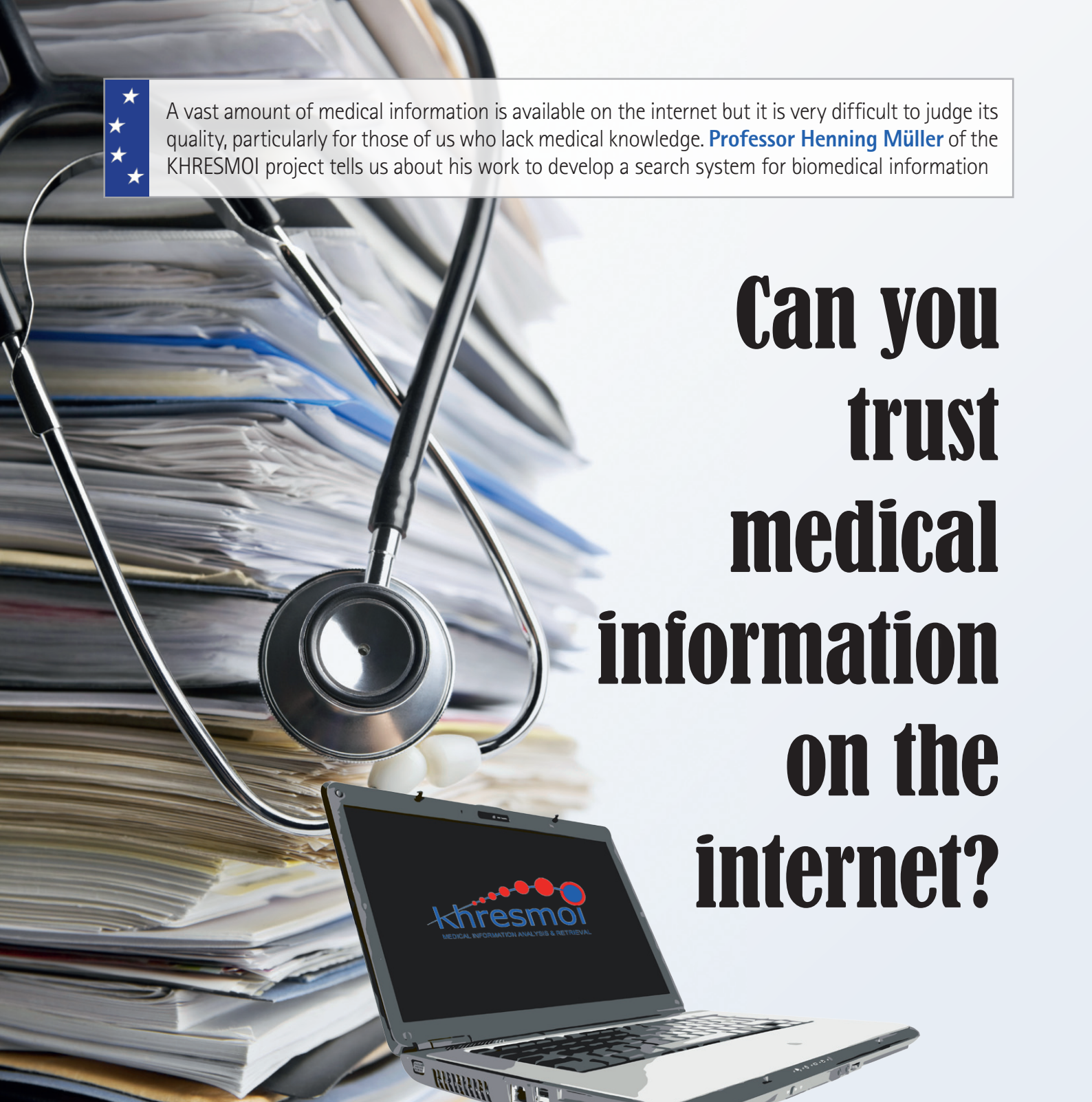




A vast amount of medical information is available on the internet but it is very difficult to judge its quality, particularly for those of us who lack medical knowledge. **Professor Henning Müller** of the KHRESMOI project tells us about his work to develop a search system for biomedical information

