Business Information Systems

ImageCLEFmed 2009: towards clinically relevant tasks

ImageCLEF

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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”)

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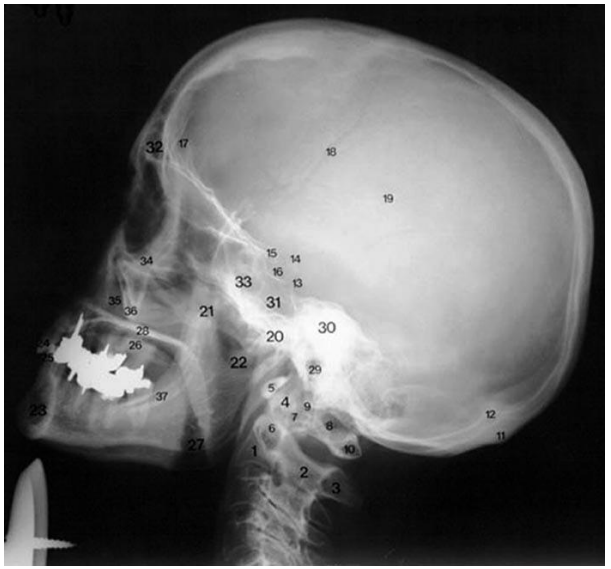
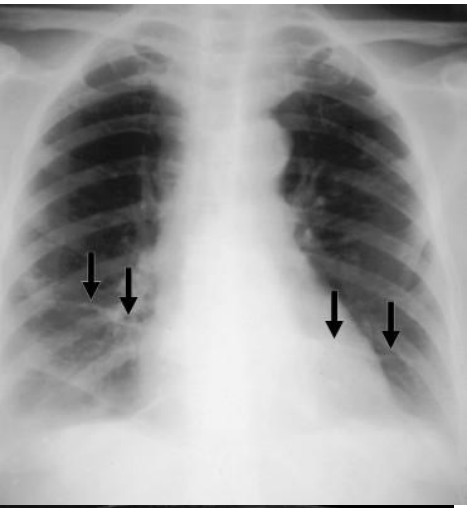
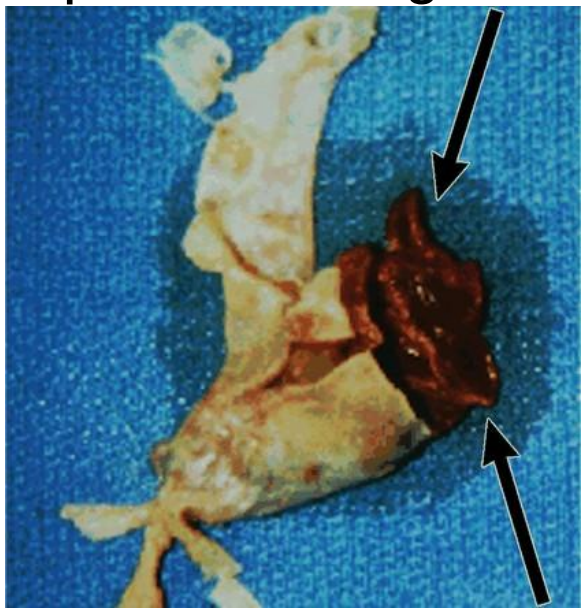
Example topics (1)



Example topics (2)

