# Gaps in content-based image retrieval

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# The Semantic Gap

human vision

- X-ray of skull
- lateral view
- good quality
- elderly patient (denture)
- ...

mismatch

machine vision

- 3.278
- 1.426
- 0.450
- ...
- 3.267

# Gaps in Medical CBIR

- Semantic gap
  - Human vs. computer vision (features)
- Sensory gap
  - Situation vs. recording
- Other gaps
  - Lack of running systems (performance)
  - Tools for query formulation (usability)

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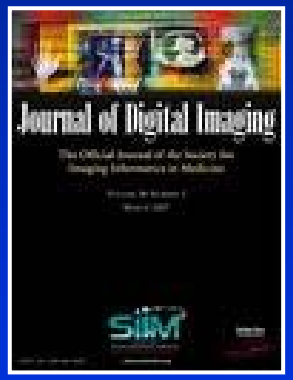
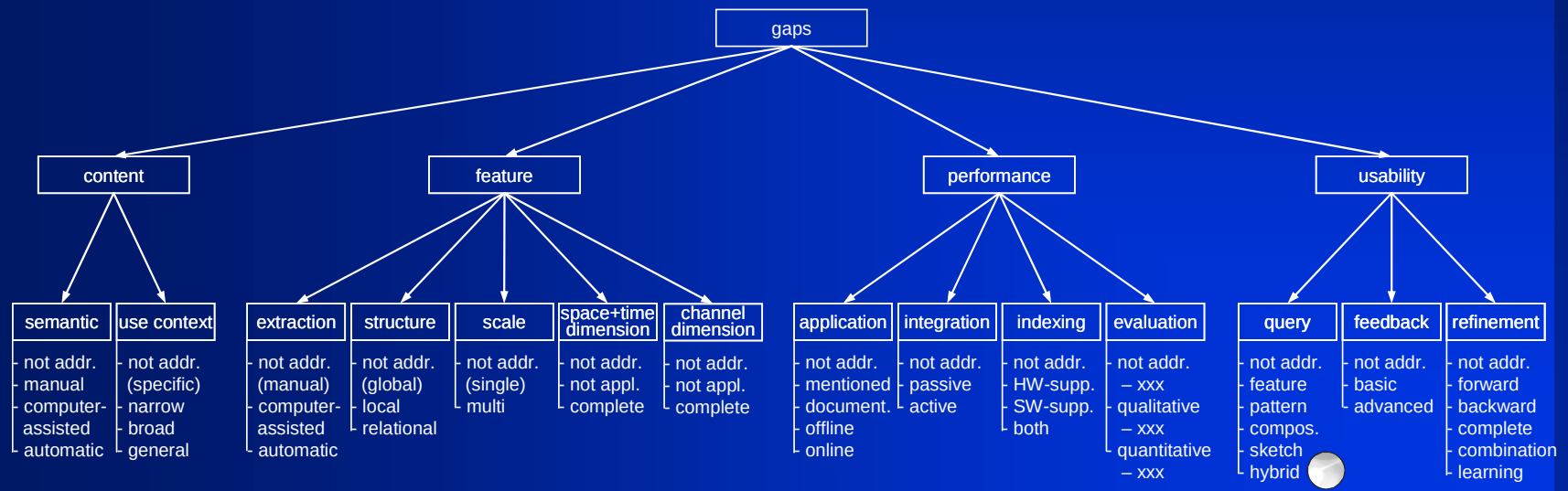



➔ Systematic analysis
  - Ontology of Gaps in Content-Based Image Retrieval. Journal of Digital Imaging 2008

# Ontology of Gaps

- 14 gaps identified
  - Content
  - Feature
  - Performance
  - Usability



# Content Gaps

- Semantic gap
  - computer ↔ human
- Use context gap
  - restricted ↔ general

# Feature Gaps

- Extraction gap
  - manual ↔ automatic
- Structure gap
  - global ↔ local
- Scale gap
  - single ↔ multi
- Space + time dimension gap
  - partly used ↔ complete used
- Channel dimension gap
  - partly used ↔ complete used

