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AWESOMME : Application WEB pour la génération de maSse de dOnnées expertisées en iMageriE MEDicale

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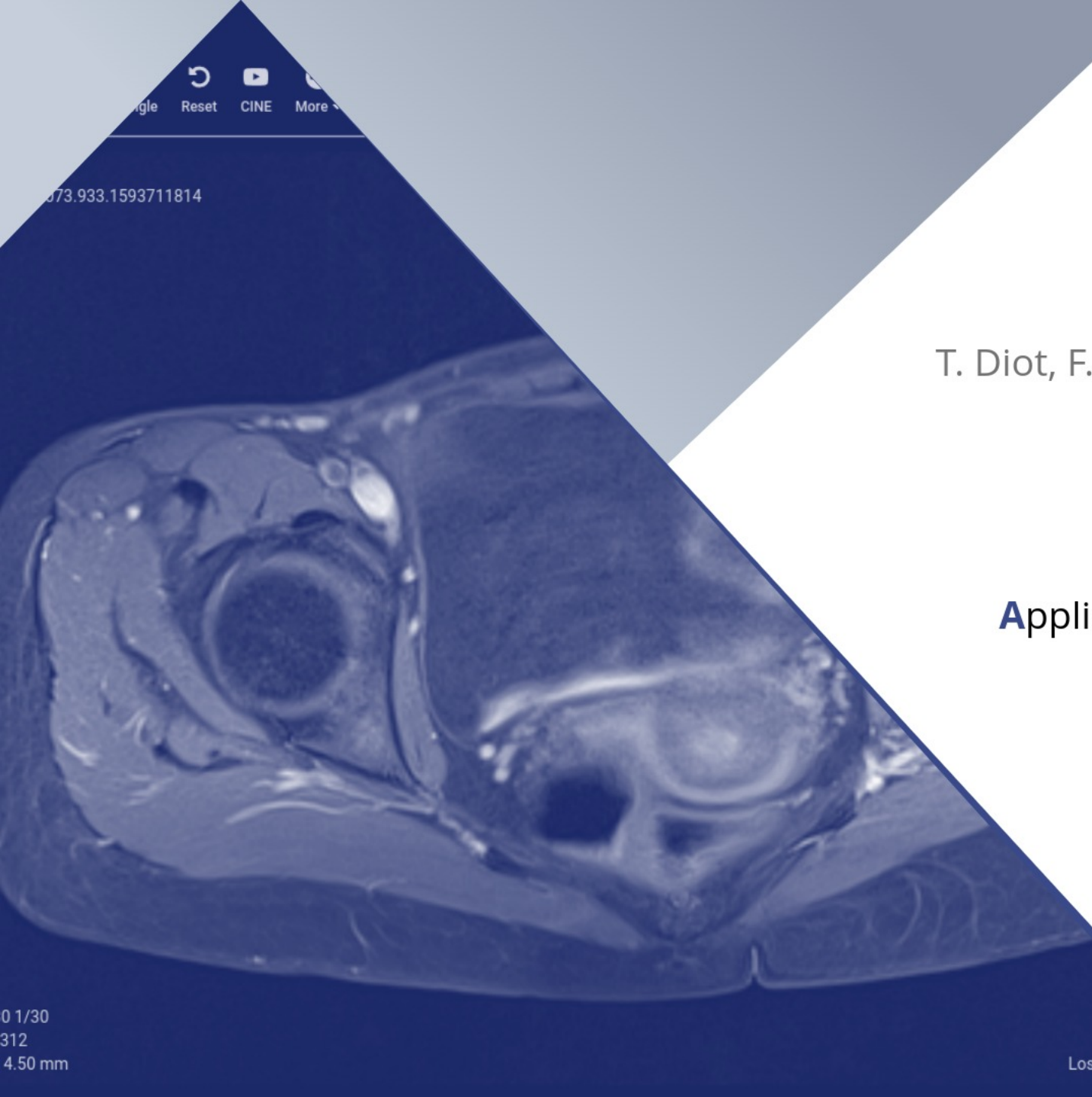
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T. Diot, F. Cervenansky, B. Leporq, H. Ratiney, O. Beuf

AWESOMME

Application **WE**b pour la génération de ma**S**se de
d**O**nnées expertisées en **iM**agerie **ME**dicale

