Advancements in Social Media Retrieval

How did PetaMedia help?

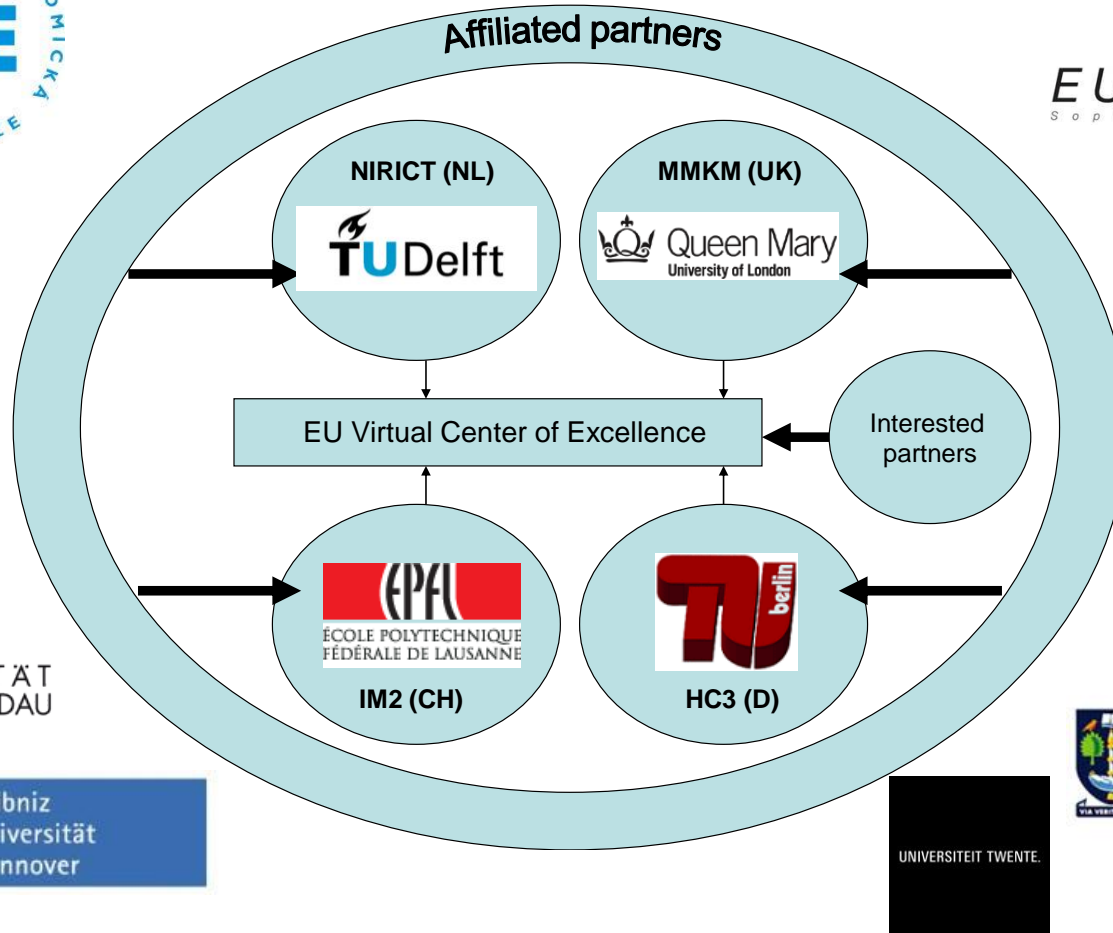**Alan Hanjalic**

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Delft University of Technology
The Netherlands

FP7 NoE PetaMedia

www.petamedia.eu

Affiliated partners

NIRICT (NL)

MMKM (UK)

EU Virtual Center of Excellence

Interested partners

IM2 (CH)

HC3 (D)

PetaMedia Context:
Multimedia Information Retrieval (MIR)

- Expansion of the text-oriented IR paradigm onto a broader scope of modalities (images, audio clips, video, compound documents)

- Set of theories, algorithms and systems enabling content-based access to multimedia data on the web and in other (large) collections

- Content
  - Meaning of data ➔ Semantics
  - Factual (e.g. objects, scene structure) or perceived (e.g. mood)

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What does MIR stand for?

