making functional MRI easy

NordicNeuroLab

Complete Products and Solutions for fMRI

www.nordicneurolab.com

NordicNeuroLab

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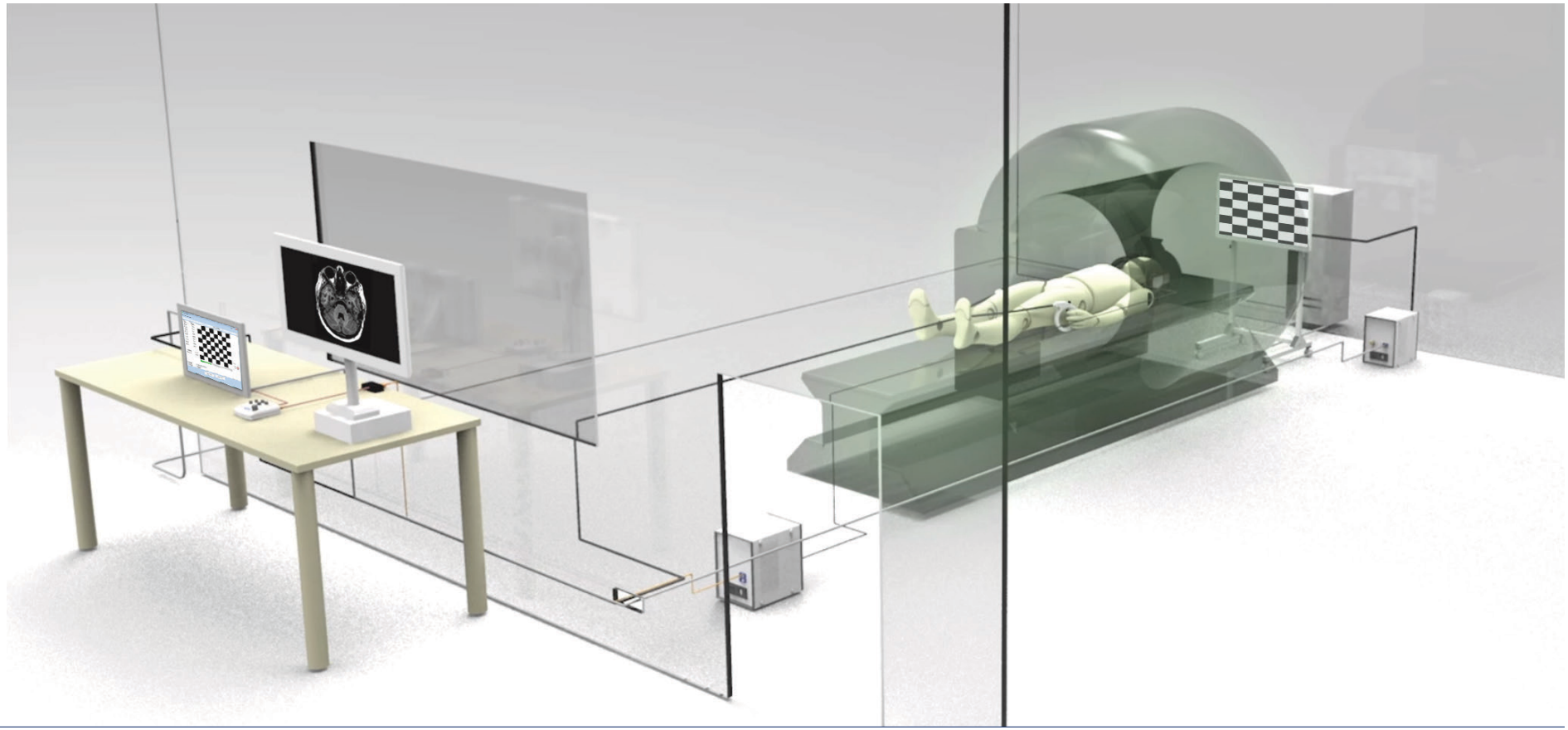
System Overview

Integrated solutions for fMRI

NordicNeuroLab is a leading global provider of products and integrated solutions for functional MRI, used for evaluation of diseases and injuries related to brain function. Our product range spans from state-of-the-art post-processing and visualization software for BOLD fMRI, Diffusion/DTI and Perfusion DSC/DCE analysis, to fMRI hardware for audio and visual stimulation, eye-tracking and patient response collection.

Our goal is to bring the most advanced neuroimaging tools to market, and at the same time make them easy to implement and use. We have therefore created complete fMRI solutions that include everything required to conduct an fMRI scan. In addition to complete packages, we also offer modular solutions both for clinical and research purposes.



nordic fMRI Solution

nordic fMRI Solution has been designed as a complete package including everything needed for fMRI and post-processing. It has been created to fit within the workflow of the hospital's daily routine, and has been tailored to integrate software and hardware components simply and effectively.

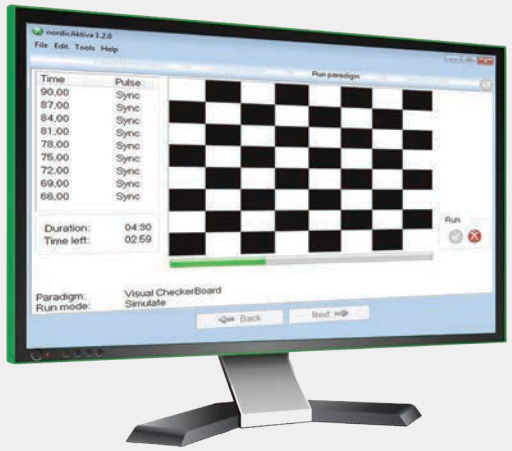
The solution's main characteristics are:

- quick set-up and adjustment to individual patients
- minimal footprint and easy storage of equipment in MRI room
- minimal user interaction due to optimized workflow and automated data analysis
- standardized stimulus paradigms

As part of the nordic fMRI Solution we offer professional installation, application training and support provided by our highly educated and experienced specialists.

Turnkey solution for fMRI

Integrated hardware and software solution for clinical fMRI



Paradigm and workflow software

- Intuitive interface and instructions guide the user through the process of presenting stimuli to the patient
- Included library of ready-to-use standard clinical paradigms allows the physician to test perceptual, motor and language functions
- A single technician can handle stimulus generation and image acquisition at the same time

Stimulus delivery hardware

- Fully integrated hardware for audio-visual stimulus presentation and response collection
- Flexible VisualSystem HD or InroomViewing-Device for visual stimulus presentation
- Ergonomically designed response device
- Compatible with MR scanners and head coils from all major vendors
- Suitable for field strengths up to 3T
- All signal transfers to and from the scanner room via fibre cables

Analysis and report software

- Intuitive interface guides the user through the process of loading and analyzing BOLD fMRI, DTI, Perfusion DSC/DCE analysis and structural data sets
- 2D/3D visualization of white matter tracts together with BOLD fMRI activations on various underlays
- Analyzed data can be exported to neuro-navigation systems or PACS
- Works with image data acquired on scanners from all major vendors
- Runs on standard PC or laptop

fMRI Hardware

Our hardware portfolio consists of equipment designed for functional magnetic resonance imaging.

We offer a complete hardware package for clinical fMRI and a modular solution for research purposes. Our hardware is compatible with MRI scanners from all major vendors and uses standardized interface adapters for audio and visual input.

Our fMRI hardware system is designed, developed and manufactured under certified ISO 13485 Quality Management system. Our products intended for clinical use meet regulatory and safety requirements and have respective market clearances.

Our highly competent and experienced specialists can provide guidance, helping customers to choose professional solutions tailor-made to their needs.

InroomViewingDevice

For fMRI, patient comfort and instant feedback

Specifications

Screen diagonal	40”
Pixels	3840 x 2160
Contrast	5000:1
Refresh ratio	60Hz @FHD 30Hz@UHD
Camera	1920x1080, 30fps, 1280x720@30fps
Video input	HDMI
Mounting interface	VESA (2 x 100 x 100, D: 400mm, M4)

Multipurpose Usage

The 40” 4K UHD InroomViewingDevice was designed to provide an optimal MR compatible monitor that satisfies the needs of both clinical and advanced scientific applications.

Integrated Camera

With its slim design, high definition display and superior image quality, the InroomViewingDevice is an optimal choice for an easy to use alternative to conventional projectors or goggle based image delivery systems. The innovative, front-facing camera provides an uninterrupted patient surveillance during examination. Thanks to the built-in USB hub, connecting patient communication and interface device is now extremely easy.

