

ImageCLEFmed 2009: towards clinically relevant tasks

Image
CLEF

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Overview

- **History** and goals of ImageCLEFmed
 - Past databases, goals, tasks
- Clinical workflow
 - **Evidence-based** medicine, case-based reasoning
- **Ideas** for 2009
- Discussion

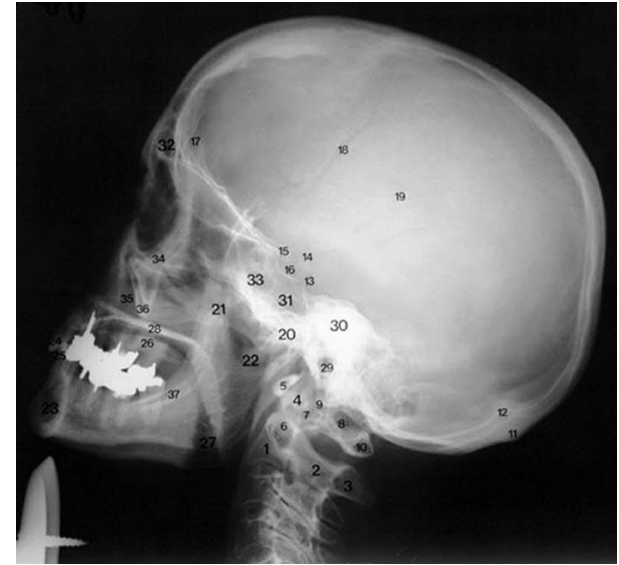
ImageCLEFmed 2004-2008: Goals

- 2004: Motivate **visual** retrieval researchers to participate
 - Topics were images, only
- 2005-2007: stimulate the combination of visual and textual retrieval methods (**multimodal**)
 - Larger database of teaching files
- 2008: move towards a new database with **clinical** relevance (Goldminer)
 - Peer reviewed articles from scientific journals

Task development

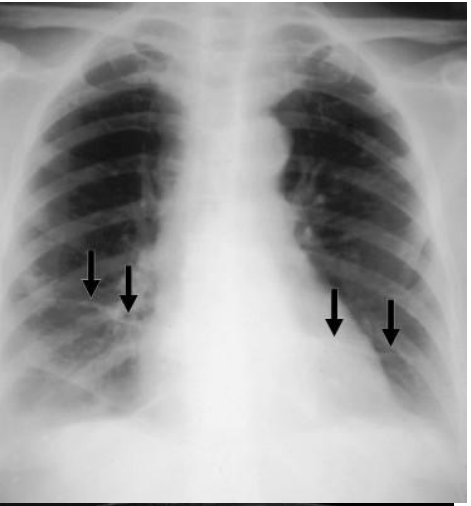
- Using various sources to find topics
 - Log files of search engines, medline, surveys, etc.
- Along **four axes** that were identified
 - Anatomic region
 - Modality
 - Pathology (regarded as most important)
 - Visual observation (“enlarged heart”)

Example topics (1)



Example topics (2)

- Ultrasound with rectangular sensor.
- Ultraschallbild mit rechteckigem Sensor.
- Ultrason avec capteur rectangulaire.



Pulmonary embolism all modalities.
Lungenembolie alle Modalitäten.
Embolie pulmonaire, toutes les

Example case 2005-2007

Teaching Files - Case Viewer - Imagerie Thoracique "Le Discours de la Méthode"- Pneumopathie interstitielle lymphocytaire - Mozilla

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Digital Imaging Unit
Geneva University Hospital
Switzerland

This case is part of [Casimage Web Site](#) from collection: *Imagerie Thoracique "Le Discours de la Méthode"*.
[Don't miss this huge radiology teaching file database!](#)


Pneumopathie interstitielle lymphocytaire

Chapter: Pneumopathie interstitielle	Keywords: Infection; pneumonie interstitielle; lymphome; immunosuprimé	ID: 3168
Diagnosis: Pneumopathie interstitielle lymphocytaire	Anatomy: thorax	ACRs: 6.21
	Age: 55	Sex: M


Clinical Presentation: Etat fébrile chez un patient suivi pour un lymphome non-Hodgkin bas grade stade IV A.

Description: Sur la radiographie du thorax de face et profil, présence d'un infiltrat bilatéral, micro-nodulaire diffus, prédominant dans les régions para-hilaires, associé à un élargissement des hiles pulmonaires faisant suspecter la présence d'adénopathies. Sur le CT thoracique, on confirme la présence d'un infiltrat micro-nodulaire diffus avec une distribution sous-pleurale et peribroncovasculaire des micronodules. Présence d'adénopathies sous-carénares et hilaires bilatérales.


Commentary:
 Le diagnostic a été posé par biopsie chirurgicale. Le lavage bronchiolo-alvéolaire préalable avait permis d'éliminer une infection.
 La pneumopathie interstitielle lymphocytaire est caractérisée par une infiltration interstitielle polymorphe et cytologiquement bénigne de cellules lymphoplasmocytaires variées. Elle est le plus souvent associée à un syndrome de Sjögren ou une cirrhose biliaire primitive et plus rarement à d'autres maladies dysimmunitaires. Chez les enfants, elle est liée au VIH. L'évolution est variable. L'aggravation peut être liée à une fibrose pulmonaire ou un lymphome.




