

# niQC SIG Meeting

At OHBM19 Rome

Led by Pradeep Reddy Raamana

# Goals of niQC SIG

- Develop protocols
  - Per use-case
  - Based on available evidence
- Corresponding **[easy to use]** tools
  - Reference implementation for peer-review
- Education for adoption
  - Rationale for protocols
  - Tool manuals
  - Workshops

# Progress so far

- niQC SIG formed at INCF in July 2018
- Meeting at INCF NI'18 in Montreal – summary:
  - Each participant described the challenges they faced (from various perspectives), as well the results from their own analyses.
  - Topics: neonatal data, crowdsourcing, lack of consistency, lack of public “rated”/labelled datasets (“ground truth” to develop algorithms).
  - Everyone agreed on the need for standards, easier to use tools and more educational materials.
  - A consensus was reached on running a survey to learn “who is doing what”.
- Built a website – thanks to Annibal Solon

Growing community:  
96 members  
as of today!

nCC (shared publicly) Settings

Topics · Top · Manage group · Manage members · Help

Sorted by name [Sort by join date](#) Showing 96 of 96 members

 ja.kozlowski@uic.edu joined Jul 20, 2019 (Member)	 adam@uic.edu joined Jul 19, 2019 (Member)	 mihailo@uic.edu joined Aug 1, 2019 (Member)	 jay@uic.edu joined Jul 19, 2019 (Member)	 david.hawley@uic.edu joined Jul 30, 2019 (Member)	 anastasiya@uic.edu joined Jul 19, 2019 (Member)	 shon.duchene@uic.edu joined Jul 27, 2019 (Member)	 helen@uic.edu joined Jul 31, 2019 (Member)	 shigehito@uic.edu joined Jul 20, 2019 (Member)	 jerry.john@uic.edu joined Jul 28, 2019 (Member)	 jared@uic.edu joined Jul 23, 2019 (Member)	 robert.singh@uic.edu joined Aug 1, 2019 (Member)	 greg@uic.edu joined Jul 19, 2019 (Member)
 walter@uic.edu joined Jul 19, 2019 (Member)	 luke@uic.edu joined Oct 1, 2019 (Member)	 shon.duchene@uic.edu joined Jul 19, 2019 (Member)	 alex@uic.edu joined Jul 23, 2019 (Member)	 ethan@uic.edu joined Jul 19, 2019 (Member)	 jay@uic.edu joined Aug 6, 2019 (Member)	 sean@uic.edu joined Jul 30, 2019 (Member)	 walter@uic.edu joined Sep 1, 2019 (Member)	 alexander@uic.edu joined Jul 19, 2019 (Member)	 thomas@uic.edu joined Jul 30, 2019 (Member)	 alex@uic.edu joined Aug 7, 2019 (Member)	 alexander@uic.edu joined Aug 6, 2019 (Member)	 alex@uic.edu joined Aug 28, 2019 (Member)
 amir@uic.edu joined Jul 21, 2019 (Member)	 arsal@uic.edu joined Oct 9, 2019 (Member)	 artemisa@uic.edu joined May 15, 2019 (Member)	 alex@uic.edu joined May 7, 2019 (Member)	 ben@uic.edu joined Feb 28, 2019 (Member)	 bob@uic.edu joined Jul 21, 2019 (Member)	 cory@uic.edu joined Aug 6, 2019 (Member)	 dave@uic.edu joined Mar 1, 2019 (Member)	 david@uic.edu joined Feb 13, 2019 (Member)	 dylan@uic.edu joined May 4, 2019 (Member)	 dmitry@uic.edu joined Aug 1, 2019 (Member)	 dylan@uic.edu joined Aug 1, 2019 (Member)	 edward@uic.edu joined Aug 1, 2019 (Member)
