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MSSEG-2: A medical imaging challenge on VIP

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MSSEG-2: A medical imaging challenge on VIP

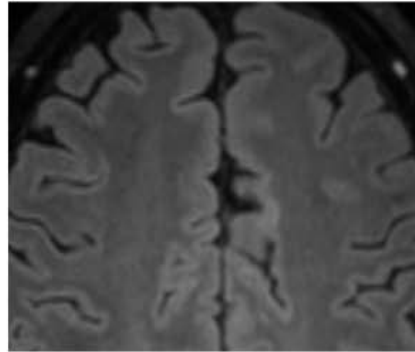
Sorina Camarasu-Pop, Axel Bonnet, Arthur Masson, Michael Kain, Michel Dojat, Olivier Commowick, Frédéric Cervenansky

EGI Conference 2021, 21/10/2021

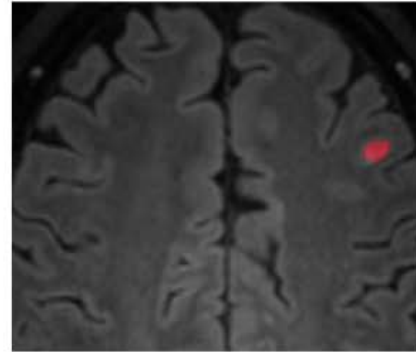
What is MSSEG-2?

- 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 tissue and lesions in MRI brain scans
 - Detection of lesions appearing between two patient's visits
 - <https://portal.fli-iam.irisa.fr/msseg-2/>

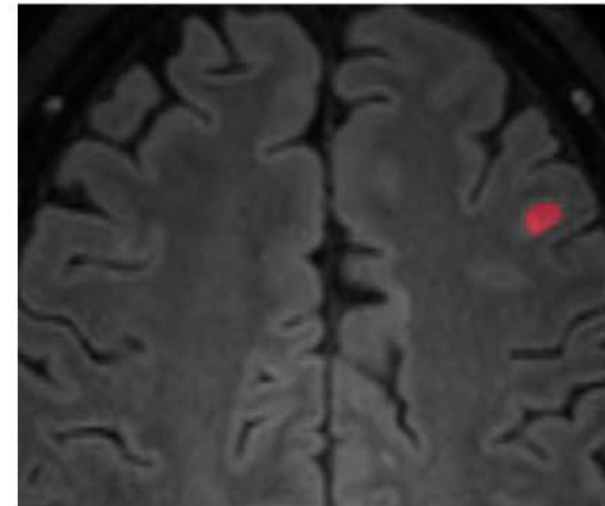
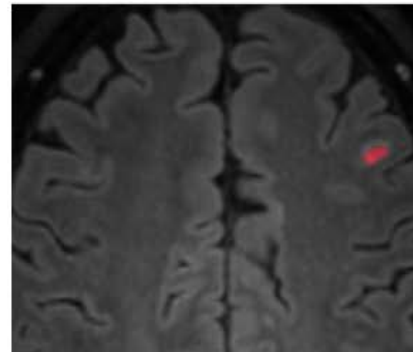
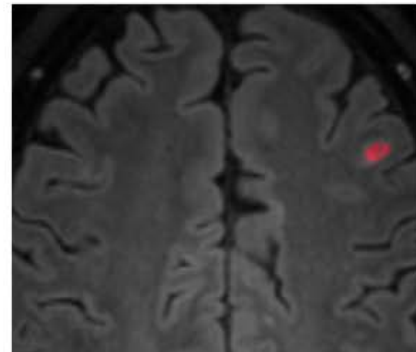
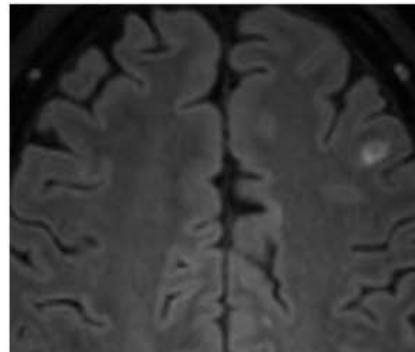
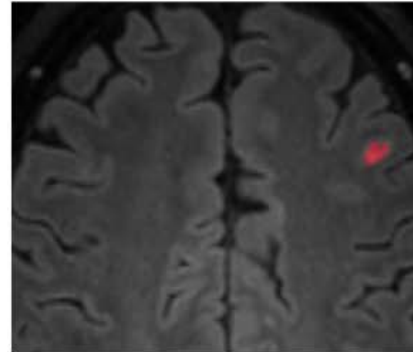
An example dataset



