

Knowledge Space of semantic inference for automatic annotation
and retrieval of multimedia content
K-Space: 027026



K-Space PhD Exchange

K-Space is a network of leading research teams from academia and industry conducting integrative research and dissemination activities in semantic inference for automatic and semi-automatic annotation and retrieval of multimedia content. K-Space exploits the complementary expertise of project partners, enables resource optimization and fosters innovative research in the field.

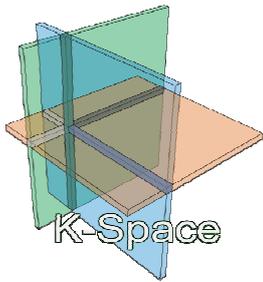
The aim of K-Space research is to narrow the gap between low-level content descriptions that can be computed automatically by a machine and the richness and subjectivity of semantics in high-level human interpretations of audiovisual media: The Semantic Gap.

Research Exchange Opportunities

Exchange of ideas across the Network is vital to the long term research within the field of Semantics and Multimedia. To this end the K-Space Network has established a research exchange framework. This framework will allow PhD students to visit research centres other than their own and to collaborate and be involved in the world class research occurring within the Network.

Any PhD student who wishes to be part of this cutting edge research and also wishes to work in another country from 2 weeks to 12 months, should contact Joemon Jose (jj@dcs.gla.ac.uk) who will co-ordinate their application.

The rest of this document describes the research centres within the K-Space Network and the research they are undertaking.



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Research Partners

Queen Mary, University of London, UK

The Multimedia and Vision Research Lab at QMUL was formed in 2001 to conduct research in image, video processing and computer vision. The MMV-Lab was created to underpin future technological developments in the information society of this century by addressing the consequential challenges of digital media processing and content engineering.



<http://www.elec.qmul.ac.uk/index.html>

Head of group: Prof. Ebroul Izquierdo
Point of Contact: Craig Stewart (craig.stewart@elec.qmul.ac.uk)

Research Topics:

- Integration of knowledge, semantics and low-level multimedia processing
- Semantic based media retrieval,
- Video classification in the compressed domain
- Scalable video source and channel coding,
- Image and video watermarking,
- Stereo imaging and mixed reality

London:

"A vibrant, ever changing city, London not only boasts an eclectic mix of old and modern architecture, but superb monuments and attractions, an abundance of cultural riches and a continually improving art, entertainment and gastronomic scene."

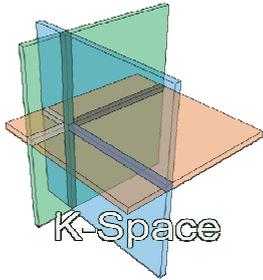
Please visit http://www.talkingcities.co.uk/london_pages/london_main.htm for more information on London.

University of Koblenz-Landau, Koblenz, Germany

The University of Koblenz-Landau is one of the youngest universities in Germany. Its academic profile is marked by a combination of Computer Science and Psychology together with the traditional Departments of Education, the Humanities, and Natural Science. To K-Space the University of Koblenz-Landau contributes expertise in higher level image understanding, semantic web and peer-to-peer technology. The Research Group "ISWeb - Information Systems and Semantic Web"



<http://www.uni-koblenz-landau.de/>



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K-Space PhD Exchange

concentrates its work on the basic principles and applications of semantic-based technologies and their integration into complex, dynamic information systems.

Head of group: Prof. Dr. Steffen Staab
Point of Contact: Simon Schenk (sschenk@uni-koblenz.de)

Research Topics:

ISWeb works on approaches and methods of the design and maintenance of ontologies, as well as the semantic annotation of documents, multimedia data or web services to enable the semantic search and usage of these resources.

Semantic technologies are used for information retrieval, for information integration and for semantic-based peer-to-peer networks and for semantic middleware (Web Services, Grid).

Koblenz & Landau:

“Situated in the picturesque landscape of the Rhine and Moselle and surrounded by four low mountain ranges is the 2000-year-old town of Koblenz. Its abundance of cultural monuments and historic buildings, its cosy lanes and narrow alleyways, the relaxed and happy atmosphere of its squares and river promenades make Koblenz a friendly town where its guests feel right at home.”