 elena@uic.edu joined May 10, 2019 (Member)	 elizabeth@uic.edu joined Feb 26, 2019 (Member)	 filip@uic.edu joined Aug 1, 2019 (Member)	 gabriel@uic.edu joined Feb 13, 2019 (Member)	 greg@uic.edu joined Feb 19, 2019 (Member)	 greg@uic.edu joined Jan 17, 2019 (Member)	 gabriel@uic.edu joined Feb 19, 2019 (Member)	 gus@uic.edu joined Feb 14, 2019 (Member)	 hali@uic.edu joined Feb 23, 2019 (Member)	 henry@uic.edu joined Apr 30, 2019 (Member)	 joe@uic.edu joined Jul 19, 2019 (Member)	 alex@uic.edu joined Jul 19, 2019 (Member)	 jana@uic.edu joined May 11, 2019 (Member)
 jay@uic.edu joined May 10, 2019 (Member)	 jon@uic.edu joined May 29, 2019 (Member)	 kyle@uic.edu joined Nov 1, 2019 (Member)	 kyle@uic.edu joined Aug 8, 2019 (Member)	 kyle@uic.edu joined Aug 1, 2019 (Member)	 kyle@uic.edu joined May 1, 2019 (Member)	 kyle@uic.edu joined Mar 4, 2019 (Member)	 kyle@uic.edu joined Aug 1, 2019 (Member)	 lisa@uic.edu joined Jan 2, 2019 (Member)	 laurent@uic.edu joined May 4, 2019 (Member)	 lee@uic.edu joined Feb 19, 2019 (Member)	 lei@uic.edu joined Sep 1, 2019 (Member)	 lee@uic.edu joined Jul 23, 2019 (Member)
 lily@uic.edu joined May 10, 2019 (Member)	 marc@uic.edu joined Aug 19, 2019 (Member)	 marc@uic.edu joined May 1, 2019 (Member)	 marie@uic.edu joined Apr 30, 2019 (Member)	 michael@uic.edu joined Feb 28, 2019 (Member)	 michael@uic.edu joined May 29, 2019 (Member)	 michael@uic.edu joined Aug 6, 2019 (Member)	 mike@uic.edu joined Feb 19, 2019 (Member)	 mohamed@uic.edu joined Aug 8, 2019 (Member)	 nora@uic.edu joined Aug 10, 2019 (Member)	 omar@uic.edu joined Mar 24, 2019 (Member)	 omar@uic.edu joined Aug 6, 2019 (Member)	 paul@uic.edu joined May 9, 2019 (Member)
 pavel@uic.edu joined Aug 9, 2019 (Member)	 pin@uic.edu joined Aug 9, 2019 (Member)	 pin@uic.edu joined Jul 19, 2019 (Member)	 ryan@uic.edu joined Feb 19, 2019 (Member)	 robert@uic.edu joined Mar 4, 2019 (Member)	 roman@uic.edu joined Feb 12, 2019 (Member)	 sean@uic.edu joined May 10, 2019 (Member)	 sean@uic.edu joined Aug 7, 2019 (Member)	 selma@uic.edu joined Aug 1, 2019 (Member)	 serena@uic.edu joined Aug 10, 2019 (Member)	 stephen@uic.edu joined Jul 29, 2019 (Member)	 tomas@uic.edu joined May 24, 2019 (Member)	 vira@uic.edu joined Feb 12, 2019 (Member)
 vlad@uic.edu joined May 15, 2019 (Member)	 vlad@uic.edu joined Oct 20, 2019 (Member)	 walter@uic.edu joined Sep 19, 2019 (Member)	 yasmin@uic.edu joined Sep 19, 2019 (Member)	 zuzka@uic.edu joined Feb 28, 2019 (Member)								

# Community status quo survey

- We ran a broad community survey
- To learn the status quo of niQC processes in the community!
- Reached out to over 10,000 members
  - Big thanks to OHBM and MICCAI
  - 74 responses!

