



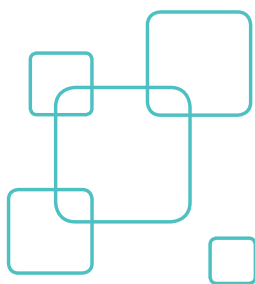
The Intervention Centre Annual report 2009

Oslo University Hospital and
Faculty of Clinical Medicine, University of Oslo



THE INTERVENTION CENTRE

Oslo University Hospital and
Faculty of Clinical Medicine,
University of Oslo



ANNUAL REPORT 2009

The Intervention Centre

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ANNUAL REPORT 2009

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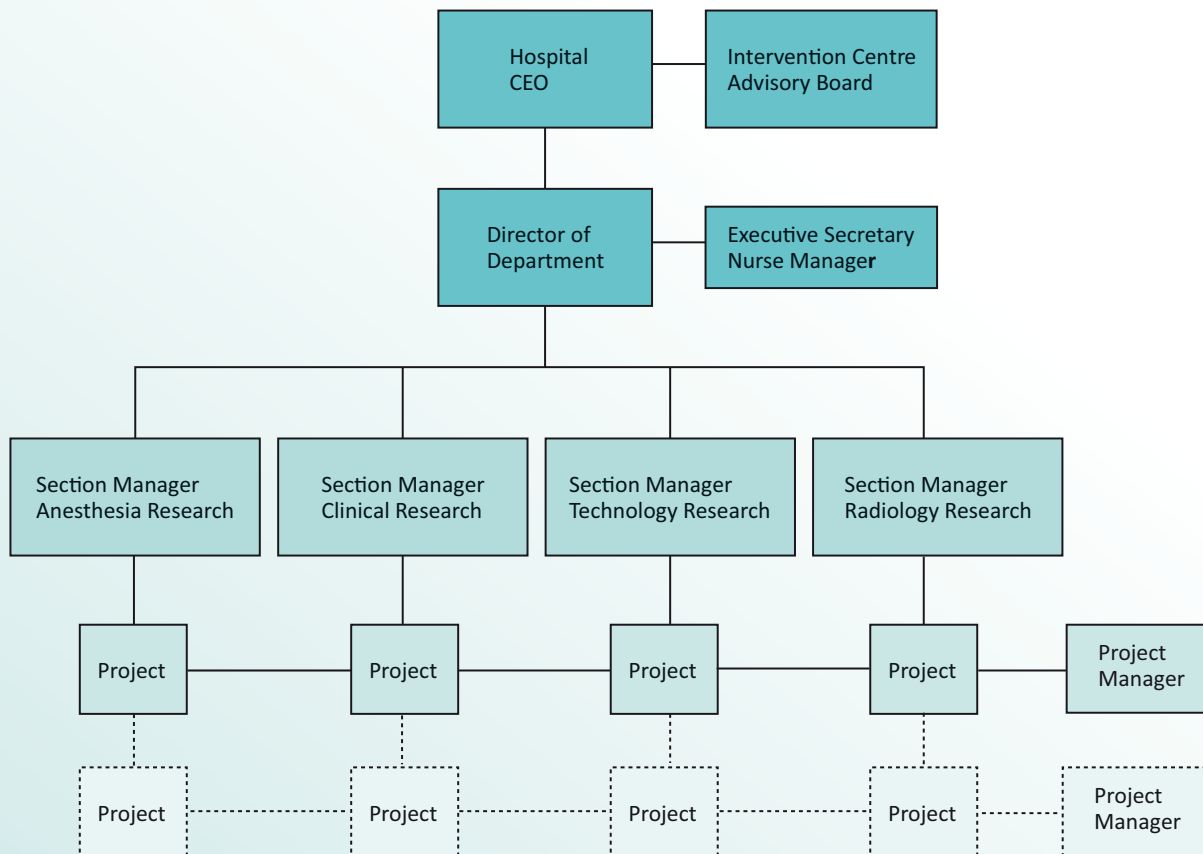
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The Intervention Centre

Organisation chart 2009



A year of change

- In 2009 the merge between all the public hospitals in Oslo was started. In the new organisation The Intervention Centre will be part of the Clinic for Diagnostics and Intervention, together with all the laboratory departments and the radiology department. The clinic represents a comprehensive research environment that will benefit The Intervention Centre as a research and development department.

Both in 2008 and 2009 the activities in the Centre's advanced ORs have increased, and there is an increasing number of procedures that have been developed at The Intervention Centre, but for various reasons can not be exported back to the mother departments. Thus the planned expansion of the Centre in the surrounding buildings and the establishment of a unit for routine operations that require the Centre's technology within The Intervention Centre framework need to be implemented.

We expect that the merge of the hospitals will facilitate the collaboration between the Intervention Centre and the various clinical departments, and therefore the demand for use of the facilities will increase.

All the research groups at the Centre had a high activity in 2009 resulting in three PhD dissertations and 58 publications. Through four EU-projects the research groups are international, representing scientists from all over the world.

The Intervention Centre will expand the international research collaboration in the coming years.

Erik Fosse
Head of Department

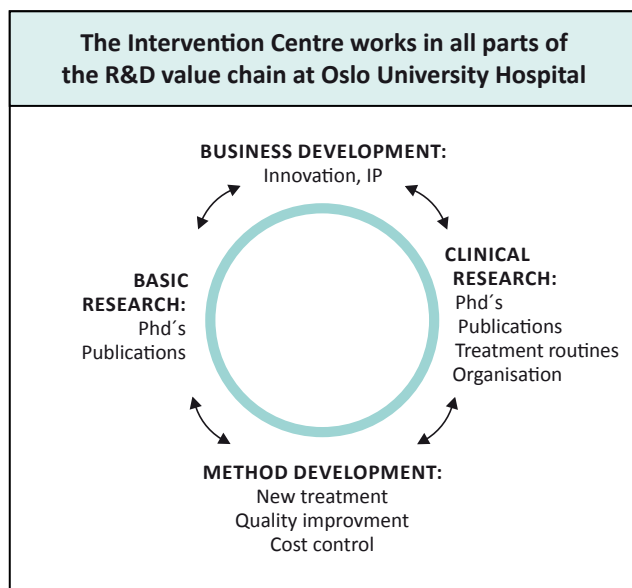
Main goals and objectives

MAIN GOALS AND OBJECTIVES

The Intervention Centre is a research and development department for image guided and minimally invasive therapy at Oslo University Hospital in Oslo.

The Intervention Centre has the following tasks:

1. Development of new procedures
2. Development of new treatment strategies
3. Compare new and existing strategies
4. Study the social, economic, and organisational consequences of new procedures on health care



STRATEGY

The Intervention Centre shall be a research and development resource for all the clinical and laboratory departments at Oslo University Hospital.

The Intervention Centre shall actively offer similar services to the healthcare community in Norway outside the hospital.

The Intervention Centre shall work as a link between technology institutions (commercial and academic) and the clinical medical environment in the hospitals.

The Intervention Centre shall promote and work actively to protect new knowledge and facilitate commercial exploitation.

The research is focused in four strategic areas:

1. MR guided intervention and surgery
2. X-ray, CT, ultrasound, video-guided interventions and surgery
3. Robotics and simulators
4. Biosensors, data management and communication

DELIVERIES

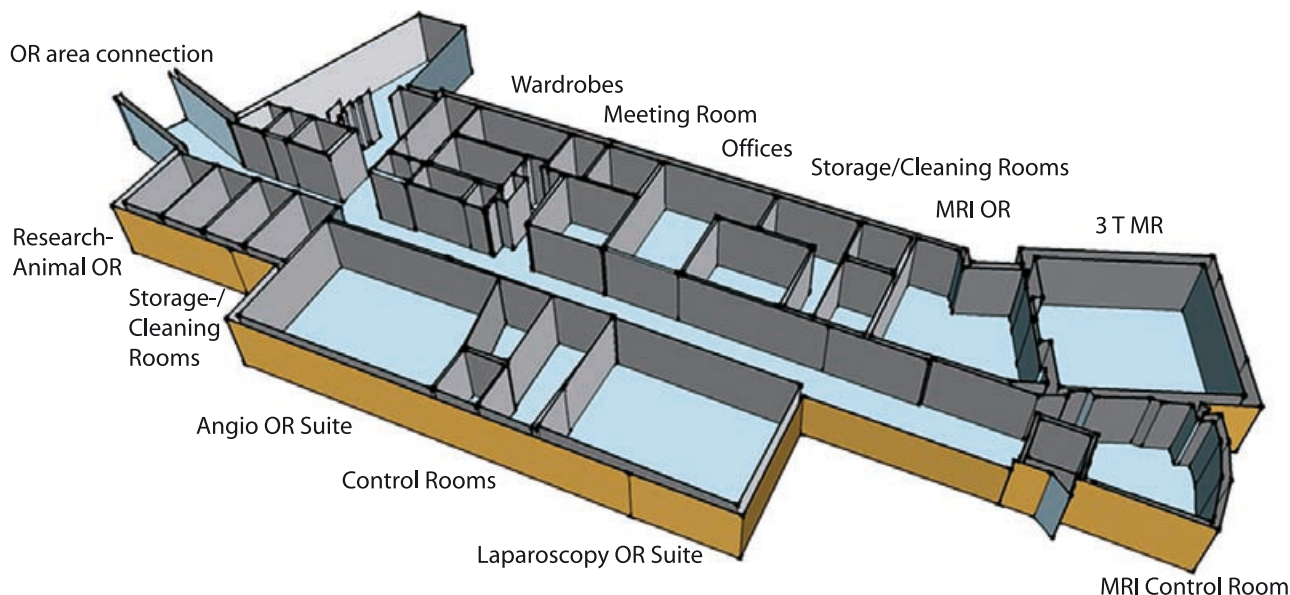
The Centre delivers the following:

1. New clinical methods
2. Research
3. Intellectual property/innovation

ORGANISATION

The Intervention Centre is an independent hospital department. A National Advisory board with representatives from all universities and university hospitals in Norway and the main departments at Oslo University Hospital monitors and gives advice on research and activity.

In 2009 The Intervention Centre had a cross-disciplinary staff of 20 employees. Seven doctors, nurses, radiographers and engineers employed by other departments worked regularly at the Centre while a large number of medical staff from most departments in the hospital worked at a less regular basis at the Centre. There was one university-employed professor (Erik Fosse) at the Faculty of Medicine, University of Oslo, one associate professor at the Department of Informatics, University of Oslo (Ole Jakob Elle) and one professor from the Department of Electronics and Telecommunication at the Norwegian University of Science and Technology (NTNU) in Trondheim (Ilanko Balasingham). Professor Atle Bjørnerud from the Department of Physics, University of Oslo established his research group at the Centre in 2006. In addition 23 scientists were working at the Centre by external funding.