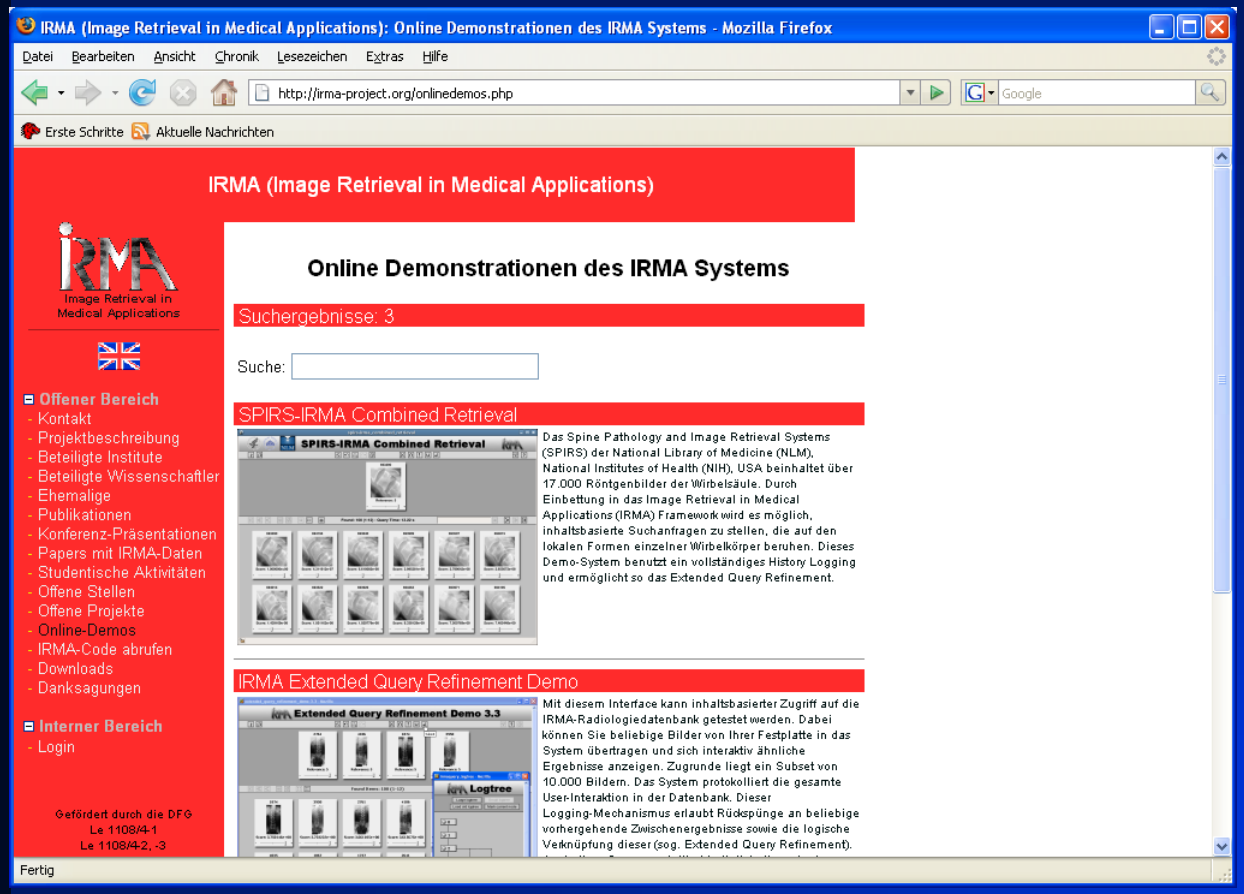
# Performance Gaps

- Application gap
  - not implemented ↔ executable via Internet
- Integration gap
  - stand alone ↔ full communication with HIS
- Indexing gap
  - brut force search ↔ indexed trees / hardware support
- Evaluation gap
  - non ↔ based on large ground truth data

# Usability Gaps

- Query gap
  - text only ↔ image pattern / sketches / drawings
- Feedback gap
  - non ↔ results are explained / visualized
- Refinement gap
  - non ↔ redo-undo / full history / system learns on user

