FetReg 2021 – Placental Vessel Segmentation and Registration in Fetoscopy Challenge

Part of the Endoscopic Vision Challenge – MICCAI2021

FetReg 2021 challenge details are available on the challenge website:

https://www.synapse.org/#!Synapse:syn25313156

For any query, write to us: endovis-weiss-vision@ucl.ac.uk

Submission Guidelines – Test Phase

This document covers the technical details on preparing and submitting the docker submissions for the two sub-tasks of the FetReg 2021 challenge. Please also visit FetReg - Placental Vessel Segmentation and Registration in Fetoscopy - syn25313156 - Wiki (synapse.org) and follow the writeup instructions for making a complete and valid submission.

Testing data will not be accessible during the testing phase. The participants must create a valid docker file, following the guidelines in this document and upload it to the synapse platform. The challenge organisers will evaluate the docker submissions on the test data.

1. Submission Docker Image Format

The docker image must read data from **/data/input** and **/data/output** the resulting segmentation mask (for task 1) or txt file with the transformation matrix (for task 2) into **/data/output**.

All the images to be tested by the container will be copied into **/data/input**, the container will process them and store the results in **/data/output**.

Follow the instructions in 'Testing docker image locally' to verify that your docker image is functioning as desired before submitting it on the Synapse.

*Docker containers **must** contain an execution script called **run.sh** that takes the input path and output path as arguments. **Please note that any container entry point will be ignored**.*

```
#!/bin/bash
input_path = "$1"
output_path = "$2"
python main.py $input_path $output_path
```

1.1. Task 1 (Placental semantic segmentation) Submission

For Task 1, the submitted docker will be used for testing in the following way:

- All test images will be copied into `/data/input` in 'png' format.
- The submitted docker will scan all images from the `/data/input` folder with '.png' extension
- The submitted docker will process each image and output a single channel mask with value [0, num_classes].
- The submitted docker will store the output mask in `/data/output` folder. The output mask will have the exact same name and extension as of its input image.

  For example,

  INPUT: `/data/input/Video001_frame00500.png` …

  OUTPUT: `/data/output/Video001_frame00500.png` …

1.2. Task 2 (Placental RGB frame registration for mosaicking) Submission

For Task 2, the submitted docker will be used for testing in the following way:

- All test frames from a video clip will be copied into `/data/input` in 'png' format.
- The submitted docker will scan all frames from the `/data/input` folder with '.png' extension and ensure they are in ascending order.
- The submitted docker will process each consecutive pair of frames *(k, k+1)* and output the transformation matrix that defines the warping from *k* to *k+1* frame.
- The submitted docker will store the output transformation as a txt file in `/data/output` folder.

```
0.9867 -0.0151 -4.4883
-0.0154 1.0020 4.4437
0.0000 0.0000 1.0000
```

- The output txt file will have the exact same name as *k+1* frame name with a txt extension.

  For example,

  INPUT: `/data/input/Video001_CLIP01_0001.png`
  `/data/input/Video001_CLIP01_0002.png`
  `/data/input/Video001_CLIP01_0003.png` …

  OUTPUT: `/data/output/Video001_CLIP01_0002.txt`
  `/data/output/Video001_CLIP01_0003.txt` …