MATRIX ORGANISATION

In order to facilitate effective execution of cross-disciplinary projects, the personnel and equipment at the Centre were allocated to four sections in a matrix organization. Each section was headed by a section manager. In each project a project manager was responsible for management and reporting to the section manager in charge. The advanced operation rooms and the staff were made available as a common resource for development and assessment of new methods. The operation rooms were managed by the head nurse Kjersti Wendt.

Scientists/clinical departments outside the Centre were responsible for a substantial number of the projects run in 2009. 40% of the staff had a technological, non-medical background. By the end of 2009 the employees of The Intervention Centre came from 15 different nations all over the world. The Intervention Centre thus represented a unique multi-national environment of medical and technological expertise.

FACILITIES

The Centre is located in a unique architectural structure. In the three suites advanced imaging equipment was integrated in an operation room environment. In 2008 all advanced imaging equipment was renewed. In the combined surgical and radiological suite, the conventional angiographic equipment was replaced by the Siemens Zeego system, based on robotic technology and containing new advances in imaging and functionality. Our MRI suite was completely rebuilt into a dual room suite where a 3T MRI-device was installed in one room beside a state of the art OR. The two rooms were separated by a sliding door, allowing surgery with standard equipment and intermittent MRI imaging. In the videoscopy room all systems are equipped with Olympus HD equipment.



Research Groups

IMAGE GUIDED GENERAL SURGERY AND INTERVENTION

Section Manager Bjørn Edwin, MD, PhD

Several new techniques in laparoscopic surgery have been introduced in Norway through this group. Some of the methods are now routine procedures, like laparoscopic adrenalectomy and laparoscopic prostatectomy. The group validates new procedures and establishes effective training.

Education programs in minimal invasive surgery in both gastrointestinal- and urological surgery are organized in collaboration with other hospitals in Norway, Sweden, Russia and Denmark.

The Department of Surgery is one of our main collaborators with research projects ongoing in:

- Minimal invasive surgery on the liver, pancreas, stomach, oesophagus, kidney, adrenal gland and colon/rectum
- Minimal invasive techniques in children
- Thermal liver ablation

PhD programs:

1. Cand. Med. Airazat M. Kazaryan M.D.
Extracorporeal high intensity focused ultrasound ablation of liver malignancies
Mentors: Bjørn Edwin, MD, PhD, The Intervention Centre, Oslo University Hospital. Erik Fosse, MD, PhD, The Intervention Centre, Oslo University Hospital.
2. M.Sc. Martin Johansson
Percutaneous access and connection to visceral organs
Mentors: Peter Thomsen MD, PhD, Institution for Clinical Sciences, University of Gothenburg, Bjørn Edwin MD, PhD, The Intervention Centre, Oslo University Hospital, Leif Hulten MD, PhD, The ColoRectal Unit, Sahlgrenska University Hospital.

RADIOLOGY RESEARCH AND IMAGE GUIDED INTERVENTION

Section Manager Per Kristian Hol, MD, PhD

A number of research projects using the 3T MR scanner or the combined angiographic suite are performed in corporation with different academic partners, including Stavanger University Hospital, The Paediatric Research Institute, Departments of Neuropsychiatry and Psychosomatic Medicine, Oncology, Ear Nose and Throat, Neurosurgery, Neurology, Anesthesiology and Radiology. The research topics cover brain, spine, liver, prostate, brachial plexus and inner ear. Programs for using the Flat-detector Computed Tomography technology of the angiographic system, for guidance of the insertion Cochlear Implant Electrode and for brain perfusion studies are under preparation.

PhD programs:

1. Cand. Med. Charlotte de Lange
Detection of organ injuries after hypoxia and resuscitation. An experimental study in piglets
Mentors: Berit H. Munkeby and Ola D. Saugstad, Paediatric Research Institute, Oslo University Hospital.
2. Cand. Med. Trygve Kjelstrup
Axillary plexus block, nervestimulator, ultrasound and MRI
Mentors: Øivind Klaastad and Harald Breivik, Department of Anaesthesiology/The Intervention Centre, Oslo University Hospital, Albert Castellheim, Department of Anaesthesiology, Diakonhjemmet Hospital
3. M.Sc. Håvard Kalvøy
Bioelectrical properties of needle electrodes and human tissue, spatial and temporal dependencies
Mentors: Sverre Grimnes and Ørjan G. Martinsen, Institute of Physics, University of Oslo.

3. Cand. Med. Torbjørn Elvsåshagen

Neuroplasticity in patients with bipolar disorders

Mentors: Ulrik Frederik Malt and Stein Andersson, Department of Neuropsychiatry and Psychosomatic Medicine, Oslo University Hospital, Espen Dietrichs, Department of Neurology, Oslo University Hospital, Ole Andreassen, Institute of Psychiatry, University of Oslo.

4. Cand. Med. Eric Dorenberg

Aspects of interventional procedures for treatment of uterine fibroids

Mentors: Jarl A. Jacobsen, Department of Radiology, Oslo University Hospital and Per Kristian Hol, The Intervention Centre, Oslo University Hospital.

5. M.Sc. Ralf Greisiger

Cochlear Implants and DynaCT imaging

Mentors: Greg E Jablonski and Terje Osnes, Dept of Ear Nose and Throat, Oslo University Hospital, Ole Jacob Elle and Per Kristian Hol, Intervention Centre, Oslo University Hospital, and Jon K Shallop, Mayo Clinic Medical School.

IMAGE GUIDED CARDIAC SURGERY AND INTERVENTION

Jacob Bergsland, MD

The heart group is in the process of developing multiple new programs, in the area of treatment and follow-up of cardiac patients. After keeping a strong research focus on beating heart coronary surgery, The Intervention Centre is increasingly focusing on projects related to the new exiting area of endovascular cardiovascular therapies and minimally invasive monitoring of cardiac function.

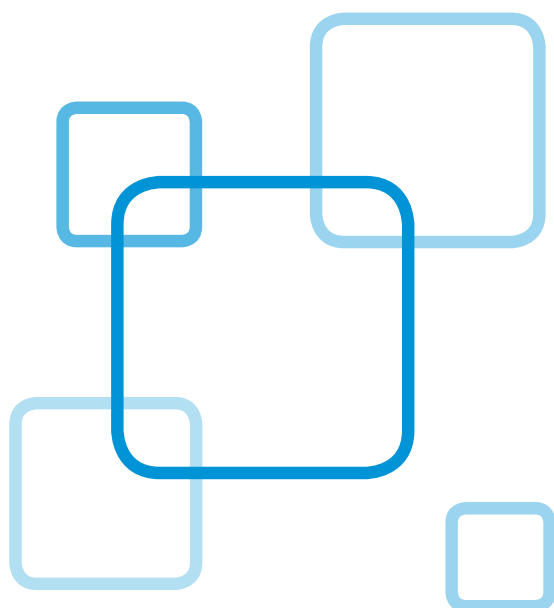
Ongoing projects in 2009:

1. *Aortic valve implantation through the endovascular route*

A pilot study was started in 2009 to establish both the transfemoral and transapical route for implantation of aortic valves. A large randomized study, focusing on short and long-term outcomes as well as cost benefit and life quality studies is connected to this study. The project is a cooperative project between cardiology and cardiac surgery departments within Oslo University Hospital and several other groups which will focus on the cost issues and studies related to quality of life.

2. *Pulmonary valve implantation in patients with congenital heart disease*

A highly successful project of pulmonary valve implantation in patients with poor function of the pulmonic valve has been initiated in cooperation with specialists from Oslo University Hospital departments for cardiac surgery and cardiology. Long term life quality studies and cost are being performed. This program follows a successful development of various procedures at the Intervention Centre for congenital heart disease; several of these have been successfully transferred to the interventional cardiology service.



3. **Heart sensor projects** have been a focus area for The Intervention Centre for a number of years. At present several experimental and clinical projects are ongoing.

A three dimensional accelerometer, patented by The Intervention Centre is being tested out for possible commercial use after the feasibility of detecting abnormalities in heart motion due to ischemia has been demonstrated. Several PhD degrees are related to these devices. Similar research is ongoing using *implantable ultrasound probes*, the early results are encouraging. *The CO2 sensor* developed at the Intervention Centre has also been tested experimentally as a monitor of ischemia of the heart as well as in other organs.

4. **The Ultrasponder project** is funded by EU and is an exiting study where The Intervention Centre cooperates with multiple investigators within EU countries. The project which originates from the IVS engineering group will develop wireless sensors for use in patients with heart failure with the purpose of improving management of this very challenging group of patients which rapidly increase in size.

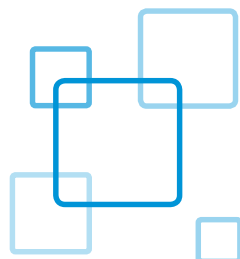
5. **International cooperation in clinical medicine**
The Intervention Centre and affiliated groups continue to have government funded programs to assist in the development of the health care systems in countries in transition and other less fortunate countries. There are ongoing programs in Bosnia and Herzegovina and Palestine.

PhD programs:

Cand. Med. Jacob Bergsland

Safe Introduction and quality control of new methods in coronary surgery

Mentors: Erik Fosse, Intervention Centre and Jan L. Svennevig, Dept. of cardiothorasic and vascular surgery, Oslo University Hospital.



WIRELESS SENSOR NETWORKS

Professor Ilanko Balasingham, PhD

The sensors, signals, and systems research group aims to facilitate deployments of intelligent sensors and systems for different procedures in surgery, minimal invasive therapy and ambient point of care monitoring. The main focus area of research is in efficient design and development of novel sensors, power efficient real time signal processing algorithms, sensor data fusion, and wireless communication solutions for in vivo and ex vivo purposes. Some of our activities have been on studying the use of ultra wide band medical radars to estimate blood pressure, blood flow and tissue/organ motions. Furthermore, novel signal processing algorithms to facilitate power efficient processing of digital data in sensors, which are popularly called as sensor nodes in wireless communications networks. The digital sensor data fusion and multi parameter analysis are also active areas of research. We are working to design reliable, power efficient and robust wireless body area sensor networks for in vivo (implantable) and ex vivo use.

We have a close collaboration with the Department of Electronics and Telecommunications at the Norwegian University of Science and Technology (NTNU) in Trondheim and several national and international research institutions and companies participate in different projects. Collaboration with the Nordic academic and industry has been through the Nordic project *Biomedical Wireless Sensor Network (BWSN II)*, where the project has been successfully finished in December 2009 after three years. Similarly the WIREMED project on developing an implantable wireless sensor ended in December 2009 after a project period of 3.5 years.

