



HAL
open science

MSSEG-2: A medical imaging challenge on VIP

Sorina Camarasu-Pop, Axel Bonnet, Arthur Masson, Michael Kain, Michel Dojat, Olivier Commowick, Frédéric Cervenansky

► **To cite this version:**

Sorina Camarasu-Pop, Axel Bonnet, Arthur Masson, Michael Kain, Michel Dojat, et al.. MSSEG-2: A medical imaging challenge on VIP. EGI Conference 2021, Oct 2021, En ligne, France. hal-03708105

HAL Id: hal-03708105

<https://hal.science/hal-03708105v1>

Submitted on 28 Jun 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

MSSEG-2: A medical imaging challenge on VIP

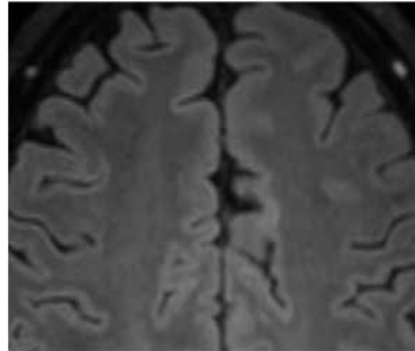
Sorina Camarasu-Pop, Axel Bonnet, Arthur Masson, Michael Kain, Michel Dojat, Olivier Commowick, Frédéric Cervenansky

EGI Conference 2021, 21/10/2021

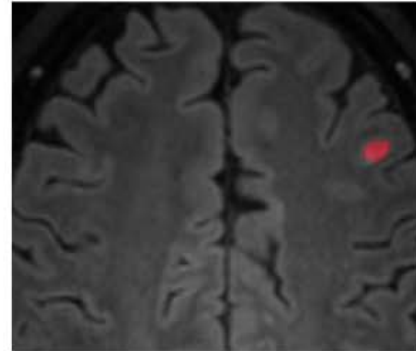
What is MSSEG-2?

- A scientific challenge
 - Research teams work on solving a common scientific hard problem
 - Their solutions are evaluated on a given set of data according to the guidelines given by the organizers
- MSSEG-2
 - 2nd Multiple Sclerosis (MS) Segmentation (Seg)
 - Automatic segmentation of tissues and lesions in MRI brain scans
 - Detection of lesions appearing between two patient's visits
 - <https://portal.fli-iam.irisa.fr/msseg-2/>

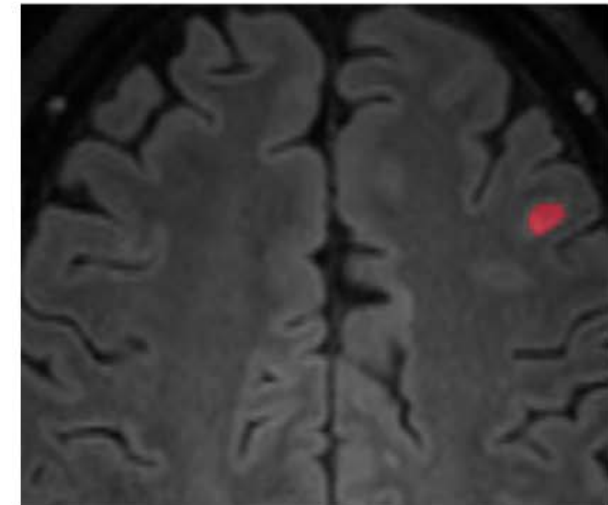
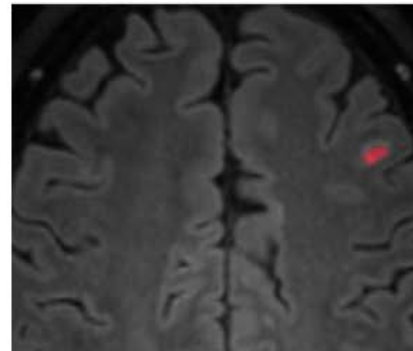
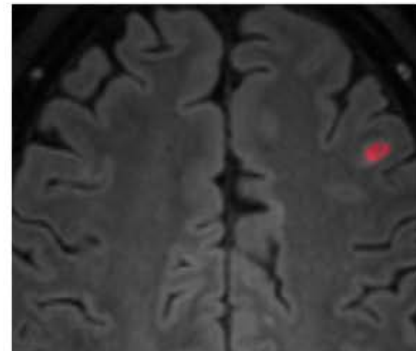
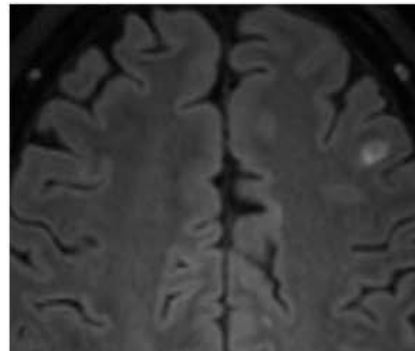
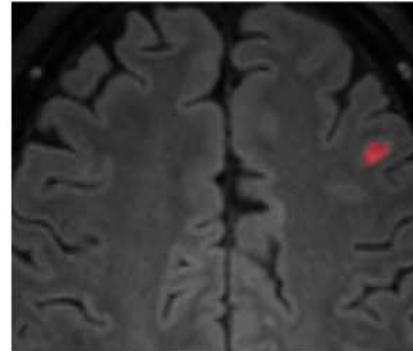
An example dataset