I want to see a 5-minute summary of the soccer game I missed, with pointers to interesting actions and events

He wants a video that fits his current mood!
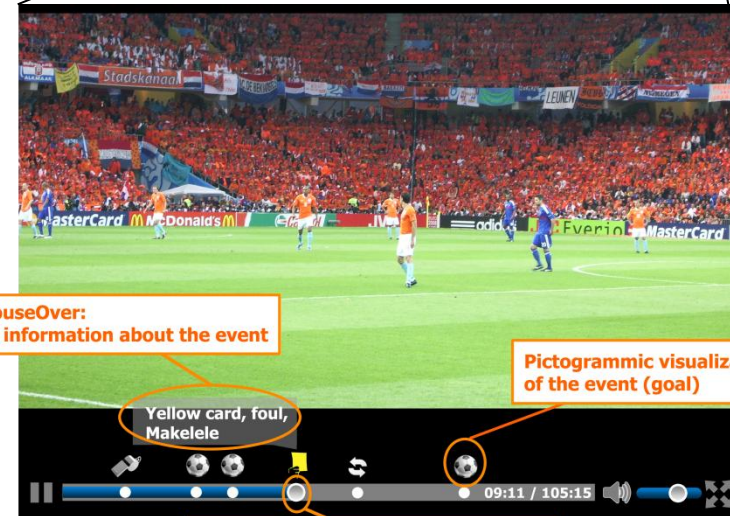
OnMouseOver:
Extra information about the event

Pictogrammic visualization of the event (goal)

Yellow card, foul, Makelele

09:11 / 105:15

Currently playing:
Fourth abstract segment (white dot)
Pictogram indicates yellow card event

She wants a compact overview of the news of today while getting ready for work

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A Historical Perspective

- Initially: Two separate MIR "worlds"

  - Content: Multimedia Content Analysis (MCA)
    - Data-driven, automatic extraction of content-related metadata
    - Advocated by signal processing/computer vision/pattern recognition communities

    overview in **Hanjalic et al., PIEEE April 2008** and **Snoek&Worring, FTIR 2009**

  - Context: Web (2.0) inspired and (Geo-)Tags enabled
    - Relying on implicit and explicit user actions "around content", e.g. taking photos, inserting (geo-) tags, user interactions in social networks and textual "context" of an image on a website
    - Advocated by the WWW community

    initiated in **Davis et al., ACM MM 2004**

A Historical Perspective

- Recently: Bringing Content and Context closer together

  - Social Media Retrieval (SMR) - a new paradigm for approaching the development of robust and reliable MIR solutions
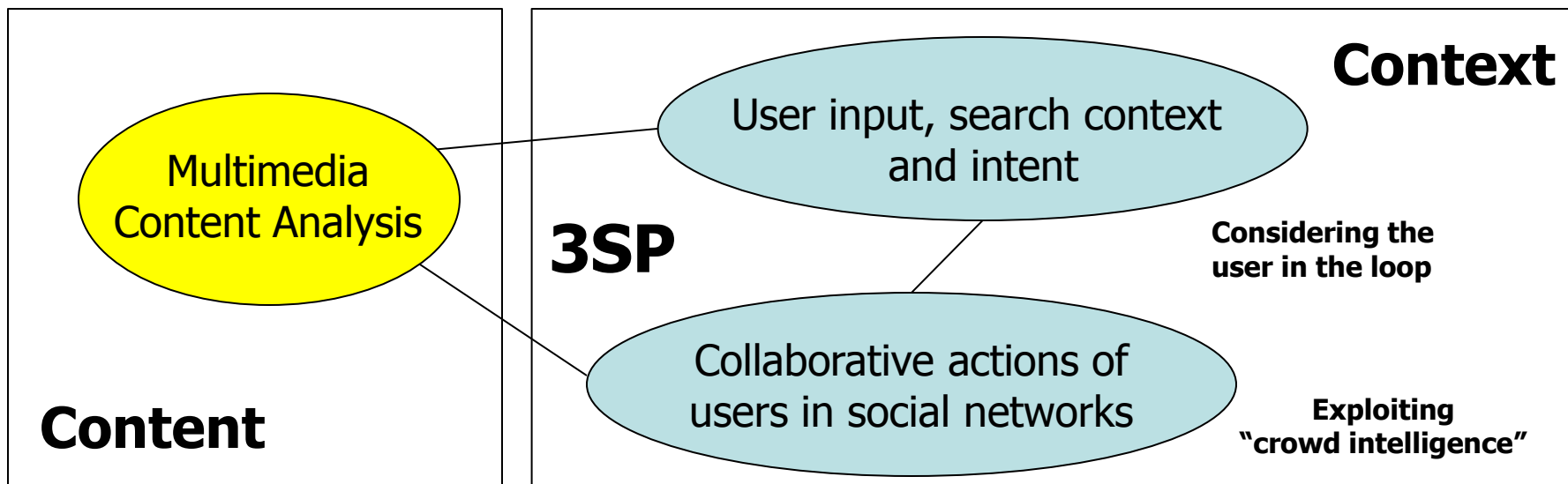
    one of first articles in this direction: **Boll, IEEE Multimedia Jan.-Mar. 2007**