The group participates in two new projects such as "Oslo Medtech Cluster" and COST action "Cognitive Radio and Networking for Cooperative Coexistence of Heterogeneous Wireless". Project "Oslo Medtech Cluster" is funded by Innovation Norway, SIVA and Research Council of Norway through the ARENA program with a budget of NOK 17.4 million for 3 years from November 2009. The project will be administrated by IT Fornebu. The COST project IC 0902 "Cognitive Radio and Net-

working for Cooperative Coexistence of Heterogeneous Wireless” is funded by the COST, Research Council of Norway and Ministry of Foreign Affairs for 4 years from November 2009.

There has been an effort to establish a test bed for designing, developing and testing new technologies in sensors and wireless systems at The Intervention Centre in collaboration with SINTEF and industry. The pilot study on establishing a test bed concluded in 2009 that it should be established as a project with the financial support from Innovation Norway, etc.

The research group, which is split between Oslo and Trondheim, has presently nine PhD fellows and seven Post doctoral fellows employed through the projects. Dr. Sang-Seon Byun joined the group as an ERCIM Postdoc fellow in 2007, where he will continue working in the WISENET project for another year and is located at NTNU in Trondheim. Dr. Ali Khaleghi, who joined as a Postdoc fellow in the WISENET project for two years since January 2008, returned to Iran in December 2009 but will be associated with The Intervention Centre throughout 2010. Dr. Djamel Djenouri, who joined as an ERCIM Postdoc fellow in October 2008, returned to Algeria after finishing his position at NTNU. Dr. Raul Chavez-Santiago joined as a Postdoc fellow from February 2009 and will work in the MELODY project for two years. Dr. Jianguo Ding joined as an ERCIM Postdoc fellow for 9 months since April 2008 and Dr. Alex Cartagena Gordillo joined as an ERCIM Postdoc fellow for 12 months since June 2008. Both of them will be located at NTNU. Lars Erik Solberg, Babak Moussakhani and Nguyen Trung Hieu joined as PhD fellows in the MELODY project, where Lars Erik is with The Intervention Centre while Babak and Hieu are with NTNU.

Xuedong Liang visited Professor Victor Leung’s group at the University of British Columbia, Canada for 8 months returned in May 2009 and successfully defended his PhD thesis at the Department of Informatics at the University of Oslo on December 21, 2009. The defense committee consisted of Professor Xiaoming Fu of the Georg-August University of Goettingen, Germany, Dr. Yan Zhang (Josh) at the Simula Research Laboratory, Norway and Associate Professor Martin Steffen at the University of Oslo.

PhD programs:

1. M.Sc. Xuedong Liang

Modelling tools for cross layer optimization in sensor networks

Mentors: Ilangko Balasingham, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology. Olaf Owe and Einar Broch Johansen, University of Oslo.

2. M.Sc. Stig Støa

Ultra wide band impulse radio

Mentors: Ilangko Balasingham and Erik Fosse, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology. Dag Wisland and Tor Sverre Lande, University of Oslo.

3. M.Sc. Hessam Moussavinik

Super robust short range wireless sensor network

Mentors: Ilangko Balasingham, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology. Geir Øien and Tor Ramstad, Norwegian University of Science and Technology. Niels Aakvaag, Multihop Com AS.

4. M.Sc. Minh-Long Pham

Distributed signal processing for power efficiency

Mentors: Tor Ramstad, Norwegian University of Science and Technology and Ilangko Balasingham, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology.

5. M.Sc. Mariam Kaynia

Adaptive spectrum allocation in wireless sensor network

Mentors: Geir Øien and Tor Ramstad. Norwegian University of Science and Technology and Ilangko Balasingham, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology.



6. M.Sc. Fatemeh Kazemeyni

Modelling tools and optimization of wireless sensor network

Mentors: Ilangko Balasingham, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology. Olaf Owe and Einar Broch Johansen, University of Oslo.

7. MSc Lars Erik Solberg

UWB medical radar for estimating blood pressure

Mentors: Ilangko Balasingham and Erik Fosse, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology. Svein-Erik Hamran, Norwegian Defence Research Establishment.

8. Nguyen Trung Hieu

Information theoretical bounds for wireless sensor networks

Mentors: Tor Ramstad, Norwegian University of Science and Technology and Ilangko Balasingham, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology.

9. Babak Moussakhani

Signal processing for robust invivo-exvivo communication

Mentors: Tor Ramstad, Norwegian University of Science and Technology and Ilangko Balasingham, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology.

Post Doc projects:

1. Dr. Djamel Djenouri

Multi-objective QoS optimization in wireless sensor networks

Mentor: Ilangko Balasingham, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology.

2. Dr. Sang-Seon Byun

Development of Cognitive wireless sensor networks

Mentor: Ilangko Balasingham, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology.

3. Dr. Pål Anders Floor

Signal processing for robust wireless communications

Mentors: Ilangko Balasingham, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology. Tor Ramstad, Norwegian University of Science and Technology.

4. Dr. Ali Khaleghi

Invivo and exvivo UWB applications

Mentor: Ilangko Balasingham, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology.

5. Dr. Raul Chavez-Santiago

Cognitive UWB sensor networks

Mentor: Ilangko Balasingham, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology.

6. Dr. Jianguo Ding

Deployment and management of wireless sensor networks

Mentor: Ilangko Balasingham, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology.

7. Dr. Alex Cartagena Gordillo

On antennas and modulation for UWB sensor networks

Mentor: Ilangko Balasingham, The Intervention Centre, Oslo University Hospital and Norwegian University of Science and Technology.

MEDICAL SENSORS

Head of Department Professor, Erik Fosse MD, PhD

The Intervention Centre is coordinating a joint project called "Micro- Heart" for detection of motion changes of the heart surface. The goal is to develop a system for early detection of ischemia through continuous per- and post-operative monitoring using a 3-axis accelerometer for patients undergoing coronary revascularization (Patent number: NO 20016385). The "Micro- Heart" project is in close collaboration with Vestfold University College in Tønsberg. The Intervention Centre is responsible for the clinical research activity, and both an animal study and a human study are ongoing to verify the sensitivity and specificity of the detection method. Vestfold University is responsible for miniaturizing a three-axis accelerometer for incorporation into a temporary pace-maker electrode. The project is partly financed by the Research Council of Norway (NRC) with 4 PhD scholarships at Vestfold University College.

Together with the Department of Clinical Engineering, Professor Sverre Grimnes this group was also involved in the development of a sensor for measuring the sweat production in different parts of the body by a bio impedance technique.

PhD programs:

1. Cand. Med. Steinar Halvorsen

Basic and clinical studies on cardiac ischemia by biosensors

Mentors: Erik Fosse and Tor Inge Tønnessen, The Intervention Centre/Dept of Anaesthesiology, Oslo University Hospital.

2. M.Sc. Christian Trondstad

Development of a sensor for sweat measurement

Mentor: Sverre Grimnes, Dept of Clinical Engineering, Oslo University Hospital.

BIOSENSORS

Professor Tor Inge Tønnessen MD, PhD

The Biosensor research group has three main branches of interest, namely the biologic basis for ischemia and the choice of parameters for detection thereof, the second is the development of a specific pCO₂ sensor and the third is developing methods for early detection of rejection in transplant patients. The biologic basis has been studied through animal experiments.

PhD programs:

1. Cand. Med. Lars Wælgard

New clinical methods for detection of ischemia

Mentor: Tor Inge Tønnessen, The Intervention Centre, Dept of Anaesthesiology, Oslo University Hospital.

2. Cand. Med. Søren Pischke

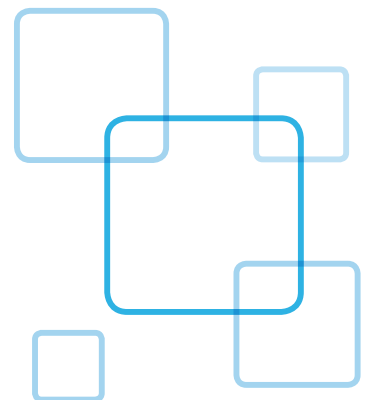
Biosensors for detecting cardiac ischemia

Mentor: Tor Inge Tønnessen, The Intervention Centre, Dept of Anaesthesiology, Oslo University Hospital. Tom Eirik Mollnes, IMMI, Oslo University Hospital.

3. Cand. Med. Håkon Haugaa

Microdialysis monitoring in transplanted patients

Mentor: Tor Inge Tønnessen, The Intervention Centre, Dept of Anaesthesiology, Oslo University Hospital. Tom Eirik Mollnes, IMMI, Oslo University Hospital.



PATIENT COMMUNICATION

Head of Department Professor Erik Fosse MD, PhD

As part of a program to make the journal available to the patients, a software program for automatic translation of medical terms into common Norwegian is being developed. The Thesaurus project has received support from Innomed to develop the application. One master thesis has so far been completed in this project.

ORGANISATION

Head of Department Professor Erik Fosse MD, PhD

The Intervention Centre co-operated with the Institute for Informatics and The Institute for Health Management and Health Economics at the University of Oslo, as well with the Norwegian School of Management (BI) in a research project focusing on the relationship between innovation, learning, technology and organizational change processes.

PhD programs:

Cand. Polit. Bjørn Erik Mørk

Organizing for learning and innovation in Norwegian hospitals – How new technologies challenge existing organizational structures and cultures

Mentors: Erik Fosse, The Intervention Centre, Oslo University Hospital, Johan Olaisen, Norwegian School of Management Oslo, Terje Hagen, Institute for Health Management and Health Economy, University of Oslo.

ADVANCED MR NEURO IMAGING

Professor Atle Bjørnerud, PhD

The main research focus of the Advanced Neuroimaging Group (ANG) is related to functional MRI applied to different neuropathological conditions. There is currently a particular focus on MR based imaging for diagnosis, prognosis- and treatment response assessment in patients with primary brain tumors (gliomas). A multi-centre study for evaluation of diagnostic efficacy of MR based perfusion imaging for diagnosis of gliomas is incorporated in the Norwegian Research Council (NRC) -financed project: *Evaluation of functional Magnetic Resonance in the Diagnosis of Brain Tumors for Assessment of Clinical Efficacy (EMBRACE)*. As part of the EMBRACE project a new prospective study is currently being launched, which will assess the clinical utility of advanced MR based imaging methods for evaluation of treatment response in high grade gliomas patients.

The ANG is a multi-disciplinary effort and is collaborating closely with many other groups both internally within the OUH and externally with world-class research groups in Europe and the US. The group has also a close link to industry through collaboration/co-development with software companies (NordicNeuroLab, Bergen, Norway and CorTechs Labs, SanDiego, USA). The group has filed several patent applications related to novel image processing techniques which have been sub-licensed to our industrial partners. The ANG group members are further involved in a large number of imaging studies ongoing in the Oslo-region.