Please visit http://www.koblenz.de/touristik_kultur/koblenz_allgemeine_infos_e.html for more information on Koblenz.

Joanneum Research Forschungsgesellschaft mbH, Graz, Austria

Information is considered to be the key resource in the twenty-first century. With its scientific experts the JOANNEUM RESEARCH Institute of Information Systems & Information Management develops cutting edge methods designed to organise the constantly growing flood of data and to selectively filter out the desired information.

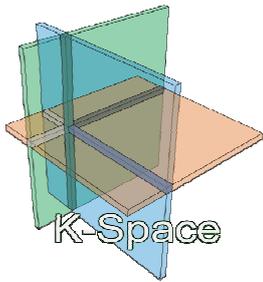


<http://www.joanneum.at/iis>

Head of group & Contact: Dr. Herwig Rehatschek (Herwig.Rehatschek@joanneum.at)

Research Topics:

The Institute of Information Systems & Information Management is the central part of the information technology division. It concentrates on the combination of classical information systems with visualisation, digital media and communication technologies,



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K-Space: 027026



K-Space PhD Exchange

thus developing spectacular applications at an international level. It is organized into two research areas, namely Digital Media and Web Information Systems.

The digital media group performs research in digital video technologies digital film restoration, intelligent search algorithms and navigation within multimedia content. Our current research focus is on content based search & retrieval, content abstraction and spatio-temporal video and object segmentation. As metadata standard for our work we are relying on MPEG-7, where we developed a (free to use) MPEG-7 library based on a full C++-implementation of the standard (see: <http://mpeg-7.joanneum.at/>).

The range of ongoing projects in the Institute deals with various applications for the analysis and recognition of video content and its application for knowledge management. These activities are performed with a high emphasis on available and evolving standards or initiatives for meta data and communication protocols (e.g. MPEG-2, and -7, SMIL, SOAP, OAI, XML, OWL). Further application areas for our technologies are cultural heritage, digital libraries and computer supported training and education.

Graz:

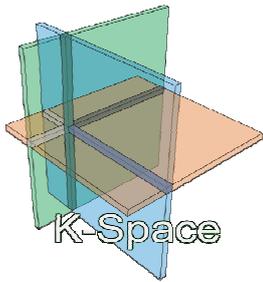
The Styrian capital of Graz is famous for its high quality of life and stands out as a vital business location and as a centre of science, research and culture. Take your time to experience Graz in all its variety. Even though Culture Capital Graz 2003 is over, Graz continues to impress with its prime cultural selection. Our numerous sites will make your stroll around the city an unforgettable experience. Sports fans will also find we have much to offer. However you choose to spend the sunlight hours, a perfect day is best ended in one of the numerous romantic beer gardens and outdoor cafes of the old town. Please visit <http://www.graztourismus.at/>.

Informatics and Telematics Institute, Thessaloniki, Greece

ITI is a founding member of the Centre of Research and Technology Hellas (CERTH). The most important related areas of R&D activities performed by ITI-CERTH include: image and video analysis, multimedia indexing and retrieval, informational retrieval and knowledge discovery for semantic-web applications, extraction and usage of semantic information (recognition of objects, events, properties and relations) from multimedia data, intelligent human computer interaction and intelligent agents, MPEG-7 and MPEG-21 standards. The ITI groups that participate in k-space are The Multimedia Knowledge Group (MKG, <http://mkg.iti.gr/index.htm>) and The Image, Video and Multimedia Systems Lab (IVML, <http://image.ntua.gr/>).