Flexible Positioning

The low weight and height adjustable mobile foot stand allows easy positioning of the monitor anywhere in the MRI room. The monitor can also be ceiling mounted (through 3rd party).

Instant Feedback

The monitor facilitates the examination process by allowing the operating personnel to remain inside the examination room during procedures, thus allowing uninterrupted patient care and quick response time, which significantly improves clinical workflow.

VisualSystem HD*

High-end visual stimulation for fMRI

Sophisticated and Flexible

NordicNeuroLab VisualSystem HD is a sophisticated and flexible solution for presenting visual stimuli inside the MRI scanner. By rendering sharp images and brilliant colors, high quality graphics or text is easily presented to the patient.

Unique Design

The VisualSystem HD has a unique design which fits most head coils and is easy to mount with coil specific adapters. The adjustable arm allows fast positioning in the preferred angle of view. The built-in diopter correction and fine tuning of pupil distance are easy to regulate and customize to each patient, either adult or child. Because the VisualSystem HD is placed close to the eyes, there are no external distractions during stimuli presentation and individuals are also less likely to experience discomfort related to the confined space of the MRI scanner.

New Features

Our new VisualSystem HD offers some of the most advanced features available today:

- Full HD resolution displays (1920 x 1200)
- Integrated binocular eye-tracking
- Support for 3D / Stereoscopic
- Built-in diopter- and pupil distance adjustment

* Market cleared in EU and US.

AudioSystem

Audio solution for fMRI

State-of-the-art Properties

The headphones give a superb sound, replicating even minute details with incredible precision, thanks to the state-of-the-art electrostatic transducers. The device significantly reduces scanner noise, allowing undisturbed patient communication during stimuli presentation.

Designed for fMRI - Suited for Clinical Use

Designed specifically for fMRI, the superior sound quality and increased noise attenuation provide a more precise audio stimulation to the patient, which yields a more robust BOLD response than traditional pneumatic audio systems. Designed with reliability and durability in mind, the headphones are incredibly robust and suited for daily use in a busy clinical environment.

Communication Console

Through easy and accessible controls, the Communication Console offers one-way patient communication and full flexibility of audio settings. Thanks to its two input channels, it allows to connect a wide variety of audio devices through 3,5 mm mini jack.

* Market cleared in the US. Pending market clearance in the EU.

ResponseGrip

A unique patient response device

Developed for Clinical and Research Use

The ResponseGrip is an MRI compatible subject response device developed for both clinical and research users. Ergonomically designed for use in either hand and for minimizing patient movement inside the scanner, it is suitable for a wide range of experimental paradigms.

Compatible

The ResponseGrip is compatible with all leading stimulus presentation software packages, and interfaces with a number of third-party hardware devices.

Interface Unit

The ResponseGrip is 100% fibre optic, and connects to the ResponseGrip Interface Unit in the operator room through an available wave-guide. The Interface Unit provides real-time feedback of subject responses via LED indicators and optional sound signaling.

SyncBox

Simple solution for accurate control over stimulus presentation

Accuracy of Timing

One of the challenges in fMRI is synchronizing stimulus presentation with MR image acquisition. The accuracy and verification of timing information is critical to the validity of results. With a flexible and user-friendly menu system, the SyncBox allows the user to select how the trigger pulse from the scanner is transferred to the software presenting the stimuli. Compatible with the leading software packages, the SyncBox provides a simple solution for accurate control over stimulus presentation and easy access to timing information for data analysis.

Cost Efficient Simulation

The SyncBox can simulate the trigger signals produced by the scanner during an MRI sequence. This enables the user to develop and test the entire experimental paradigm in the office, minimizing the need for testing in a costly scanning environment.

Compatible

The SyncBox is MRI scanner independent and interfaces with a variety of external devices, allowing synchronization of signals from different hardware sources and providing accurate logging of time stamps.

fMRI Software

NordicNeuroLab provides solutions for the analysis of advanced neuroimaging for MRI.

This includes:

- stimulus presentation software
- fast and easy to use post-processing software for BOLD fMRI, DTI and Perfusion DSC/DCE analysis
- research-oriented software for post-processing advanced neuroimaging for MRI

Our main focus is to provide clinical users with easy to use tools for optimizing workflow and minimizing processing time. In this way we improve productivity, and offer research users sophisticated and advanced solutions for neuroimaging.

nordicAktiva

Stimulus presentation and workflow software

Easy stimulus generation and image acquisition

Ready-to-use standard clinical paradigm library

By using nordicAktiva a single technician can handle stimulus generation and image acquisition at the same time. It offers a choice of either using pre-defined paradigms, modifying them based on user preferences, or simply building a tailored library. nordicAktiva also supports video files.

User is guided step-by-step through the process of presenting stimuli during image acquisition.

Multi-language
nordicAktiva guides the user providing detailed patient and operator instructions in multiple languages.

nordicBrainEx

Streamlined BOLD fMRI, DTI and Perfusion DSC / DCE analysis

BOLD fMRI

DTI Tractography

Perfusion DSC / DCE analysis

Neuroimaging software for fMRI

Designed for the clinical workflow

Our advanced, yet user-friendly interface contributes to improved productivity. Advanced volume of interest tools, 2D / 3D visualization of BOLD activation areas, DTI tractography and MRI Perfusion maps, combined with advanced interaction tools allow clinicians to perform extensive evaluations of brain tissue surrounding pathological areas.

By introducing a clinical Perfusion and DCE analysis, we have taken nordicBrainEx to the next level.

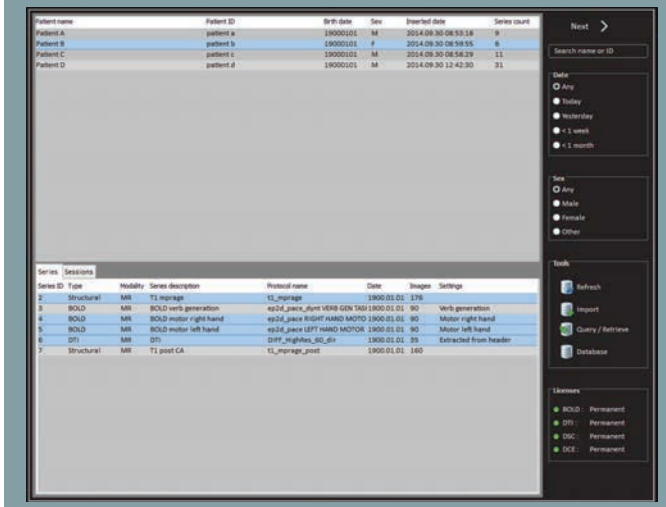
Utilize and combine all methods in one application or select them based on your specific needs.

nordicBrainEx is DICOM compatible and capable of analyzing data from all major MRI vendors. All processed data can be saved in a comprehensive report, sent to PACS or exported to neuronavigation systems.

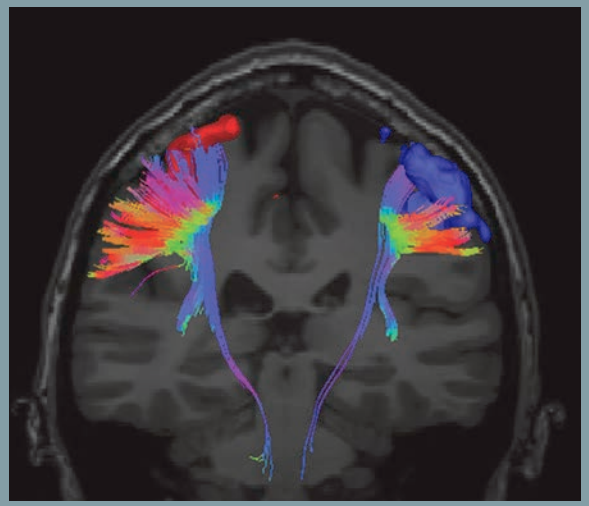
Optimized workflow

More time for your patient

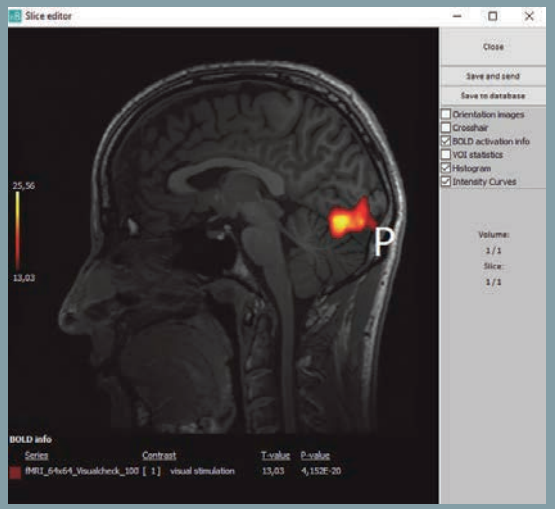
Optimize your workflow in 3 simple steps



