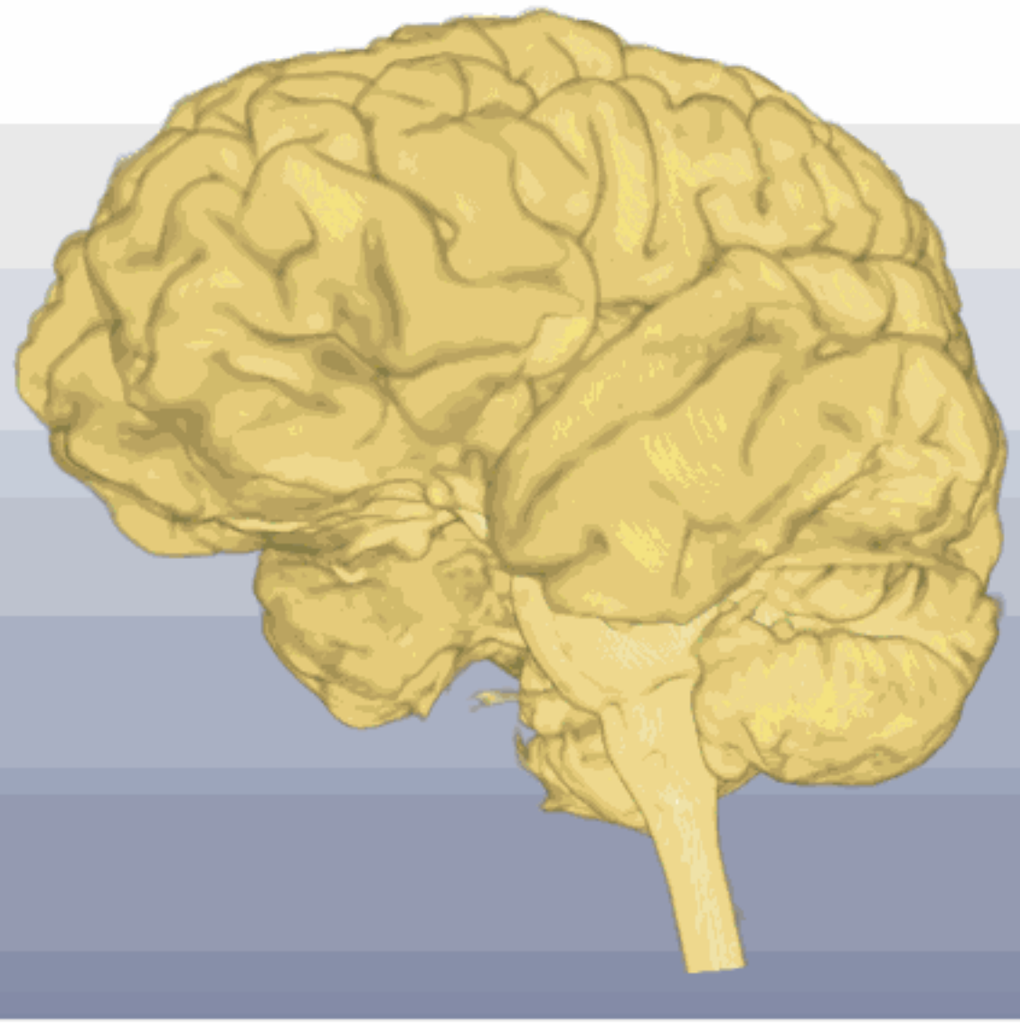
Deep Shadow Mapping

Enabled

