MICCAI 2015 – Computational Brain Tumor Cluster of Events (CBTC)

MICCAI 2015 Workshop and Challenges in Imaging & Digital Pathology

The Computational Brain Tumor Cluster of Event (CBTC) 2015 will be held on Oct 9 in Munich, Germany, in conjunction with **MICCAI 2015**. It will consist of a morning workshop and afternoon challenges. (see preliminary program here)

1. Workshop: Computational Precision Medicine II
2. Digital Pathology Nuclei Segmentation Challenge
3. Imaging and Digital Pathology Tumor Classification Challenge
4. Guess the Primary from Brain Mets Challenge

Please note important dates in the chart to the right of this page. The test phase for above challenges will be held prior to the meeting on September 1-7. Top three winners of each challenge will give brief presentations of their algorithms during the afternoon challenge sessions. Please check this site for information about access to the training and test website by July 8, 2015.

Registration: Participants in CBTC workshop and/or challenges may choose to register for the entire MICCAI conference or register at a reduced fee only for this event, listed under Satellite Events on **MICCAI 2015**.

Note: Registration to the workshop/challenge sessions on Oct 9th is a prerequisite for participation in the test phase of the challenge. Contestants should provide proof of registration in order to be allowed into the test phase of each challenge.

Questions about the workshop and challenges? Send email to: farahani@nih.gov

Date	Deadline / Event*
July 8	Training phase open for Challenges 1 & 2
Aug 1	MICCAI early bird registration deadline
Aug 10	Short papers (up to 4 pages) describing algorithms used in each challenge (1 & 2)
Sept 9-22	Test phase for Challenges (1 & 2)
Oct 5-9	MICCAI Conference (Munich, Germany)
Oct 9	CPMBT Workshop and Challenges (Munich, Germany)

* For a timeline for Challenge 3 see link in the Challenge 3 description

Workshop: Computational Imaging in Precision Medicine II

The goal of the 2nd workshop on computational precision medicine is to present and discuss basic requirements and current resources for open science approaches to the development of systems and benchmarking of tools for clinical decision support. This half-day workshop (8:00 am – 12:00 pm) will include invited talks and panel discussions.

Session 1 Theme: Review the feasibility of engaging stakeholders on an international scale from academia, government, and industry to develop an open source interoperable informatics research infrastructure for the evaluation of clinical support systems (clinical, digital pathology, pre-clinical imaging) and the technical requirements to meet this goal.

Session 1 invited speakers and panelists: D. Comanicui (Siemens, Germany); L. Clarke (National Cancer Institute, USA); A. Dekker (Maastro Clinic, the Netherlands), T. Fox (Varian, USA); J. Freymann (National Cancer Institute, USA); D. Hawkes (University College London, UK); R. Kikinis (Harvard University, USA); J. Saltz (Stony Brook University, USA), A. Shuali (Philips Healthcare, Israel)

Session 2 Theme: Topics of interest include reports of software challenges that target brain tumor segmentation and diagnosis. This session will have an emphasis on integration of Big Data, including imaging, 'omics', and other laboratory and clinical data, cloud-based computing, open archives, open science validation and bench marking of algorithms in support of precision medicine in the context of imaging and image-guided interventions.

Session 2 invited speakers and panelists: S. Bakas (U Penn, USA); C. Davatzikos (U Penn, USA); T. Fuchs (Memorial Sloan Kettering Cancer Center, USA); J. Kalpathy-Cramer (Harvard University, USA); J. Kleesiek (University of Heidelberg, Germany); B. Menze (Technical University of Munich, Germany); H. Muller (Techno Pole, Switzerland); B. Wiestler (Technical University of Munich, Germany)

Challenge sessions

The Test phase of challenges will be held online, Sept 1-7. On Oct 9th, three afternoon sessions will be dedicated to presentations by the top three teams ranked in each challenge competition.