Select patient and image series



Visualize and interact



Export to PACS / neuronavigation

DTI / Fibertracking Module

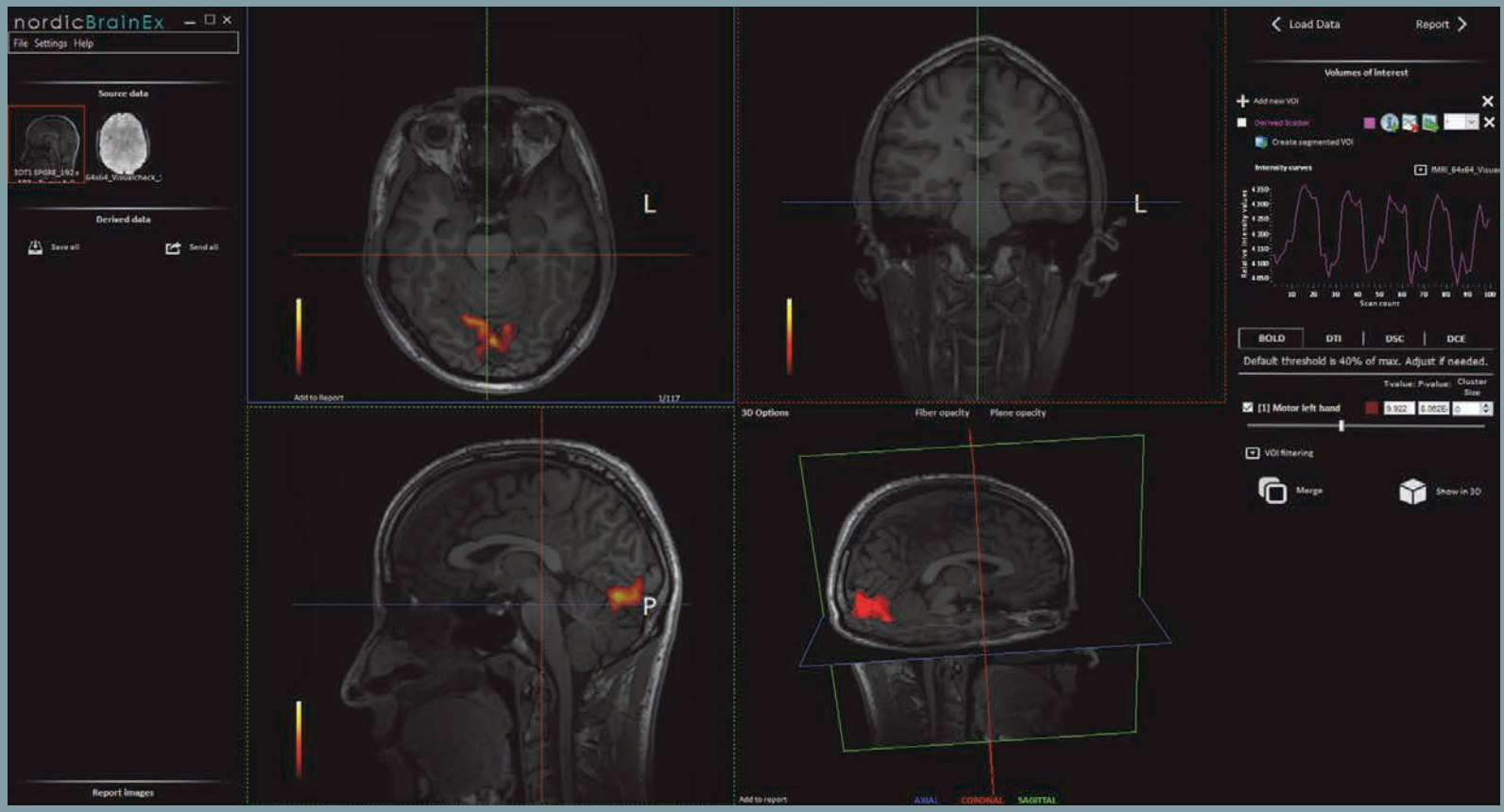
Pre-processing

Motion correction and eddy current corrections are available. Smooth, average and adjust noise levels in order to improve analysis quality.

Isolate fibre groups

Use multiple VOI-tools to isolate fibre groups, explore connectivity and customize color schemes. Fibre groups can be presented in 2D/3D and exported to neuronavigation. Export into DICOM tractography format (DICOM supplement 181) is available.

BOLD fMRI Module



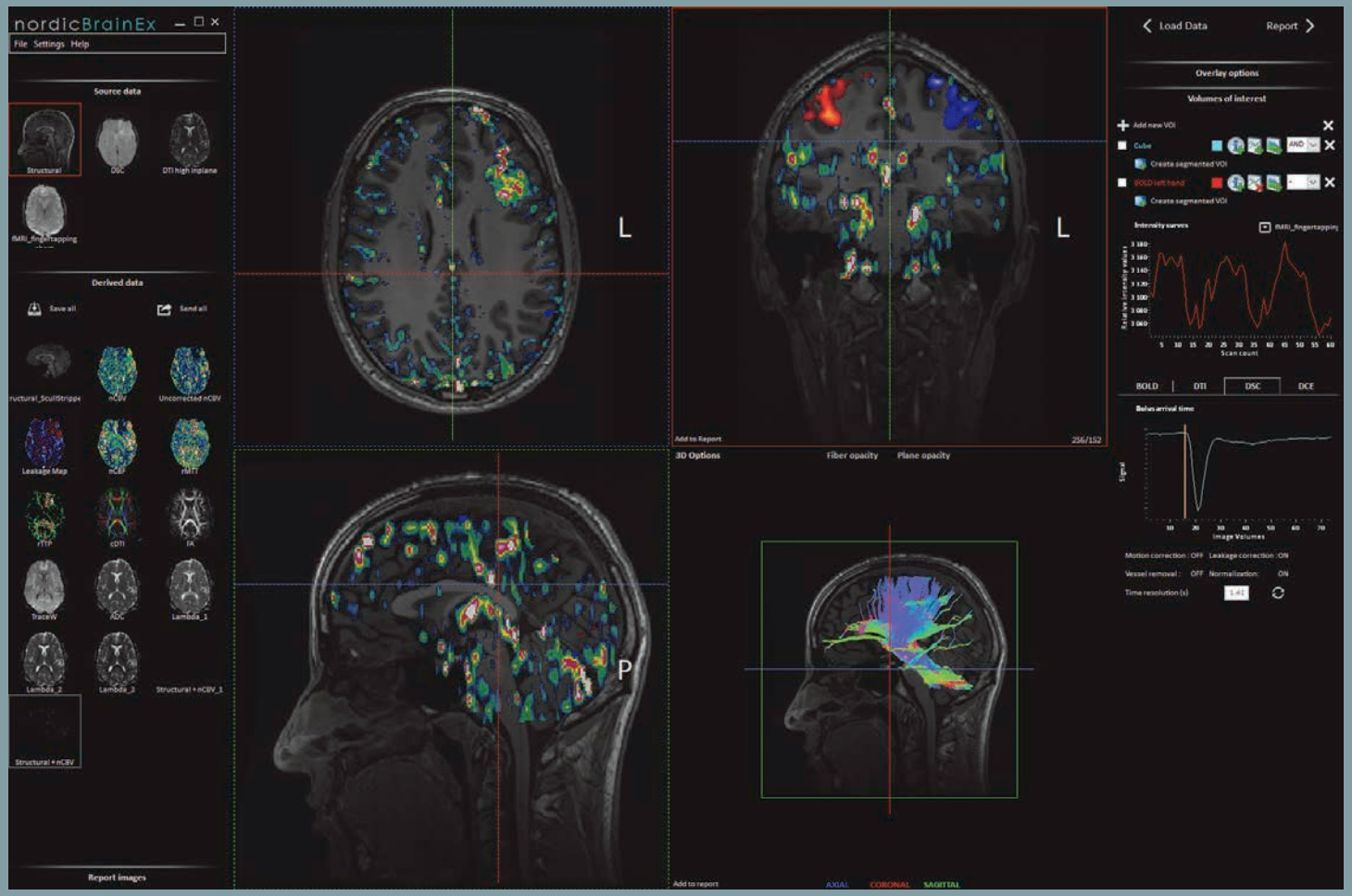
Time-intensity curves

Easily perform a quality check of your BOLD activation maps by displaying time-intensity curves of your dynamic data sets.