In particular, the group provides MR expertise in several morphometric MR studies where high resolution MRI is used to assess neuro-structural changes related to neurodegenerative disease, Alzheimer's disease and normal aging.

PhD 2009:

Kyrre Eeg-Emblem

Combined structural, microvascular and functional mapping of brain tumors for improved diagnosis and treatment planning

Master-thesis 2009:

Ingvar Andersen

Preoperative determination of macro-adenoma consistence- with focus on relaxometry

Tuva Hope

Sequence optimization in MR-based diffusion tensor imaging

Other Master students:

Endre Grøvik

Anne-Lene Mathisen

PhD programs:

Cand. Med. Paulina Due-Tønnessen

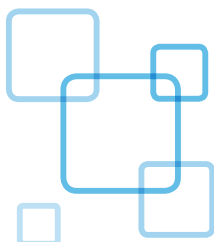
Post Doc projects:

Kyrre Eeg Emblem

Inge Andre Rasmussen Jr.

Software engineer:

Raimo Aleks Salo



MEDICAL ROBOTICS (Application and control)

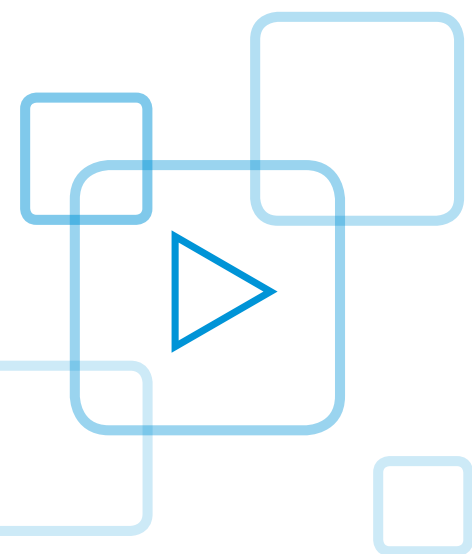
Section Manager Ole Jakob Elle, PhD

Surgical robotics has been a research topic of The Intervention Centre since 1998. The Zeus Micro Joint telemanipulator has been used for animal studies performing coronary bypass-surgery and human trials for thoracoscopic IMA-takedown and sympatectomy. Through this work, spin-off research projects such as head-tracking as a control modality for a robotic scope-holder and haptic feedback to give the operator the feeling of touch when remotely controlling the robot has been initiated. Industrial and academic contact with Patric Finlay (Prosurgics Lmt., Medimation Lmt.) has been fruitful within the area of neurobotic systems, and a cross-disciplinary research collaboration between engineers and neurosurgeons were established through this contact. The project was aimed at precise positioning of a tool within target points in the brain using image guidance and without the use of a stereo-tactic frame, by use of the neurosurgical PathFinder robot. This project is on hold due to software upgrade of the PathFinder robot as a result of our preliminary use of the system.

In 2005 the PhD fellow Edvard Nærum was hired with the research topic of haptic and tactile feedback in remote surgery. Edvard Nærum was in 2008 at a research stay at Seattle University, USA hosted by Professor Blake Hannaford. Two papers were published in 2009 based on work performed with Balke Hannaford, and two more publications based on the collaboration with Hannaford are in preparation. Hannaford is an important academic contact within the robotic research field. Edvard Nærum is now working with his last study, and is planning to complete his PhD in spring 2010.

The development of collision detection systems and visualization systems to help and guide the surgeon performing telemanipulated surgery was lead by the ARIS*ER PhD-student, Tangui Morvan. He made a demonstrator of this system in 2007, which was evaluated through a user study in 2008 and published in 2009.





Katholieke Universitat Leuven was partner in the Marie Curie project ARIS*ER, which was coordinated by The Intervention Centre. As a spin-off from ARIS*ER, the EU-Strep proposal SCath (Smart Catheterization) was granted in 2009 initiated by Katholieke Universitat Leuven. The Intervention Centre is partner in this project, where the aim is to develop a navigation platform and a robotic control system for safer and more precise positioning of catheter introduced devices.

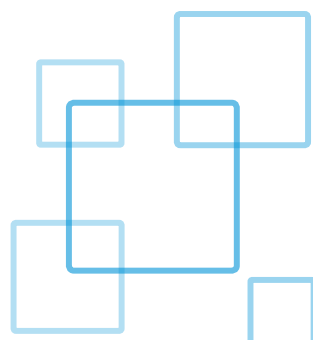
Ole Jakob Elle holds a position at The Department of Informatics, University of Oslo as an Adjunct Associate Professor. In 2009 a four PhD-scholarship was decided to be dedicated to research work within robotic surgery at The Intervention Centre. The Candidate will start his work in spring 2010.

PhD programs:

1. M.Sc. Edvard Nærum

***Haptic and tactile feedback
in remote surgery***

Mentor: Ole Jakob Elle
and Erik Fosse,
The Intervention Centre,
Oslo University Hospital.



CARDIAC IMAGING

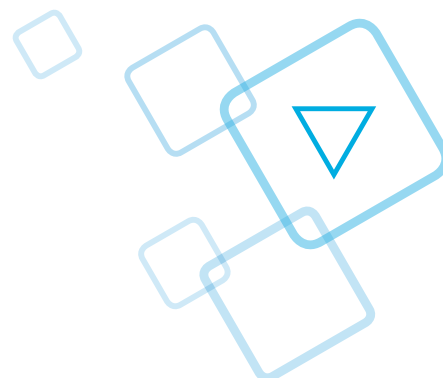
Professor Thor Edvardsen MD, PhD

The Intervention Centre has great facilities and support for research in different cardiac imaging modalities. The 3T MRI scanner at The Intervention Centre has augmented research efforts in cardiac imaging of structure and function of the heart. Several PhD students have ongoing projects that include cardiac MR. One project is exploring myocardial function in patients with NSTEMI (non ST-elevation myocardial infarct) after PCI treatment. Another project is studying patients with stable angina pectoris.

The development of epicardial accelerometers and ultrasound probes for continuous monitoring of myocardial ischemia has resulted in 3 papers in scientific journals during 2009 and several presentations at international conferences. The development of these devices has been in close collaboration with Dept of Cardiology. The idea behind the project is to improve per and post operative monitoring of myocardial function.

One PhD project will describe myocardial function in sepsis. Myocardial function will be assessed by advanced monitoring including myocardial sensors and echocardiography. This project includes large animal models and studies in patients.

There is widespread clinical use of therapeutic hypothermia in comatose survivors of an out-of-hospital cardiac arrest. Hypothermia is demonstrated to improve outcome in these patients, but there is sparse knowledge of cardiac function during hypothermia. This PhD project will elucidate myocardial function in hypothermia.



PhD programs:

1. Cand. Med. Andreas Espinoza
Miniaturized epicardial ultrasound probes for perioperative myocardial monitoring
Mentors: Thor Edvardsen, Dept of Cardiology, Oslo University Hospital. Erik Fosse, Intervention Centre, Oslo University Hospital. Halfdan Ihlen, Dept of Cardiology, Oslo University Hospital.
2. Cand. Med. Marit Kristine Smedsrud
Myocardial viability in patients with stable angina pectoris
Mentor: Thor Edvardsen, Dept of Cardiology, Oslo University Hospital.
3. Cand. Med. Christian Eek
Diagnostic and therapeutic stratification of patients with acute coronary syndrome (Echo-str-acs)
Mentors: Helge Skulstad and Thor Edvardsen, Dept of Cardiology, Oslo University Hospital.
4. Cand. Med. Siv Hestenes
Cardiomyopathy in sepsis
Mentors: Thor Edvardsen, Dept of Cardiology, Oslo University Hospital. Erik Fosse, Intervention Centre, Oslo University Hospital. Erik W. Nilsen, IMMI, Oslo University Hospital.
5. Cand. Med. Stefan Hyler
Myocardial function in graded ischemia assessed by myocardial sensors
Mentors: Erik Fosse, The Intervention Centre, Oslo University Hospital, Helge Skulstad, Dept of Cardiology, Oslo University Hospital.
6. Cand. Med. Viesturs Kerans
Myocardial function in therapeutic hypothermia
Mentors: Jan F. Bugge, Dept of Anesthesiology, Oslo University Hospital. Helge Skulstad and Thor Edvardsen, Dept of Cardiology, Oslo University Hospital.

NEURO COGNITIVE IMAGING

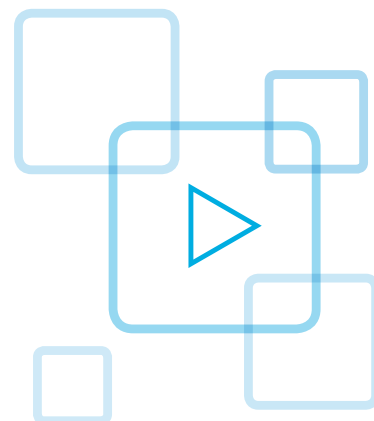
Associate Professor Tor Endestad

The fMRI group at the Center for Study of Human Cognition at UiO work with basic research related to cognitive functions. In 2009 a lot of the necessary piloting of projects and technical set up related to fMRI activities has been finalised.

The group is engaged in the study of memory and cognitive control. In one of the programs studies of early visual memory are combined with attention to better understand the building block of the human memory system. In addition memory errors (false memories) and the relationship between executive functions and impulse control are studied. Both patients with focal brain injuries and psychological disturbances are included in the research. In another line of projects studies of brain damaged patient address frontal lobe damage, hormone influence on cognitive functions.

Several projects with cooperation between the Centre and RH (FRONT, SOBER3, Cerebellum) were started in 2008 and continued in 2009. For all these projects data collection has been or are close to be finalized.

In addition to basic research, the group participate in the development of functional MRI as part of pre-surgical planning and improvement of neuropsychological diagnostics. In 2009 focus has been on memory encoding to provide data on temporal lobe function in Epilepsy patients.





Ongoing projects that continue in 2010:

PhD programs:

1. M.Sc. Markus Sneve
Can the brain make sense of nothing, fill in of the Blind spot
Principal Res: Tor Endestad, Svein Magnussen.
2. M.Sc. Markus Handal Sneve
Plasticity in the human visual system
Principal Res: Tor Endestad, Svein Magnussen.
3. M.Sc. Marianne Løvås, Ingrid Funderud
FRONT Frontal Lobe Injury and Cognition
Principal Res: Tor Endestad, Anne Kristin Solbakk, Magnus Lindgren.
4. M.Sc. Torgeir Moberget
Cerebellar damage and cognitive control
Principal Res: Tor Endestad, Stein Anderson.