# Summary of survey coming!

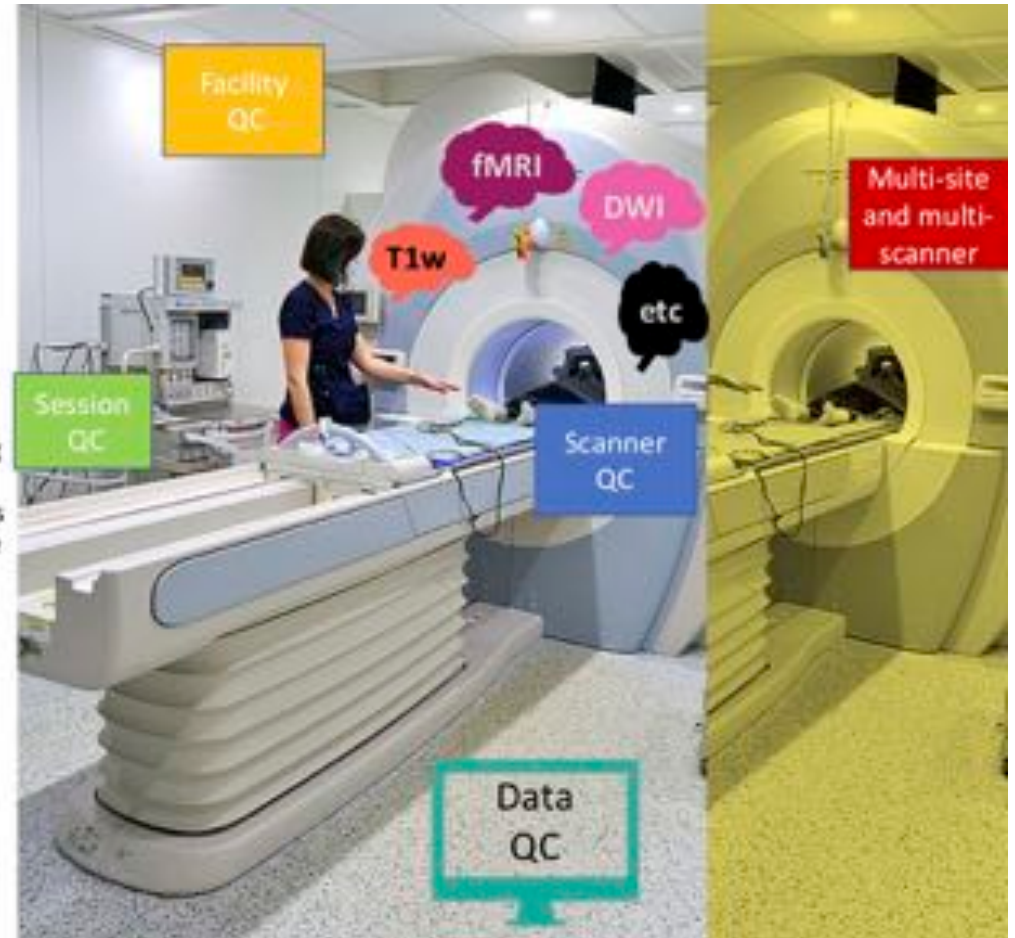
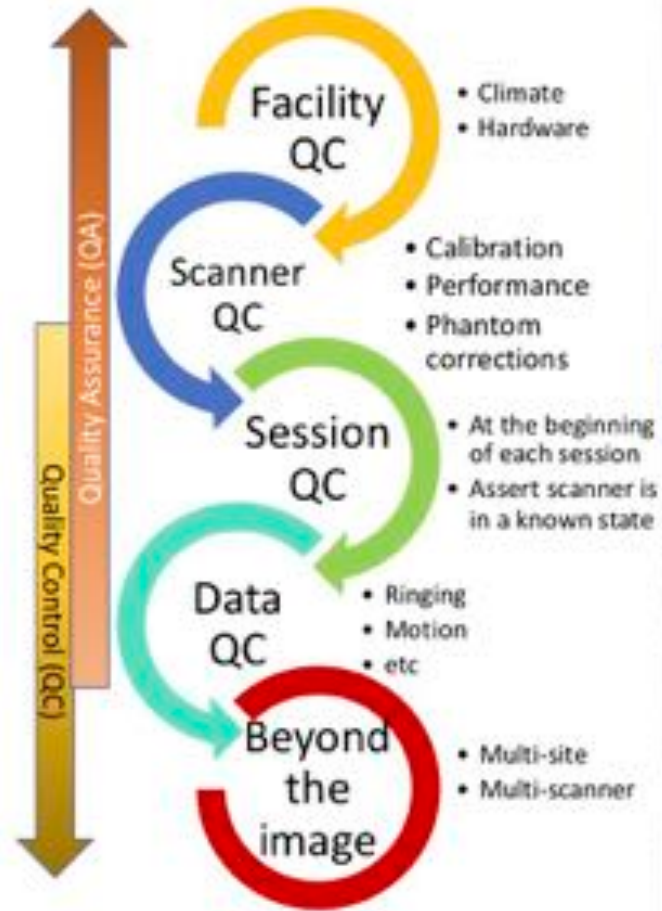
3 images are what they should be.	To ensure that scanner prob A visual inspection of the data before and after each preprocessing steps. Scripts that
7 neurotypical and ASD group	To remove bad images (e.g., We have 3 people who rate the images on a scale from 1 to 3. 1=accept, 2=edit suggest
2 evaluating preproc pipelines	Maximize sensitivity and spe See Chapter 4, <a href="https://espac">https://espac</a> We believe that every QC pipeline is unique and has to be
5 Outputs of Freesurfer	Correct any defect via semi- I verify any defect leading to misconstruction of whitepial surface, correct the adequate
3 Connectivity analysis and machine learning	To clean up the data and reg Use standard pipelines in softwares such as SPM and CONN
5 and give reports for researchers on the QC of their data	Monitoring health of equipme acquisition of images of test objects and post-processing of those images for QA. For G
2 QC of data	To check my own code, to a I want my processing code for my research to be QC'ed by myself and others. I first wr
1 MRIQC	measure movement, identify We first run visual inspection on all MRI sequences acquired looking for artifacts and en
3 several steps: registration, brain mask, gray-white-ctf	Flag MRI volumes that are n visual checks on each image A "visual check" is noting any inaccuracy (subtle or catast
7 pipeline. Historically this has been done with visual	To ensure the highest fidelity We do typical Freesufer edits and check as recommended by the Freesurfer group. We
2 and after preprocessing	check quality of acquisition (i convert dicom files, open each file and visualize it, for EPI files: visualization of the whole
3 AFNI fMRI analysis	reduce noise and artifacts AFNI has a script called @ss_review_driver that does a series of steps. We examine th
3 fMRI for cognitive imaging	Quickly ensure that the data Overlay of anat and fMRI images to detect mismatch examination of motion parameters
2 paedric MRI analyses	Exclusion of data with too m, T1; Visual inspection of imag rs-fMRI: Visual inspection + ( DTI: Visual inspection + Appl
5 morphometry	ensure my measures are no the segmentation pipeline go volumetric segmentation req careful visual assessment of
2 DPARSFA, FSL--on healthy subjects or	to ensure the sample is roug for fMRI, checks on head movement, normalization; on structural imaging, usually some