BOLD activation tools

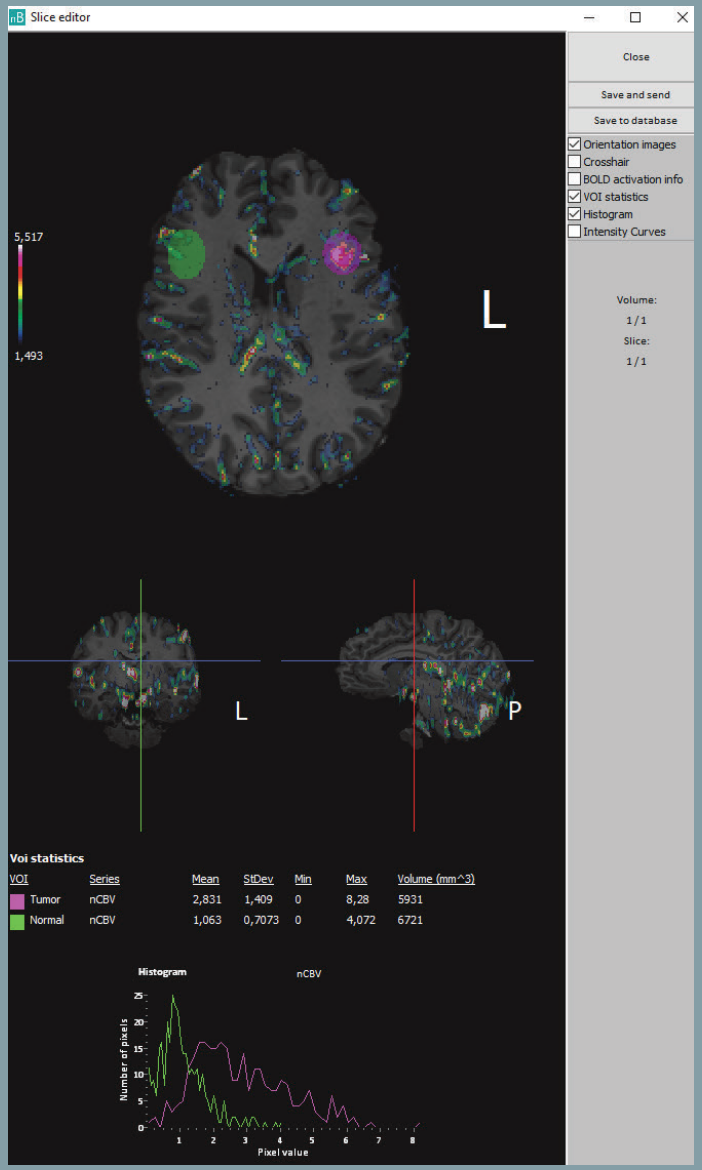
Display a large number of conditions in the same view, both in 2D and 3D. Threshold interactively, based on T-/P-value and/or cluster-size, select individual colors and adjust opacity. Export BOLD activations to neuronavigation.

Perfusion DSC Module



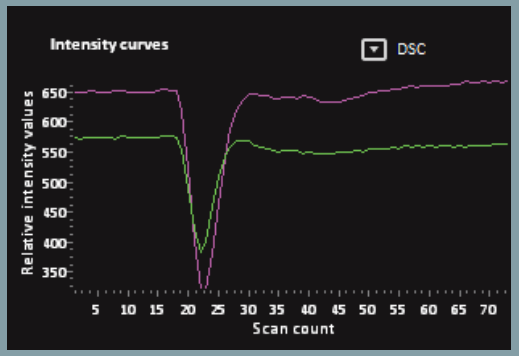
The perfusion (DSC) module includes normalization, leakage correction and vessel removal, providing fast generation of CBV, CBF, MTT, TTP, leakage and vessel mask output maps. Output maps and results including volume-of-interest statistics, tissue response curves and histogram can be saved to PACS, and the CBV map can be thresholded and exported to neuronavigation platforms.

Perfusion DSC Module - VOI

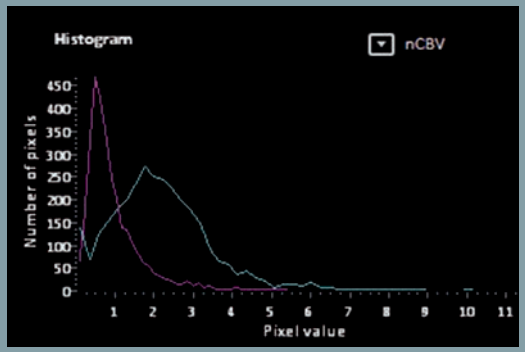


VOI	Series	Mean	StDev	Min	Max	Vol. (mm^3)
VOI 1	ADC	89,15	20,68	33	243	3,408E4
VOI 1	nCBF	1,477	1,23	0,02749	14,93	3,408E4
VOI 1	nCBV	2,43	1,727	0,01725	16,54	3,408E4
VOI 2	ADC	87,92	25,21	61	220	3,408E4
VOI 2	nCBF	1,227	0,9186	0,004811	6,39	3,408E4
VOI 2	nCBV	0,9798	0,7573	0,002874	10,44	3,408E4

VOI statistical information can be displayed in a list. This list can be saved to text file and/or exported to PACS together with the images.