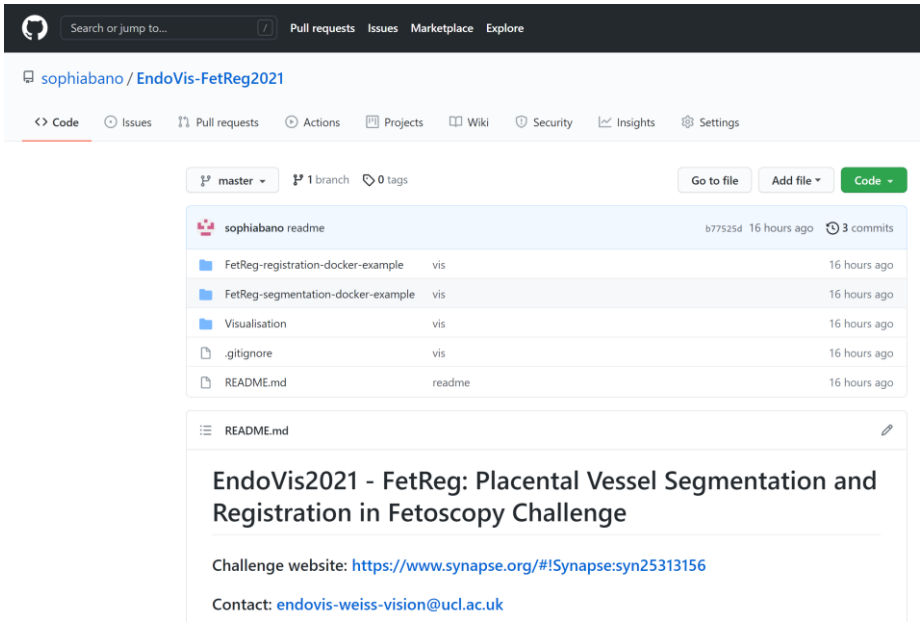
1.3. Docker image format – Dummy Examples for Task 1 and Task 2

To facilitate the submission, we have provided dummy docker images for both Task 1 and Task 2, which shows the path to set for the input and output folders and the format of the output mask ('png' for Task 1) and homography matrix ('txt' for Task 2).

Visit the EndoVis-FetReg2021 GitHub page (below mentioned link) for accessing these docker dummy examples

https://github.com/sophiabano/EndoVis-FetReg2021

This GitHub repository also contains scripts for visualising the output masks (Task 1) and mosaics obtained from the homography matrices (Task 2).



2. Submission instructions

Each team/participant needs to fulfil the following submission criteria to qualify in the challenge leaderboard.

- A **docker container** for each subtask uploaded to Synapse along with its writeup on its WIKI page. (Complete docker submission instructions are provided in this document)

- **Writeup of the method** used (for each task), submitted via the WIKI as a public Synapse Project.
    - Please visit THIS LINK for the method writeup guidelines.
    - For submitting the writeup, follow the following two steps:
        1. In the project that you created, create a Wiki for the project: Tools > Edit Project Wiki.
        2. Register to the challenge to submit your writeup

- **Pre-recorded short presentation**:
  MICCAI2021 and Endovis2021 challenge will be virtual this year. Each team/participant must submit a pre-recorded video presentation of their methods. Further details on the duration of the talk will be published closer to the challenge day.

1.4. Becoming a certificate user

IMPORTANT: To use all docker functionality on Synapse, you must be a certified user. You can become a certified user by filling out the following quiz:

https://www.synapse.org/#!Quiz:

2. Building and testing docker images

2.1. Building docker images

Ensure that you are in the top-level directory of the project where the Dockerfile is located.

Build the image using the command:

```
docker build -t <image_name> .
```

```
/fetreg-seg-docker$ docker build -t fetreg2021_task1_sbtest:v1 .
```

Note: Use the format fetreg2021_<task_name>_<team_name>:<version>

where,

<task_name> is either *task1* or *task2* depending on the task you are submitting to
<team_name> is the acronym of your team that you specified at the time of team registration. In the above example, it is *sbtest*
<version> is the version number

2.2. Testing docker image locally

To test the docker image locally, you will need a directory with example input images and an empty directory to output resulting image/txt files.

You can test your image using the following command

```
docker run –gpus all –it –rm –v “$PWD/images:/data” <image_name> /data/input /data/output
```

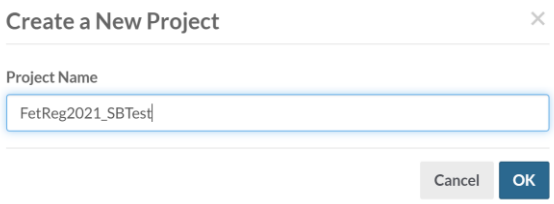
```
/fetreg-seg-docker$ docker run --gpus all -it --rm -v "$PWD/images:/data" fetreg2021_task1_sbtest:v1 /data/input data/output
```