Post Doc projects:

1. Post Doc Johanna Lind
Memory, genetics & brain imaging
2. Post Doc Thomas Espeseth, PhD Markus Sneve
Parametric BOLD activation in multiple object tracking: Prediction of individual differences in attentional performance

Master students:

1. Master student Erik Normann Andersen
Unconscious processing of emotions
Principal Res: Tor Endestad, Bruno Laing.
2. Master student Haakon Engen
Cognitive control, mood, brain function and genetics in major depressive disorder and healthy people
Principal Res: Tor Endestad, Nils Inge Landrø.
3. Master student Nils Breivik
SOBER Sex on brain European initiative
Principal Res: Tor Endestad, Ira Haraldsen.
4. Master students Dag Alnes and Merethe Hauge
Hippocampus and temporal lobe activation
Principal Res: Tor Endestad.
5. Master student Trine Elverum
Memory for trauma
Principal Res: Tor Endestad.

IMAGE PROCESSING, VISUALIZATION AND NAVIGATION

Professor Eigil Samset, PhD

Most minimally invasive procedures restrict the access and direct vision to the regions which require surgery. Such procedures require intra-operative image modalities such as ultrasound or endoscopic images to be able to monitor the surgery. In many cases this information is not sufficient to perform the procedure accurately and safely. Merging information acquired pre-operatively, mainly from for instance MRI, CT or PET, with intra-operative data can increase the basis for decisions and thereby improve the safety and accuracy of the procedure.

The image processing, visualization and navigation group develops cutting edge technological solutions which support minimally invasive procedures. As the title of the group indicates, the research focus is divided into three areas. Image processing methods are key elements in any software system which supports minimally invasive procedures.

In particular, we are focused on developing real-time image-segmentation and -registration methods where segmentation methods finds important anatomical structures such as tumors and vessel structures in images, while registration methods enables fusion of images. Visualization and navigation is required to present the medical images to the surgeon intra-operatively. We are developing visualization systems which use advanced techniques such as augmented reality and volume rendering for this purpose.

PhD programs:

1. M.Sc. Tangui Morvan (ARIS*ER Early stage researcher)

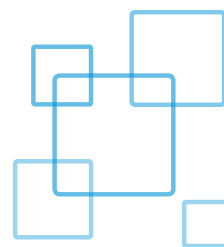
Development of general purpose algorithms for collision detection using GPU (Graphics Processing Unit)

Mentors: Eigil Samset, The Intervention Centre, Oslo University Hospital and Martin Reimers, Department of Informatics, University of Oslo.

2. M.Sc. Sergiy Milko (ARIS*ER Early stage researcher)

Automatic registration of Ultrasound and CT/MRI images

Mentors: Prof. Eigil Samset, The Intervention Centre, Oslo University Hospital and Timor Kadir, Siemens Magnet Technologies.



MATMED

Professor Eigil Samset, PhD

The project “*Mathematical and computational methods for co-registering multi-modal medical images*” (MATMED) is funded under the eScience program at the Norwegian Research Council for the period 2007–2011. It is a joint project between The Intervention Centre, Centre for Mathematics and Applications (CMA) at UiO and Center for Integrated Petroleum Research at the University of Bergen, and funds three PhD positions.

PhD programs:

1. M.Sc. Petter Risholm

Intra-operative deformable registration

Mentor: Prof. Eigil Samset, The Intervention Centre, Oslo University Hospital.

2. M.Sc. Eivind Lyche Melvær

Reconstruction of 3D images from free-hand 2D ultrasound

Mentors: Prof. Knut Mørken, CMA/UiO and Prof. Eigil Samset, The Intervention Centre, Oslo University Hospital.

3. M.Sc. Egil Bae

Image Segmentation and Reconstruction using level sets and graph cuts

Mentors: Prof. XueCheng Tai, CIPR/UiB and Prof. Eigil Samset, The Intervention Centre, Oslo University Hospital.

ENDOBRONCHIAL PROCEDURES

Arve Sundset, MD

This program has become a national program for the interventional bronchoscopy and treatment of airway lesions, including patients with lung cancer obstructing airways, patients with benign airway stenosis, and patients with airway complications following lung transplantation. This program also includes of EBUS-TBNA (endobronchial ultrasound-guided trans bronchial needle aspiration), a novel method of mediastinal staging in lung cancer, and diagnostic fine needle aspiration of mediastinal disease.

PhD programs:

1. Cand Med Kirill Neyman

Survival and quality of life following interventional bronchoscopy in patients with inoperable lung cancer

2. Cand Med Arve Sundset

Airway perfusion in lung transplant recipients, and treatment of ischemic airway complications following lung transplantation

MINIMAL INVASIVE VASCULAR SURGERY

Kirsten Krohg-Sørensen MD, PhD

The development of minimally invasive vascular surgery has been executed by a multi-disciplinary group in the combined angio/surgery suite at the Centre. The program has been focused on endovascular treatment of thoracic and abdominal aneurysms using endovascular stenting.

The team led by Kirsten Krohg-Sørensen, has performed repair of thoracic and aortic stent grafts successfully. One PhD program related to this project is planned. Contacts are being established to expand this program to more complex aortic pathology, including aortic arch pathology.

PAEDIATRIC CARDIAC INTERVENTION

Erik Thaulow MD, PhD

Oslo University Hospital has been a prime mover in the Norwegian initiatives to decrease the invasiveness of repair of cardiac defects in children. It is well known that cardiac surgery in the young can contribute to psychological and developmental difficulties which are concern for families of such children. The uses of non-operative methods are desirable to replace surgery, especially those procedures that require heart lung machine and circulatory arrest. Using the combined operating suites and the multi-specialty approach of The Intervention Centre, repair of atrial septal defects has now become a non operative procedure for most Norwegian children. Similarly, some patients with VSD can also be treated in a similar fashion. The Intervention Centre is now embarking, as one of the first centers in the world on the non operative replacement of the pulmonic valve in a certain group of children. A comprehensive program of evaluation of short and long term outcomes in these patients as well as cost considerations for individuals and society are under planning. One PhD program is focusing on the patient experiences.

The cooperation between The Intervention Centre and the Pediatric Clinic is the basis for further progress in interventional therapy. This relates both to practical arrangements, technical skills in The Intervention Centre staff and also broader support in developing these strategies.

IMAGE GUIDED NEUROSURGERY

Section manager Torstein Meling, MD, PhD

In 2007/2008, the operation room magnet was upgraded from an open magnet to a closed bore 3T MR for MR-guided neurosurgery. The Department of Neurosurgery performs the majority of its direct trans nasal, trans sphenoidal pure endoscopic pituitary surgeries in this 3T OR room. Furthermore, the activity has been extended to include brain tumor surgery. Since 2006, we have performed vascular neurosurgical procedures guided by angiography in our combined angiography-operation suite. The angio-suite was refurbished and fitted with state-of-the-art intra-operative angiography equipment from Siemens in 2007/2008, allowing rotational angiography with 3D representation intraoperatively. This will facilitate our work on vascular neurosurgery guided by angiography.

Main projects in cooperation with the advanced imaging group are:

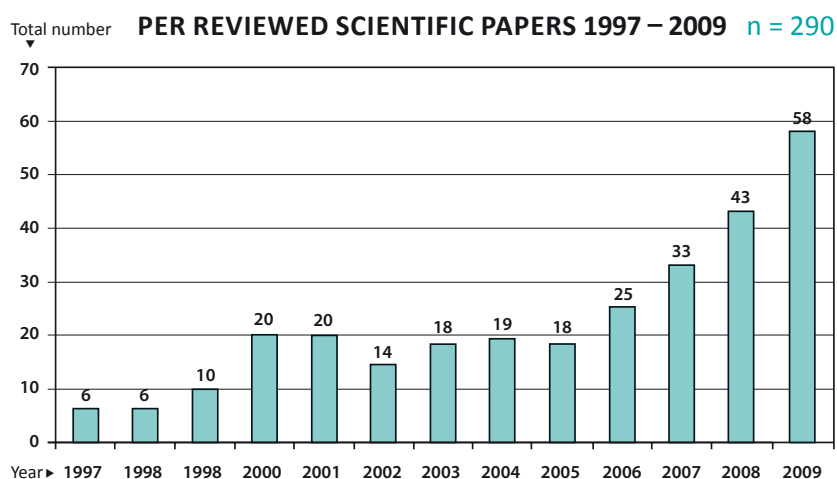
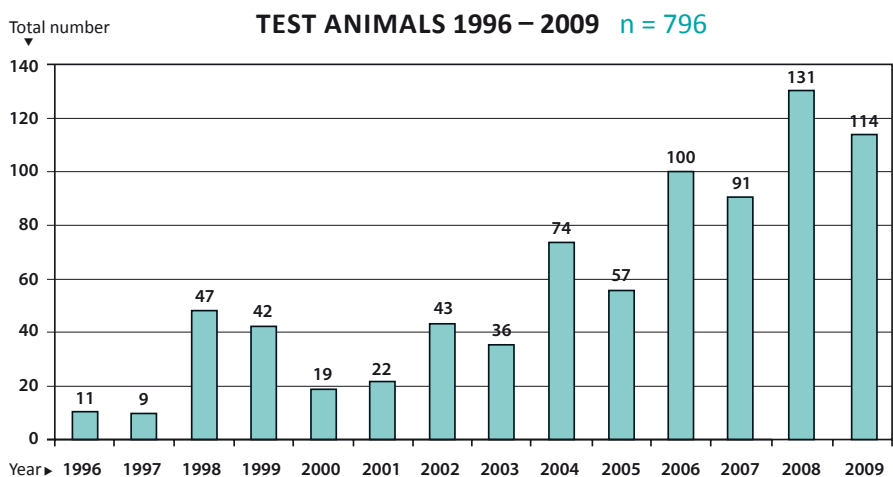
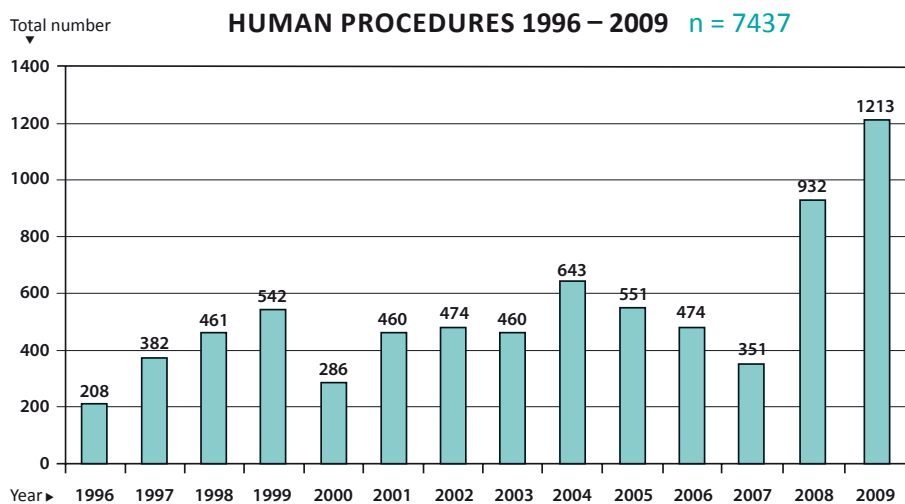
- A study on predictive value of 3T MRI characteristics in determining pituitary tumor consistency and hence suitability for transsphenoidal resection of macro adenomas
- Establishing intraoperative tractography/DTI in the 3T MR