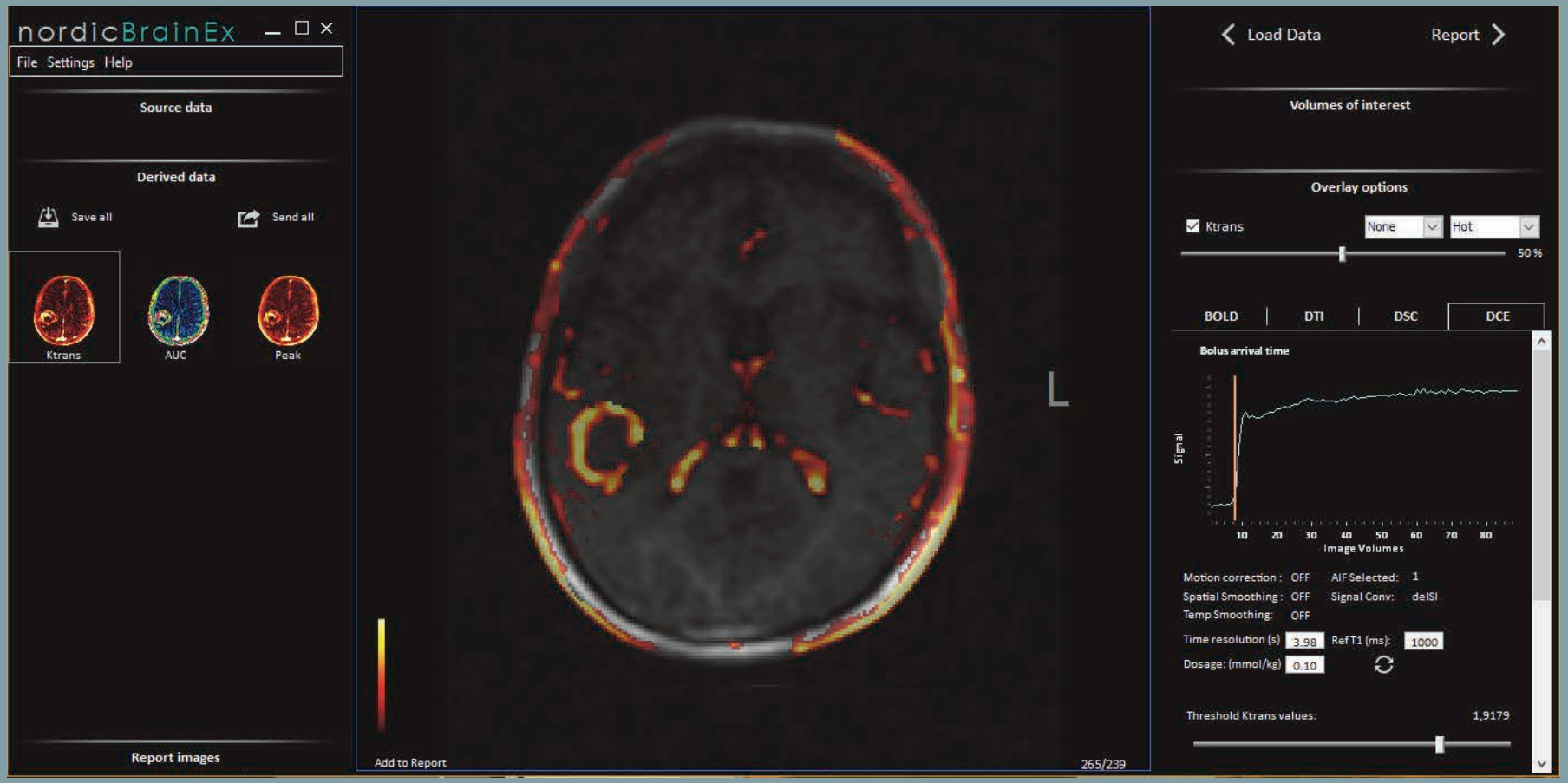


Use the VOI to create time-intensity curves for dynamic data sets. This allows visualization of the dynamic signal in a BOLD, DTI or DSC data set.



The VOI can be used to create histograms of various parametric values. Histograms can then be added to the report or saved as a text file.

Permeability DCE Module

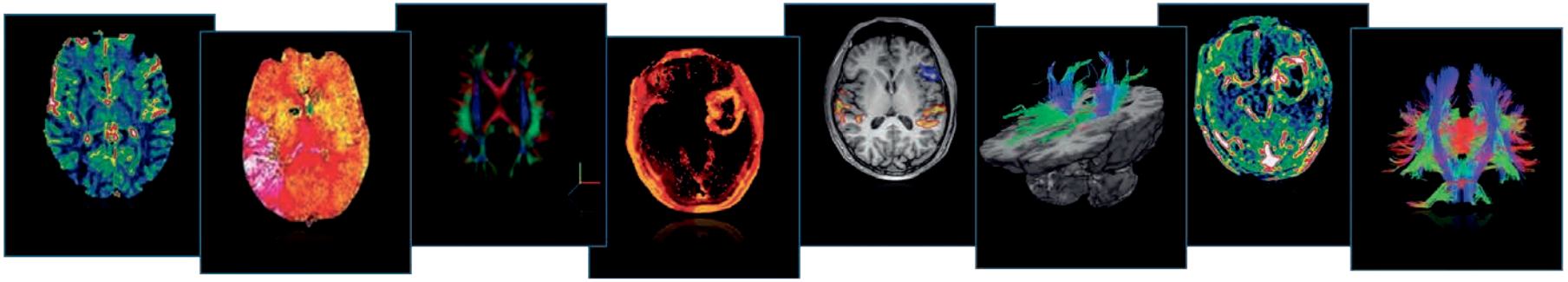


The DCE analysis employs two compartment modelling to generate output maps such as area under the curve (AUC), volume transfer constant (Ktrans), rate constant (Kep), plasma volume (Vp), fractional volume (Ve) and time to peak (TTP). Output maps and results including volume-of-interest statistics, tissue response curves and histogram can be saved to PACS, and the Ktrans map can be thresholded and exported to neuronavigation platforms.

The MPR viewer displays perfusion and permeability maps, fibertracking and BOLD fMRI data together for extensive patient evaluation.

nordicICE

Post-processing software for advanced neuro MRI applications



Designed for research environment

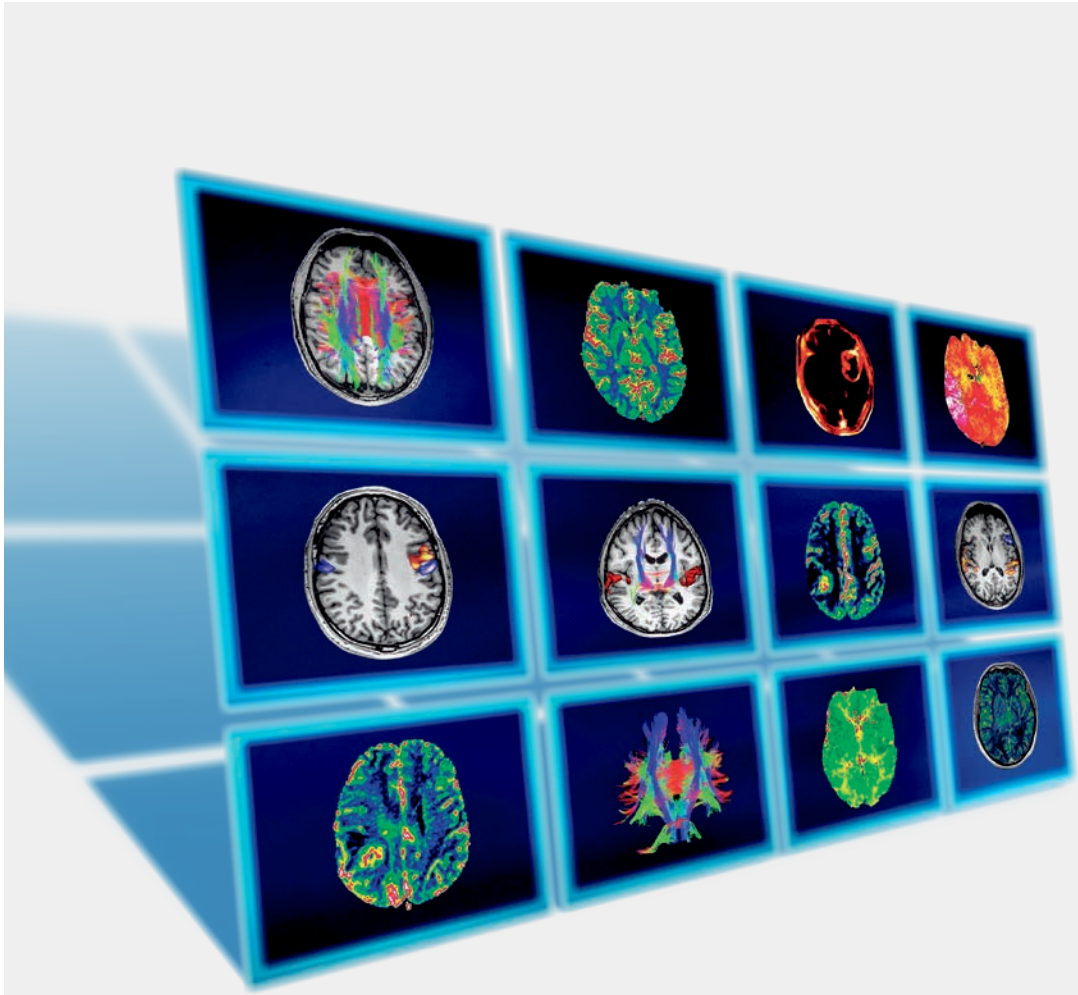
nordicICE is a post-processing software for advanced neuro MRI applications. The software package offers analysis abilities for most types of functional MR images including all types of perfusion related MR acquisitions (DSC, DCE and ASL), diffusion weighted images (DWI and DTI), images for relaxation calculations (both T1 and T2) and BOLD images. nordicICE can be used for neuro, as well as for abdomen, prostate, breast and musculoskeletal applications.

Having been in the market for nearly 20 years, NordicNeuroLab has had the chance to learn what needs a researcher has and functionality has continuously been added to fulfil these.

In NordicNeuroLab's product collection, nordicICE comprises the researcher's counterpart to nordicBrainEx.

While nordicBrainEx is the clinical tool that focuses on ease of use and efficiency in a clinical setting, nordicICE is targeting the researcher's needs: handling of many different types of image types including nifti, a wide range of analysis options, image analysis and processing, and finally an advanced tool for batch processing of multiple datasets. This last feature is invaluable for a researcher that possesses maybe hundreds of image sets and wants to experiment with various analysis options.