  - EC FP7 Network of Excellence **PetaMedia** - Pioneering holistic effort exploring the possibilities to combine the best of two MIR worlds
  - Rationale:
    - Increasing contextualization of multimedia data in social networks
    - Consciousness about imperfection of each of the MIR worlds considered separately
    - Awareness of a broad scope of available information resources to help compensate for deficiencies of each of the two worlds
    - Potential for improving MIR **Reliability**, **Quality of Experience** and **Scalability**

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Social Media Retrieval in PetaMedia
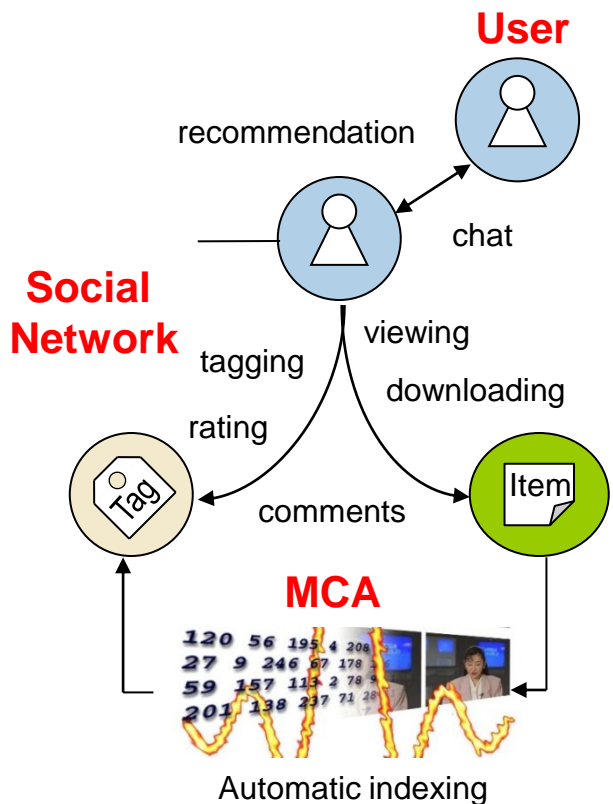## The Triple Synergy Paradigm (3SP)

- Enhancing the "classical" multimedia information retrieval (MIR) paradigm by taking into account the information inferred from individual and collaborative interactions of the users with multimedia content

Content

Multimedia Content Analysis

3SP

Context

User input, search context and intent

Collaborative actions of users in social networks

Considering the user in the loop

Exploiting "crowd intelligence"

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PetaMedia Challenge
Getting the most from 3SP to improve MIR

User

recommendation

chat

Social Network

tagging

viewing

downloading

rating

comments

Tag

Item

MCA

120 56 195 4 208
27 9 246 67 178
59 157 115 2 78
201 138 237 71 28

Automatic indexing

relations among users (friendship, trust)

authority distribution

similarity between users

user preferences

user's search intent

tag relevance

implicit relations among multimedia items

Implicit links between items and tags

verification of MCA results

item relevance

item quality (e.g. trivial?)

Reliable

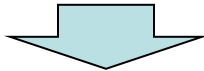Scalable

Easy

Intuitive

Fast

MIR

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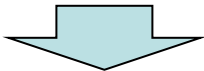peta media

