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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
  – 2\textsuperscript{nd} Multiple Sclerosis (MS) Segmentation (Seg)
  – Automatic segmentation of tissues and lesions in MRI brain scans
  – Detection of lesions appearing between two patient’s visits
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
  – Coordinated and harmonized network of biomedical in vivo imaging in France
  – Challenges support
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
    • 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
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](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
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- Dirac: Andrei Tsaregorodtsev, Vanessa Hamar