4. Docker submission on the Synapse platform

4.1. Create a new project on Synapse

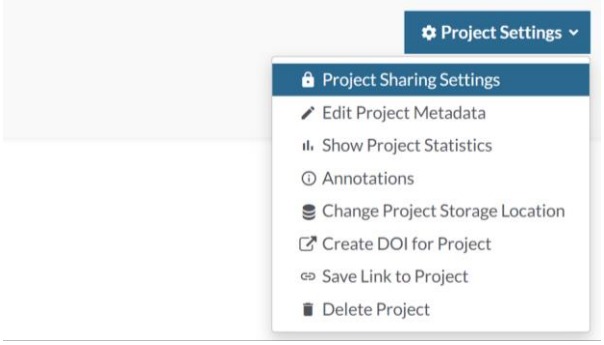
In order to submit a docker container, you first need to create a new project on the Synapse platform with the challenge name and your team:

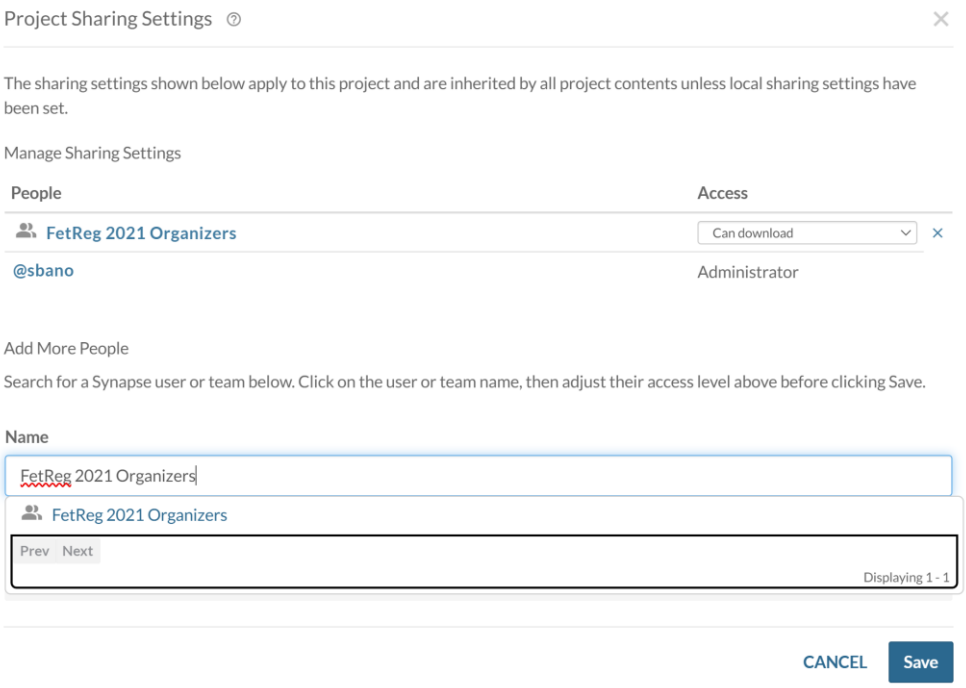
FetReg2021_<team_name>



Once the project is created,

- Note its Synapse ID (e.g., syn26041645)
- Give download permission of the project to the FetReg organising team (FetReg 2021 Organizers)





4.2. Login to Synapse with docker

`docker login docker.synapse.org` (Enter Synapse username and password)

```
/fetreg-seg-docker$ docker login docker.synapse.org
Username: sbano
Password:
WARNING! Your password will be stored unencrypted in /home/sophiabano/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
/fetreg-seg-docker$
```

4.3. Tag the submission docker image

Please note the synapse ID highlighted in blue in the screenshot.

