Open-Source Initiative for Perfusion Imaging – OSIPI

Welcome

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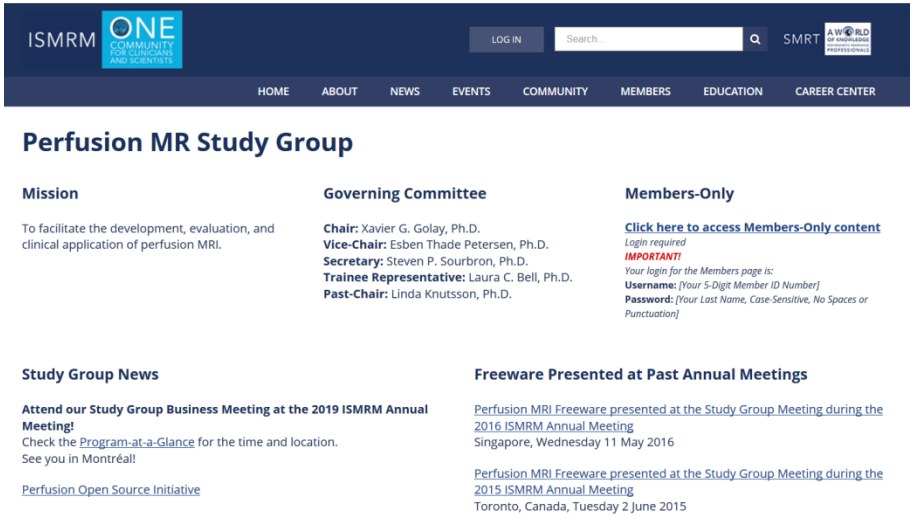
How it all began …

Perfusion Study Group :
Previous efforts on open-source sortware for perfusion (Fernando Calamante)



Meeting @ISMRM2018 on DICOM for Parametric maps

Andrey Fedorov & David Clunie (DCMQI),

Ina Kompan & Charlie Debus (DKFZ)

- Amendmend of DICOM Standard for Parametric Maps for Perfusion MRI
- Idea: This is bigger than just DICOM for storage of results!

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OSIPI is an initiative!

OSIPI brings together a community of researchers, developers and end-users of perfusion imaging software, working across the spectrum of perfusion methods and clinical/preclinical application areas. Together we will establish standardized and transparent perfusion image analysis by providing well-documented, benchmarked open-source software tools, reporting guidelines, as well as data and digital reference objects for software evaluation. Interaction and exchange will be promoted through a discussion platform.

- OSIPI is NOT software (framework) itself
- OSIPI is not limited to MRI
- OSIPI is not funded

Initiative by Laura Bell & Steven Sourbron: Perfusion Open-Source Initiative (POSI)

OSIPI newsletter: February 26, 2019

Dear colleagues,

Thank you for recording your interest to support the **Open Source Initiative for Perfusion Imaging**, or OSIPI, as it is now called. Steven and I have a few announcements we'd like to share with you about OSIPI's progress and ways we all can connect at ISMRM this May.

SAVE THE DATE! Get together in Montreal 2019.

Thanks to the gracious offer of Ives Levesque of McGill University we can announce a first face-to-face meeting of OSIPI in Montreal on **Friday, May 17th from 10:30 am - 12:45 pm**. The meeting will be an opportunity to get in touch with other developers of perfusion open source software, and will aim to pinpoint the objectives of OSIPI and develop plans for progressing the initiative over the next year. As we get closer to the date, we will publish the agenda on the website (see below!). There will also be an opportunity to demo existing open source software, DROs, or data.

- **Registration**: the meeting is free but **please register here** if you are planning to attend such that everyone can be properly accommodated for.
- **Presentations**: please contact Laura Bell (laura.bell@barrowneuro.org) if you would like to provide a demo.
- **Meeting venue** (https://goo.gl/maps/c8v74HyuQ8z): Cancer Centre, McGill University Health Centre, 1001 Decarie Blvd, Montreal, QC H4A 3J1
- **Local organiser**: Ives Levesque, PhD, Assistant Professor, Medical Physics Unit and MUHC Department of Medical Physics, McGill University

OSIPI Executive Management Board (EMB):

Executive Management Board

- **Charlotte Debus**, German Aerospace Center, Cologne, Germany (chair)
- **Andrey Fedorov**, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, USA (co-chair)
- **Amedeo Chiribiri**, King's College London, UK
- **Patricia Clement**, Ghent University, Belgium
- **Simon Lévy**, CRMBM, Faculty of Medicine, Aix-Marseille University, France.
- **Frank Zoellner**, University of Heidelberg, Germany
- **Laura Bell**, Barrow Neurological Institute, Phoenix, AZ, USA (ISMRM liaison)
- **Steven Sourbron**, University of Leeds, UK (ISMRM Perfusion study group liaison)

➢Define the structure of OSIPI

OSIPI Mission Statement

To promote the sharing of perfusion imaging software in order to eliminate the practice of duplicate development, improve the reproducibility of perfusion imaging research, and speed up the translation into tools for discovery science, drug development and clinical practice.

OSIPI aims to develop:

1. Inventory of complete open source packages for perfusion imaging analysis
2. Library of open-source functions, scripts and pipelines for perfusion imaging analysis.
3. Inventory of data for the evaluation of perfusion software.
4. Consensus guidelines for reporting image acquisition and analysis of perfusion imaging.
5. Platform for discussion and exchange between developers and users of perfusion software.
6. Benchmarks and application to existing software.