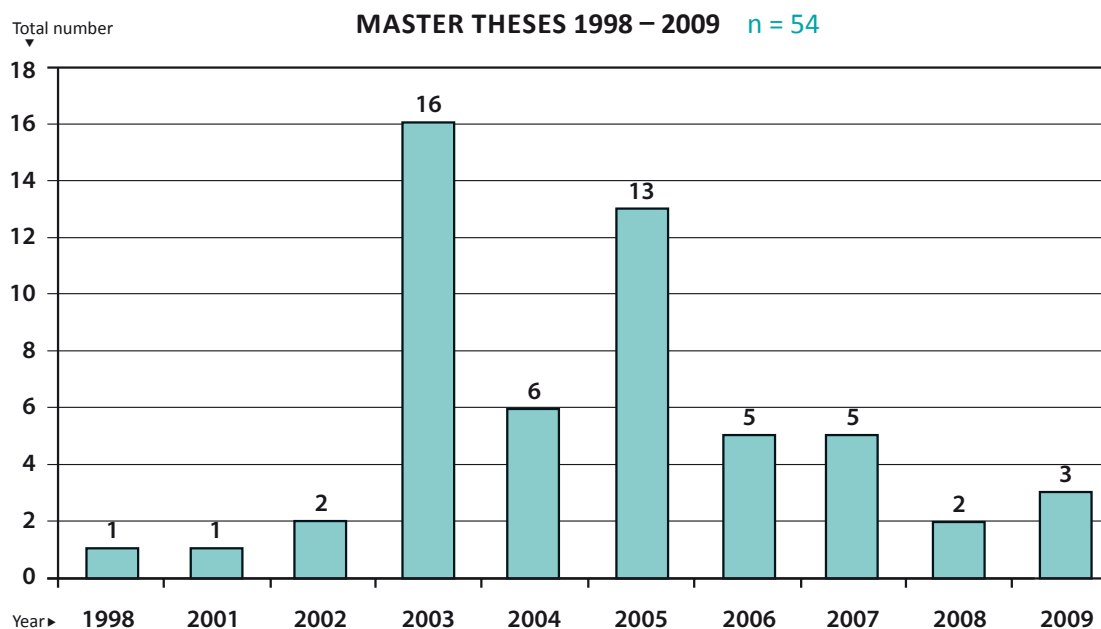
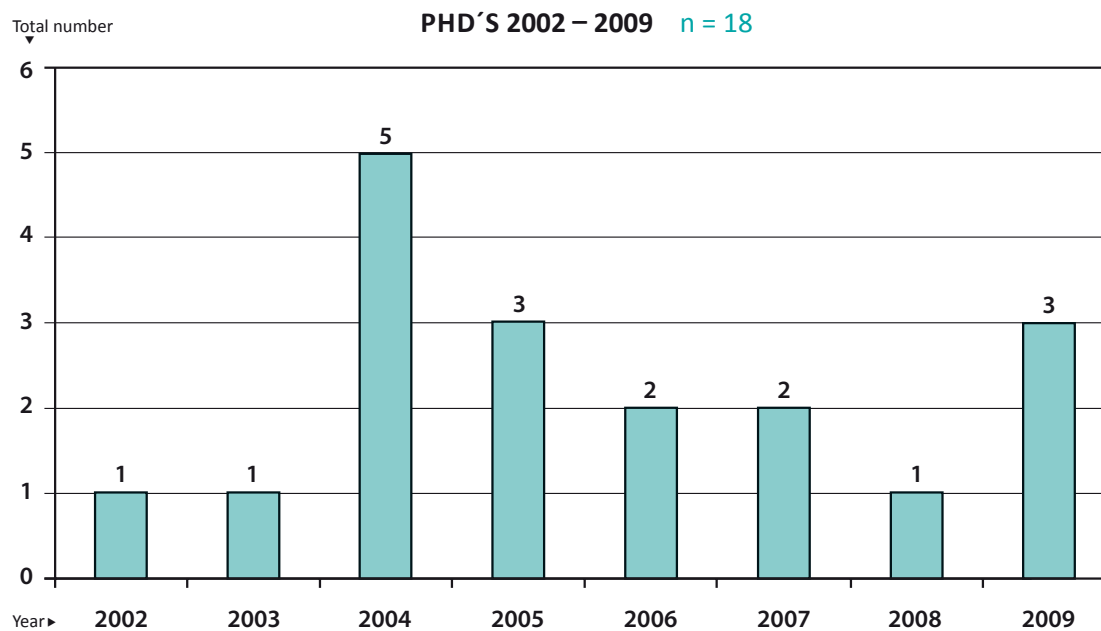
Scientific statistics

The Intervention Centre 2009



Scientific statistics

The Intervention Centre 2009



Budget and expenditures

The Intervention Centre 2009

INTERNAL HOSPITAL FUNDS ADMINISTERED BY THE INTERVENTION CENTRE IN 2009

	BUDGET	EXPENDITURE
Payroll expenses	13.394.000	
Other operating expenses	6.274.000	
Sum internal finance	19.668.000	20.031.000

EXTERNAL FUNDS ADMINISTERED BY THE INTERVENTION CENTRE IN 2009

SOURCE	INCOME	EXPENDITURE
Research Council of Norway	12.937.000	
Regional Health Authority	1.993.287	
European Commission	1.090.664	
University of Oslo	398.000	
National Heart and Lung Association	560.000	
Ministry of Foreign Affairs	2.000.000	
Norwegian Cancer Society	565.000	
Others	400.000	
Research-, and pending expenditures		19.686.630
Overhead		257.321
Balance	19.943.951	19.943.951

DRG INCOME GENERATED AT THE INTERVENTION CENTRE IN 2009

(80% compensation = 28.102 NOK/DRG point)

2009	N	CORR. WEIGHT	80% DRG VALUE	INCOME
Heart, Lung and Vascular Clinic	239	603,4	28102	19766946,8
Surgical Department	112	395,3	28102	11108720,6
ENT, Plastic & Gynaecology Surgery	16	52,3	28102	1469734,6
Women & Children Clinic	1	1,1	28102	30912,2
Orthopaedic Department	1	0,4	28102	11240,8
Other	10	130,6	28102	859921,4
All	379	1183,1	28102	33247476,4

Patents

The Intervention Centre 1998 – 2009

ACTIVE PATENTS (GRANTED)

PATENT NR.	TITLE	INVENTORS
EP 1063923	Method and device for suturless anastomosis	Sumit Roy, Erik Fosse
WO 0169130	Light system for use especially by operating theatre	Erik Fosse, Frode Lærum, Ole Jakob Elle
WO 0004386	Device for PCO ₂ detection	Tor Inge Tønnessen, Peyman Mirtaheri
WO 9211823	Filtering device for preventing embolism and/or distension of blood vessel walls	Frode Lærum
NO 20016385	System for monitoring changes in movements of an organ, preferably a heart muscle	Erik Fosse, Martin G. Gulbrandsen, Ole Jakob Elle
NO 20023605	Method and device for connecting two tubular organs	Erik Fosse, Ole Jakob Elle, Sumit Roy
US PCT/EP2008/058437	Method and kit for sweat activity measurement	Ørjan Grøttem Martinsen, Sverre Grimnes

PENDING PATENTS

PATENT	TITLE	INVENTORS
US PCT patent application: 2007	Method and apparatus for visualization of a flexible body	Egil Samset
US Patent: 20030114876	Device for use by brain operations	Egil Samset, Henry Hirschberg, Åge Kristiansen
IPCS 8 class: AA61 1B603FI; USPC class: 600425	Tumor grading from blood volume maps	Kyrre Emblem, Atle Bjørnerud
EP1632201 Implant. 5/10 2004	Implant	Bjørn Edwin, Erik Fosse
PCT/IB2007/050646 (also filed as EP1825839 "Implant" and WO2007/099500). 28/2 2006	Implant and method for its manufacture	Bjørn Edwin, Erik Fosse
PCT/EP2008/060837 (also filed as EP2027835 "Implant" and WO2009/024568 "Percutaneous abdominal implant"). 21/8 2007	Percutaneous abdominal implant	Bjørn Edwin, Erik Fosse
US 61/173494. Priority 28/4 2009	Percutaneous port for a continent ostomy	Bjørn Edwin
WO2009027522A1	Automated monitoring of myocardial function by ultrasonic transducers positioned on the heart	Ole Jakob Elle, Erik Fosse, Halfdan Ihlen, Andreas Espinoza, Lars Hoff
WO03061473A1	Use of sensor and system for monitoring heart movements	Ole Jacob Elle, Erik Fosse, Martin G. Gulbrandsen
US20080281214A1	Method for estimating cardiac pumping capacity	Ole Jakob Elle, Erik Fosse, Steinar Halvorsen
PCT/EP2009/055570. 8/5 2008	Vessel segmentation in DCE MR imaging	Atle Bjørnerud, Kyrre Emblem
Priority date: 3 April 2009 EPO filing number: 09157255.2	Computer aided diagnosis tools for longitudinal tumor monitoring	Atle Bjørnerud, Kyrre Emblem
Priority date: 27 May 2009 EPO filing number: 2009 2068	Method of identifying activated brain regions for a single subject	Glenn Lawyer, Atle Bjørnerud



Academic partners 2009

NATIONAL ACADEMIC PARTNERS

Centre of Mathematics for Applications, Faculty of Mathematics and Natural Sciences, University of Oslo

Prof. Knut Mørken

Mathematical methods supporting minimally invasive therapy in medicine.

Centre for Micro technology, Vestfold University College, Horten

Assoc. Prof. Henrik Jacobsen

Micro-heart.

Department of Computer and Information Science, Norwegian University of Science and Technology (NTNU), Trondheim

Bård Kjos, Prof. Richard Blake,

Prof. Hery Ramampiaro

Image processing, data graphics, medical journal indexing and search engines.

MSc student supervision.

Department of Electronics and Telecommunications, Norwegian University of Science and Technology (NTNU), Trondheim

Prof. Ilanko Balasingham,

Prof. Tor Ramstad, Prof. Andrew Perkis,

Prof. Geir Øien

Signal processing algorithms, wireless sensor network, multimedia patient record systems. Supervision of several MSc and PhD students.