`docker tag <imagename_local> docker.synapse.org/<Synapse ID>/<imagename_synapse>`

```
/fetreg-seg-docker$ docker tag fetreg2021_task1_sbtest:v1 docker.synapse.org/syn26041645/fetreg2021_task1_sbtest:v1
/fetreg-seg-docker$
```

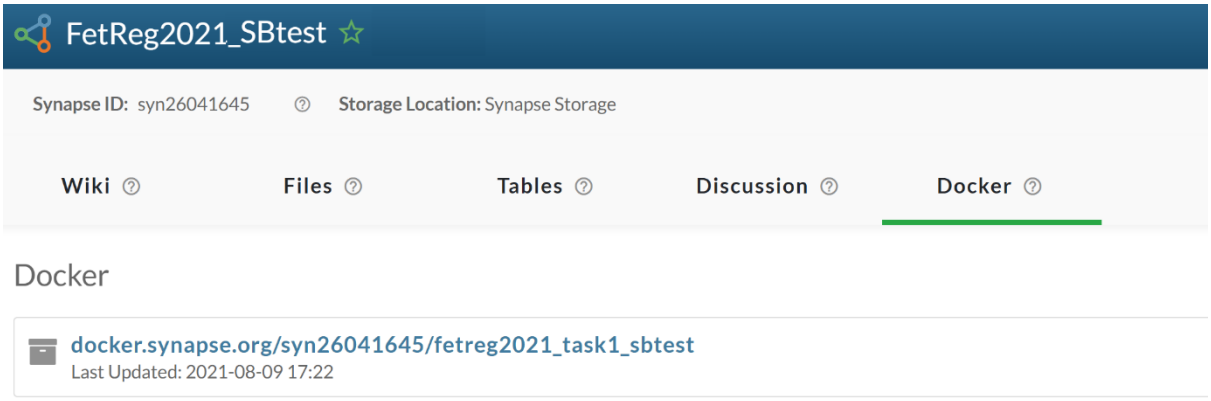
4.4. Push the docker image to Synapse

`docker push docker.synapse.org/<Synapse ID>/<imagename_synapse>:<version>`

```
/fetreg-seg-docker$ docker push docker.synapse.org/syn26041645/fetreg2021_task1_sbtest:v1
The push refers to repository [docker.synapse.org/syn26041645/fetreg2021_task1_sbtest]
0bec278056fc: Pushed
0f8f9a1425ab: Pushed
1ed0e2617ffd: Pushed
fbf231877aa6: Pushed
4923b3a899cf: Layer already exists
b2c054647c06: Layer already exists
3e57cc4e79f7: Layer already exists
28ba7458d04b: Layer already exists
838a37a24627: Layer already exists
a6ebef4a95c3: Layer already exists
b7f7d2967507: Layer already exists
latest: digest: sha256:b671c38888a2dfef0b796491eec0b78af52e79cb55117950c6e27d76864c4931 size: 2633
/fetreg-seg-docker$
```

4.5 Verify the docker image push

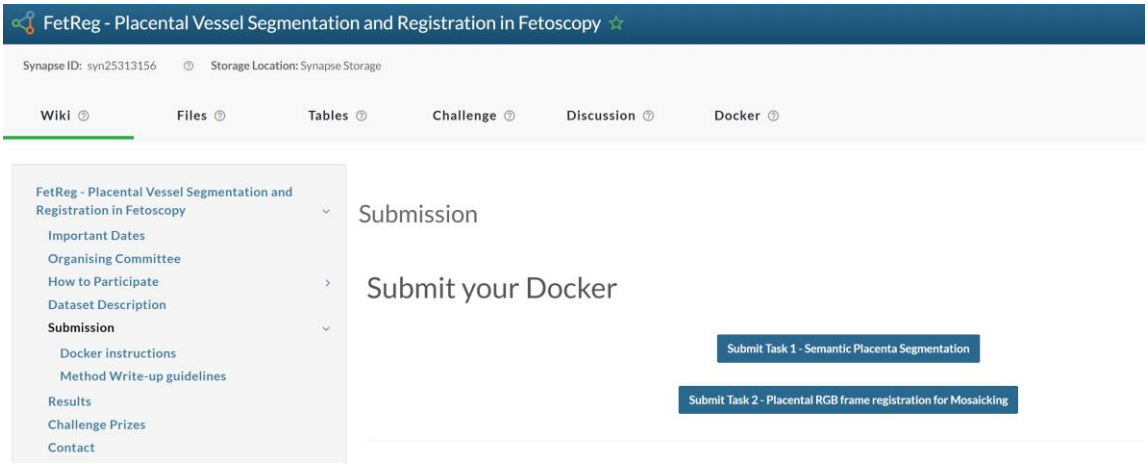
You can verify on the Synapse website if the push was successful. If the download fails, it might be because you are not a certified user.



