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AWESOMME

Application WEB pour la génération de maSSse de dONnées expertisées en IMagerie MEDicale
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

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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

**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
cannot be modified for radiomics...


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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

Check if the user has access rights to visualize the patient

Direct access with credentials available to see radiomic & diagnostic files

Authentication form if connection allowed return a **encrypted** token stored temporary in the viewer session

- **Research PACS** (DicomWeb server)
- **Radiologists**
- **Girder Server**
- **Web Viewer OHIF**

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Tools & technologies

Girder Server

Research PACS  
(DicomWeb server)

Application: C++  
Communication: restApi  
for dicomWeb server

Application: Python / JS  
Communication: restApi

Application: JS / React  
Communication: restApi

Web Viewer  
OHIF
Enhanced viewer OHIF

Segmentation
- Improve use of manual tools
- Enable possibility to upload previously done segments
- Automatic segmentation tools

Feature Extraction
 Radiomic through PyRadiomics

Diagnostic
 Based on image, segmentation or radiomic

Web Viewer OHIF

Girder Server
Receive instruction and start extraction & automatic processing tools
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

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
Thank you for your attention!

Questions?

Address:

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