<http://www.iti.gr/>



Knowledge Space of semantic inference for automatic annotation
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K-Space: 027026



K-Space PhD Exchange

Head of group & contact person: Yiannis Kompatsiaris (ikom@iti.gr)
Director: Prof. M.G. Strintzis

Research Topics:

- knowledge-assisted analysis,
- multimedia ontologies,
- semantic reasoning-enhanced knowledge extraction from multimedia content

Thessaloniki:

<http://www.thessalonikicity.gr/English/index.htm>

Head of IVML & Contact Person: Yannis Avrithis (iavr@image.ntua.gr)
Director: Prof. Stefanos Kollias

Research Topics:

- fuzzy ontologies/reasoning

Athens:

<http://www.cityofathens.gr/portal/site/AthensPortalEN/>

Dublin City University, Dublin, Ireland

The Centre for Digital Video Processing at Dublin City University is an inter-disciplinary research centre whose mission is to research and develop techniques and tools to automatically analyse and index digital video information and allow content-based operations such as browsing, searching, alerting, filtering and summarisation

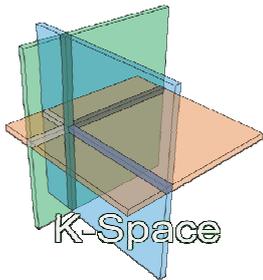


<http://www.cdvp.dcu.ie>

Head of group: Prof Alan F. Smeaton
Point of Contact: Noel O'Connor (oconnorn@eeng.dcu.ie)

Research Topics:

The CDVP conducts research into audio-visual content analysis for feature extraction, content-based information retrieval for information-seeking applications, browsing and search interfaces (including using mobile and next generation interface devices) also for information-seeking, and overall video navigation for safety and for security applications. In addition in our work we perform 3-D and multi-spectral imaging and the design of low-power hardware architectures for video processing. This points to a large and diverse



Knowledge Space of semantic inference for automatic annotation
and retrieval of multimedia content
K-Space: 027026



K-Space PhD Exchange

range of research activities, but all are linked together by the common aim of providing efficient management of large collections of information.

Dublin:

“Historical Dublin is the capital and the gateway to the entire island of Ireland. This vibrant city features a heady mix of nightlife and cultural attractions likely to appeal to the young and old alike.”

Please visit <http://www.visitdublin.com/>.

Centrum voor Wiskunde en Informatica, Amsterdam, The Netherlands



The Centre for Mathematics and Computer Science (CWI) is the national research institute for mathematics and computer science. CWI is founded in 1946 and performs frontier research in mathematics and computer science and transfers new knowledge in these fields to society in general and trade industry in particular

<http://www.cwi.nl>

Head of group: Prof. Lynda Hardman
Point of Contact: Raphaël Troncy (Raphael.Troncy@cwi.nl)

Research Topics:

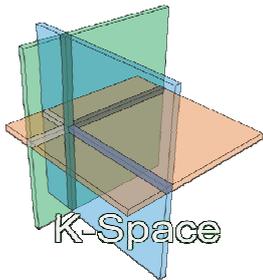
The *Semantic Media Interfaces* research team aims to use explicit semantic annotations of media assets for improving the generation of hypermedia presentations personalised to a specific user. This requires the association of semantic annotations with media assets, the identification of which semantics require to be explicitly encoded, and the use of the stored semantics in the process of generating a personalised presentation. In addition, underlying issues of storing media assets with their associated annotations need to be addressed.

- Knowledge representation of content and structure of multimedia documents
- Discourse theory and discourse authoring in interactive multimedia environment
- Semantic design: user-centred multimedia presentation generation
- Semantic interaction with annotated multimedia assets

Amsterdam:

<http://homepages.cwi.nl/~steven/amsterdam.html>

“Amsterdam's appeal lies in its rich cultural heritage, diverse & creative culture, commercial dynamism and high quality of life. Ultimately, the city's strongest asset is its



Knowledge Space of semantic inference for automatic annotation
and retrieval of multimedia content
K-Space: 027026



K-Space PhD Exchange

*people: the people who live here, the people who work here, the people who study here,
and the people who visit here.”*

Groupe des Ecoles des Télécommunications, Paris, France

TELECOM - PARIS

GET is a public administrative institution placed under the aegis of the French Secretary of State for Trade and Industry and federates four “Grandes écoles” including Telecom Paris.

