

Dear CHAOS participants,

This document explains the critical rules and details about submissions. Each participant/team must use the same format for their results. A fully automated script will handle the evaluation so, using the same format is obligatory.

1) About Data

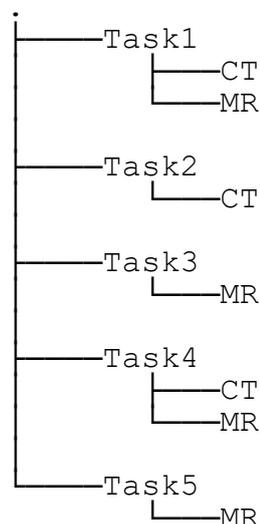
There are two different modalities in the dataset, CT and MR (T1DUAL and T2SPIR sequences). Each modality contains 40 different patients' upper abdomen images. The CT and MR data were divided into two groups which are train sets and test sets:

- **CT Train Sets:** [1,2,5,6,8,10,14,16,18,19,21,22,23,24,25,26,27,28,29,30]
- **CT Test Sets:** [3,4,7,9,11,12,13,15,17,20,31,32,33,34,35,36,37,38,39,40]
- **MR Train Sets:** [1,2,3,5,8,10,13,15,19,20,21,22,31,32,33,34,36,37,38,39]
- **MR Test Sets:** [4,6,7,9,11,12,14,16,17,18,23,24,25,26,27,28,29,30,35,40]

The train sets contain both anonymized DICOM images and their ground truth (reference) images as PNG file series. The test sets contain only anonymized DICOM images.

2) Result Submission Format

The result submission format template is shared as a separate zip file. The file tree of the template (CHAOS_submission_template_new.zip) is showed below:



Please unzip the file first. The empty folders are ready to save PNG file series. Participants need to save their results into the empty folders as same as the template. You may join the challenge for single or multiple tasks. The only thing that is necessary is filling the folders under specific task. Please **do not create any folder** and **not remove any empty folder** from the template even you want to submit for a specific task. Let remaining task folders empty. Otherwise, the evaluation script may give an error.

3) About the PNG files

The results must be exported as **8-bit grayscale PNG** file series which are as same as ground files in the training set. The intensity values of organs for each modality are presented in Table 1.

Table 1: Pixel values of organs in segmentation results. (*x* represents an arbitrary pixel value.)

	CT	MR
Liver	$x > 0$	$x = 63$ (55<<<70)
Right kidney	-	$x = 126$ (110<<<135)
Left kidney	-	$x = 189$ (175<<<200)
Spleen	-	$x = 252$ (240<<<255)
Background	Other values	Other values

For MR results, pixel values of organs are defined by a range, as shown in Table 1 because there might be slight changes while saving the PNG files. Please check your results before sending.

4) Order of the PNG files

The order of the PNG files is critical. They must have the same order as .dcm files in *Dicom_Anon* folder. The orientation of the results is determined by **only file names** of .dcm files, not by the tags inside of DICOM header. If you are using a library such as ITK, it can import the data in the reverse order. Please be careful about this situation while exporting your results.

Please use sequential names for your file series as the training set. It is recommended to use three digits padding. For example, {*result001.png, result002.png, ... result120.png*} is a preferred file name format. If you do not have any idea, you may use the name of DICOM files. For example, the segmentation result of *i0006,0000b.dcm* can be saved as *i0006,0000b.png* in *Results* folder. The file locations are presented below:

For CT results:

Task#\CT\\Results\img000.png, img001.png, ... img#.png

For MR-T1DUAL results:

Task#\MR\\T1DUAL\Results\img000.png, img001.png, ... img#.png

For MR-T2SPIR results:

Task#\MR\\T2SPIR\Results\img000.png, img001.png, ... img0#.png

For CT and MR-T2SPIR series, the number of files in the *Results* folder must be equal to the number of files in *DICOM_anon* folder. For MR-T1DUAL series, the number of files in *Results* folder must be equal to the number of files in *DICOM_anon/InPhase* and *DICOM_anon/OutPhase*

folder. (Only a single result folder is necessary for both InPhase and OutPhase images because they are registered.). If the number of files does **not match**, the results **will not be evaluated**.

5) About Tasks

There are five competition categories in which the participating teams can take place and submit their result(s):

- Task 1: Liver Segmentation (CT-MRI)
- Task 2: Liver Segmentation (CT only)
- Task 3: Liver Segmentation (MRI only)
- Task 4: Segmentation of abdominal organs (CT+MRI)
- Task 5: Segmentation of abdominal organs (MRI only)

If there are more than one modality or sequence in a task, the final score will be calculated by the average of all. Any team can submit results for any task above. They need to put their results under the specific Task# folder.

6) Submitting Your Results

After saving the PNG file series into the empty task folders inside the template, please create a single .zip or .tar.gz file that includes all task folders (the system does not support .rar files.). The file must have exactly same file tree structure as template file. Participants may send their results for both train sets and test sets. Although the score will be calculated by **only test sets**, the results in the train sets will be used for statistics.

Before sending results, you may use the checklist below:

Does your submission file have exactly as same folder structure as template file?	<input type="checkbox"/>
Does your submission file contain all the folders from template file?	<input type="checkbox"/>
Were your results saved as 8-bit grayscale PNG files?	<input type="checkbox"/>
Do your PNG result images have the same file order as DICOM images?	<input type="checkbox"/>
Are the pixel intensity values of the organ(s) as same as in Table 1?	<input type="checkbox"/>
Did you save your results in the specially created "Result" folder in each set?	<input type="checkbox"/>
In each set, is there the same number of PNG files in "Results" folder with DICOM files in "Dicom_Anon" folder?	<input type="checkbox"/>

As mentioned before, the evaluation will be handled by a fully automated script. That is why it is very critical to use the exact same result submission format. Otherwise, it is not guaranteed to evaluate your results correctly. If you have finished checking, you are ready to send your submission.

In addition, for each submission, it is necessary to prepare a new PDF file that contains team members, contact information, and a brief description of the algorithm. You may make multiple submissions, but for each submission, it is necessary to make design change and prepare a new and novel PDF file which explain design changes. The new submissions that is generated by just only parameter tuning will not be published.

If you have a question you may check our FAQ page and our Google Group, or you may contact us:

[https://chaos.grand-challenge.org/News and FAQ/](https://chaos.grand-challenge.org/News_and_FAQ/)

<https://groups.google.com/forum/#!forum/chaos-challenge>

<https://chaos.grand-challenge.org/Contact/>

Welcome to CHAOS challenge!

Best regards.