Modules and Functionality



Modules and Functionality:

- Arterial Spin Labeling (ASL)
- Perfusion DSC
- Permeability DCE
- Relaxometry (T1 & T2 mapping)
- Diffusion Weighted Imaging (DWI)
- DTI
- BOLD fMRI
- Resting state fMRI
- Batch processing
- Multi-Channel Perfusion Analysis
- Vessel Architectural Imaging

Wide range of general image analysis tools:

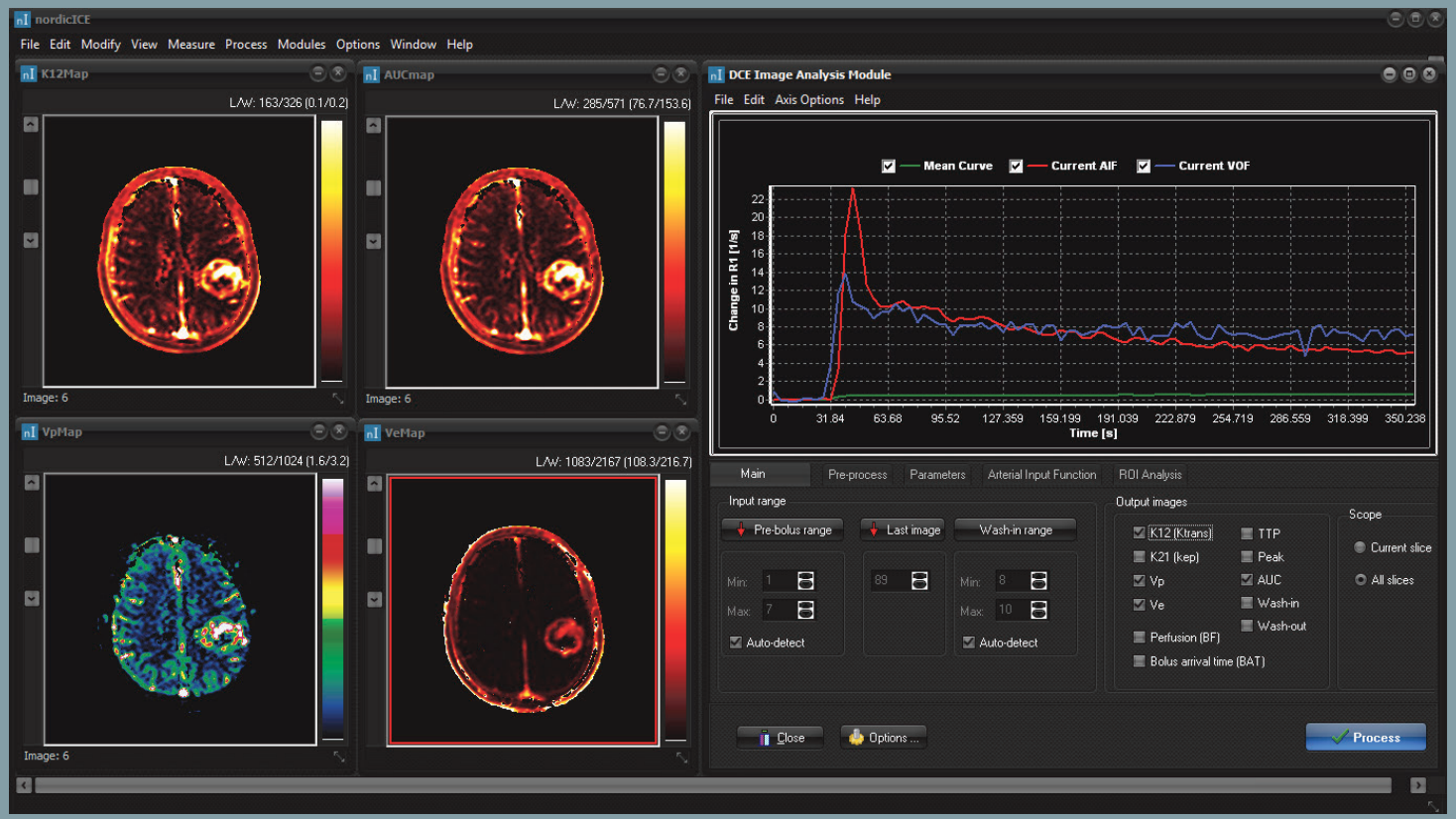
- ROI functionality
- Image arithmetics
- Segmentation
- Smoothing

Key Features:

- Research only (no clinical approvals)
- Advanced functionality
- For Neuro, Abdomen, Breast, Prostate, Musculoskeletal
- New methods
- 64-bit application
- DICOM database

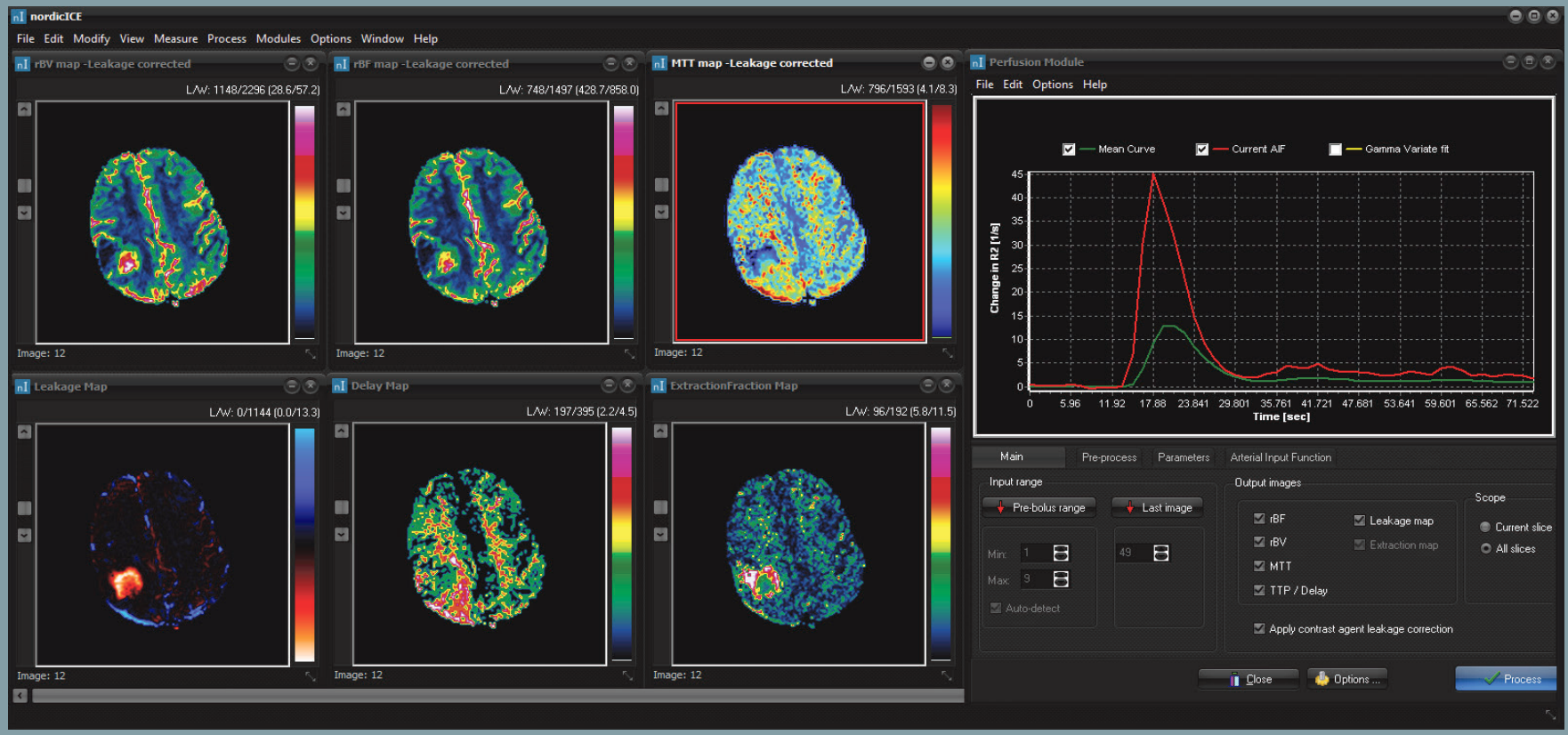
Dynamic Contrast Enhanced Perfusion (DCE)

Dynamic Contrast Enhanced perfusion module uses advanced kinetic modelling to obtain permeability maps from T1-weighted MRI time-series data. The module implements one-click AIF-estimation with partial volume correction from currently selected slice or ROI. Standard population based AIFs can also be used for standardized analysis. The DCE module provides a large range of parametric output maps (Ktrans, Kep, Ve, Vp, AUC, TTP, Peak, WashIn and WashOut) and several kinetic models are available. In specific, using a statistical test, the optimal kinetic model can automatically set for each voxel, allowing for optimization of the kinetic modelling.