4.6 Submit the docker image to the challenge

There are two ways in which you can submit the docker image to the challenge.

1. **Method 1:** To make a submission, go to the challenge website → Submission → Submit your docker

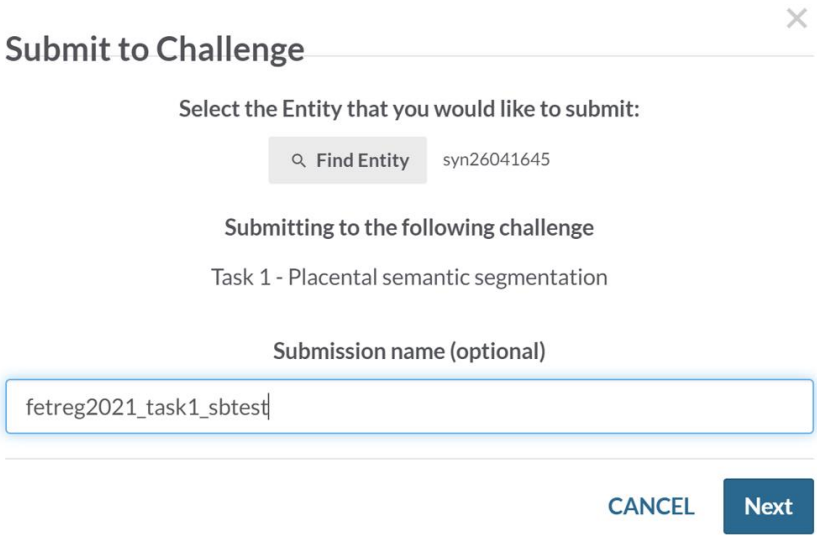


   Click on the subtask to which you want to submit.

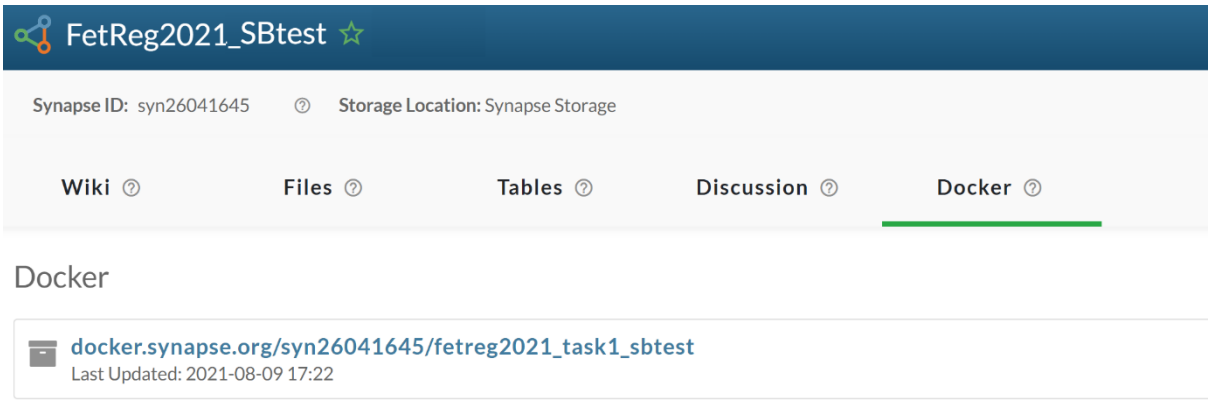
   Then, select the docker entity that you would like to submit.