3 AFNI	Primarily to let the researche I don't understand this question. Is it about how the QC software is created, or about hor
2 gel phantom).	Monitor the temporal stability It is described in the preprint: <a href="https://www.biorxiv.org/content/10.1101/546564v1">https://www.biorxiv.org/content/10.1101/546564v1</a>
1 preprocessing pipeline.	To assess the quality of the Visual inspection of raw data in a structured manner and recording of poor quality, visua
1 before the realization of MRI for stereotactic frame	controls the distortion of the we needed a CQ for our new MRI --> Buy a software with the MRI --> carry out cqs for
2 the market in US and Europe	intended use for autonomou 1) Full traceability of each pixels / voxel of each patient and each expert contributing trul
2 T2w, diffusion MRI, rsfMRI), as well as all on the results	In all tasks there are 2 goals: depends on the task (and there are too many to list them all), but in general there are 2
5 tumors with various MRI protocols.	Validation of detection and se Standard segmentation ground truth validation
7 preprocessing, at all stages of the pipeline	picking up failed acquisitions MPRAGE conversion to NIf After segmentation and volumetry: check segmentation qu
3 volumetry	minimize systematic biases I three travelling brains with three cycles of volumetry and parameter mapping scans per
1 diseased brains (largely neurodegenerative disorders)	Our goal in QC is to provide We are building a corpus of metrics to generate automated flags of image quality in a sin
7 preprocessing structural T1 data	Identify segmentations that c After FreeSurfer recon-all has completed running on the entire dataset, I use VisualQC
4 optimization starting at basic image metrics up to a full	Choosing the optimal sequen Mainly mean and ISNR images, realignment parameters, t-values. But really depends on
2 MRI data.	make sure that data has goo Our QC start after preprocessed by SPM 12, information used were from re-alignment:
4 Preprocessing	Warrant high quality data, de Visual check, quantify via average maps, check variance maps.
1 Visual inspection MRIQC and FMRIPREP reports	Detect artifacts and exclude Inspect each hmi file from MRIQC and FMRIPREP per subject
7 Analysis of task functional data, acquired at 3T or 7T	Aligning as well as possible: I Alignments are done on the f Full alignment procedure involving more manual steps: one
4 and stroke patients	identify the ones that need to DICOM download check - is all steps above all steps above