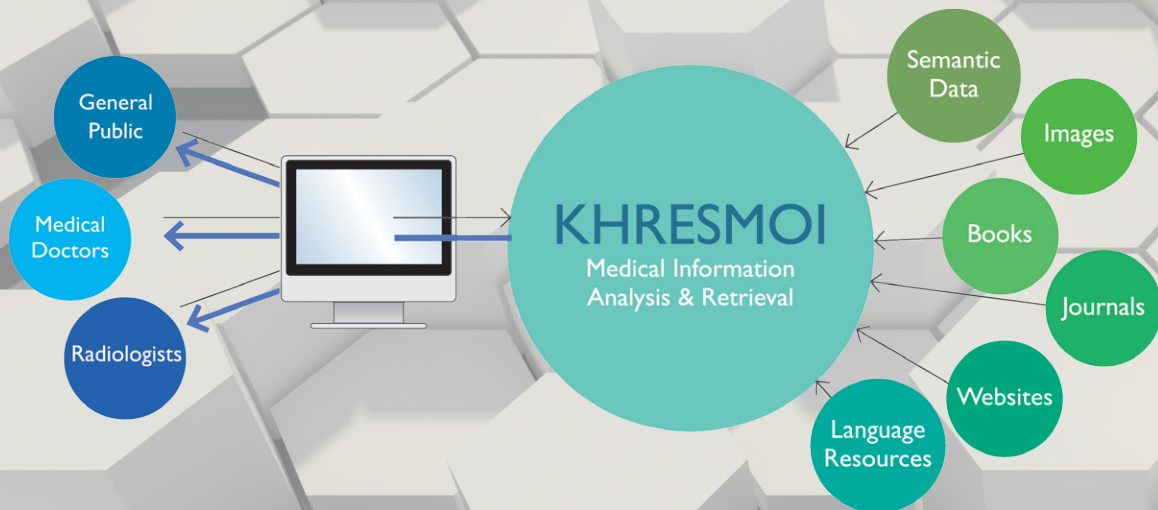
Can you trust medical information on the internet?



A large proportion of internet searches are health-related, with both the general public and physicians using the web to research symptoms, look at previous cases and identify possible treatments and their risks. However, while a vast amount of biomedical information is available on the internet, it is very difficult to judge its quality, an issue the KHRESMOI project is working to address. “The main objective

of the project is to develop a search system for biomedical information for three main target user groups; the general public, General Practitioners and Radiologists,” says Professor Henning Müller, the project’s overall coordinator. It often takes a few years before emerging research is applied by busy GP’s, so supplying them with relevant, up-to-date information faster would be very beneficial; Professor

Müller believes it would also be helpful for radiologists. “They deal with a lot of visual information. This is actually the most quickly growing area of medical information,” he points out. “Each of our partners has a role for either one of the user groups, or for one of the underlying technologies. We aim to build a system for health information research, giving access to health information in a variety of



Khresmoi system overview

different ways. The goal is to create a community around medical information extraction and analysis.”

Sharing information

This work reflects the way the doctor-patient relationship is changing as medical information becomes more widely available. Professor Müller believes that getting patients more involved in their treatment, rather than just being a passive recipient, can encourage them to take more responsibility for their own health. “Several studies have shown that if people know about a condition then they can adapt to it and change their behaviour,” he says. If they are actively engaged in their treatment patients are also likely to share more information, which can help doctors diagnose the problem and treat it more effectively. “Often physicians are not 100 per cent sure about the exact condition a patient has. So they may look at the statistics, try to find the most probable diagnosis, and then base the treatment on this. But very often it’s still not fully clear what a patient really has,” continues Professor Müller. “The treatment process is based on experience – a physician will give a certain treatment when people come in with a fever. And then if the first three people come back, because maybe it’s a new strain or a different type of bacteria/virus, then they will change the treatment and adapt it. But if the physician has more information from his colleagues, then maybe the first three people would not have been treated incorrectly.”

The project is indexing publicly available web-pages and medical literature to gather information across a wide range of conditions then asking physicians to classify it. The user groups being targeted of course require different kinds of information. “Radiologists are very interested in being able to mark a region in an image and then find visually similar regions in diagnosed images. They can then find information about the pathologies and look at the evidence to support the diagnosis such as a biopsy,” explains Professor Müller. The general public don’t usually have the same level

of years you might have become quite knowledgeable about it, so would be comfortable with technical language.”

The underlying technology and the basic information are the same for the parts of the system concerning the general public and medical professionals. However, when users access the website they identify their user group and the interface can be adapted. “We have a back-end, where we have the automatic machine translation. We also have the semantic information extraction, the knowledge base, an image retrieval engine and a text retrieval engine. In all

We aim to build a system for health information research, giving access to health information in a variety of different ways. The goal is to create a community around medical information extraction and analysis

of medical expertise, so are looking for clear, accessible information that they can trust. “They want information that is on their level –they don’t want a scientific article describing a study in very technical language,” stresses Professor Müller. “We’re doing a specific classification on the technical level of the language. So we’re trying to classify how technical the language is on a web-page or an article and how difficult it is to read, in line with patient needs. Patients who’ve just been diagnosed might need quite basic information on their condition. At the other end of the scale if you’ve had diabetes for a couple

of this, the indices are basically the same information. We can have a very simple, I would say Google-like, interface for the general public, whereas we have something that resembles more a digital library for GPs. Then the interface for radiologists looks more like a radiology viewing station, a tool that they’re used to,” explains Professor Müller. The web pages have to meet certain criteria. “We index medical web pages certified by Health On the Net Foundation (HON). HON is evaluating health websites according to ethical and quality criteria, the HONcode, in order to provide trustworthy and ethical health online information.”

continues Professor Müller. Medical journals are indexed as well. Both are linked to a knowledge base, the LinkedLifeData. "Then we index the medical literature, such as PubMed, which is maintained by the national library of medicine in the U.S; they also have an index of the open-access literature. So we index all of the open-access literature including the article images."