   Under the submission name, mention the challenge name followed by task name (task1 or task2) and team name:

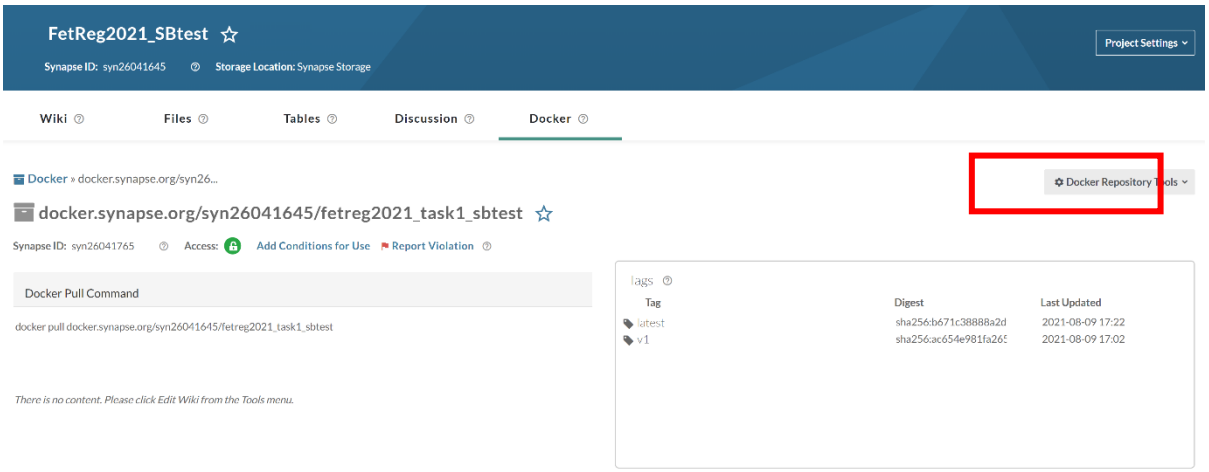
   Fetreg2021_<task_name>_<team_name>



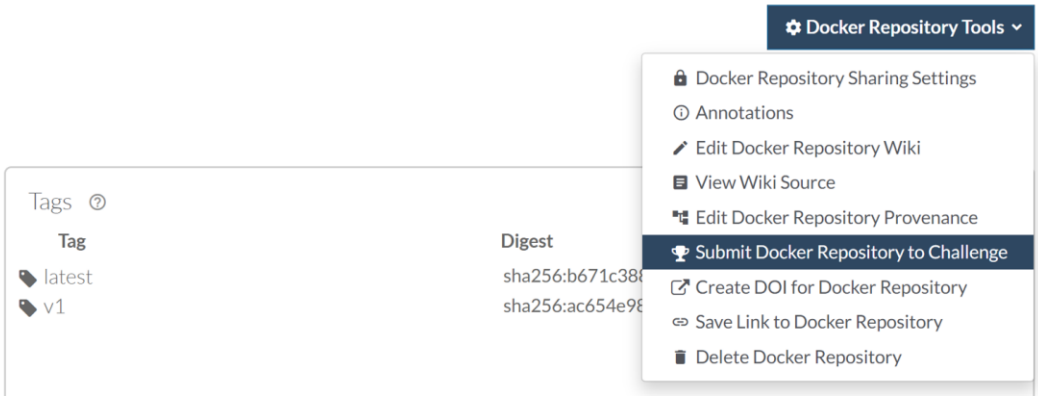
2. **Method 2:** Under your project FetReg2021_<team_name>, press the 'Docker' tab



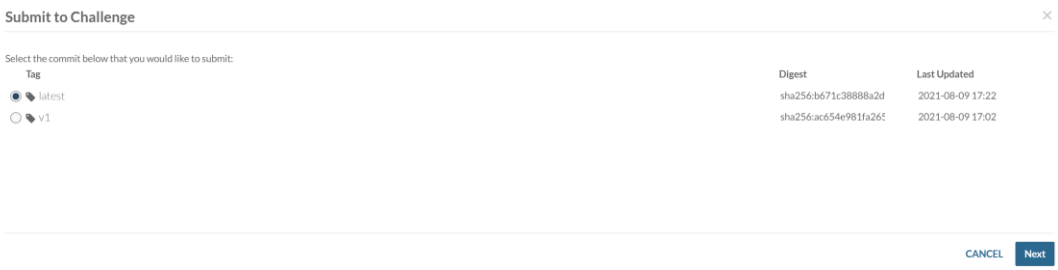
Click on the docker that you wish to submit to the challenge