Department of Engineering Cybernetics, Norwegian University of Science and Technology (NTNU), Trondheim

Associate professor Øyvind Stavdal

Robotic technique and ultrasound.

Department of Informatics, Faculty of Mathematics and Natural Sciences, University of Oslo

Prof. Knut Mørken, Prof. Jim Tørresen

CONNECT project.



Department of Informatics, Faculty of Mathematics and Natural Sciences, University of Oslo

Prof. Morten Dæhlen

MELODY project.

Department of Physics, Faculty of Mathematics and Natural Sciences, University of Oslo

Prof. Atle Bjørnerud

Neuro imaging.

Department of Physics, Faculty of Mathematics and Natural Sciences, University of Oslo

Prof. Sverre Grimnes,

Prof. Ørjan G. Martinsen

Bioelectrical properties of human tissue.

Development of a skin moisture sensor.

Two PhD programs.

Department of Psychology, Faculty of Social Sciences, University of Oslo

Assoc. prof. Tor Endestad,

Prof. Svein Magnussen

Cognitive function and fMRI.

Prof. Anders Fjell

MR morphometry and diffusion tensor imaging.

Institute of Psychiatry, UiO

Prof. Ole Andreassen

Neuroplasticity in patients with bipolar disorders.

St. Olavs Hospital, Norwegian University of Science and Technology (NTNU), Trondheim

Assoc. prof. Asta Håberg

New statistical methods for improved characterization of gliomas.

St. Olavs Hospital, Norwegian University of Science and Technology (NTNU), Trondheim

Prof. Hans Olav Myhre,

Prof. Ronald Mårvik

"Fremtidens operasjonsrom."

The School of Pharmacy, Faculty of Mathematics and Natural Sciences, University of Oslo

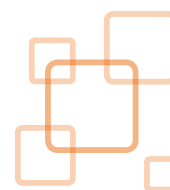
Prof. Jan Karlsen

Development of a radioactive gel for treatment of bowel tumours.

University Hospital Stavanger

Kathinka Kurz

Characterization of breast tumors using MR mammography.



INTERNATIONAL ACADEMIC PARTNERS

Department of Anaesthesiology, Massachusetts Medical Center, Boston, USA

Contact person: Prof. Babs Soller
Collaboration in the SAMPOS project
on optical pH-sensor.

Department of Radiology, Brigham and Women's Hospital, Harvard University, Boston, USA

Contact person: Prof. Ferenc Jolesz
Non-rigid image registration.
Perfusion mapping of tumours.

EURECOM, Sophia-Antipolis, France

Contact person: Prof. Raymond Knopp
MELODY project.

Fakultini Nemocine u sv. Anny Brne, Czech Republic

Contact person: Dr. Thomas Kara
IIIOS.

Graz University of Technology, Institute of Biomechanics, Center of Biomedical Engineering, Graz, Austria

*Contact person: Prof. Gerard Holzapfel,
Dr. David M. Pierce*
SCath.

Göteborgs Universitet, Institution för kliniska vetenskaper, Sweden

*Contact person:
Prof. Peter Thomsen, MD PhD*
Oostomy device.

Imperial College London, UK

*Contact person:
Professor Guang-Zhong Yang*
SCath.

Linköping University, Sweden

Contact person: Prof. Erik G Larsson,
MELODY project.

National Institute of ICT, Yokosuka, Japan

Contact person: Prof. Huan-Bang Li,
MELODY project.

Royal Institute of Technology, Stockholm, Sweden

Contact person: Prof. Mikael Skoglund
MELODY project

Sahlgrenska University Hospital, The ColoRectal Unit, Gothenburg, Sweden

Contact person: Prof. Leif Hultén MD PhD
Oostomy device.

School of Computer and Communi- cation Sciences, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland & Department of Electrical Engineering, University of California, Berkeley, USA

Contact person: Prof. Martin Vetterli
Collaboration in the SAMPOS and
WISNET projects on signal processing
in sensor nodes.

School of Electrical Engineering, Royal Institute of Technology (KTH), Stockholm, Sweden

Contact person: Prof. Erik Larsson
Collaboration in the SAMPOS project
on wireless sensor networks.

Technical University of Delft, The Netherlands

Contact person: Prof. Jenny Dankelman
IIIOS.

The Katholieke Universiteit Leuven, Belgium

*Contact person: Professor Jos Vander
Sloten, Mauro Sette*
SCath project.

University of British Columbia, Vancouver, Canada

Contact person: Prof. Victor Leung
MELODY project.

University of California San Diego, USA

Contact person: Prof Anders Dale
Novel methods for quantification of
tumor growth.

University of California Santa Barbara, USA

Contact person: Prof. Ken Rose,
MELODY project.

University of Dundee, UK

*Contact person: Professor Andreas
Melzer, Professor Sir Alfred Cushieri*
IIIOS.

University of Heidelberg, Germany

Contact person: Frank Zoellner
Novel statistical methods for predictive
modeling of tumor grade.

University of Homburg SAAR, Germany

Contact person: Professor Arno Bucker
IIIOS.

University of Lübeck, Germany

*Contact person: Professor
Hartmut Gehring*
IIIOS.

Universidad Politecnica de Madrid, Spain

Contact person: Prof. Enrique J. Gomez
SCath

Uppsala University, Sweden

Contact person: Prof. Anders Rydberg,
MELODY project.

Uppsala University, Sweden

Contact person: Prof Håkan Ahlström
MR based Quantitative perfusion
analysis.

Zürcher Hochschule für Angewandte Wissenschaften, Switzerland

*Contact person:
Professor Hans Wernher van de Venn*
SCath.

Commercial partners

ABB Corporate Research, Oslo, Norway

Contact person: Dagfin Brodtkorb
Collaboration in the SAMPOS and WISENET projects on robust wireless communications.

Acree AB, Göteborg, Sweden

Contact person: Dr. Michael Salter
Collaboration in the BWSN project.

ADIGO, Oppedgård, Norway

Contact person: Øyvind Overskeid
Collaboration on devices for laparoscopic surgery.

Alertis Medical AS, Oslo, Norway

Contact person: CEO Martin Krekling
Development of a pCO₂ sensor.
Five PhD programs.

Angiocam GmbH, Duisburg, Germany

Contact person: Ingo Krisch
SCath.

Cancer Cure as, Oslo, Norway

Gunnar Myhr, CEO
Collaboration for development of a system for targeted drug delivery under MR guidance. Other partners: Institute for Cancer research.

CorTechs Labs, San Diego, USA

Novel methods for quantification of tumor growth.

Endosense SA, Geneva, Switzerland

Contact person: Giovanni Leo
SCath.

Ericsson AB, Göteborg, Sweden

Contact person: Dr. Arne Alping
& Dr. Thomas Lewin
Collaboration in the BWSN project.

Exit Business Support Centre, Banja Luka, Bosnia

Contact persons: Zoran Gajic
Improving governance and interethnic cooperation in BIH through eHealth.

GE Healthcare, Stockholm, Sweden

Contact person: Dr. Bengt Nielsen
IIIOS.

GE Vingmed-Sound, Horten, Norway

Contact person: Gunnar Hansen
Development of ultra sound equipment for cardiology.

Healthy Pointers, Oslo, Norway

Contact person: Stian Aldrin
Pointing device for laparoscopic surgery.

Hospitality AS, Oslo, Norway

Contact person:
Mr. Flemming Bo Hegerstrøm
MELODY project.

IBM Healthcare, Kolbotn, Norway

Contact person:
Mr. Jan Fredrik Sagdahl & Frode Tveit
MELODY project.

Imego AB, Göteborg, Sweden

Contact person: Dr. Peter Björholm
Collaboration in the BWSN project.

Kongsberg SIM, Kongsberg, Norway

Contact person: Øyvind Rideng
Systems in Motion provides the project with a 3Dgraphics library.
Their responsibility in the project is parallelized 3D rendering.

Lifecare AS, Bergen, Norway

Contact person: Dr. Erik Johannessen
MELODY project.

Memscap AS, Horten, Norway

Contact person: Andre Larsen
Collaboration in the BWSN and WIREMED projects on MEMS based pressure sensors.

Millicore AB, Norrköping, Sweden

Contact person: Mikael Löfgren
Collaboration in the BWSN project.

MR:Comp, Gelsenkirchen, Germany

Contact person: Gregor Schaefer
IIIOS.

Multihopp Communications, Oslo, Norway

Contact person: Niels Aakvaag
Collaboration in the WISENET project on robust wireless communications.

NordicNeuroLab AS, Bergen, Norway

Development of comprehensive software package for advanced functional image analysis

Norwegian Computing Center, Oslo, Norway

Contact person: Dr. Wolfgang Leister
Collaboration in the SAMPOS project on security and authentication platform in wireless sensor systems.

Norwegian Defense Research Establishment (FFI)

Prof. Torleiv Maseng
& Prof. Svein Erik Hamran
MELODY project.

Novelda AS, Oslo, Norway

Contact person: Eirik Næss-Ulseth
Collaboration in the BWSN, WIREMED, and Medical Radar projects on ultra wide band impulse radio platform for medical communications and remote sensor.

Novosense AB, Lund, Sweden

Contact person: Karl-Johan Ohman
Collaboration in the BWSN project.

OstomyCure, Oslo, Norway

Contact person: Martin Johansson
Development of medical implants.

Phillips Medical Systems, Oslo, Norway

Contact person: Jørn Kværnes
Development of systems for MR-guided interventions and surgery.

Prosurgics Ltd, High Wycombe, United Kingdom

Contact person: Patrick Finley
Neurosurgical robot PathFinder.

Sectra AB, Linköping, Sweden
Integration of in-house developed software into hospital PACS.

Siemens Medical Imaging, Erlangen, Germany
Contact person: Lutz Bluhm
Integration of the Zeego angiographic system in the OR.

SimSurgery AS, Oslo, Norway
Contact person: M.D. Vidar Sørhus
Surgical simulator.

SINTEF Health, Trondheim, Norway
Contact person: Prof. Torill Nagelhus Hærnes
IIIOS.

SINTEF ICT, Oslo, Norway
Contact person: Dag Aussen
Collaboration in the WIREMED project on MEMS technology for implantable pressure sensors.

SINTEF ICT, Trondheim, Norway
Contact person: Knut Grythe
Collaboration in the SAMPOS project on QoS metric in wireless sensor network.

SORIN Group, France
Contact person: Dr. Renzo Dal Molin
MELODY project.

VTT Information Technology, Helsinki, Finland
Contact person: Marku Jennu
Collaboration in the BWSN project.



Publications

Scientific publications¹

¹ Scientific channels are journals, series and publishers that fulfill specific criteria given by the Norwegian register for scientific journals, series and publishers (NSD: www.dbh.nsd.uib.no/kanaler). There are two levels: **Ordinary publication channels** (level 1) and **highly prestigious publication channels** (level 2).