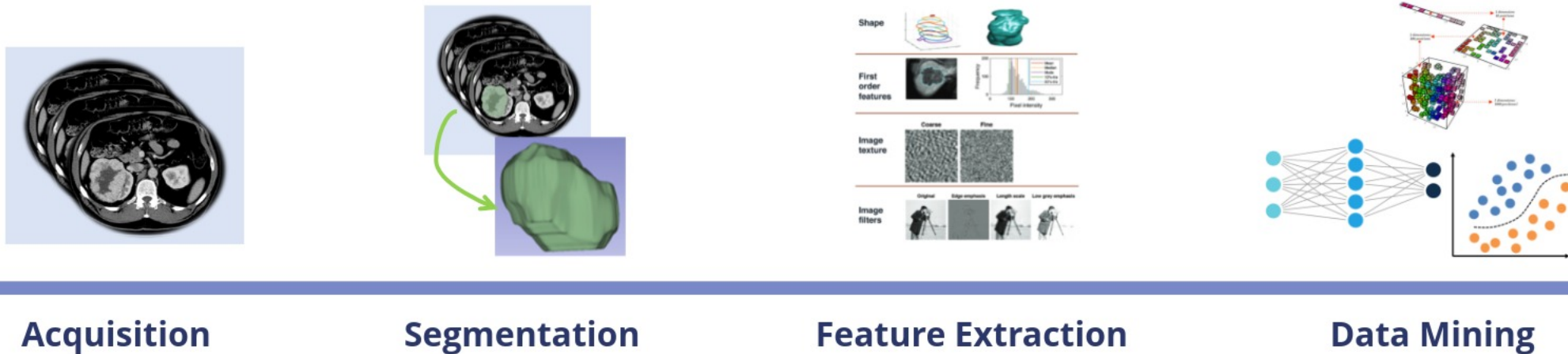
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Context

- **Precision medicine:** through generation & exploitation of large masses of "expert data" (images and Electronic Clinical Reports)
- **Use:** anywhere in a hospital, with **identity control security** & **parallel use in lab**
- **Goal:** promote the development of models via a reliable & redundant **environment for expert annotations & controlled deployment of processing modules.**