Challenge 1: Segmentation of Nuclei in Digital Pathology Images

The characteristics of cancer nuclei are central components in many aspects of pathology classification and nuclear features, combined with "omics" have been shown by many research groups to be linked to patient outcome. Although there are many important and predictive features but characteristics of cancer nuclei are overall the most important. Virtually without exception, all commercial systems and academic groups in the digital Pathology area make use of nuclear segmentation algorithms. Given this, ability to segment and then classify nuclei is a key task and a very appropriate challenge topic.

The reference standard will be pathologist generated nuclear segmentation on select regions of TCGA Glioma whole slide images for the challenge.

The contestants will be tasked with applying their segmentation algorithms, previously trained on the training data, to segment all nuclei in a tile region. Their results will be submitted online and compared with consensus pathologist segmented sub regions. Winners will be ranked based on their nuclei segmentation best matching the reference standards.

Visit http://miccai.cloudapp.net/competitions/ to access data and evaluation platform for this challenge.

Challenge 2: Combined Imaging and Digital Pathology Primary Tumor Classification

This challenge will help bring expertise in image processing in digital pathology and radiology closer by working on a single task of tumor classification. In the long term this type of collaboration will help reduce discordance and increase diagnostic accuracy of brain tumors. In addition, by computationally encompassing both digital pathology and clinical brain tumor MRI as resources in this Challenge it may generate a result that could contradict present-day classification orthodoxies of tumor stage and aggressiveness that have to date been primarily based on subjective histopathology observations.

Contestants will be allowed to use algorithms of their choice to classify brain tumors into low grade II and low grade III gliomas. They may choose to perform segmentation to extract relevant information from pathology and imaging data. The reference standards will be the result of segmentations performed by expert neuro radiologist and neuropathologist. Winners will be ranked based on the most number of correct tumor classifications derived.

Visit http://miccai.cloudapp.net/competitions/ to access data and evaluation platform for this challenge.

Challenge 3: Guess the Primary

The overall objective of this challenge is to study imaging phenotypes of metastatic disease originating from different primary cancers in the body. We challenge the image segmentation community to determine if primary cancers create distinct imaging signatures that can be automatically detected with segmentation algorithms. The impact of successfully predicting the histology of the primary tumor based on features of the brain metastasis would be to provide a biological insight into brain tumor imaging and segmentation that could result in improved clinical treatment decisions.

Through this exercise, we will develop algorithms that will advance segmentation methods for metastatic cancer in the brain. Using one or more of these algorithms, we hope to gain insight into the underlying biology and growth patterns of metastatic lesions and perhaps, their proclivity to seed and grow differently based on the inherent phenotype they carry with them from the primary cancer organ/site. An additional objective will be to develop image processing algorithms that segment, process and analyze MRI sequences for brain metastasis.

Visit https://www.synapse.org/#!Synapse:syn4112414/wiki/ to access further information for this challenge.

Abstract Submission [Deadline extended]: Workshop speakers and participants in challenges are asked to provide abstracts of their presentations (1 page) or computational algorithms (up to 4 pages) by **Aug 10.** PDF submissions (free formatted, journal style, and double-spaced) should be sent to **farahani@nih.gov**

Challenge participants will have an opportunity to revise their abstracts by Sept 18, following the completion of the Test Phase.

Organizing Committee

- Keyvan Farahani, National Cancer Institute
- Larry Clarke, National Cancer Institute
- John Freymann, Leidos Biomedical Research
- Carl Jaffe, Boston University
- Jayashree Kalpathy-Cramer, MGH Harvard
- Justin Kirby, Leidos Biomedical Research
- Arno Klien, Sage Bionetworks
- Karim Lakhani, Harvard Business School
- Bjoern Menze, Technical University of Munich
- Tahsin Kurc, Stony Brook Cancer Center
- Russell C. Rockne, City of Hope Cancer Center
- Joel Saltz, Stony Brook Cancer Center
- Ashish Sharma, Emory University
- Andrew Trister, Sage Bionetworks