Thorax face




Thorax profil




CT thoracique 1




CT thoracique 2




CT thoracique 3




CT thoracique 4



CT thoracique 5

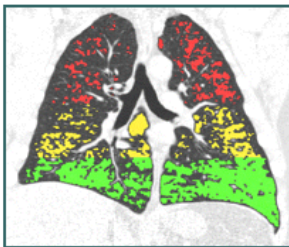
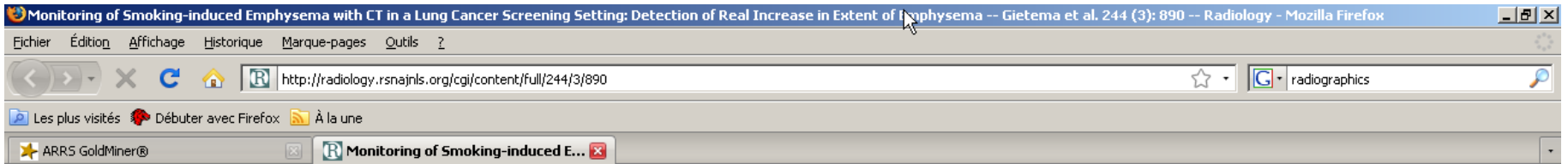


CT thoracique 6



CT thoracique 7

Example case 2008



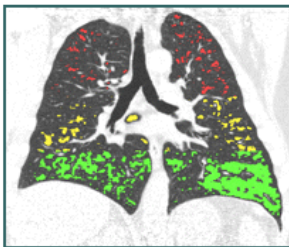
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Figure 2a: Coronal (a) baseline and (b) repeat scans in a 56-year-old man show areas with attenuation below -910 HU. The computer program divides the lungs into three equal volumes shown in red, yellow, and green and provides the total low-attenuation volume. Total lung volume was 5965 mL on the baseline scan and 6350 mL on the repeat scan.



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Figure 2b: Coronal (a) baseline and (b) repeat scans in a 56-year-old man show areas with attenuation below -910 HU. The computer program divides the lungs into three equal volumes shown in red, yellow, and green and provides the total low-attenuation volume. Total lung volume was 5965 mL on the baseline scan and 6350 mL on the repeat scan.

Clinical relevance of the search tasks

- Clearly defined information needs such as our search tasks exist, but ...
 - ... in teaching, **less critical** domains
 - Additional information for illustrations rather than decision support
 - Text can find most of what we ask for
- Database is partly of unknown **quality**
- Unit for clinician is a **case** rather than the image

Evidence-based medicine

- Use **evidence** from medical literature to find the diagnosis and the best treatment
 - Studies in favour or against a certain action
- **Case-based** reasoning
 - Find the most similar cases with their outcome
 - Perform the actions that lead to the best results
- Use **knowledge** stored in past cases (of an institution) and in the scientific literature
 - This access is not always easy

Clinical decision support – relevance

- Use **incomplete information** available at a certain moment
 - Anamnesis, lab results, images, symptoms, problems, ...
- Find high quality similar cases and their outcomes
 - Case-based reasoning
 - High quality cases in the scientific literature rather than teaching files

One proposition for 2008

- Use a similar database as in 2008
 - Maybe larger?
- Use the **case** as the unit
 - Not the image
- Search tasks are an **incomplete description**
 - 1-5 images of various sorts
 - Part of an anamnesis
 - List of symptoms, some lab results, etc.

Problems with this methodology

- Creating the search **tasks** is hard and takes time
 - Take cases from the literature (non-distributed) and remove information selectively
 - Keep diagnosis for the relevance judgements
- Pools could be increased automatically when searching with full information
- Relevance **judgements** are harder
 - More subjective time consuming

... and even more problems

- Images from clinical archives are in **DICOM**
 - Often 10-12 bit grey levels, ...
 - Images in teaching files and the literature are in **JPEG** is a certain level/window setting
- Clinical case are (fortunately) often **healthy** or with little pathology
 - Literature and teaching files do not keep proportion of reality
 - Rather **abnormal** cases, extreme scenarios, ...

Other options for 2009

- A **completely new** database
 - Finding **nodules** in lung CTs?
 - LIDC database of the NIH
 - Sorting a CT stack into the right order
 - **3D** task
 - Other image databases are available
- Maybe the literature and a new database?
 - Both tasks will need a clear focus

Conclusions

- A **change** is somewhat required for ImageCLEFmed
 - Interesting database but little can be learned from the current tasks
- **Visual** retrieval needs to be motivated in a better way
- Steps towards clinically more relevant tasks are needed
 - **Case** instead of image as unit

Acknowledgements

- Thanks to the HES SO for their support of ImageCLEF!
 - **BeMeVIS** project
 - Hopefully next year with a better management system for registrations/submissions etc.
- Google
- RSNA