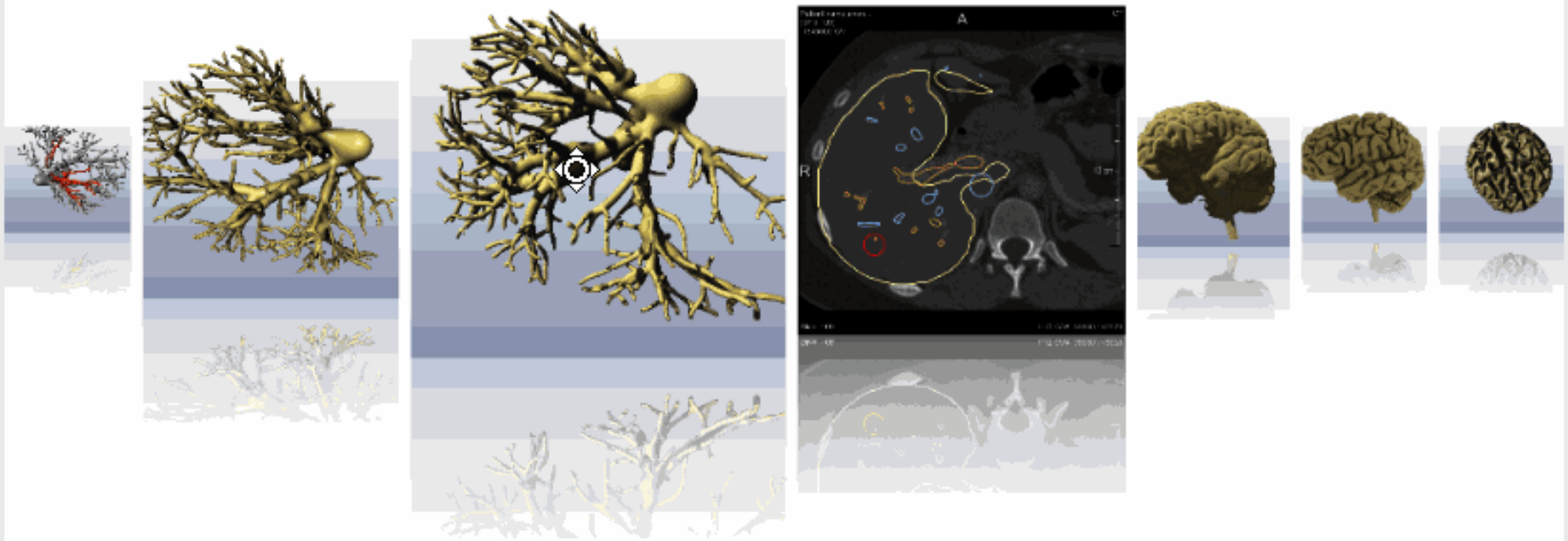


Deep Shadow Mapping

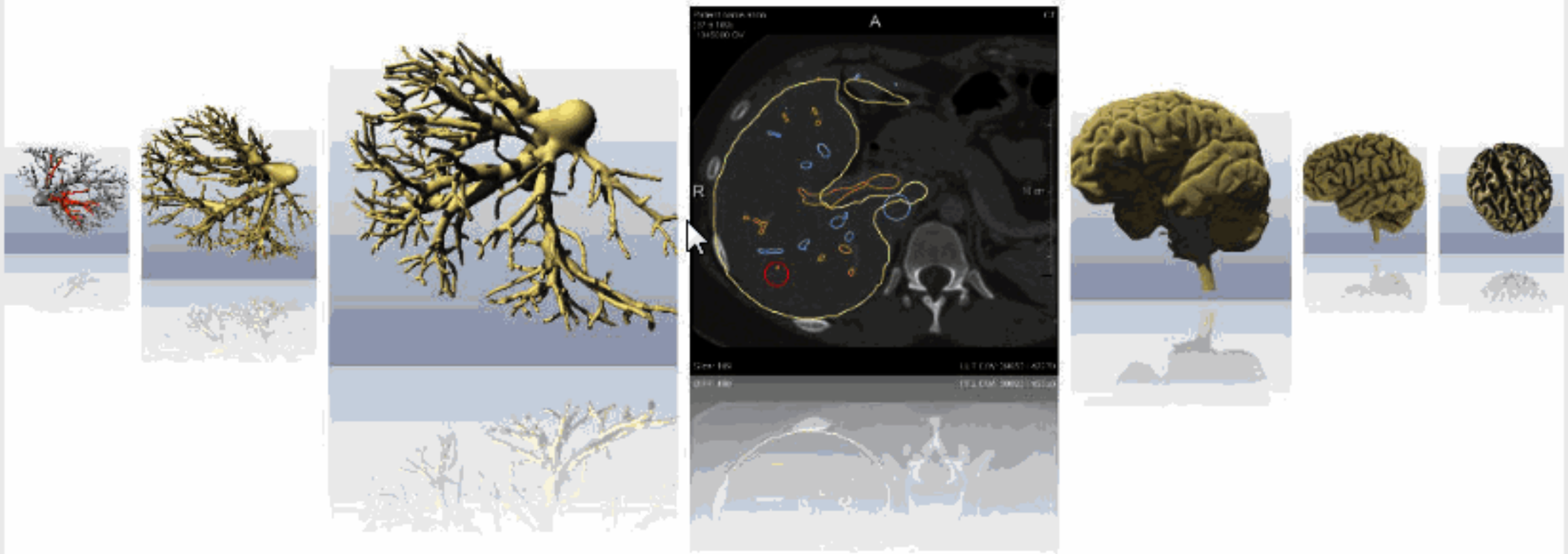
