Keynote I

Towards Semantic-Level Visual Search

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Abstract

With the explosive growth of multimedia content online, researchers have been racing to develop novel solutions for searching images and videos. The Holy Grail has always been a seamless way of accessing multimedia information at the semantic level. However, two major barriers remain in the way – the semantic gap and the intention gap. The former refers to the large difference between machine recognizable information from raw image data and the user desired descriptions at the semantic level. To address this, recently there have been major efforts in developing multimedia ontologies for describing visual concepts, training large resources for automatic concept categorization, and new image search interfaces directly in the visual concept space. The other challenge associated with the intention gap lies in the difficulty in expressing user search targets through the conventional keyword-based methods. In response to this, I will describe two new paradigms. One explores efficient methods (lexical, statistical, and Web) to map keywords to visual detectors and adds real-time interfaces for manipulating queries in the visual concept space. The other completely foregoes the textual query input, instead relies on novel brain machine interfaces and data mining techniques to decode user’s search targets. I will survey ongoing research in the above directions aiming towards a semantic-level visual search engine.

About the speaker

Shih-Fu Chang is Director of Digital Video and Multimedia Lab and Professor and Chairman of Electrical Engineering and at Columbia University. He has also led the ADVENT research consortium at Columbia University with the participation of more than 25 industry sponsors. He has made significant contributions in multimedia search, media forensics, mobile media adaptation, and international standards. He has been recognized with several awards, including IEEE Kiyo Tomiyasu Technical Field Award, IBM Faculty Award, Navy ONR Young Investigator Award, ACM Recognition of Service Award, and NSF CAREER Award. He and his students have received four Best Paper Awards and seven Best Student Paper Awards from IEEE, ACM, and SPIE. Many video indexing technologies developed by his group have been licensed to companies. He was elected to IEEE Fellow in 2004 and was Editor-in-Chief for IEEE Signal Processing Magazine during 2006-8.
Abstract
Science has undergone several revolutions - from experimental science, which focused on observations of natural phenomena, to theoretical science, which encapsulated these observations into laws of Nature, to computational science in the last 50 years, studying the simulation of complex phenomena. Now, as scientific data in almost every field is growing exponentially, the focus has moved to a fourth research paradigm for data-intensive science based on technologies and tools suitable for extracting knowledge from massive volumes of data. What comes next? And how can semantic computing contribute to it? In a knowledge-driven society the emergent ecosystem of software and services for research will require technologies enabling machine-based information management, analysis, reasoning, and inference. Products and tools from information industries are well underway to start delivering on the promise of semantic computing (e.g. visual search, semantic search). However, we need further investment in and wider deployment of semantics-based technologies, such as those demonstrated by research projects funded by the UK eScience and the NSF Cyber-enabled Discovery and Innovation programs, and which can now scale up to web-scale via the emergent cloud computing infrastructure.

About the speaker
As corporate vice president in Microsoft Research, Tony Hey is responsible for worldwide university research collaborations with Microsoft researchers. Hey is also responsible the multidisciplinary eScience Research Group within Microsoft Research. Before joining Microsoft, Hey served as director of the U.K.'s e-Science Initiative, managing the government's efforts to build a new scientific infrastructure for collaborative, multidisciplinary, data-intensive research projects. Before leading this initiative, Hey led a research group in the area of parallel computing and was Head of the School of Electronics and Computer Science, and Dean of Engineering and Applied Science at the University of Southampton.

Hey is a fellow of the U.K.'s Royal Academy of Engineering and was awarded a CBE for services to science in 2005. He is also a fellow of the British Computer Society, the Institute of Engineering and Technology, the Institute of Physics, and the U.S. American Association for the Advancement of Science (AAAS). Tony Hey has written books on particle physics and computing and has a passionate interest in communicating the excitement of science and technology to young people. He has co-authored "popular" books on quantum mechanics and on relativity.
Using Semantics to Improve Interactive Information Access

Lynda Hardman
Centrum Wiskunde & Informatica
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Abstract
Many methods have been developed to extract human-interpretable semantics from signals present in individual media assets. Ensuring that these human-interpretable semantics are also machine processable allows us to identify, describe and connect together fragments of media assets in a rich information environment. Users requiring information are then faced with the problem of finding out what information is available, and obtaining sufficient fragments to successfully carry out their task.

Systems supporting these tasks can use the fragments, descriptions of them and relationships among them, to improve both the selection and presentation of information. This talk will address two issues. Where can semantics play a role in supporting information oriented tasks, and how can they be used to improve support.

About the speaker
Lynda Hardman (http://www.cwi.nl/~lynda/) is head of the Interactive Information Access group at CWI (Centrum Wiskunde & Informatica) and professor by special appointment of Multimedia Interaction in the Faculty of Science at the University of Amsterdam. She obtained her PhD from the University of Amsterdam in 1998, having graduated in Mathematics and Physics from Glasgow University in 1982. During several years of working in the software industry she was the development manager for Guide - the first hypertext authoring system for personal computers (1986).

Her early experiences in industry with the development of hypertext authoring tools inspired her towards underlying questions of combining time-dependent documents (such as video sequences) along with interaction through links into a single model. She was a member of the W3C working group that developed the first SMIL recommendation.

Since the development of the semantic web, she has dedicated herself to improving human access to the ever-expanding 'linked data cloud'. Her current research efforts are focused on improving design methods for human-based interfaces in relation to developing technology.

She is a member of the editorial board for the Journal of Web Semantics, and the New Review of Hypermedia and Multimedia, and was co-programme chair for SAMT 2008 and ACM Hypertext 2003.
Keynote IV

What I Learned about Semantics from Textual Question Answering

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Abstract

Natural Language Processing (NLP) techniques employed in textual Question Answering (QA) rely on many forms of semantic information. Questions have a semantic focus and they convey an information need through a variety of semantic forms. On-line documents can be annotated with rich semantic structures to enable superior search for answers. Answers are validated by textual inference techniques that operate on knowledge encoding many semantic frameworks. In addition, semantic resources such as WordNet, FrameNet, PropBank, NomBank and TimeBank provide a multitude of semantic encodings useful for QA. Wikipedia allows researchers to mine for additional semantic information, in their quest to develop answer ranking and extraction methods.

During a decade of envisioning and developing QA systems, I ventured often on the path of exploring semantic information, either readily available or, mostly mined with NLP methods from large on-line text collections. Semantic information was selected on-demand, to serve several inference tasks required in the process of understanding a question, capturing the context in which it may be answered and pinpointing and justifying its answers.

About the speaker

Sanda Harabagiu is Associate Professor and Erik Jonsson School Research Initiation Chair in the Computer Science Department of the University of Texas at Dallas. She is also the Director of the Human Language Technology Research Institute at the University of Texas at Dallas. Dr. Harabagiu has earned a PhD from University of Southern California in 1997 and a Doctorate from University of Rome Tor Vergata in 1994. She has been on the faculty of Southern Methodist University, University of Texas at Austin and University of Texas at Dallas. Her research spans Natural Language Processing, Information Retrieval, Knowledge Processing and Artificial Intelligence.

In her work, Dr. Harabagiu combines knowledge extracted from the World Wide Web with knowledge coerced from large lexical databases (e.g. WordNet or FrameNet) to be able to model the semantics of language in texts. In 2006 she co-edited a book entitled "Advances in Open Domain Question Answering". Dr. Harabagiu is a past recipient of an NSF CAREER award for studying reference resolution. Additional information is available from www.hlt.utdallas.edu/~sanda