Study Case: presentation

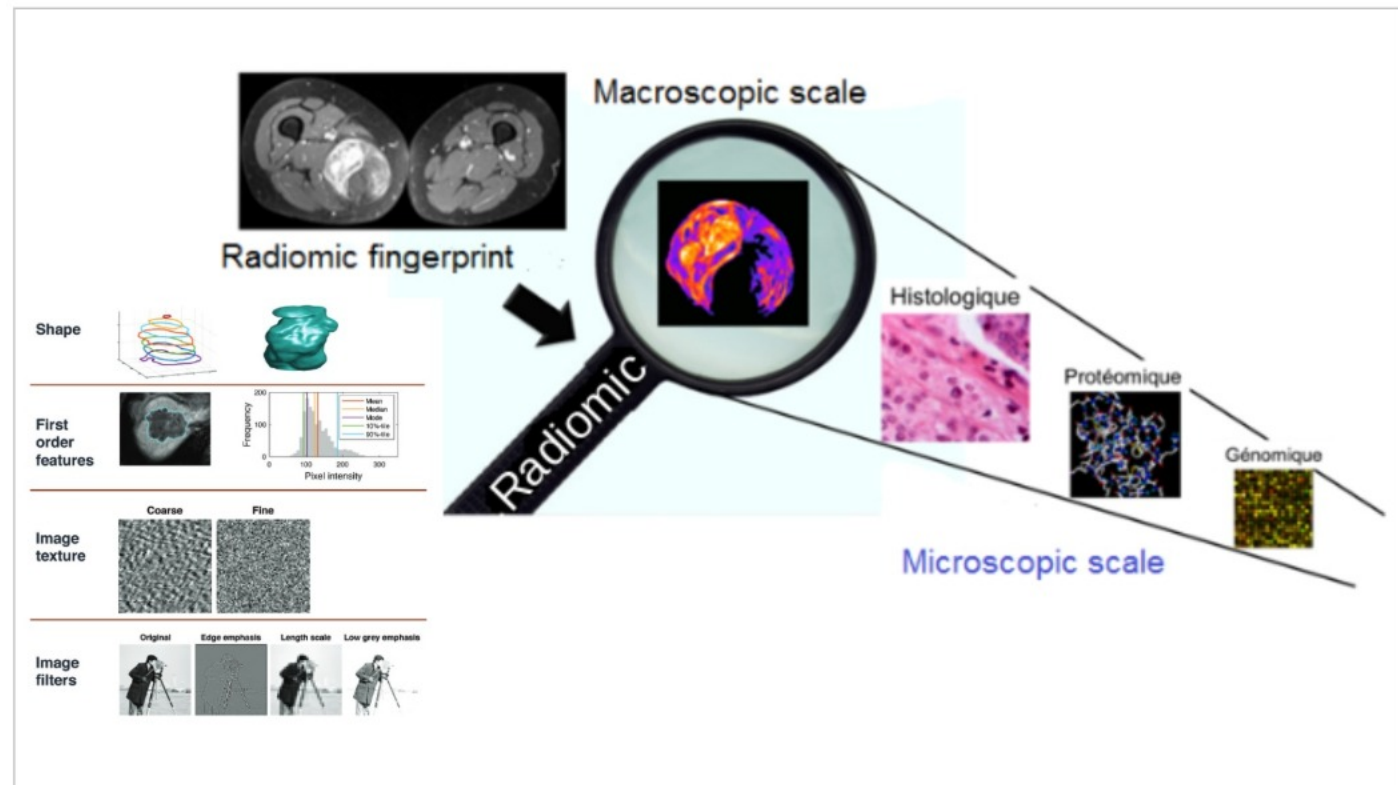
Multicenter cohorts

Patients with **osteosarcomas**

MRI DICOM images and **segmentation** files

Extraction of **Radiomic** to analyze response to neoadjuvant radiotherapy treatment

Up to 120 features



A. BOUHAMAMA *et al.* ECR 2019 10.26044/ecr2019/C-0930
J.D. Shur *et al.* RadioGraphics 2021 41:6, 1717-1732

Study Case: analysis

Case Ideas

Continue to visualize & work **on segmentations done with others tools**

Previous work: add automatic tools

- 2D **segmentation** tool by Altran-Capgemini
- **Prognostic classification** model to help interpret radiomics

Emerging Constraints

Multiple data source

- **PACS** (hospital official database)
- Local imports, from other centers

Save **segmentation modifications**

- Collaborative annotation if several experts
- Automatic generated segmentation might require **manual correction**

Matching platforms in hospitals and laboratory

- **Restriction of use** for some tools

Some latest practices

OHIF

Key points:

- Web viewer for medical images
- Measurements, segmentation tools available
- Connection to PACS
- Open source, editable

But no deep learning functions and no post-processing storage

Ziegler E. *et al.* JCO Clinical Cancer Inform. 2020 Apr;4:336345.

XNAT

Key points:

- Tools for segmentation & machine learning analysis
- Use OHIF as a web viewer, but not as principal resource
- Open source

But web is not their first approach, download is necessary & patient, study PACS storage not respected

Doran SJ *et al.* Tomography. 2022 Feb11;8(1):497-512.

MONAI

Key points:

- Monai Label is a segmentation server-web interface app
- Provides pre-trained models
- Using OHIF for the web viewer
- Open source, editable

But OHIF in a compiled resource can not be modified for radiomics...