Enabled



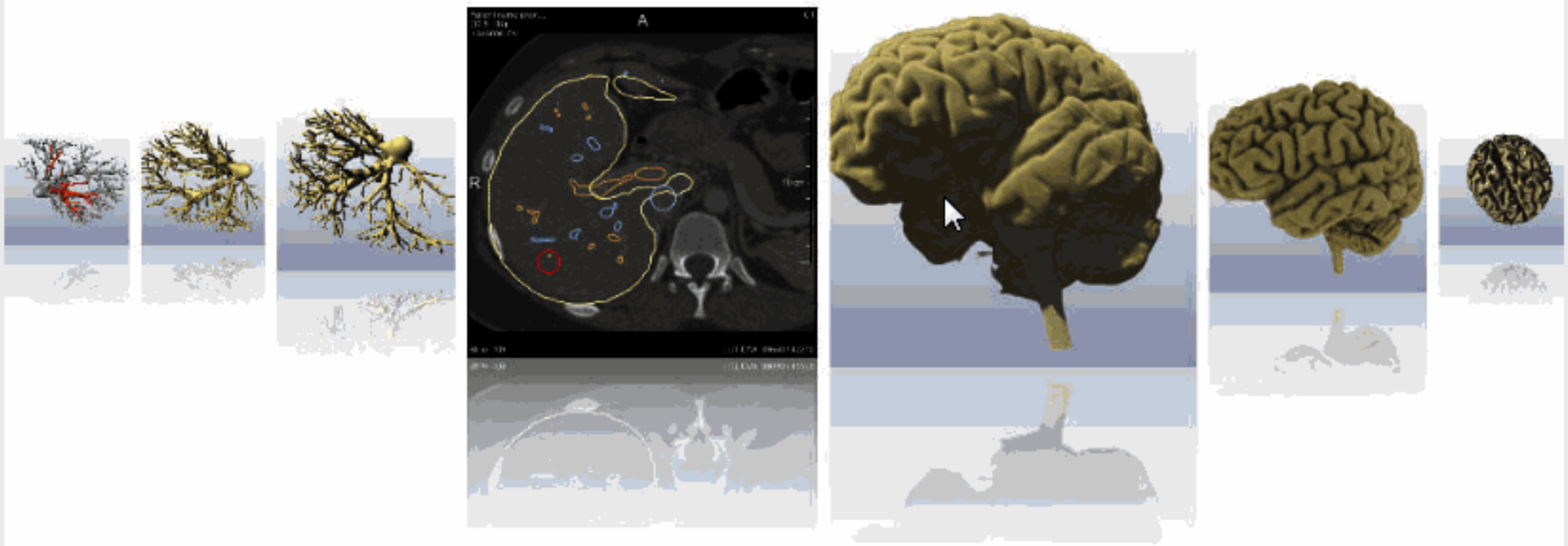
Thanks!