3 QC in any large scale projects	identify bad subjects / centre run "standard" QC as described in the literature from raw data
2 statistical modelling of preprocessed data	to increase reproducibility an 1. Several general linear mo 2. GLMs are statistically ass 3. Group-level statistical infer
3 Diffusion MRI	Flag artifacts, flag outliers, c Automatic screenshots, bas We have a nextflow pipeline, singularity container doing th
7 studies	catch changes likely to affect adopted variation of adni QA protocol
5 QC/QA "cradle to grave"	Eliminate/identify errant data Establish "regular work flows" which have no human interaction leading to data in a com
5 artifacts (caused by noise, motion, etc) prior to any	To ensure the quality of the i (a) run the script that loads the images sequentially with Slicer or other softwares (b) ch
3 preprocessing: raw images, after brain extraction, after	Making sure that the data us Mainly visual inspection of images. Looking for anything anomalous. When something oc
5 analysis, image processing, ExploreASL	to increase reproducibility of We use several parameters, of which we aim to compare the performance. We will subr
2 functional MRI data.	it depends on what I am QC-Mostly this involves opening nfi files in some kind of image viewer and performing a vis
5 comparing pipelines	exclude data for analysis visual inspection, as well as sometimes extraction of SNR
5 manual inspection and mrqc	To make sure all data is ok t Manually going through each slice to determine severity of artifacts and deeming where

# Plans ahead and action items

- Curate the responses and summarize the survey
  - to define scope broadly and deeply
- Forming sub-groups per each modality or analysis!
- Running periodical tutorials
  - Most excited about this!
  - Via virtual conferencing
- Define terminology
  - Reuse or rely on COBIDAS
  - What is even a “protocol”?
- Define and refine “image quality metrics” (IQMs)
- Get everyone to share datasets and ground truth ratings

Take home message!

- QC is not what is just in the image!





# What do you get out of this?

- Publications
  - Each finalized document (protocol, education material etc) will be published
  - First big paper will be the survey!
  - Followed by progress in the sub-groups
- This SIG framework would allow everyone receive grants to solve their QC problems

Stay tuned

- Website: [incf.github.io/niQC](http://incf.github.io/niQC)
  - has an RSS News feed
- Subscribe to google group [niQC](#)