# Example: http://irma-project.org



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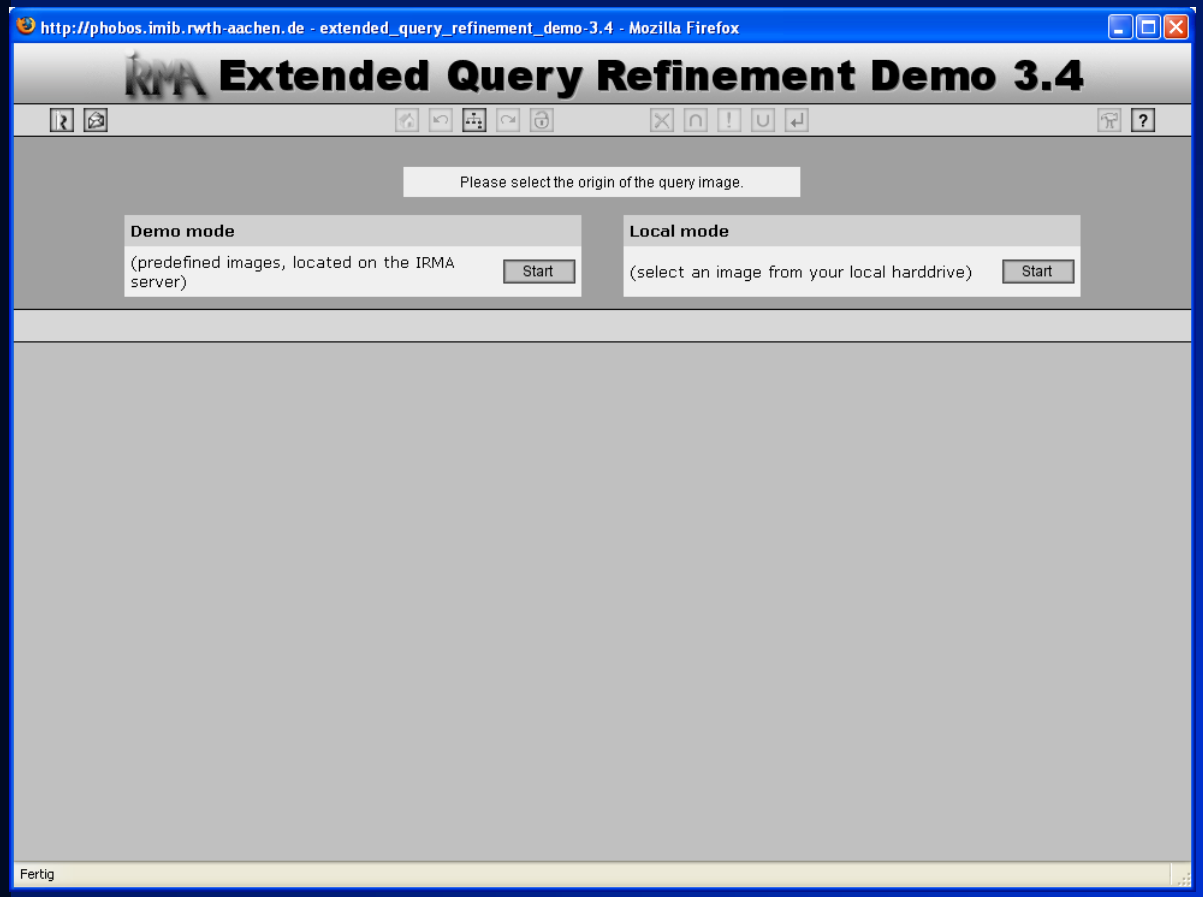


