

# Working Group Meeting 3 Dec 2018

KCL

## WG attendants:

At site:

Andrew Reader (KCL), Claudia Prieto (KCL), David Atkinson (UCL), Kris Thielemans (UCL), Evgueni Ovtchinnikov (STFC), Charalampos Tsoumpas (Leeds), Richard Brown (UCL), Martin Turner (STFC)

Remote:

Edoardo Pasca (STFC), Julian Matthews (Manchester), Nikos Dikaios (Surrey), Ben Thomas (UCL), Jeff Fessler (U Michigan), Ciprian Catana (MGH, Harvard), Martyn Winn (STFC), William Hallett (Invicro)

Apologies received:

Jo Hajnal (KCL), Paul Matthews (Imperial), Sébastien Ourselin (KCL)

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## Overview of past activities (Kris)

- Introductions
- Grant until 2020.
- MIC STIR 1-day course
- Various seminars (past and future)
- Data agreements - GE: same, Siemens: some progress (listmode, gantry offset etc)

## Exchanges (Julian)

- UCL exchange (Palak: Leeds). GE Signa PET/MR PET IO. Report still pending.
- Johannes Mayer. 2 weeks UCL in August
- Ashley Gilman. UCL and Leeds. Extended visit.
- Kris: still have money.
- Julian: repeated details for proposing future researcher exchanges.

## Software status for both CCP and Flagship (Evgueni/Kris)

- Evgueni
  - Image hierarchy underway (allows for synergism, converting from MR to PET)
  - Unified reconstruction framework with CCPi
  - Better Matlab/python integration with element-wise multiplication/division
  - Subset forward/backprojection for PET

- Parallel level sets anatomical prior (v1.1)
- Edoardo
  - Added CIL framework and regularisers to Superbuild
  - New VM with Ubuntu 18.04 (and updated Gadgetron/ISMRMRD)
  - Work on ACE package
  - Progress with Conda build (still stuck on Gadgetron)
- Ben
  - Azure and/or Terraform (STIR and SIRF). Used at PSMR2018 and MIC2018
- Richard - SIRFReg
  - More generic (for other registration packages)
  - Image hierarchy
  - Motion correction changes from STIR
- Palak
  - Comparison between STIR and GE Toolbox
- Johannes Mayer
  - Simulation framework (kinetics, respiratory and cardiac motion)
- STIR coming soon
  - TOF (Efthimiou et al.)
  - Bed position (Gillman et al.)
  - HKEM (Deidda et al.)
  - Block detectors (Khateri et al.)
- CCP PET-MR awards
  - Gold: Ashley Gillman, Silver: Ben Thomas, Bronze: Casper da Costa-Luis
- Deliverables: networking (only noted points of weakness)
  - More outreach activities required
  - GPU (decided to leave that to the individual packages)
  - Precompiled libraries

## Software plan

### Planned releases (Kris)

- Won't go through now given the audience has already agreed it.
- Showed roadmap on GitHub. Currently at 1.X.

### Supported systems and consequences for Continuous Integration (Kris)

- Which OS? 1st Linux, 2nd Windows, 3rd MacOSX. Many people who chose Windows/Mac also chose Linux.
- Which language bindings? 1st Python, 2nd MATLAB, 3rd C++.
- Which types of parallelism to exploit? 1st multithreading, 2nd GPU, 3rd MPI.

JM noted that we need to be careful of confirmation bias (people are used to it not working very well on Windows, and so now deem it less important. Doesn't actually reflect what they want.)

- Future supported languages
  - C++: C++11
  - Python: drop version 2.7
  - Matlab: ?

## Phantom sub-group

### Overview and past activities (Julian)

- Not much progress there. Call from JM for help from someone else.
- Curation of list of all phantom data required

## Patient Data

- Aim to provide (access to/interface to) small database
  - all raw "data" & manufacturer reconstructions
  - Difficulties:
    - no database infrastructure already in place.
    - Issues on ethics, GDPR, patient consent.

## Ethics conversation

- KT: Release of anonymised data does not constitute a breach of confidence.
- CP: need consent to be able to anonymise in the first place.
- CP&DA: Large databases of MR already available.

## Future initiatives

- STFC has a database initiative with infrastructure. Currently concentrating on physical sciences, but will likely look at human data. Consultation process with CCPs probably January.
- MRC has introduced Health Research Data UK (aimed at developing methods around data in medical research) has been introduced - <https://mrc.ukri.org/about/institutes-unitscentres/uk-institute-for-health-and-biomedical-informatics-research/>.
- Joint initiatives between MRC and ESRC on secure data and ethics.

## Anonymisation conversation

- GDPR must be adhered to with pseudo-anonymisation
- JM: Can only do pseudo-anonymisation, since true anonymisation is impossible (e.g., dates, site info, etc.)
- DA: Mentioned various different databases and how they handle patient data (fastmri.org, CRUK, some others). His feeling is that we need a data-sharing mechanism (automatic versus vetting process (to avoid robots)).
- JM: agree that we need to control how we share data. But need to think about who **owns** the data. Comes down to contract agreement, which may be explicit but often is not.
- AH: If, for example, there is a study with 1 female over 60, then even pseudo-anonymisation will allow for identification of patient. However, if there were 10 females over 60, then it would be impossible to identify patient and therefore data does not come under GDPR.
- DA: Question to AH - Who owns the data?
- AH: Tricky for research & normal NHS data. Purely research acquisitions are easier. Could cut face area to make data unidentifiable?
- KT: not possible, since we want raw data (listmode & k-space).
- AH: Not aware of other initiatives sharing raw data.
- KT: DPUK?
- AR: Realistic artificial data (with GANs)?
- KT: Similar initiative on using simulations already in place in Portugal: SimPET-WEB. Some info on <http://stir.sourceforge.net/MIC2018UsersMeeting/Pacheco-STIRUM2018-SimPET.pdf>
- KT: conclusion. we are in the realm of pseudo-anonymisation, so we need more exterior expert advice.
- AH: Could use images of ourselves as an exemplar to show other patients/ethics panels.

## Future events

### Planned journal publications (Evgueni + Kris)

- 1<sup>st</sup> SIRF paper – 50 years Computer Physics Comms. – Plan for Autumn.
- Flagship paper – Dynamic PET, MoCo and priors.

## Hackathon (Edo)

- Train new developers (Python only?)
- Port new algorithms (existing implementations to SIRF (python only?))
- Resolve mMR processing issues (finish image geometry)
- SIRFReg - finalisation and testing, start with MCIR in SIRF.

AR: w.r.t to Hackathon, do we need to send around requirements for new developers (required installed packages etc.)? Could we concentrate on Abi's synergistic recon?

## ISMRM 2019 (reproducible research group) (David)

- Possibly 20-minute “demo” of open-source software.

## MIC meeting 2019 (Harry)

- Short course 1 day
- Joint with CCPi
- Synergistic multi-modal and multi-spectral image reconstruction: methods & software.
  - Would like to invite keynote speakers.
  - Conference abstract submission – could be a way forward.
  - Julian: need to make clear differentiation from main conference.
  - Special issue – also good but would have to be to TRPMS.
  - Need PET, CCPi and MR people to help drive forward.

## Action items:

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