Time points



Expert neuroradiologists delineations



Consensus

The Challenge Partners

- OFSEP (<https://ofsep.org/en>)
 - The French MS registry (gathering clinical, imaging and biological data), ~30,000 patients
 - Interest in automated methods to apply over the database



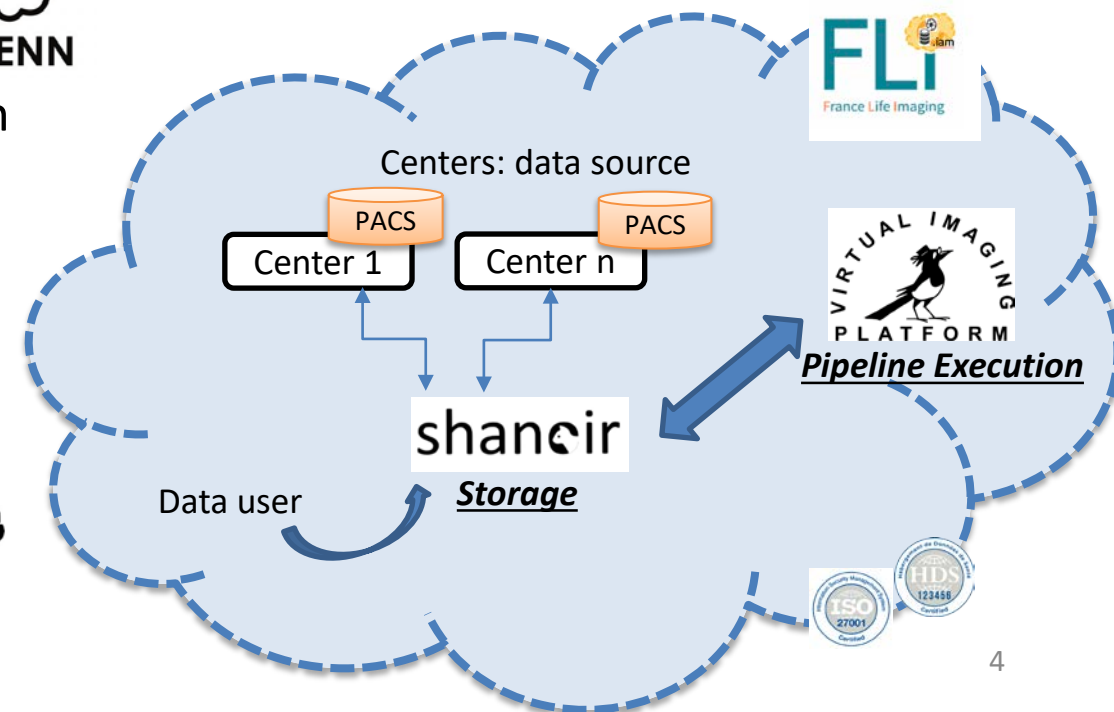
- Empenn
 - <https://team.inria.fr/empenn>
 - Inria team working on MS for a long time
 - Interest in evaluating state-of-the-art segmentation



- France Life Imaging
 - <https://portal.fli-iam.irisa.fr>
 - Coordinated and harmonized network of biomedical in vivo imaging in France
 - Challenges support



Web
portail

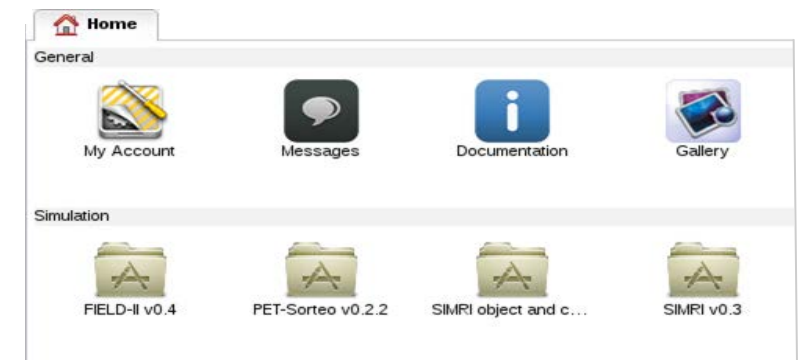


VIP

- Scientific applications as a Service
 - More than 20 applications publicly available
- Transparent access to computing resources
 - 395 CPU years (EGI biomed VO) used in 2019-2020
- Large community
 - More than 1300 registered users
- Open and reproducible science
 - Zenodo, DOIs, Containers, Boutiques



<https://vip.creatis.insa-lyon.fr/>



Challenge Organization

- Dataset
 - 40 images released to challengers in March for training
 - 60 images used for testing (evaluation of submitted pipelines)
- Pipeline integration, execution and evaluation
 - https://gitlab.inria.fr/amasson/lesion-segmentation-challenge-miccai21/-/blob/master/SUBMISSION_GUIDELINES.md
 - build a Docker or Singularity image containing the segmentation method
 - create a Boutiques descriptor
 - make the image and descriptor available to the VIP team
 - Challengers to submit their method by end of June
 - Most evaluations executed on VIP by the VIP team in July