Dynamic Susceptibility Contrast Perfusion (DSC)

The perfusion module provides fast generation of perfusion maps: Blood volume (CBV), Blood flow (CBF), Mean Transit Time (MTT), Time to Peak (TTP) or Delay (SVD), Leakage map, Brain Mask and Vessel Mask. State-of-the-art deconvolution techniques, choice of manual or fully automatic selection of arterial input function, automated calculation of leakage map when the BBB is disrupted (leakage map), vessel removal algorithm for increased accuracy in evaluation of maps. The perfusion module provides both normalization and deconvolution post processing methods for T2*-weighted neuro-perfusion. The AIF estimation for deconvolution implements one-click estimation from currently selected slice or ROI, automated global detection, and selection of standard population based AIFs. The module offers several advanced leakage correction algorithms.



Multi-Channel Perfusion Analysis

Emerging multi-echo dynamic MRI techniques allow you to measure both DCE and DSC related perfusion parameters using a multi-echo T1-weighted SPGR or IR acquisition. The advantage of the multi-echo over the traditional perfusion techniques is a reduced contrast dose, as well as a more precise estimation of DCE-MRI permeability related parameters (with no T2-contamination) and R2*-based perfusion parameters (with not T1-contamination), which has been shown to aid in differential diagnosis of several types of cancer.

The multi-channel analysis module in nICE enables you to process the multi-dimensional (4D or 5D) datasets, and to interact with the high-resolution structural dataset with ease. With its robust and user-friendly lesion segmentation and lesion stats tools, it allows you to perform statistical and histogram analysis of lesion permeability, leakage, blood flow, R2*max, and more.

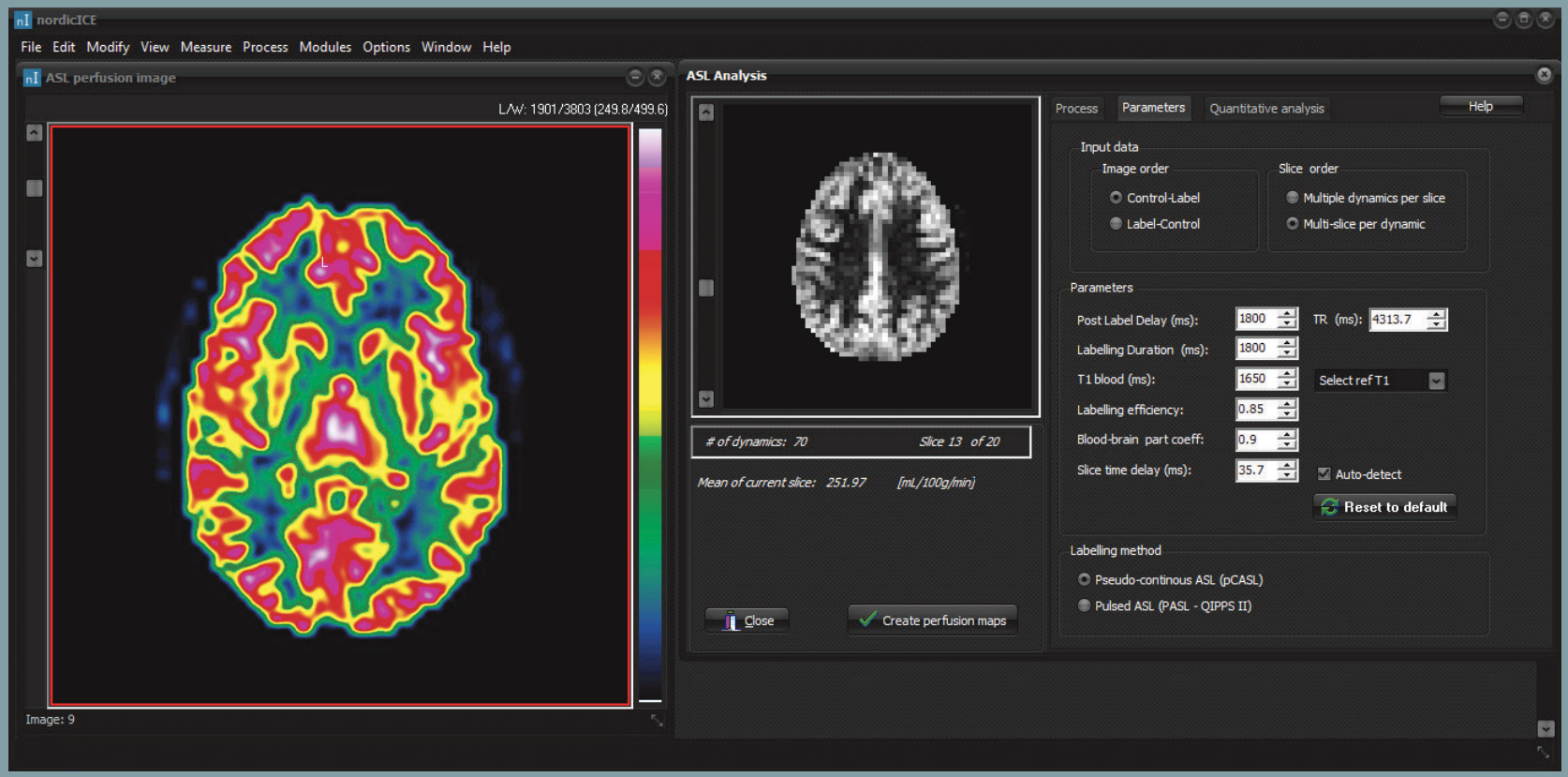
Vessel Architectural Imaging

Simultaneously acquired gradient- and spin-echo DSC MRI techniques have been shown to generate parameters which are sensitive markers of vessel architecture (size, caliber, leakiness), vascular fraction, and blood oxygen saturation levels, all of which change in tumors.

The Vessel Architectural Imaging (VAI) analysis module in nICE enables you to process dual gradient- and spin-echo DSC acquisitions and to interact with the high-resolution structural dataset with ease. With its robust and user-friendly lesion segmentation and lesion stats tools, it allows you to perform statistical and histogram analysis of DSC parameters, as well as VAI-related parameters, such as VAI vascular fraction, vessel caliber, vessel size image, vortex area, direction, and peak shift.

Arterial Spin Labeling (ASL)

Arterial Spin Labeling perfusion module provides post-processing of both pseudo continuous and pulsed ASL data. The module integrates motion correction, M0-correction, and co-registration through a simple drag-and-drop interface. Qualitative and quantitative perfusion analysis can be performed with just a few clicks, generating blood flow output maps.