➔ Bridges: application gap

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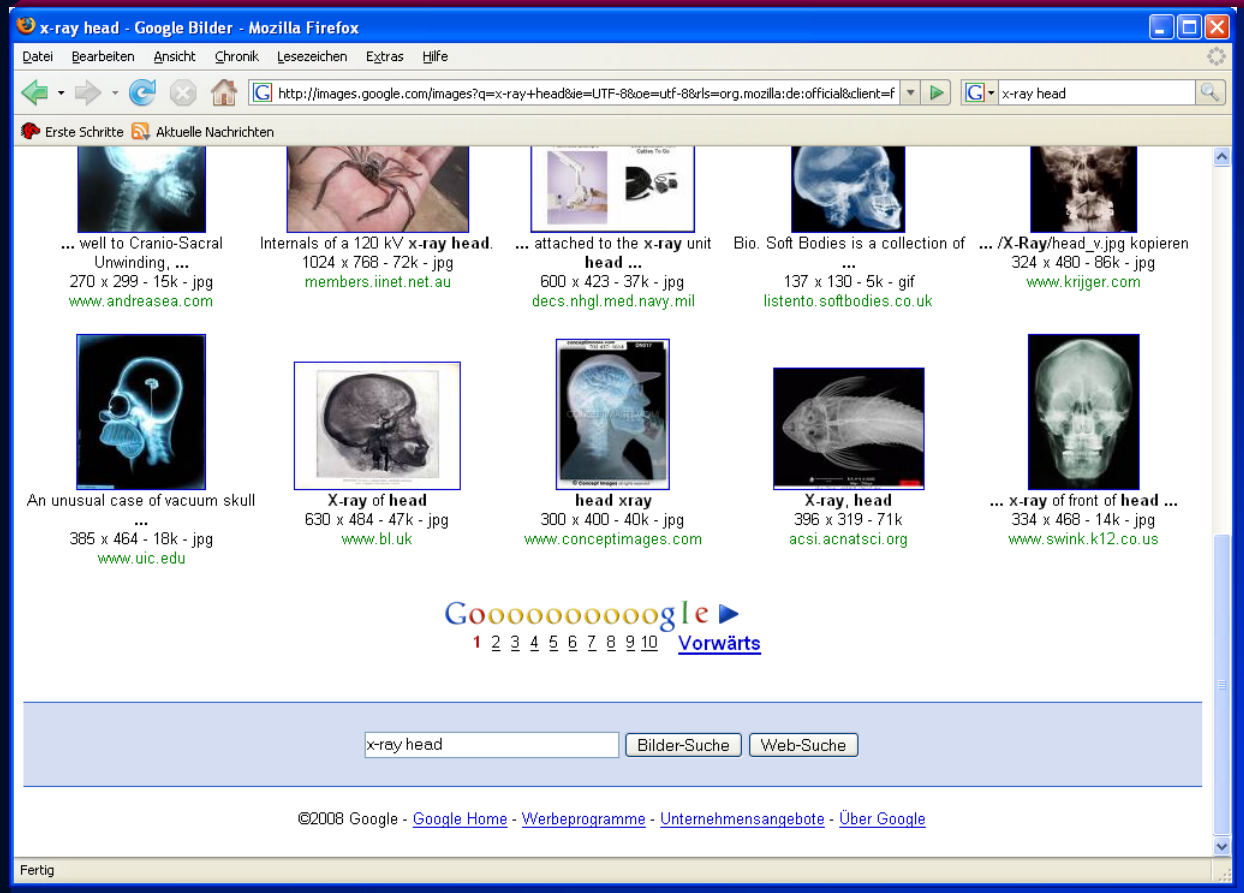


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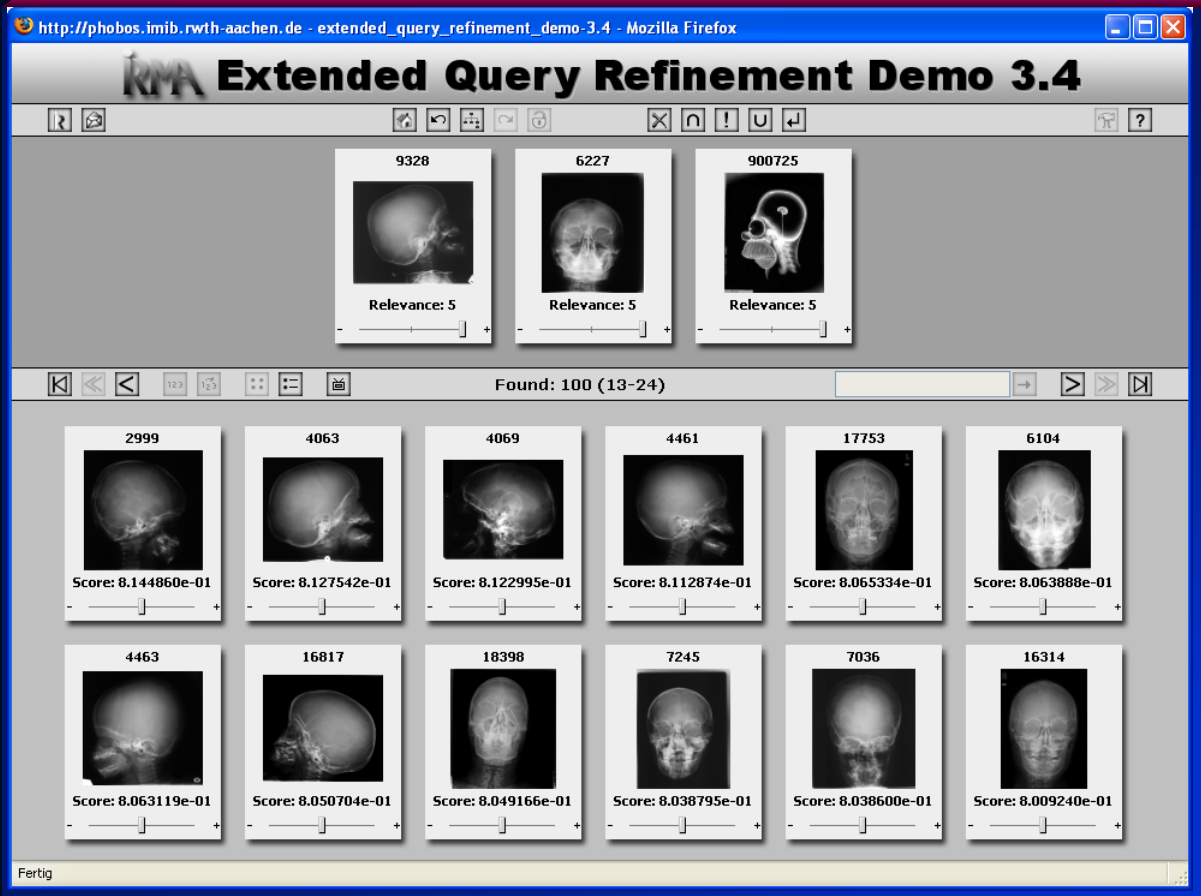