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



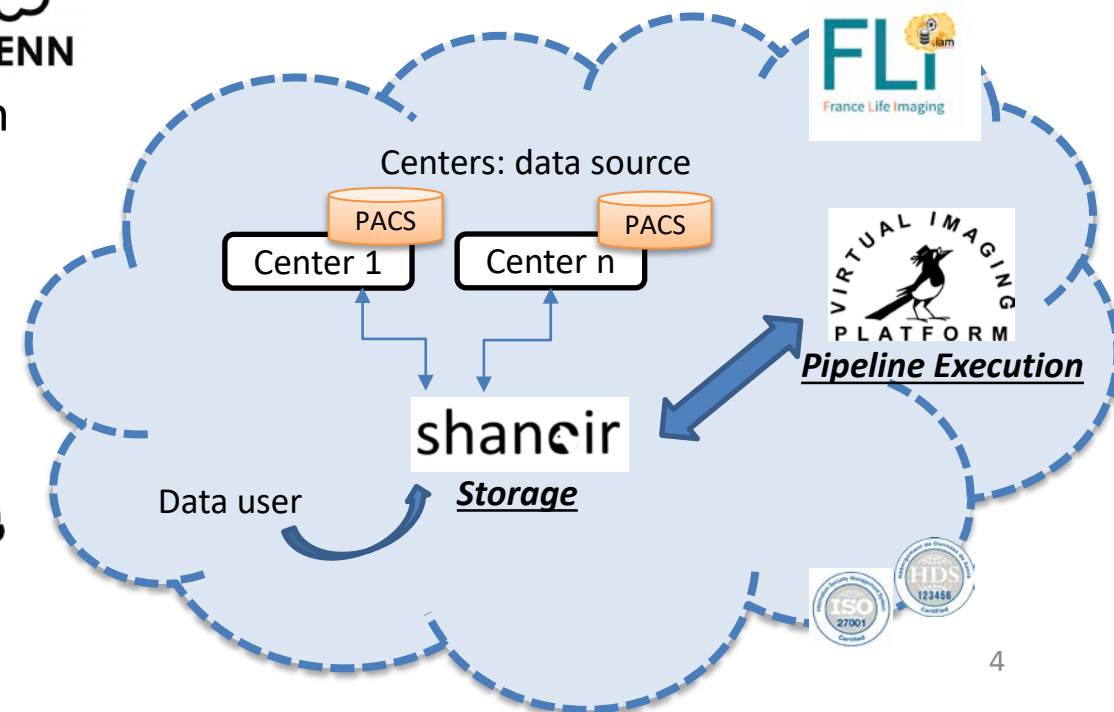
- Empenn
 - <https://team.inria.fr/empenn>
 - Inria team working on MS for a long time
 - Interest in evaluating state-of-the-art segmentation