2009

Level 2

1. Emblem KE, Nedregaard B, Hald JK, Nome T, Due-Tønnessen P, Bjørnerud A.
Automatic Glioma Characterization from Dynamic Susceptibility Contrast Imaging: Brain Tumor Segmentation Using Knowledge-Based Fuzzy Clustering.
Journal of Magnetic Resonance Imaging 2009 Jul; 30(1): 1-10.
2. Gilbert M, Fosse E.
Inside Gaza's Al-Shifa hospital.
Lancet 2009 Jan 17;373(9659):200-2.
3. Hamidi V, Andersen MH, Oyen O, Mathisen L, Fosse E, Kristiansen IS.
Cost Effectiveness of Open Versus Laparoscopic Living-Donor Nephrectomy.
Transplantation 2009 Mar 27; 87(6): 831-8.
4. Kullberg J, Johansson L, Ahlstrom H, Courivaud F, Koken P, Eggers H, Bornert P.
Automated Assessment of Whole-Body Adipose Tissue Depots From Continuously Moving Bed MRI: A Feasibility Study.
Journal of Magnetic Resonance Imaging 2009 Jul; 30(1): 185-93.
5. Kvarstein G, Mawe L, Indahl A, Hol PK, Tennoe B, Digernes R, Stubhaug A, Tønnessen TI, Beivik H.
A randomized double-blind controlled trial of intra-annular radiofrequency thermal disc therapy – A 12-month follow-up.
Pain 2009 Oct; 145(3): 279-86.
6. Mathisen L, Lingaas PS, Andersen MH, Hol PK, Fredriksen PM, Sundet K, Rokne B, Wahl AK, Fosse E.
Changes in cardiac and cognitive function and self-reported outcomes at one year after coronary artery bypass grafting.
J Thorac Cardiovasc Surg 2009 Dec 15.
7. Walhovd KB, Fjell AM, Amlie I, Grambaite R, Stenset V, Bjørnerud A, Reinvang I, Gjerstad L, Cappelen T, Due-Tønnessen P, Fladby T.
Multimodal imaging in mild cognitive impairment:

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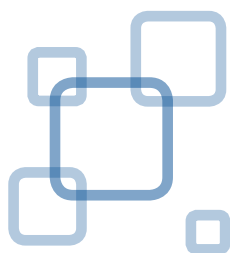
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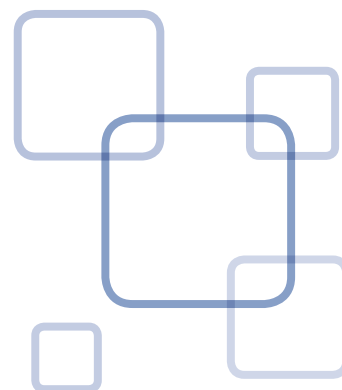
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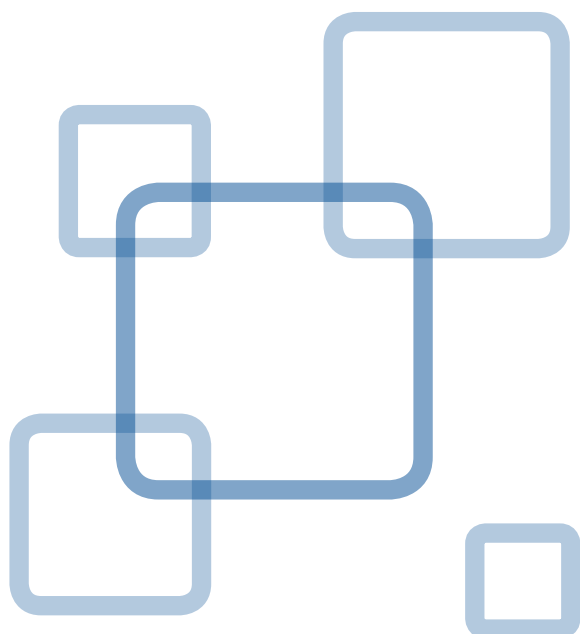
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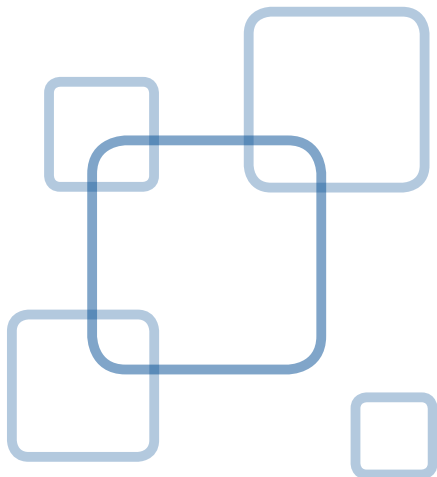
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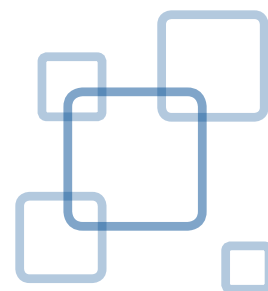
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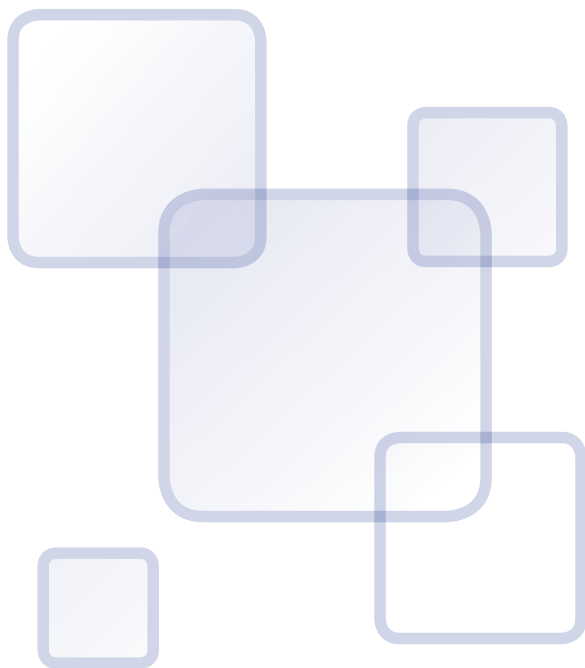
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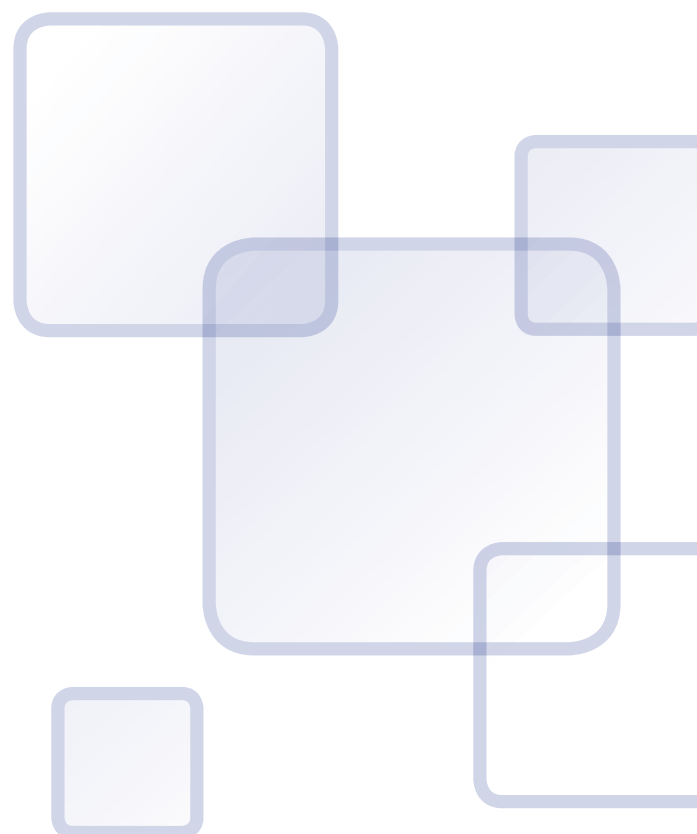
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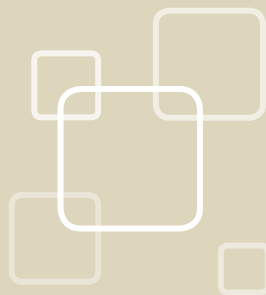
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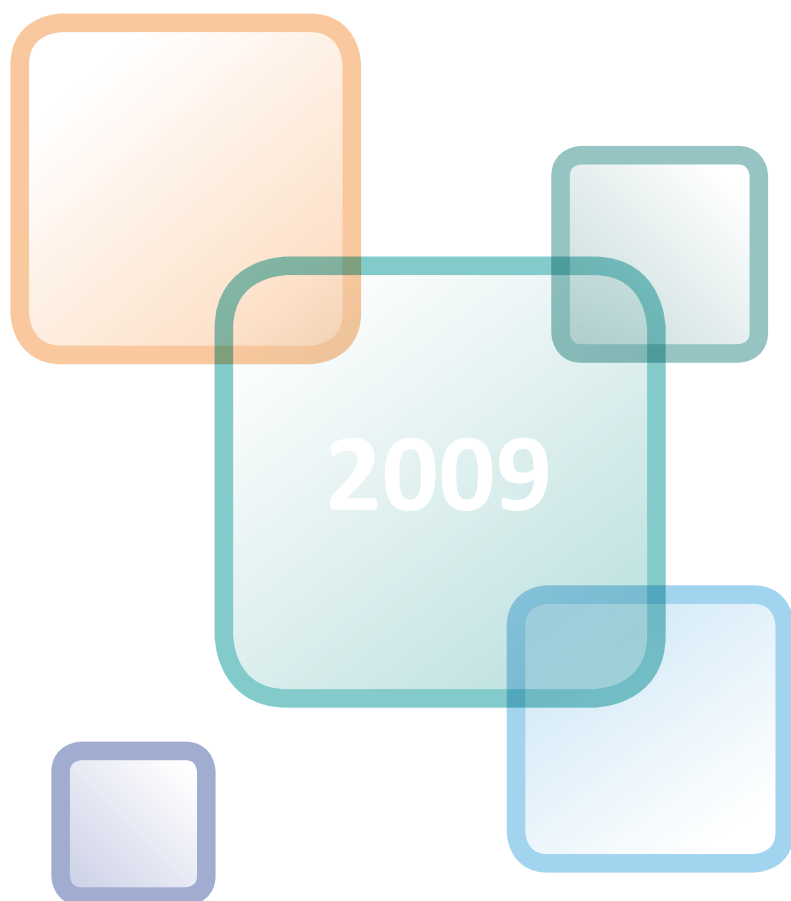


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