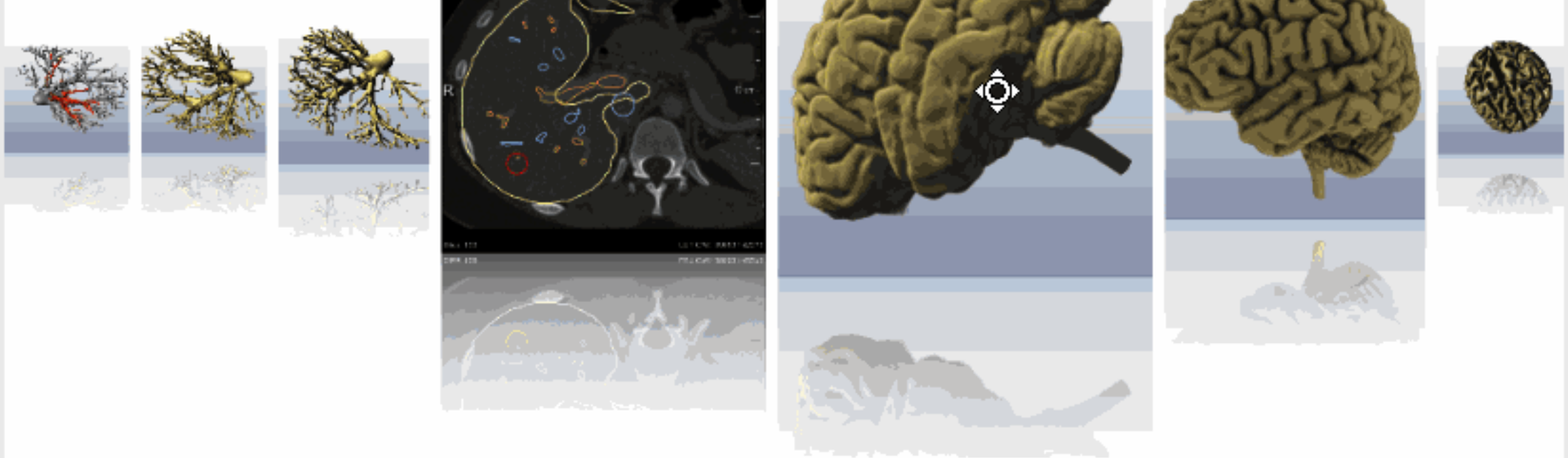
Thanks!



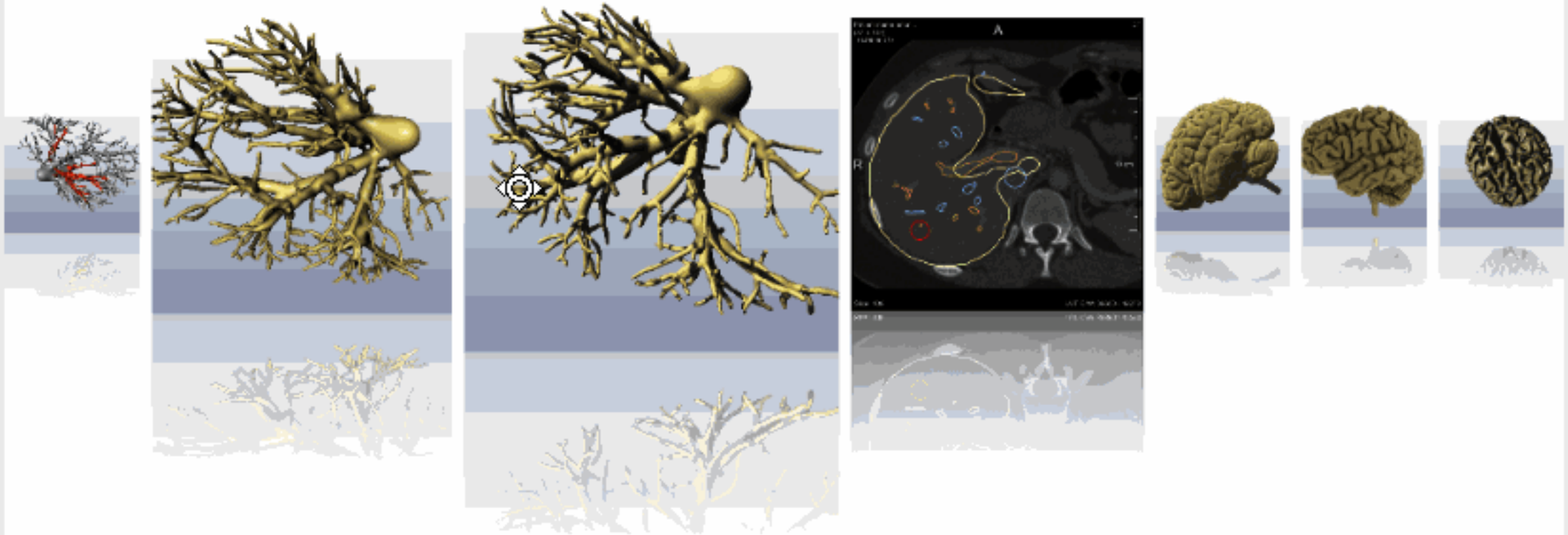
Thanks!