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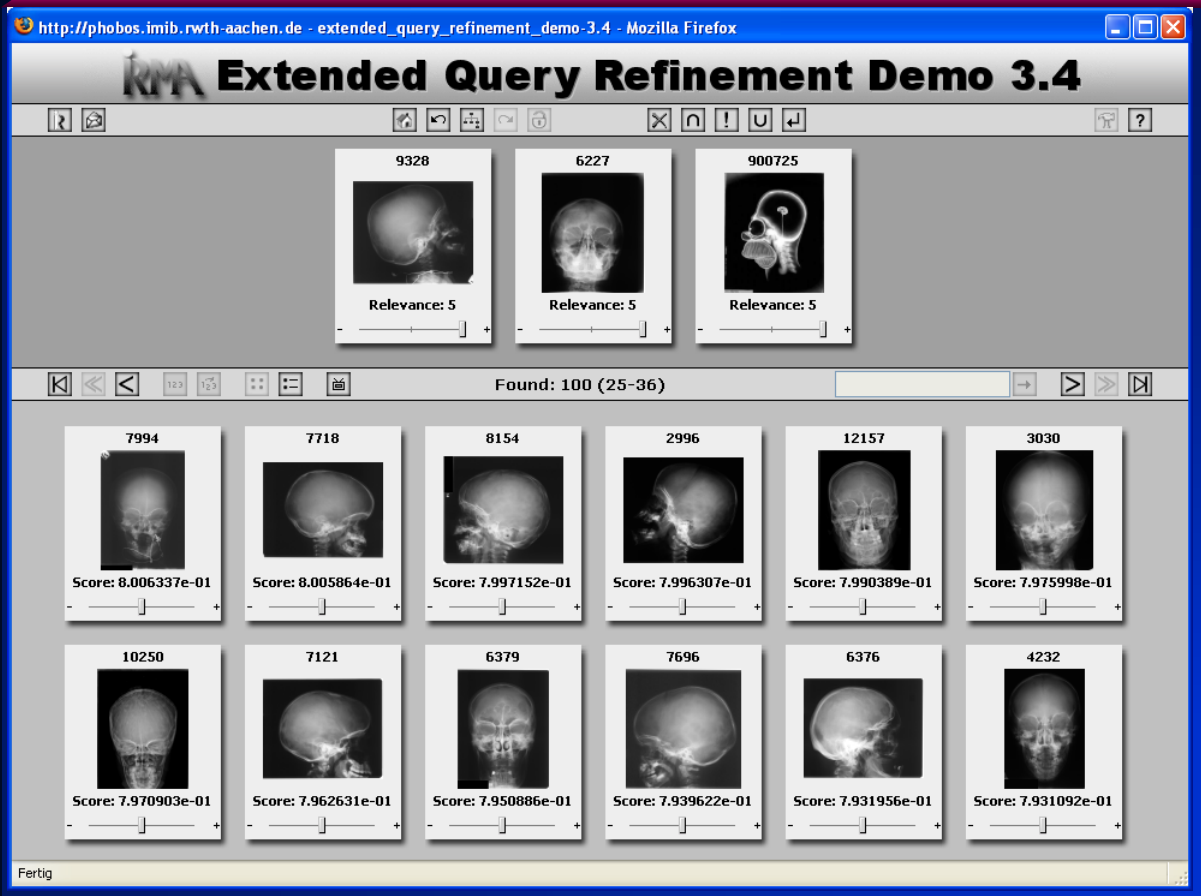


➔ Bridges: application & refinement gaps

# Summary

- Message: *it's not only one gap!*

- Taxonomy: *allow system comparison*
  - 4 groups
  - 13 gaps
  - 50 instances

➔ Question: *which are the most crucial gaps?*