VIP and the challenge

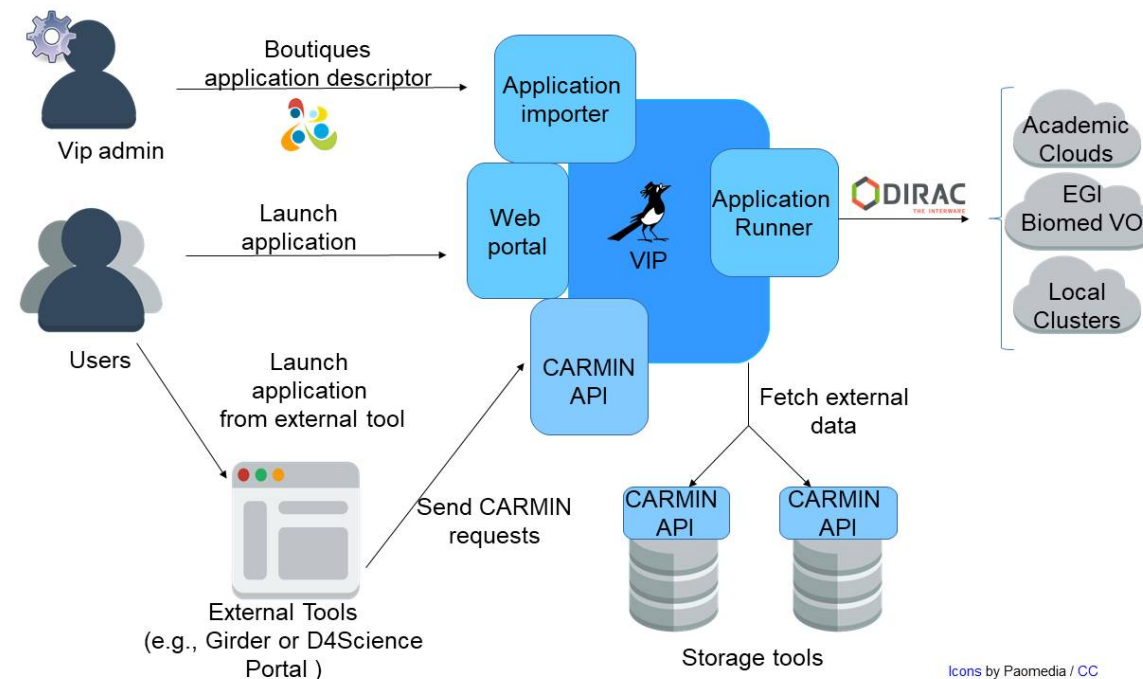
- 31 pipelines integrated in VIP for the challenge (24 teams)
- Very heterogeneous requirements
 - CPU time: from 2 minutes to 6 hours per patient
 - RAM: up to approx 64 Go RAM
 - CPU versus GPU
 - Size and availability (private/public access) of Docker images

- VIP used

- The DIRAC EGI Workload Manager Service
- EGI Cloud resources within the Biomed VO (IN2P3 IRES, CESNET, SAVBA).

The resources were « booked » during the testing duration

- A few local (Creatis) VMs



Icons by Paormedia / CC BY

Handling of Docker images

- udocker
 - Very easy set-up on EGI WN
 - git clone <https://github.com/indigo-dc/udocker>
 - udocker pull camarasu/demo:0.1
 - Using CVMFS for deploying images
 - udocker import \${CVMFS_IMAGEPATH}/demo.tar docker.io/camarasu/demo:0.1
 - Some issues with certain images, probably depending on how they were created by the challengers
 - Enforce good practices in the future
- Docker on Cloud VMs
 - Private and public images copied on the VMs
 - Docker installation according to the needs (GPUs vs CPUs)



Wrap-up

- MS new lesions detection and segmentation: a very difficult task
- Info on pipeline evaluation and results <https://portal.fli-iam.irisa.fr/msseg-2/challenge-day>
- Pipeline integration and execution on VIP
 - 31 pipelines integrated using Docker images and Boutiques descriptors
 - Challengers tested and validated the pipeline execution on training images
 - Simple and user-friendly access through the VIP Portal
 - VIP team executed pipelines over the 60 patients of the testing set
 - Automation using of the CARMIN API
 - Use of Dirac and EGI Cloud resources

Acknowledgments

- EGI ACE partners: Enol Fernández
- EGI Cloud sites and administrators
 - Jérôme Pansanel (SCIGNE Platform, Strasbourg, France)
 - Miroslav Ruda, Andrei Kirushchanka (CESNET metacentrum, Czech Republic)
 - Jan Astalos (Slovak Academy of Sciences)
- Udocker: Jorge Gomes, Isabel Campos
- CVMFS: Jose Caballero Bejar
- Dirac: Andrei Tsaregorodtsev, Vanessa Hamar