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PetaMedia Contribution

- ## Scientific advancements

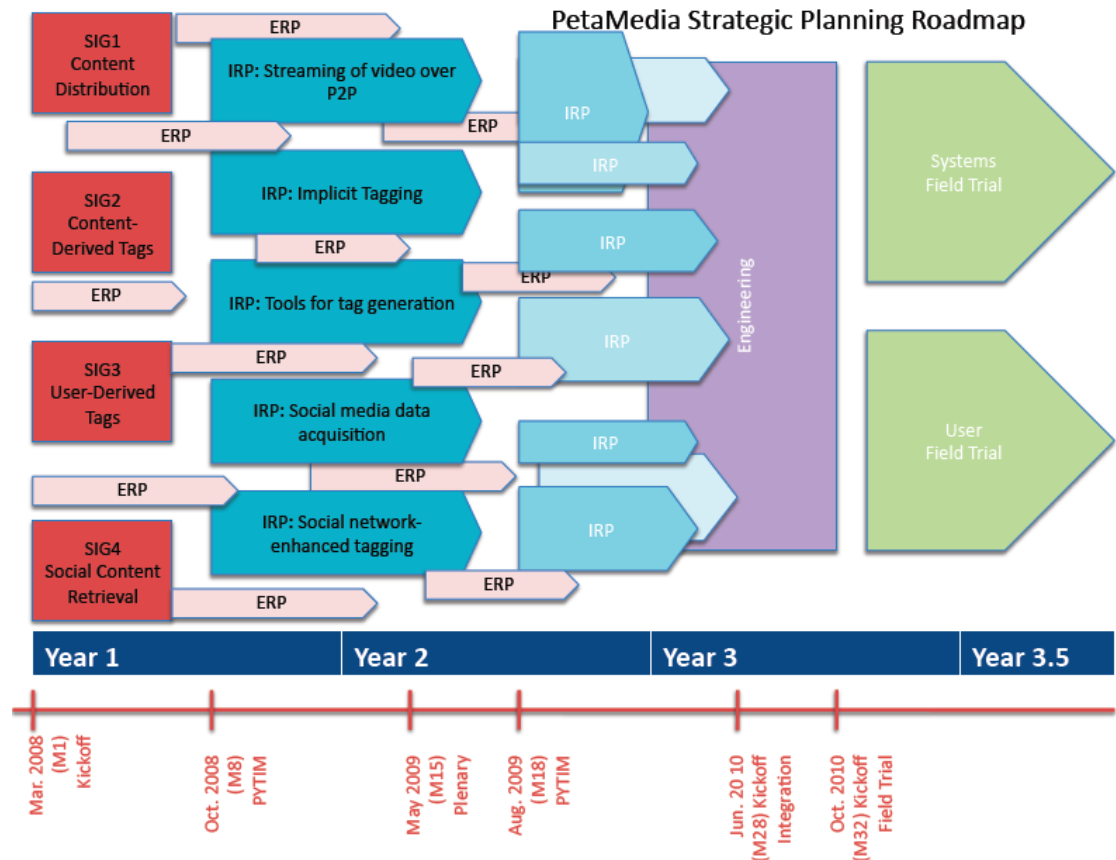 - Broad bottom-up (*grassroots*) approach investigating different aspects of 3SP

  Exploratory individual projects (ERPs)

  Integrated projects (IRPs)

  Large-scale field trials

PetaMedia Strategic Planning Roadmap

Scientific challenges of PetaMedia

- Learning what the user is really searching for
  - Bridging the gap between query specification and search intent
  - Context-aware content recommendation

- Making the most out of user-generated annotations
  - Tag relevance estimation and propagation

- Making the most out of the community and data collection
  - Inferring the relations among the users (trust, friendship, authority)
  - Inferring the relations among multimedia items and metadata

- Integrating the above towards new MIR solution concepts
  - Maximizing the quality of the "best educated guess" (BEG) of MCA
  - Making the BEG optimally link to social information resources

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Predicting web MM search failure

