Analysis of the use of medical images

Medical Informatics Europe (MIE 2005)

Henning Müller
Medical Informatics Service

UNIVERSITÉ DE GENÈVE
HUG
Hôpitaux Universitaires de Genève

Overview

- Introduction
- Hon media search
- Goals of the survey
- Some numbers
  - Fields people work in
- Results
  - Clinicians
  - Researchers
  - Lecturers
  - Students/Librarians
- Conclusions

Image use of medical professionals

- Content-based image retrieval
  - Image classification
    - Fully classified collection
    - Semi-automatic coding
    - DICOM header correction
  - Image retrieval
    - Large collections with limited knowledge on it
    - Satisfy information needs of users
    - Relevance feedback and navigation are important
- Give access to images/cases as diagnostic aid
  - Use information of cases at its best, including images
  - What are the real information needs?

Image retrieval example

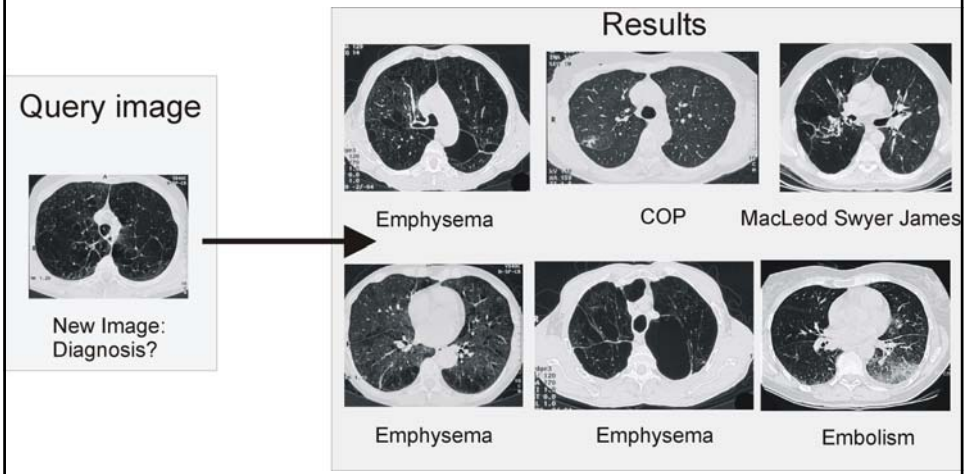

Image retrieval, image use

- Many techniques exist for medical image retrieval
  - Visual features, classifiers, database techniques, …
  - Are they useful? How useful are they?
  - What can be done better? To have a stronger use!
  - How can we evaluate it?
- ImageCLEF
  - >50.000 images, plus annotation in three languages
  - Classification task with 10.000 IRMA images
  - How can we formulate realistic tasks for the research community?
  - Analyze image use of potential users: MDs, librarians, students, patients

Log file analysis of HONmedia search

- Increase in medical online search
- http://www.hon.ch/HONmedia
- ~2,000 searches per month
  - Preliminary results (Jan 2005)
- More French than English (2/1), mainly 1-3 words
- Mostly diagnosis and anatomic region, sometimes combined
  - Leukemia, tumeur glomique, fracture, …
- Many general questions
  - Childbirth, medical images, medical media, …
- Also XXX

- CisMef should have very large log files

Survey on image use: goals

- Medical images are getting increasingly diverse and increasingly important in diagnostics, treatment planning, follow-up, …
- Little is known on the processes in which images are actually used and how they are searched for
- Analyze different user groups and tasks
- Find out their image search behavior
  - Tasks, kind of images, problems, ideas and propositions
- Use this to model information search tasks for imageCLEF and to advance system development

Analysis of survey: Questions

- For which tasks are images useful for you?
- What type of images do you use for each task?
- Where and how do you search images
- How do you define whether an image found is relevant or not?
- What kind of search would be useful for you?

- Separately for the following areas: research, clinics, lecturer, student, librarian
- 18 participants in Geneva, 13 in Portland (OHSU)
  - Many research/clinician/lectures together in Geneva

Some numbers on Portland

- 13 persons in total
- 5 researchers, 6 clinicians, 6 educators, 1 librarian and 1 student
  - Several in two groups
- Main sorts for the image use:
  - Patient care related
  - Research related
  - Education related
- Many comments on what could be done
  - Search by pathology, find similar cases, …

Some numbers on Geneva

- 4 students, one librarian
- 4 clinicians, and 2 researchers
- 7 mixed: 15% research, 75% clinician, 10% teaching
  - Most state 120%
- Survey took 30 minutes on average (10-70 minutes)
  - Interest to help research, but too many surveys, stressed
- Hard to get answers on questions, rather explanation of what they do with images

Results students, librarians

- Tasks: internships, exam preparation, search for users
- Type of images: very general types (on aids, tropical diseases), rather radiographs
- Search by google, casimage, CDs of books
- Hierarchical index search, or by keywords
- Quality is judged by resolution

- More free databases (on CD) with medical images, keyword search on these, plus hierarchical methods
- Proposition: Image google for medical images, only, browse similar images, search by sketch

Results researchers

- Tasks: presentations, publications
- Image types: often CT, illustrations, but also MRI, x-ray, …
- Search: PACS mainly, with few on google with text search, sometimes with ACR code in casimage
- Quality: high resolution for printing, personal eperience, no choice when set is given, find the most representative image

- Search for similar diagnostics, search 3D images

Results clinicians

- Task: diagnostics, treatment planning, follow up of the patient
- Image types: Much x-ray, but then CT, MRI, …
- Search: patient record, PACS, sometimes external CDs, by patient ID
- Quality: no choice

- Find simlar cases for comparisons, search by pathology

Results lecturers

- Task: presentations for teaching, prepare overviews for students, exams
- Image types: many types, very characteristic for one organ and one disease
- Search: casimage, Google, auntminnie, other special sites by keywords, pathology or simply iPhoto
- Quality: high resolution, but mainly personal experience, with main aspect clearly visible

Results in a nutshell

- Tasks are extremely different depending on department, specific work, and experience
  - Mostly diagnostics and conference presentations
- In diagnostics mainly radiographs and much CT, for research and teaching CTs and illustrations
- Most research in the PACS, but frequently in google, our teaching file, and on specialized pages
- Relevance is defined by experience, problems on the web with bad resolution/quality, sometimes no choice
- Most wanted a search by pathology added and the possibility to find similar cases to a current patient

Conclusions

- Little is known about information search behavior concerning medical images
  - Tasks need to be understood to imagine future systems
- Image retrieval needs to solve real tasks
  - Analysis of these tasks is important
- Different user groups have very different tasks and needs concerning images
  - Domain-specific search is necessary
- Visual retrieval is rarely asked directly, but similarity search is
  - Combine visual with textual characteristics, text as start
  - Take the case as a basis, not the image