

# AI unmet needs in brain tumor: clinical perspectives and discussion points

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Artificial intelligence (AI) is a useful tool to augment clinical practice and research in brain imaging. Application of AI requires domain knowledge of medical and technical perspectives. Collaboration among researchers with expert domain knowledge is essential to efficiently adopt technique in actual medical situation. In this talk, we try to share our experience of collaboration by illustrating unmet needs in brain tumor imaging and our efforts to solve them.

Application of AI can be divided into four groups- image reconstruction, segmentation, detection, and classification. In brain tumor imaging, image reconstruction is useful when MRI can be transformed to CT or vice versa. Robust segmentation is essential in extracting quantitative imaging features. Detection is useful for detecting small metastatic lesions before radiosurgery. Classification can be applied in various topics for differential diagnosis, molecular/genomic classification, or histopathologic subtyping. The demonstrable published papers and our experience will be shown. Also discussion points in regard with performance index and data sharing will be touched.

## Learning Objectives

To learn potential and feasible clinical applications of AI in brain tumor imaging

Target Audience

Researchers who are interested in research collaboration among different expert domain knowledge

Keywords : Artificial intelligence, Brain tumor

# AI in Neuroimaging Research and Technical Perspective in Collaboration

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Deep learning techniques have already demonstrated high performance in the tasks of classification and segmentation. Unlike traditional handcrafted feature-based approaches, deep learning based approaches self-learn the informative features directly from a database. Such a data-driven approach might provide an efficient robust method for brain imaging and neuroscience discovery. In this presentation, we will take an overview of the general deep learning techniques, and demonstrate our collaboration studies based on deep learning in neuroimaging – tumor, stroke, and vascular imaging. Moreover, we will discuss future considerations of the technical aspects of neuroimaging in collaboration.

Keywords : Neuroimaging, Classification, Segmentation, Deep learning, Artificial intelligence

## HeLP Challenge: Inviting multiple research groups to develop better algorithms

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In this paper we report the set-up and results of the Healthcare AI Learning Platform (HeLP) challenge. In the HeLP challenge, we will host data consisting of medical images (i.e., CT, MRI, digital pathology images) and corresponding clinical information. The goal of the HeLP challenge is to apply an open science, crowdsourced approach to developing algorithms for several segmentation and classification tasks.

The HeLP challenge will utilize deidentified medical images and clinical datasets made available for research by Asan Medical Center. Challenge participants will use this data to develop segmentation or classification models that address the specific questions posed by challenge organizers (sub-contest). Four sub-contests were defined: 1) brain tumor segmentation, 2) cardiac segmentation, 3) stroke onset time classification, and 4) breast cancer classification on frozen pathology. The submitted models will be objectively scored using a test set (that Challenge participants are unable to access), with scores posted on the challenge leaderboard. For each sub-contest, the challenge participant or team with the best performing algorithm will be declared the (1st and 2nd) winners and the cash prize will be awarded. After winners of all sub-contests were declared, they will be invited to participate in the challenge wrap up workshop. At the workshop, each team will be invited to present their method and results and the best presenters will award GPUs for the deep learning development. All winners (or more participants) will be invited to co-author a publication describing the results of the challenge analyses and highlighting their team methodologies and results.

Keywords : Segmentation, Classification, Challenge, Open science, Deep learning