Application for QIBA Project Funding

Title of Proposal: Aggregated Measures of Agreement for QIB Validation: An Open Source Toolkit		
QIBA Committee/Subgroup: None (across group project)		
NIBIB SOW Objective which this project addresses: Objective 4		
Project Coordinator or Lead Investigator Information:		
Last Name: Barboriak	First Name: Daniel	Degree(s): MD
e-mail:	Tel #:	
Institution/Company: Duke University Medical Center		
Amount Requested:		

Project Description

The purpose of this project is to develop open source software to calculate aggregated measures of agreement in order to facilitate image analysis algorithm development, comparative analysis of algorithm output, and demonstration of technical compliance. This project leverages activities in the QIBA metrology effort, development of the QIBA DCE-MRI DROs and work on the open source QIBA DRO Evaluation Tool (QDET, Round 3 Project 9) to provide a toolkit which will support image analysis algorithm verification, a critical step in quantitative imaging biomarker (QIB) validation.

Primary goals and objectives

When different image analysis algorithms are tested against purported ground truth, they are generally found to derive QIBs with different levels of bias and precision. As was noted in the QIBA metrology effort, in this situation it may become challenging to determine which method has superior performance to another, and which methods have achieved adequate levels of performance to be useful in achieving the goals of the QIB Profile. Not infrequently, if an algorithm is tailored to maximize precision, biases may be introduced, and vice-versa. It would be helpful to have simple combined aggregate figures of merit to simplify algorithm evaluation. One barrier to this process of evaluation is that there is not easy access to these aggregated measures of statistical agreement, nor widespread facility in interpreting the results of these measures.

In order to address this specific barrier, we propose to develop an open source toolkit. It is important to note that this toolkit is designed to be valuable in the evaluation of not only the QIBA DCE-MRI DRO, but also many of the growing number of DROs being developed in the QIBA portfolio developed using an assumed ground truth; for example, QIBA FDG-PET DROs. By allowing matrices of nominal ground truth, means and squared errors to be used as input, this toolkit is also designed to extend t analysis using aggregated metrics to results derived from physical phantoms such as QIBA DWI phantom, T1 response phantom, and lesion simulation phantoms.