Diaz-Pinto A. *et al.* arXiv:2203.12362

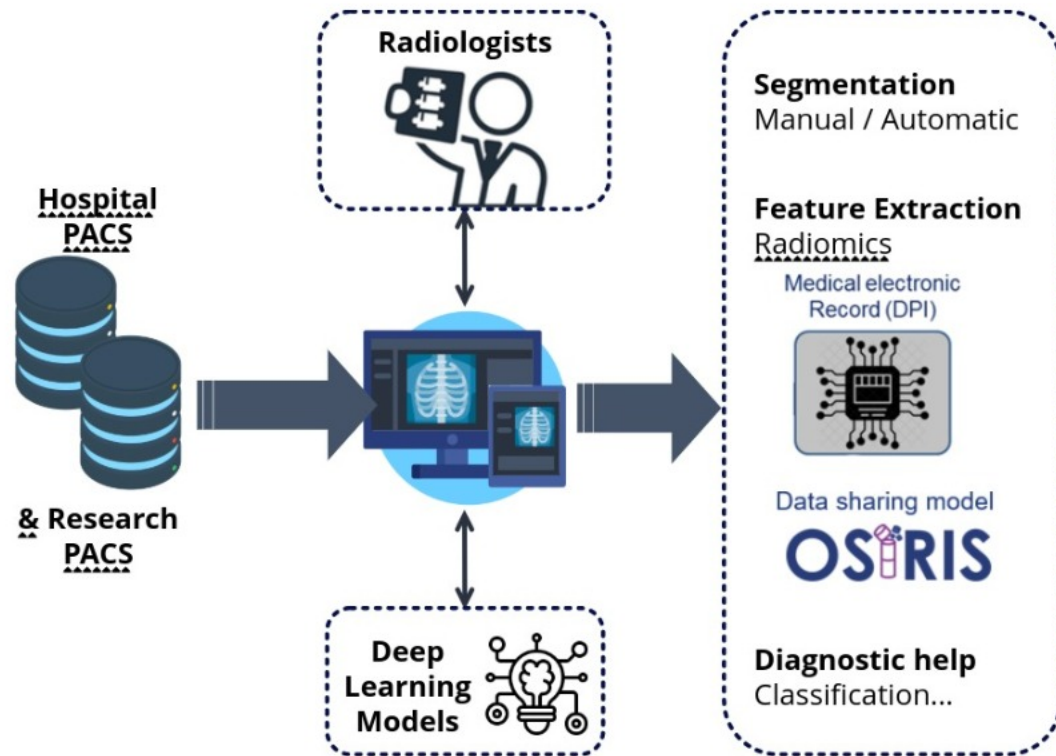
I. Context

II. The Solution: Platform AWESOMME

III. Demonstration - video

IV. Difficulties

Solution : Platform & Services



Server-web interface based on OHIF

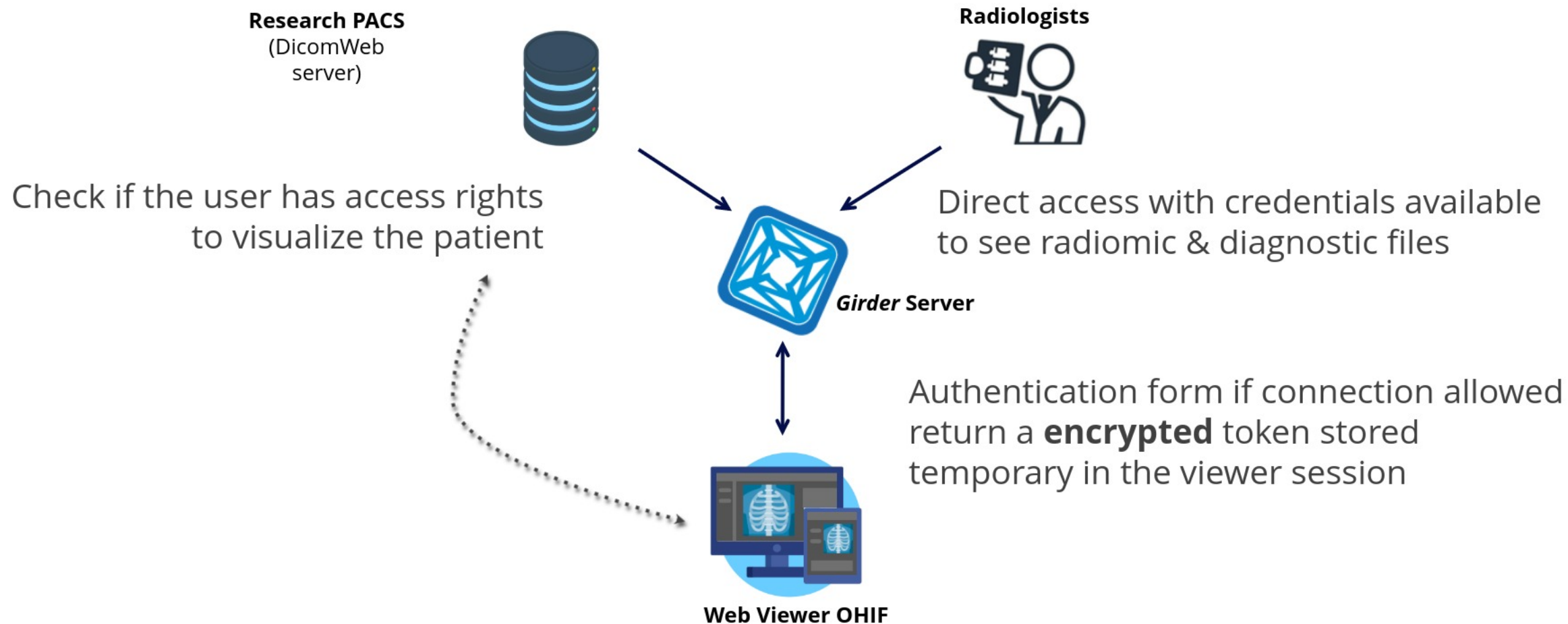
Additional server for authentication and launch deep learning tools