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



Web
portail

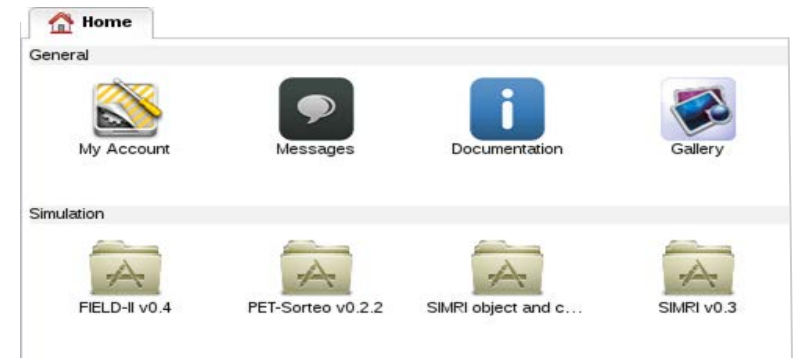


VIP

- 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

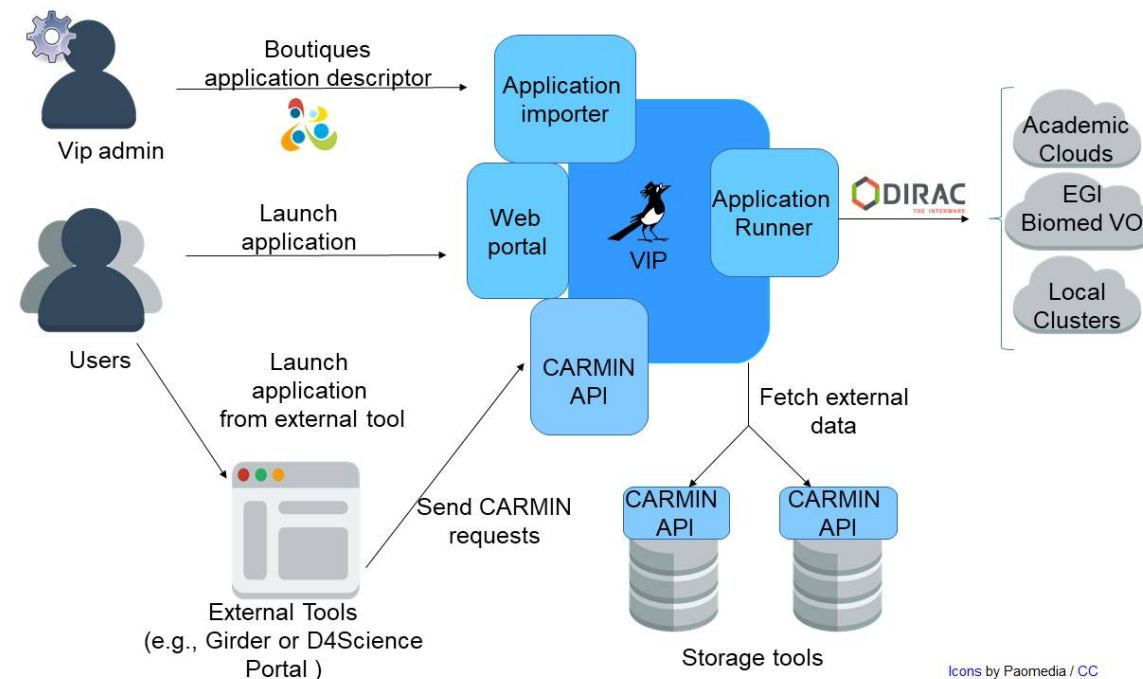
- 31 pipelines integrated in VIP for the challenge (24 teams)
- Very heterogeneous requirements
 - CPU time: from 2 minutes to 6 hours per patient
 - RAM: up to approx 64 Go RAM
 - CPU versus GPU
 - Size and availability (private/public access) of Docker images

- 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



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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

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- EGI Cloud sites and administrators
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 - Miroslav Ruda, Andrei Kirushchanka (CESNET metacentrum, Czech Republic)
 - Jan Astalos (Slovak Academy of Sciences)
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- CVMFS: Jose Caballero Bejar
- Dirac: Andrei Tsaregorodtsev, Vanessa Hamar