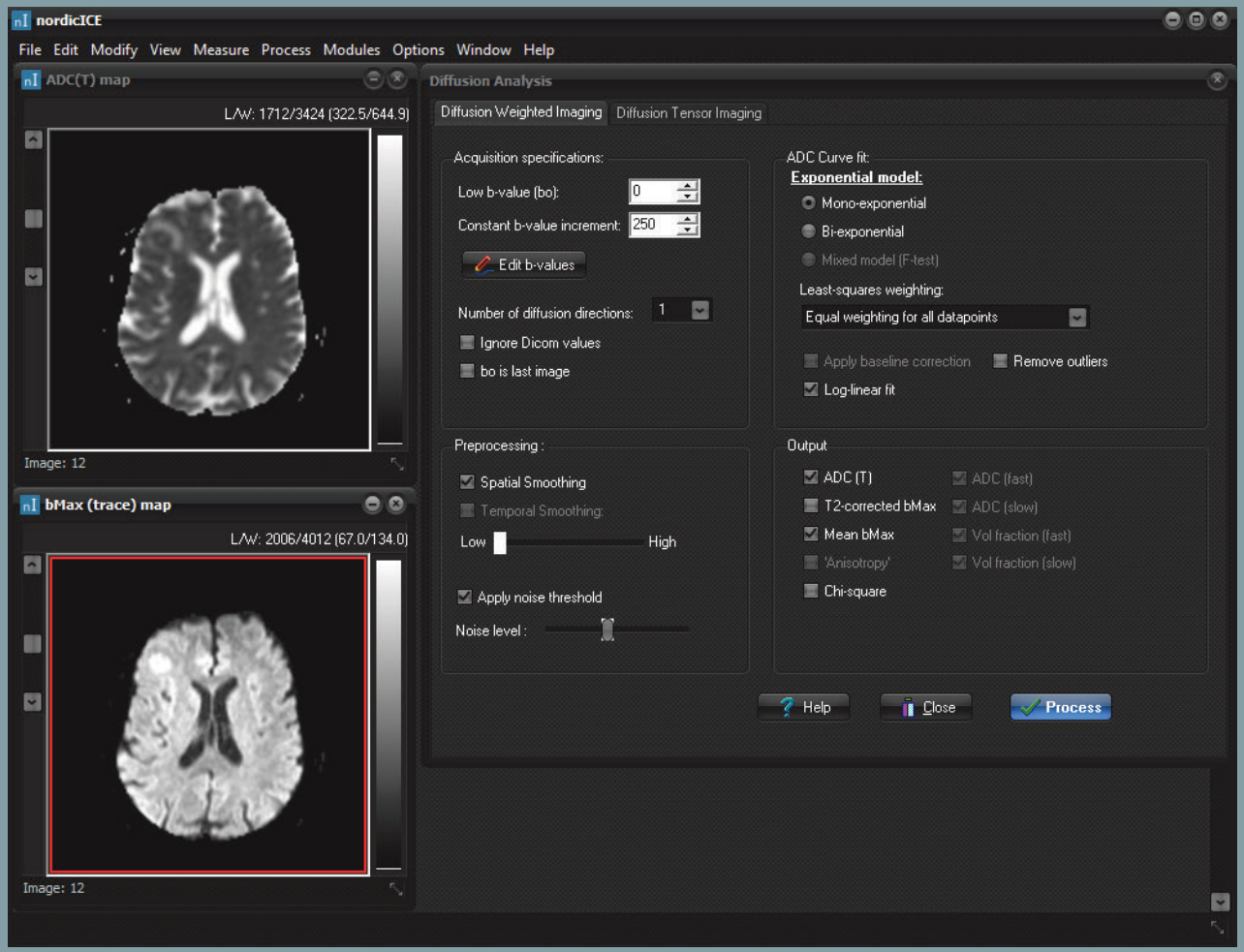


Resting state fMRI

The Resting state fMRI analysis module can be used to generate and visualize correlation maps from acquired resting state fMRI time series. The seed-based analysis is used to investigate how the time series in one region in the brain correlates to other regions. It is possible to investigate correlations and change thresholds interactively.

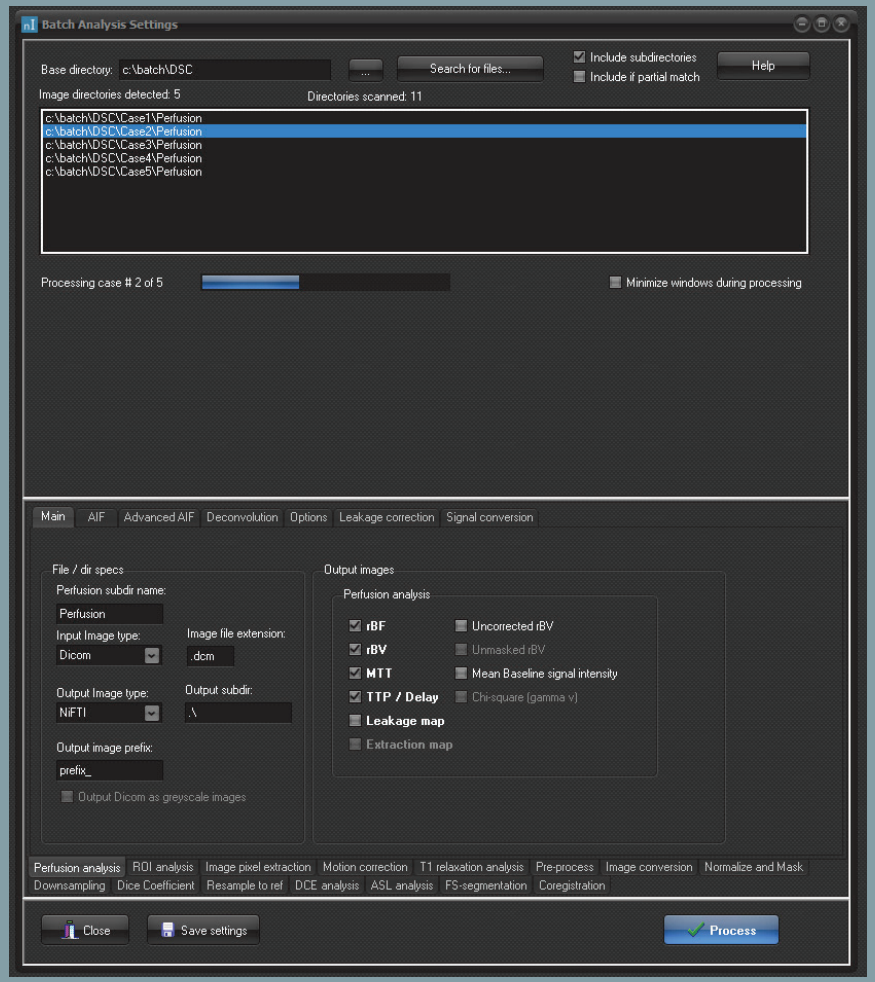
Diffusion Weighted Imaging (DWI)

In the diffusion analysis, ADC, bMax and other relevant output maps are generated using either mono-exponential (minimum 2 b-values) or bi-exponential (minimum 3 b-values) curve fitting, or a mixed model. Using a bi-exponential model, fast and slow components can be identified. If low b-values are included, the fast term can be interpreted as the perfusion related diffusion effect according to the intravoxel incoherent motion (IVIM) model.



Batch Processing

The entire post-processing pipeline from pre-processing to statistical analysis can be automated for an unlimited number of image sets subjects. Once settings are specified, analysis of several datasets can be run automatically without the need for user interactions. This module includes analyses such as perfusion, DCE, T1 relaxation, ASL analysis, image conversions, co-registration, pre-processing as well as various image analysis tools.



Corporate information

About Us

With nearly 20 years of experience, NordicNeuroLab provides products and solutions that define the field of functional MR imaging. Being a spin-off from the fMRI research environment in Bergen, Norway, we understand the growing need for reliable and innovative tools in this emerging field. This is why we make it a priority to collaborate with research and clinical teams from both academic and medical centres, MRI system manufacturers and third party vendors.

From advanced post-processing and visualization software for BOLD, Diffusion/DTI and Perfusion/DCE analysis imaging to fMRI hardware for audio and visual stimulation, eye-tracking and patient response collection, NordicNeuroLab products are used around the world by researchers and clinicians alike. We are dedicated to bringing the most advanced neuro-imaging tools to market while making functional MRI programs easy to implement.

Our Mission Statement

NordicNeuroLab will apply world leading competence and experience to provide professional solutions for functional imaging, enabling improved patient care and clinical efficiency.

Our Corporate Values

- We push for innovation
- We listen to our customers
- We focus on ease of use
- We deliver high quality
- We value safety

Service and Support

NordicNeuroLab takes pride in providing excellent service and support to our customers. Whether you are working with our team directly or through local partners and distributors, we are ready to support you in any way we can. We offer warranty, software maintenance solutions and professional installation and training packages based on your individual needs. We also offer online and on-site workshops in order to further improve product understanding and customer satisfaction.

Regulatory Compliances and Certificates

NordicNeuroLab has always emphasized quality and safety in the development and production of our devices. NordicNeuroLab fMRI hardware system is designed, developed and manufactured under certified ISO 13485 Quality Management system. As our product portfolio grows, we continue to ensure that all of our products intended for clinical use meet regulatory and safety requirements, have respective market clearances, and are tested for international UL and IEC consensus standards for Device Safety and Electromagnetic Compatibility (EMC) for medical equipment.

HEADQUARTERS
NordicNeuroLab AS
Møllendalsveien 1
N-5009 Bergen, Norway
Phone: +47 55 70 70 95

General Information
info@nordicneurolab.com

Sales Inquiries
sales@nordicneurolab.com

Website
www.nordicneurolab.com

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