Secure access for radiologists around the hospital

Inclusion of tools from partners research via the external server

Share clinical & research results through national initiative **OSIRIS**

Authentication mechanism



Tools & technologies

Research PACS
(DicomWeb
server)



Application: C++
Communication: **restApi**
for dicomWeb server

Girder Server



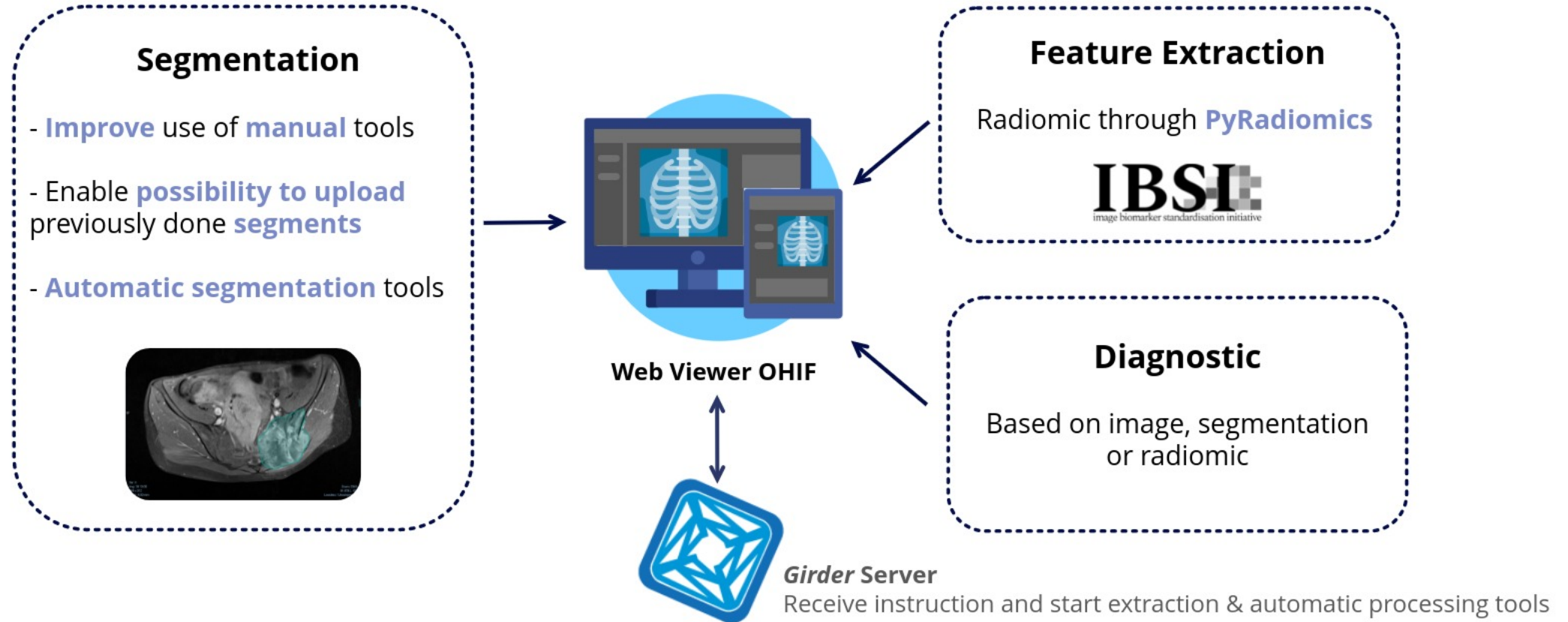
Application: **Python / JS**
Communication: restApi