The EMB

- Acts as a steering committee for OSIPI
- Manage membership in the google group
- Define, refine and redefine the aims of OSIPI based on input from members.
- Create task forces based on suggestions from members and prioritising aims if needed.
- Ensure the consistency and coherence of OSIPI by coordinating between task forces
- Oversee and approve the external communication of OSIPI activities.

The Mission:

Mission Control:

➢**OSIPI is all of you!**

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The Concept of Task Forces

The overall purpose of task forces is to implement the aims.

Task forces are groups of OSIPI community volunteers with the interest and expertise in the subject matter of a specific aim, who are actively working towards development of the aim.

- single aim can have multiple task-forces, (number of tasks required to implement the aim)
- Proposal for task forces can arise from members of the community
- Task forces are “registered” with the EMB
- One or more leads, report to EMB about progress
- Open for participation by anyone in the OSIPI community at any time, (needs to be agreed on with existing members of task force)
- Task forces define their own scope and milestones
- When task is achieved, the task force may be closed, continued, or repurposed

Example: Taskforce 4.2 The DCE/DSC lexicon (Reporting guidelines)

- Lead: Ina Kompan (DKFZ)

Ina Nora Kompan
Software Development for Integrated Diagnostics and Therapy
5/17/2019 |

Perfusion Imaging DICOM Standard

dkfz. Research for a Life without Cancer

OSIPI Aim 4: Perfusion Analysis Lexicon
(https://osipi.org/about)

A joint effort of the perfusion community!

- What we provide:
  - Basic structure
  - Initial table entries
- What we plan:
  - Dynamically growing document
  - Editable by perfusion experts (list of contributors)
  - Version-controlled updates (pre-print)

If you want to contribute…here is what to do:
- http://bit.ly/perfusion-reporting
- Email via OSIPI-mailing with link
- Propose changes, add comments, discuss

Perfusion image analysis lexicon and reporting recommendations

I.Kompan[1], C. Debus[2], L. Bell[3], C. Quarles[3], D. Clunie[4], R. Floca[1], A. Fedorov[5], S. Sourbron[6]

[1] *Division of Medical Image Computing, German Cancer Research Center DKFZ, Germany*

[2] *Simulation and Software Technology, Department of High-Performance Computing, German Aerospace Center, Cologne, Germany*

[3] *Barrow Neurological Institute, Phoenix, AZ, USA*

[4] *PixelMed Publishing, LLC, Bangor, Pennsylvania*

[5] *Brigham and Women's Hospital, Harvard Medical School, Boston, MA, USA*

[6] *University of Leeds, UK*

Short URL for this document: http://bit.ly/perfusion-reporting

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Today is Lauchday…

- Give feedback!
  On the Aims and Mission
  On the Software Survey
- Check out open-source
  Live Demos
- Join a task force and contribute!
  Later with Steven
- Sign up!
  At home

3… 2... 1… 0!

#1. Develop a comprehensive inventory of complete open source packages for perfusion imaging analysis.

This is aimed at end-users looking for a suitable tool to process their data. The inventory will list available open-source tools, providing information that will help users to select a suitable tool, such as scope of application, methodology, level of validation, licence policy, transparency, user-friendliness, and reviews by other users.

#3. Develop an inventory of data for the evaluation of perfusion software

This is aimed at researchers looking for data to test their perfusion analysis methods, and at data owners who want to share data for secondary research. The inventory will provide a curated list of publicly available synthetic, phantom, preclinical and clinical perfusion datasets. Digital reference objects (DROs) and phantom data can serve as ground truth for perfusion analysis methods, and in-vivo data can be used to test algorithms in real-world conditions for robustness, reproducibility and practicality.

#2. *Develop a library of open-source functions, scripts and pipelines for perfusion imaging analysis*

This is aimed at developers of perfusion methods looking for specific functionality or development templates, or who want to share their own in-house developments with others. Contributions will be sourced from the community, and may include individual functions and more complete pipelines in various programming languages. OSIPI will organise these in a coherent and well-documented library structure, then identify and develop any missing functionality.

#4. Develop consensus guidelines for reporting image acquisition and analysis of perfusion imaging.

This will enable interoperability and facilitate the comparison of results produced by different analysis tools, studies or sites. We aim to harmonize and increase the detail in the description of parameters and configurations, enable encoding of the complete perfusion imaging workflow, and pave the way for consensus building. An important application will be the amendment of the DICOM standard for perfusion parametric maps, and development of demonstrations and use cases.

#5. Develop a platform for discussion and exchange between developers and users of perfusion software

Effective communication is a key prerequisite for the realisation of the aims, but also to ensure long-term sustainability of the initiative. Through the use of novel communication media and organisation of events, OSIPI will build an active community promoting networking, communication, guidance and discussion

#6. Development of benchmarks and application to existing software.

Using the data collected in aim #3, develop metrics that quantify the performance of a perfusion analysis tool (eg. bias and precision on DRO's, agreement with reference methods in-vivo, reproducibility on in-vivo data, processing time, …). These metrics will be measured for the software tools collected in aims #1 and #2 in order to establish a set of benchmarks. The long-term aim is to establish OSIPI as an independent arbiter for software solutions in perfusion imaging