Telecom Paris is one of top-level graduate institutions in France. Its mission lies in higher education, research and continuing training in the field of information and communication science and technology. The main research disciplines which underpin this field are Communication media technologies, Signal and image communication and processing, Computing and networks and Economics and sociology of ICT



<http://www.enst.fr>

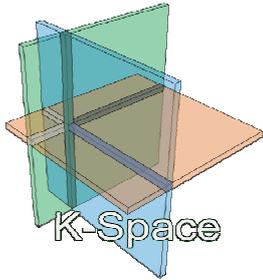
Head of group: Yves Grenier, head of the Signal and Image Processing department
Point of Contact: Gaël Richard (Gael.Richard@enst.fr)

Research Topics:

Content-based multimedia analysis, audio/speech/image processing, Audio indexing, emotion analysis, 3D image indexing, multimodal techniques, high dimensionality reduction, low-level feature fusion, data mining, knowledge-assisted annotation of audiovisual content, Text analysis, Statistical methods.

Paris:

Paris (France) is one of the culturally most exciting, diverse, and inclusive cities in the world. Some information may be found at: <http://www.pariserve.tm.fr/info/info.htm>.



Knowledge Space of semantic inference for automatic annotation
and retrieval of multimedia content
K-Space: 027026



K-Space PhD Exchange

Institut National de l'Audiovisuel, Bry-sur-Marne, France

INA (French National Institute of Audiovisual) is a public organisation with industrial and commercial role, created in 1975. INA is in charge of preserving and valorising French radio and television programmes and manages one of the worlds largest databanks of digitised images and sounds, also leads research and experimental activities on heritage projects, guides professional training towards the digital technologies, and is a producer in creation fields.



<http://www.ina.fr>

Head of group: Daniel Teruggi, Director of Research and Experimentation Department

Point of Contact: Jean Carrive (jcarrive@ina.fr)

Research Topics:

- **Description and Publishing of Audiovisual Content**
 - o Cross-Modal Video Structuring
 - o Use of Automatic Indexing Tools in Production Application
 - o Applications of Audiovisual Content Management
 - o Languages for Audiovisual Content Representation and Manipulation
- **Digitization and Restoration of Video Content**

Bry-sur-Marne:

Bry-sur-Marne is located 12 km at the East of Paris. It is 15 km far from Disneyland. Please visit <http://www.bry94.fr/>.

Institut Eurécom, Sophia-Antipolis, France

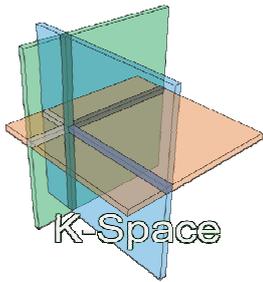
Institut Eurécom is an engineering school and research centre in communications systems created in 1991 in Sophia Antipolis by Télécom Paris (École Nationale Supérieure des Télécommunications) and EPFL (École Polytechnique Fédérale de Lausanne). It has developed a strong research activity in Network, Mobile and Multimedia communications, and is also an associated laboratory of the French CNRS (FRE 2660).



<http://www.eurecom.fr>

Head of group & Point of Contact:

Prof. Bernard Merialdo (Bernard.Merialdo@eurecom.fr)



Knowledge Space of semantic inference for automatic annotation
and retrieval of multimedia content
K-Space: 027026



K-Space PhD Exchange

Research Topics:

- digital signal processing
- multimedia indexing
- multimedia retrieval

Sophia-Antipolis:

Sophia Antipolis is a technology park which is located on the French Riviera, close to the city of Nice (2nd largest airport in France), Cannes (location of the world film festival), Monaco (Formula 1 Grand Prix), etc... The main activities of the park are Computers Communications and Biotechnologies.

Web sites:

- Sophia Antipolis technology park: <http://www.sophia-antipolis.net/uk/>
- Tourist office in Nice: <http://www.nicetourisme.com/GB/som.html>
- Tourist office in Cannes: <http://www.cannes.fr/semec/semuk/officeuk.html>

University of Glasgow, Glasgow, UK

Glasgow University is established in 1451 and is one of the oldest universities in Scotland. The Information Retrieval Group at the Department of Computing Science is involved in the development of context sensitive multimedia mining techniques. The IR group has a vigorous programme of research, based on both theory and experiment, aimed at giving end-users novel, effective, and efficient access to the world of multi-media information. Glasgow University is also leading the WP2 on the integration activities.

