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RSNA-ASNR-MICCAI Brain Tumor Segmentation (BraTS) Challenge 2021

The **Brain Tumor Segmentation (BraTS) challenge** celebrates its **10th anniversary**, and this year is jointly organized by the **Radiological Society of North America (RSNA)**, the **American Society of Neuroradiology (ASNR)**, and the **Medical Image Computing and Computer Assisted Interventions (MICCAI)** society.

The **RSNA-ASNR-MICCAI BraTS 2021** challenge utilizes multi-institutional pre-operative baseline multi-parametric magnetic resonance imaging (mpMRI) scans, and focuses on the evaluation of state-of-the-art methods for (**Task 1**) the **segmentation** of intrinsically heterogeneous brain glioblastoma sub-regions in mpMRI scans. Furthermore, this BraTS 2021 challenge also focuses on the evaluation of (**Task 2**) **classification** methods to predict the MGMT promoter methylation status.

Participants are free to choose whether they want to focus only on one or both tasks.

Important Dates

	(All deadlines are for 23:59 Eastern Time)
1 July	Registration opens (Task 1: Segmentation)
7 July	Task 1 Training Phase starts: (Release of training data + associated ground truth).
15 July	Task 2 Launch (Registration & Training phase starts)
30 July	Validation phase (Release of validation data, with hidden ground truth).
20 Aug	(Extended) Submission of short papers, reporting method & preliminary results.
3 Sep.	Contacting methods top-ranked in validation phase, to prepare slides for oral presentation at MICCAI.
4 Oct.	Challenge at MICCAI. Presentation of top-ranked validation phase methods.
20-30 Oct	Final ranking phase on unseen testing data.
29 Nov	Challenge conclusion at RSNA 2021. Announcement of top 8 ranked teams & distribution of awards.
12 Dec	Extended Camera-Ready LNCS paper submission deadline.

| | (All deadlines are for 23:59 Eastern Time) |

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Clinical Relevance

Glioma, and particularly glioblastoma, and diffuse astrocytic glioma with molecular features of glioblastoma (WHO Grade 4 astrocytoma), are the most common and aggressive malignant primary tumor of the central nervous system in adults, with extreme intrinsic heterogeneity in appearance, shape, and histology. Glioblastoma patients have very poor prognosis, and the current standard of care comprises surgery, followed by radiotherapy and chemotherapy. MGMT (O[6]-methylguanine-DNA methyltransferase) is a DNA repair enzyme that the methylation of its promoter in newly diagnosed glioblastoma has been identified as a favorable prognostic factor and a predictor of chemotherapy response. Thus determination of MGMT promoter methylation status in newly diagnosed glioblastoma can influence treatment decision making.

The International Brain Tumor Segmentation (BraTS) Challenges —which have been running since 2012— assess state-of-the-art machine learning methods used for brain tumor image analysis in mpMRI scans.

https://www.med.upenn.edu/cbica/brats2021/

Usability 8.8 License Data files © Original Authors Tags business, earth and nature, health

Description

Description

Ample multi-institutional routine clinically-acquired multi-parametric MRI (mpMRI) scans of glioma, with pathologically confirmed diagnosis and available MGMT promoter methylation status, are used as the training, validation, and testing data for this year's BraTS challenge.

Specifically, for Task 1 the datasets used in this year's challenge have been updated, since BraTS'20, with many more routine clinically-acquired mpMRI scans. Ground truth annotations of the tumor sub-regions are created and approved by expert neuroradiologists for every subject included in the training, validation, and testing datasets to quantitatively evaluate the predicted tumor segmentations.

Imaging Data Description

All BraTS mpMRI scans are available as NIfTI files (.nii.gz) and describe a) native (T1) and b) post-contrast T1-weighted (T1Gd), c) T2-weighted (T2), and d) T2 Fluid Attenuated Inversion Recovery (T2-FLAIR) volumes, and were acquired with different clinical protocols and various scanners from multiple data contributing institutions. We intend to release the associated de-identifed DICOM (.dcm) files after the conclusion of the challenge.

All the imaging datasets have been annotated manually, by one to four raters, following the same annotation protocol, and their annotations were approved by experienced neuro-radiologists. Annotations comprise the GD-enhancing tumor (ET — label 4), the peritumoral edematous/invaded tissue (ED — label 2), and the necrotic tumor core (NCR — label 1), as described both in the BraTS 2012-2013 TMI paper and in the latest BraTS summarizing paper. The ground truth data were created after their pre-processing, i.e., co-registered to the same anatomical template, interpolated to the same resolution (1 mm3) and skull-stripped.

Comparison with Previous BraTS datasets

This year we provide the naming convention and name mapping between the data of BraTS'21-'17, and the subjects used from the data collections of TCGA-GBM, TCGA-LGG, IvyGAP, and CPTAC-GBM, available through The Cancer Imaging Archive (TCIA) to further facilitate research beyond the directly BraTS related tasks.

Conditions for Use

Challenge participants must abide by the guiding principles for responsible research use and data handling within the Synapse Commons Platform as described in the Synapse Governance documents and by the Challenges Official Rules.

Publication embargo:

Use of Challenge results in a publication by Challenge participants is permitted if it is restricted to the results of your Challenge method and your Team ranking. Additionally, you agree not to report overall Challenge results or any analysis of the overall results until the organizers and Challenge participants have jointly published (or pre-published) an overview paper on the results from the RSNA-ASNR-MICCAI Brain Tumor Segmentation (BraTS) Challenge and the best performing strategies used in the Challenge. You will be contacted through your Synapse-affiliated email address when this condition has been met. This information will also be posted within this Synapse project.

Acknowledgement:

Challenge participants are permitted to use, publish and present the Challenge results, after the embargo period, provided they acknowledge the BraTS challenge organizing members as follows: "Data used in this publication were obtained as part of the RSNA-ASNR-MICCAI Brain Tumor Segmentation (BraTS) Challenge project through Synapse ID (syn25829067)."

Use of Data Beyond BraTS:

Participants are NOT allowed to use additional public and/or private data (from their own institutions) for extending the provided BraTS data, for the training of the algorithm chosen to be ranked. Similarly, using models that were pretrained on such datasets is NOT allowed. This is due to our intentions to provide a fair comparison among the participating methods. However, participants are allowed to use additional public and/or private data (from their own institutions), only if for scientific publication purposes and they explicitly mention this in their submitted manuscripts and also report results using only the BraTS'21 data to discuss potential result differences.