Web Viewer
OHIF

Application: **JS / React**
Communication: restApi

Enhanced viewer OHIF



I. Context

II. The Solution: Platform AWESOMME

III. Demonstration - video

IV. Difficulties

Demo



I. Context

II. The Solution: Platform AWESOMME

III. Demonstration - video

IV. Difficulties

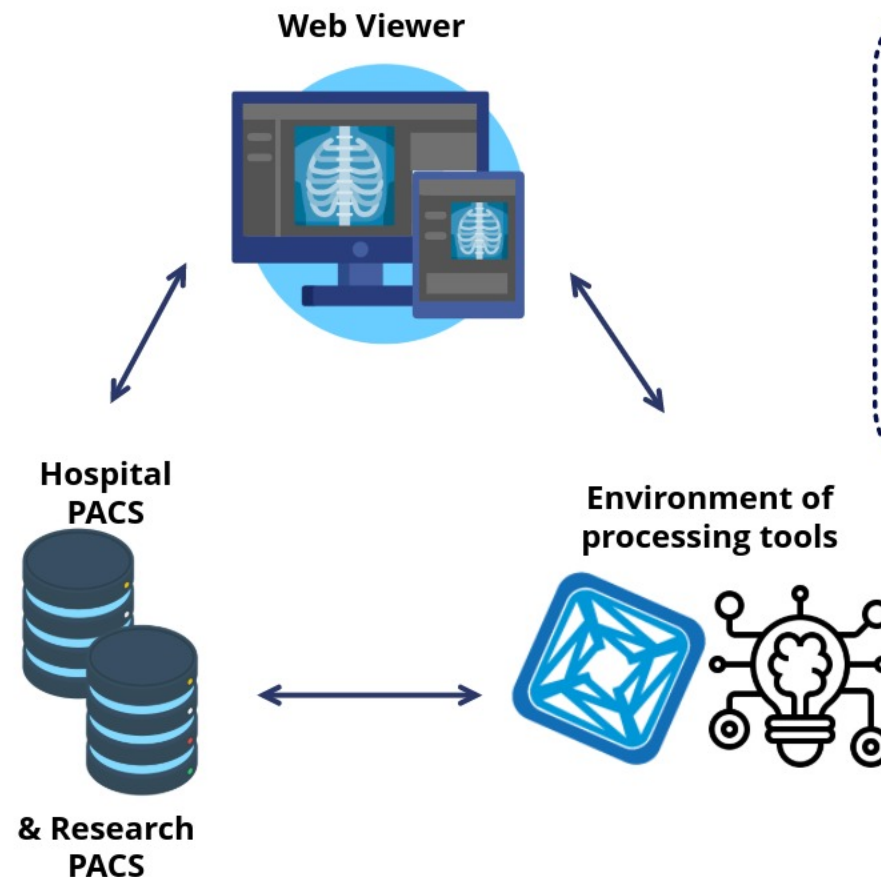
Difficulties: segments

Dual Source Link

- Matching system **tools** should be available for **both lab & hospital**
- **upload impossible** on PACS
- Hospital PACS: **not anonymized** cannot share access in all cases
- OHIF does **not support multisources yet**

Single segments

OHIF viewer **only reads 1 segment/file**, do not support multiple segments yet



Traceability

- Data transfer & **multiple server saving**: Nomenclature needed
- **Segment versions**: cannot update a segment, new save obligatory. Several user expected

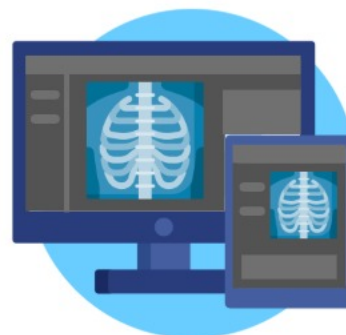
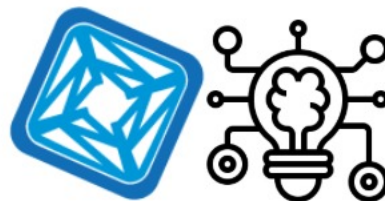
Difficulties: models

Leveraging research models

- Wrap algorithm in **Docker**
- **Different inputs**: number, type, format...
- **Failing is possible** because of the variability of the data accessible

- Inputs with different data type (int vs float)
- Diagnostic model that need radiomics vs one needing two segmentations

Environment of processing tools



Web Viewer

Delays

- Between services:
data transfer
- Some models are slow to infer:
not possible in real time



Discussion & Conclusion

Achievements

- **Complete solution** for analysis & exploitation
2 automatic segmentation models added : Osteosarcoma & lungs
- **One public instance deployed** at CREATIS
- Secure link between clinical and research
- **On-going deployment** instance at CLB

Further Work

- **Open platform to other use**
Extract more features, and add more models
- **Educational purposes**
For medical students: comparison with expert annotations, computation of metrics to evaluate

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Questions ?

<https://covid.creatis.insa-lyon.fr/awesomme-ohif/>