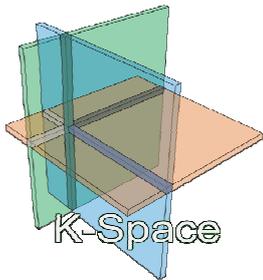


<http://ir.dcs.gla.ac.uk/>

Head of group: Prof. C. J. van Rijsbergen
Point of Contact: Joemon Jose (jj@dcs.gla.ac.uk)

Research Topics:

- Multimedia Mining & Retrieval
- Adaptive and Context Sensitive Multimedia Retrieval
- Interactive Search Models
- Theoretical Models for IR
- Applications of Quantum Computing in IR
- P2P IR
- Web IR



Knowledge Space of semantic inference for automatic annotation
and retrieval of multimedia content
K-Space: 027026



K-Space PhD Exchange

- Evaluation of IR systems & Search Interfaces

Glasgow:

Glasgow is one of Europe's most visited cities. In recent years it has been designated:

- *European Capital of Sport 2003*
- *UK City of Architecture and Design 1999*
- *European City of Culture 1990*

More than 2 million tourists visit Glasgow every year to enjoy a wealth of cultural and leisure attractions and as a base to explore the magnificent scenery which surrounds the city. Glasgow is also gateway to magnificent Scottish highlands. The URL for Scottish tourist info is: www.visitscotland.com.

German Research Centre for Artificial Intelligence, Kaiserslautern & Saarbrücken, Germany



[http://www.dfki.de/
web/index.en.html](http://www.dfki.de/web/index.en.html)

Founded in 1988, DFKI today is one of the largest nonprofit contract research institutes in the field of innovative software technology based on Artificial Intelligence (AI) methods. The role of the Language Technology Lab of DFKI in this project will mainly consist in investigating the ontology-driven information and knowledge extraction from text & image analysis for cross-media knowledge markup on the base of the merging of features from linguistic and multimedia analysis. DFKI is also leading the WP7 on dissemination.

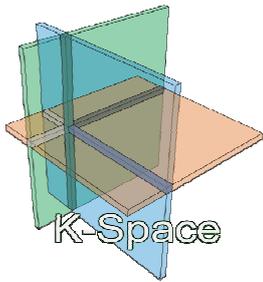
Head of group: Prof. Dr. Hans Uszkoreit
Point of Contact: Thierry Declerck (declerck@dfki.de)

Research Topics:

- Ontology-driven Information Extraction applied to textual documents/speech transcripts accompanying AV material for semantic metadata annotation.
- Automatic alignment of low-level features and high-level semantic features extracted from text/transcripts, guided by an integrated knowledge representation
- (Cross-Media) Knowledge Markup, Ontology Development and Ontology Learning

Saarbrücken:

Saarbrücken is the centre of the conurbation Saarland-Lothringen-Luxemburg, the Saar-Lor-Lux region. It is the urban centre of an area of little towns which is for the most part densely populated, but also occasionally very rural. Saarbrücken, the capital of the federal State of the Saarland, has grown into the economic and cultural centre of the



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K-Space: 027026



K-Space PhD Exchange

cross-border region Saarland-Lothringen and Luxembourg, with its rivers the Mosel and the Saar. And where there are rivers you are sure to find bridges, too. The ability to build bridges inherited by the people living on the river Saar dates way back: indeed the name Saarbrücken means bridges of the Saar. And the inhabitants of Saarbrücken, who are used to crossing over the river back and fro on a daily basis, are good at forging links too.

Please visit <http://www.die-region-saarbruecken.de/index.php5?lang=en>.

Technische University Berlin, Berlin, Germany

The TUB (also known as TU Berlin) as one of the largest German Institutes of Technology looks back over a long and distinguished tradition of teaching and research. The Communication Systems Group as a part of the Faculty for Electrical Engineering and Computer Science is directed by Prof. Sikora and comprises of more than 25 researchers. The main research focus is on the content-based analysis, description, segmentation, classification as well as coding of speech, audio, and video data.