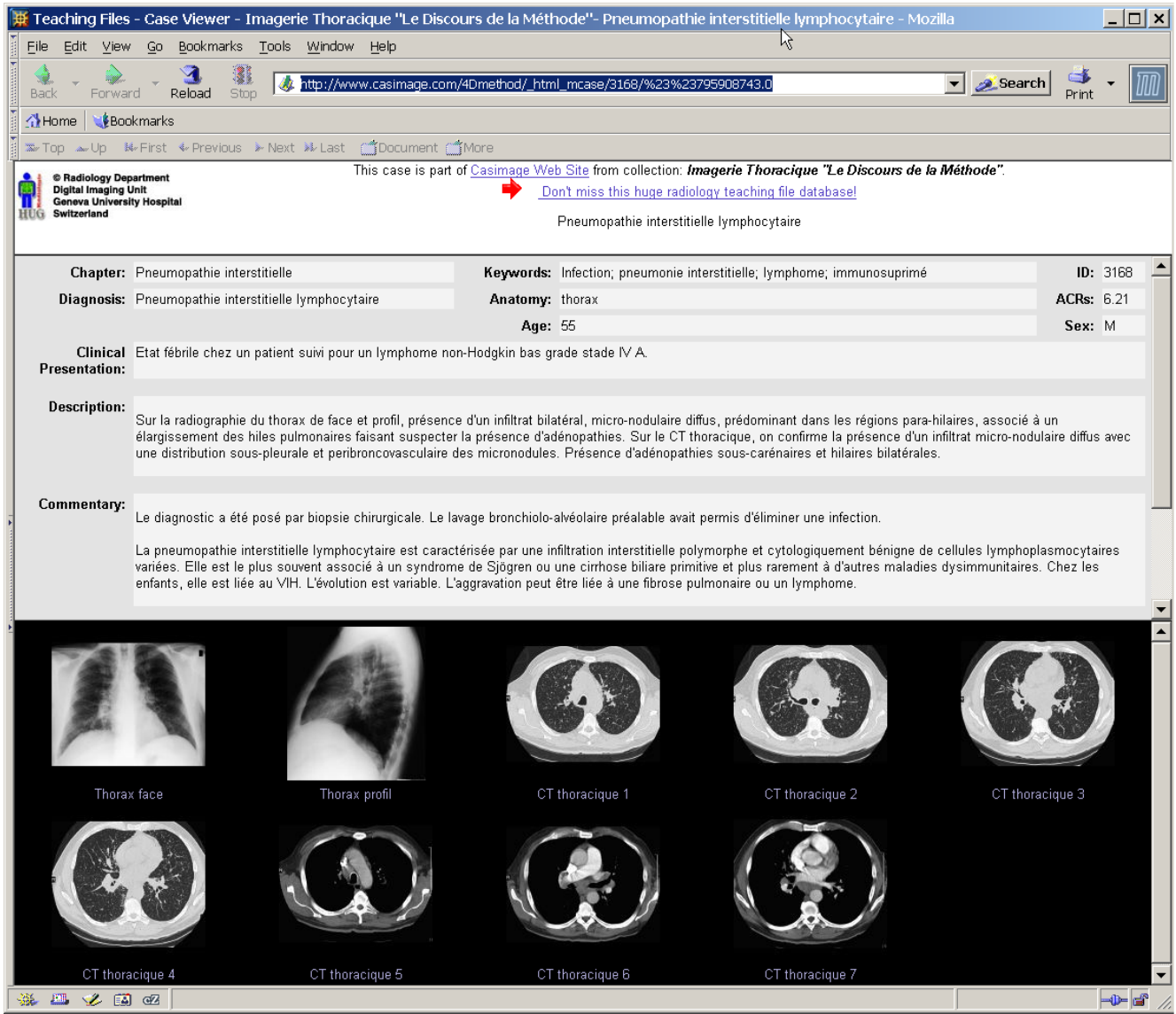
Ultrasound with rectangular sensor.
Ultraschallbild mit rechteckigem Sensor.
Ultrason avec capteur rectangulaire.





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

Example case 2005-2007



Example case 2008

Monitoring of Smoking-induced Emphysema with CT in a Lung Cancer Screening Setting: Detection of Real Increase in Extent of Emphysema -- Gietema et al. 244 (3): 890 -- Radiology - Mozilla Firefox

Fichier Édition Affichage Historique Marque-pages Outils ?

http://radiology.rsnajnls.org/cgi/content/full/244/3/890

radiographics

Les plus visités Débuter avec Firefox À la une

ARRS GoldMiner® | Monitoring of Smoking-induced E...

References

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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.

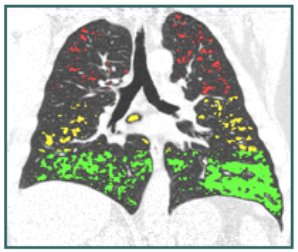

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Figure 2b: Coronal **(a)** baseline and **(b)** repeat scans in a 56-year-old man show areas with attenuation below –910 HU. The computer program divides the lungs into three equal volumes shown in red, yellow, and green and provides the total low-attenuation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

Radiology Radiology Radiology

Terminé

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