Search results

The results are ranked based on trustworthiness, complexity of the language and relevance to the search query, while it's also possible for Doctors to add information. All of the case-based literature the project is working with is fully anonymised, which ensures patient confidentiality, but Doctors have to take care to maintain it when adding information to the system. "Physicians have a kind of personal library where they can store found cases when they log into the system. They can also upload information – they are responsible for ensuring that there is no personally identifying information in that," says Professor Müller. It is also important to consider where the information came from, any environmental factors and whether the local population might be more likely to suffer from a particular condition. "If you look at statistics on certain diseases, some ethnicities are more prone to heart infarctions than other ethnicities, so this is something that needs to be taken into account," acknowledges Professor Müller. "When we have an anamnesis, the description of a patient's basic medical history, we analyse information on a

younger patient very differently to how we'd look at an older patient. For example, an image of a young patient's lung looks very different to an older patient's, even if they're both totally healthy."

Some medical articles include information on age, ethnicity and gender, which allows Professor Müller and his colleagues to filter their results. The system itself is multi-lingual, with the project mainly concentrating on European languages, specifically English, French, German, Spanish and Czech. "We have an automatic translation possibility in the interface – so if you're typing a query in French, German, Spanish or Czech it will automatically suggest a corresponding English term if needed. So you can type the terms e.g. in French but then make the query in English. Many people are comfortable with reading text in English, but then precisely describing a medical condition in English is much harder," says Professor Müller. There are often many ways of describing the same condition in one language, but Professor Müller says the system can take account of these kinds of issues. "We use, among other sources, a knowledge base called LinkedLifeData. This covers medical terminology, including thousands of synonyms of specific terms, as well as the standard or non-standard abbreviations that are used," he continues. "Many of these terms do not exist only in English, but also in French, Spanish and German. We can extract these semantic terms and then use them in other languages, for example to run the queries. This makes it possible to retrieve documents in several languages."

At a glance

Full Project Title

Knowledge Helper for Medical and Other Information users (KHRESMOI)

Project Objectives

Khresmoi is developing a multilingual multimodal search and access system for biomedical information and documents.

Project Funding

EC contribution: €8 Million

Project Partners

HES-SO (CH) • Vienna University of Technology (AT) • Atos Origin (ES) • ELDA (FR) • Ontotext (BG) • Dublin City University (IE) • University of Duisburg-Essen (DE) • Charles University in Prague (CZ) • University of Sheffield (UK) • Health on the Net (CH) • Medical University of Vienna (AT) • Society of Physicians in Vienna (AT)

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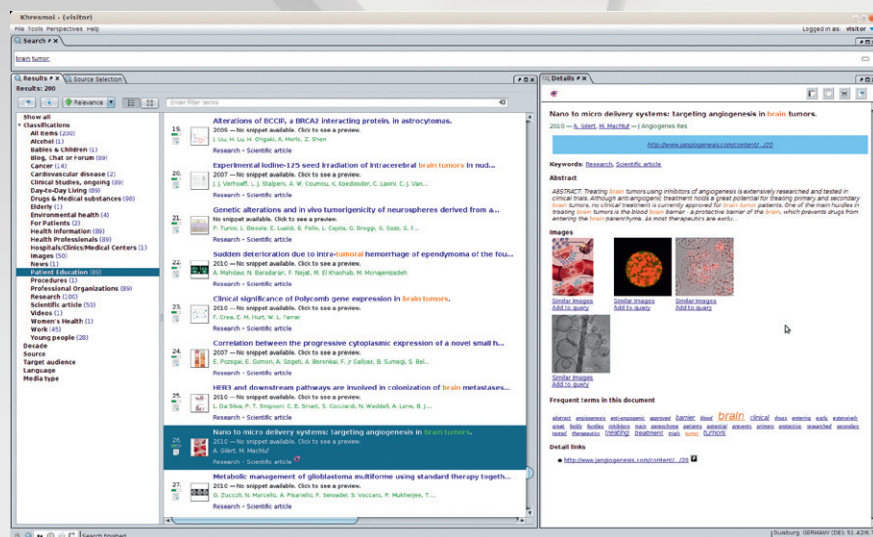
Allan Hanbury, Célia Boyer, Manfred Gschwandtner, Henning Müller, KHRESMOI: Towards a Multi-Lingual Search and Access System for Biomedical Information, Med-e-Tel, pages 412–416, Luxembourg, 2011.

Henning Müller, PhD, Prof.
Project Coordinator (left) and
Allan Hanbury, PhD, Scientific
Coordinator (right)



Project Coordinator Henning Müller and the scientific coordinator Allan Hanbury

Henning Müller studied medical informatics at the University of Heidelberg from 1992 to 1997. He has worked at the medical faculty of the University of Geneva since 2002, becoming a Professor at the HES-SO in 2007. He is currently coordinator of the EU-project Khresmoi and scientific coordinator of the VISCERAL project.



Khresmoi screenshot