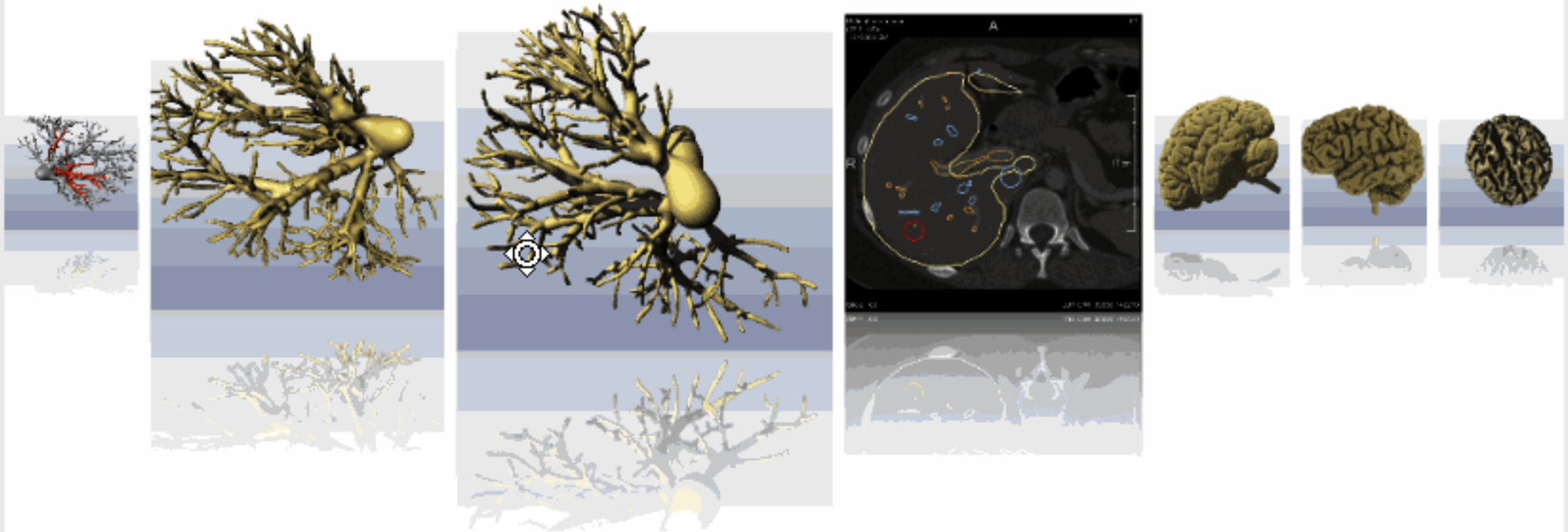
Thanks!



Thanks!



Thanks!



1.7. Contributions by Fraunhofer MEVIS

- Added the registration module MERIT.
  The MERIT (MeVis Image Registration Toolkit) module is a software framework for image registration. It is particularly aimed at the rapid prototyping of registration methods often required in everyday work with MeVisLab. Among its core features are:
  - 2-D/3-D affine-linear image transformations (translation, rigid, similarity, rigid+scale, affine) with customizable component orders.
  - Newton-type optimization (and approximation thereof) with line-searching (linear or Armijo's rule).
  - Multi-resolution image pyramids with custom downsampling, stop levels, and number of levels.
  - Inherent pre-registration initialization schemes (e.g., initial matching of centers of gravity).
  - Five common image similarity measures (SSD, NCC, NMI, LCC, NGF).
  - Nearest neighbor, cubic, Lanczos, and linear image interpolation methods.
  - Multi-threading support using OpenMP processor threads.
  - Robust convergence criteria, e.g. Gill-Murray-Wright, for a unified convergence behavior of all algorithms.
  - Entirely graphical usage through a consistent user interface.
  - Error curve output, mask image support, plugin methods, and much more.
- The python-based 2D plotting library Matplotlib (http://matplotlib.sourceforge.net/) has been integrated into MeVisLab.
  - Qt4 backend has been ported to PythonQt/MeVisLab.
  - MatplotlibCanvas MDL control allows to embedd plots in MeVisLab UIs.
  - See MatplotlibMDLExample for an example usage.