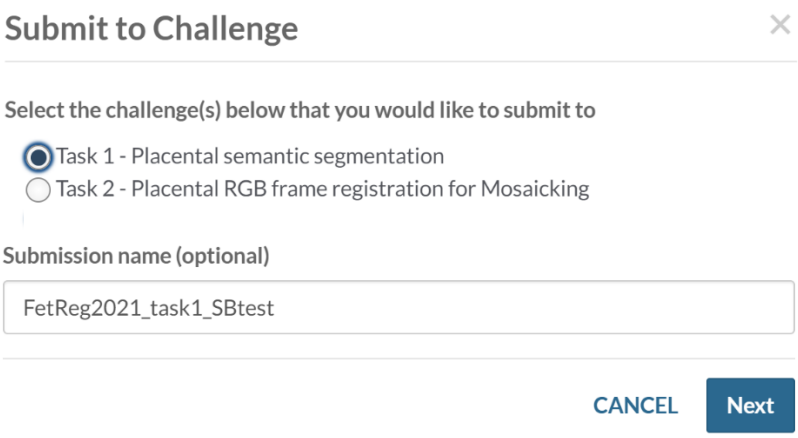
Then, click on 'Docker Repository Tools' → 'Submit Docker Repository to Challenge'



Select the docker 'Tag' you would like to submit.

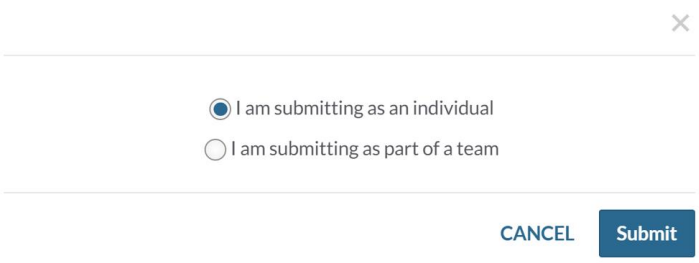


Next, select the 'Challenge task' you would like to submit.

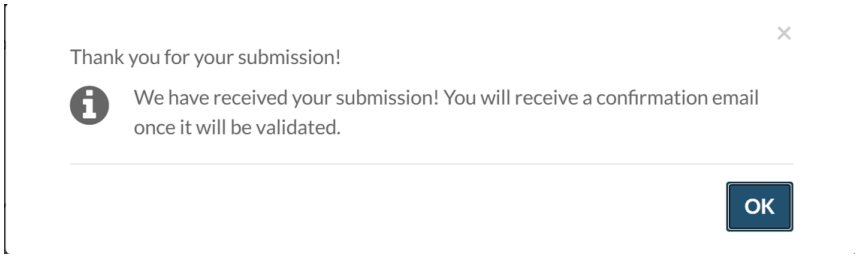


Next, select 'I am submitting as an individual'.

Note that team registration is taking place through a separate email. On the Synapse Challenge website, **only the lead participant of the team can make the submission** to avoid voiding the Participation Policy.



You would receive an email within 12 hours confirming if the submission made is valid.



Your submission will appear in the Submissions table for the specific task.

Submissions - Task 1 - Semantic Placenta Segmentation

Docker	Submitter ID	Team ID	Last Update	Name	Status
	@sbano		08/09/2021 5:05 PM	fetreg2021_task1_sbtest	RECEIVED
docker.synapse.org/syn26041645/fetreg2021_task1_...	@sbano		08/09/2021 5:27 PM	fetreg2021_task1_sbtest	RECEIVED

For any query, write to us: endovis-weiss-vision@ucl.ac.uk or post on the EndoVis-FetReg2021 Slack forum.