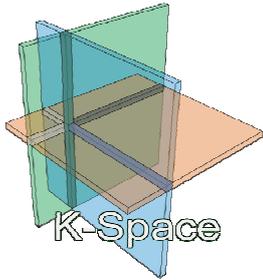
<http://www.nue.tu-berlin.de/>

Head of group: Prof. Dr.-Ing. Thomas Sikora
Point of Contact: Martin Haller (haller@nue.tu-berlin.de)

Research Topics:

- *Content-based Analysis*
 - Audiovisual analysis of video streams (parsing, indexing)
 - Description of persons in videos (detection, recognition, tracking)
 - Audio and speaker segmentation
 - Modality conversion: Speech recognition, Video OCR
 - Description, querying, retrieval, adaptation
- *Compression and Transmission*
 - MPEG-4 Audio Lossless Coding (ALS)
 - 2D & 3D video compression techniques, 3DTV NoE
 - Multiple description coding of speech and video signals
- *Source Detection and Separation*
 - Microphone array and noise reduction
 - Source separation of stereo signals

Berlin:



Knowledge Space of semantic inference for automatic annotation
and retrieval of multimedia content
K-Space: 027026



K-Space PhD Exchange

*Berlin the capital of Germany is dynamic, cosmopolitan and creative, allowing for every kind of lifestyle. East meets West in the metropolis at the heart of a changing Europe. Germany's largest city is a city of opportunities just waiting to be seized in all areas, like entertainment, recreation, economy, science and academic life.
Please visit <http://www.berlin.de/english/index.html>.*

Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland



EPFL is one of the two Federal Institutes of Technology in Switzerland with main emphasis on teaching and research in Engineering Sciences and Technologies. EPFL participation to this project is from two research teams headed by Prof. Touradj Ebrahimi and Prof. Sabine Suesstrunk respectively. The teams are active in research and teaching in the field of visual information processing and coding. Prof. Ebrahimi's team is made of 3 post-doc researchers, 6 graduate researchers pursuing PhD theses, and between 5 to 10 undergraduate students. The research topics span through three highly interconnected disciplines of imaging, namely, compression, processing, and security. The team is very active in MPEG and JPEG standardisation activities, where it contributes both at the technical and leadership levels. Prof. Suesstrunk's team is made of 1 post-doc researcher and 5 graduate researchers pursuing PhD theses. The team is primarily concerned with the capture, analysis and reproduction of natural colour images.

<http://mmspl.epfl.ch>

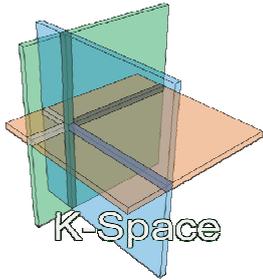
Head of group & Contact Person: Touradj Ebrahimi (Touradj.Ebrahimi@epfl.ch)

Research Topics:

- Distributed Video Coding
- Video Quality Assessment
- Video Segmentation and Tracking
- Image Replica Detection
- Unusual event Detection
- Augmented Reality

Lausanne:

www.lausanne.ch



Knowledge Space of semantic inference for automatic annotation
and retrieval of multimedia content
K-Space: 027026



K-Space PhD Exchange



University of Economics, Prague, Czech Republic

UEP is the sixth largest Czech university, founded in 1953. It consists of six faculties; the Department of Information and Knowledge Engineering, which carries out the project, is organisational part of the Faculty of Informatics and Statistics.



<http://www.vse.cz>

Head of group: Dr. Vilém Sklenák
Point of Contact: Dr. Vojtěch Svátek (svatek@vse.cz)

Research Topics:

- Knowledge discovery from databases
- Ontological engineering, semantic web technology
- Web information extraction and mining
- Reasoning in knowledge-based systems
- Web engineering, XML technology

Prague:

Prague, the capital of the Czech Republic, is our most valuable historical city reserve. In 1992 the historical core of the city covering 866 hectares was listed in the UNESCO World Cultural and Natural Heritage Register. Cultural life in Prague is very rich — world-famous festivals, prestigious exhibitions, theatre and film shows, concerts and other events are held here all year round.

Please visit <http://www.pis.cz/a/>.