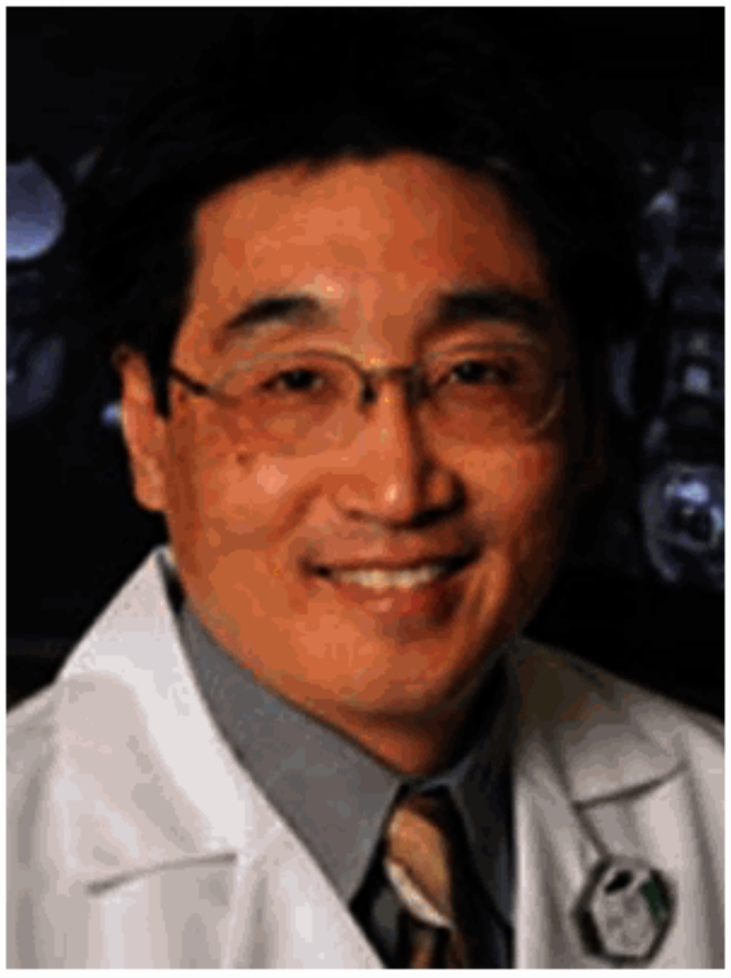
Figure 1.12. Example graph plotted with matplotlib.

Example graph plotted with matplotlib.

2012 Medical Imaging

Paul J. Chang, M.D.,

MI12 Plenary Lecture Summary



"Current medical software platforms are incomplete and inefficient."

San Diego, Feb 2012

Fraunhofer MEVIS

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Fraunhofer MEVIS

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This website is under construction. For the development of this website and the framework behind it we use github. Here the full source code and current issues can be found.
If you have any suggestions, criticisms or bugs to report, please create a new issue on github. Alternatively you can contact us directly.

Welcome to the web framework of the Consortium of Open Medical Image Computing. On this website you can

Create a project

A project is a website like the ones listed here. To create a project, sign in and use the Create new project link in the gray box to the left. Once there, choose a url and a skin, create pages, and set permissions. For detailed instructions on how to create a new project, check out the support section.

Sign in or register
to create a new project page

Already signed in?
Create new project

Example projects:

Share data

You can connect to your dropbox account and render HTML and images directly on project pages. You can upload data via this website or FTP, or link to an XNAT database. You can specify which persons or groups can download the data.

Visualize

Use web rendering to interactively scroll through uploaded scans, add masks and annotations. See an example here.

Receive data

Perspectives

- Quantification and Characterization of Change Over Time
- Automated Analysis of Digital Pathology
- Interactive Multimodal CAD
- Combined Phenotyping and Decision Support
- Optimized Contrast-Agent Less MRI Protocols

- Knowledge Prototyping (today: tool development)
- Cloud Based Applications, iPad etc.