Kofler, Larson, Hanjalic, ECIR 2011

- What are the typical user's search strategies in failure-prone cases?
- Can we predict that a given query formulation is likely to fail?
- Approach via
  - collecting user content needs from Yahoo! Answers
  - deploying Mechanical Turk for acquiring ground truth
 - evaluating the outcome of our classification scheme (search failure or not)
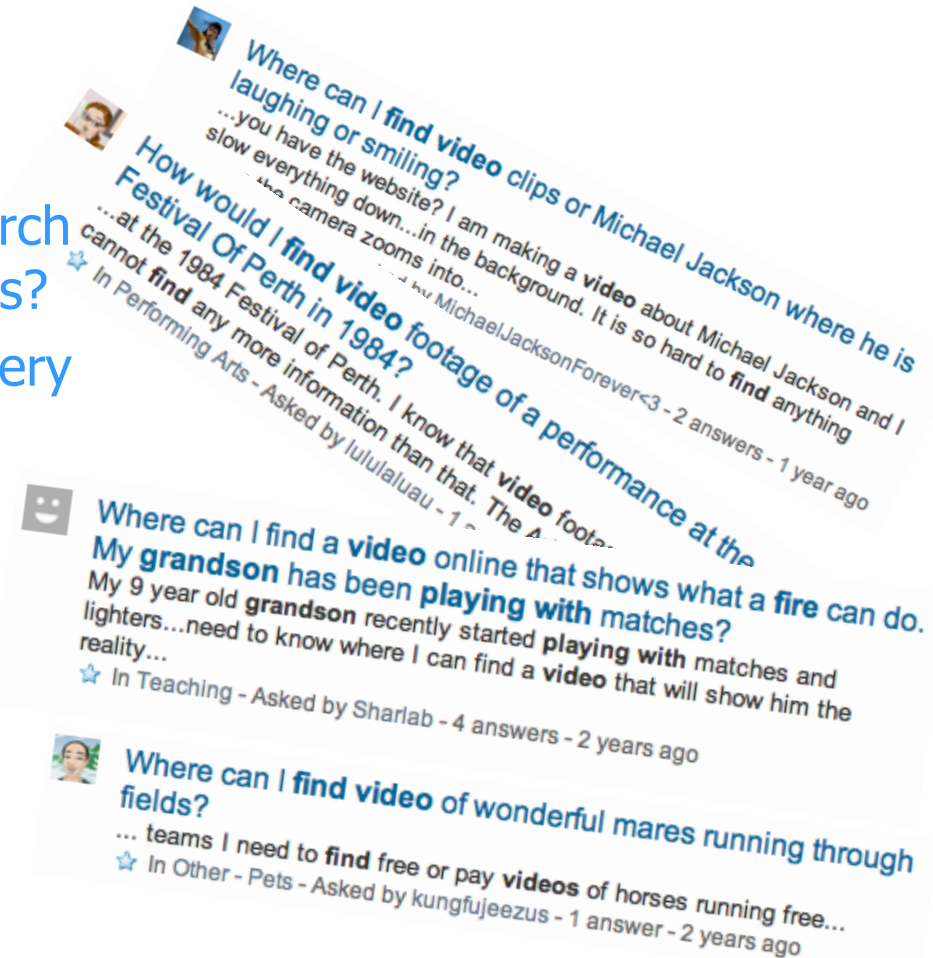
EEG Analysis for Implicit Video Tagging

Koelstra, Muehl, Patras, ACII 2009

Koelstra, Yazdani, Soleymani, Muehl, Lee, Nijholt, Pun, Ebrahimi, Patras, Conf. Brain Informatics 2010

- Search for neuro-physiological indicators to validate tags attached to video content
- Observing emotional reaction to music in terms of valence and arousal
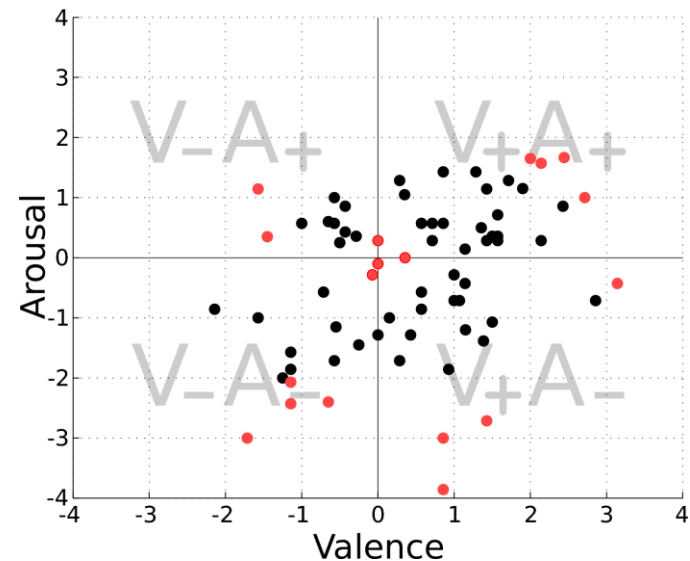
Object-based Tag Propagation for Semi-Automatic Annotation of Images

Ivanov, Vajda, Goldmann, Lee, Ebrahimi, ACM MIR 2010

- Automatic recommendation of tags from images containing user-marked object

- User interaction reduced to verifying the recommended tag set and approving tag propagation
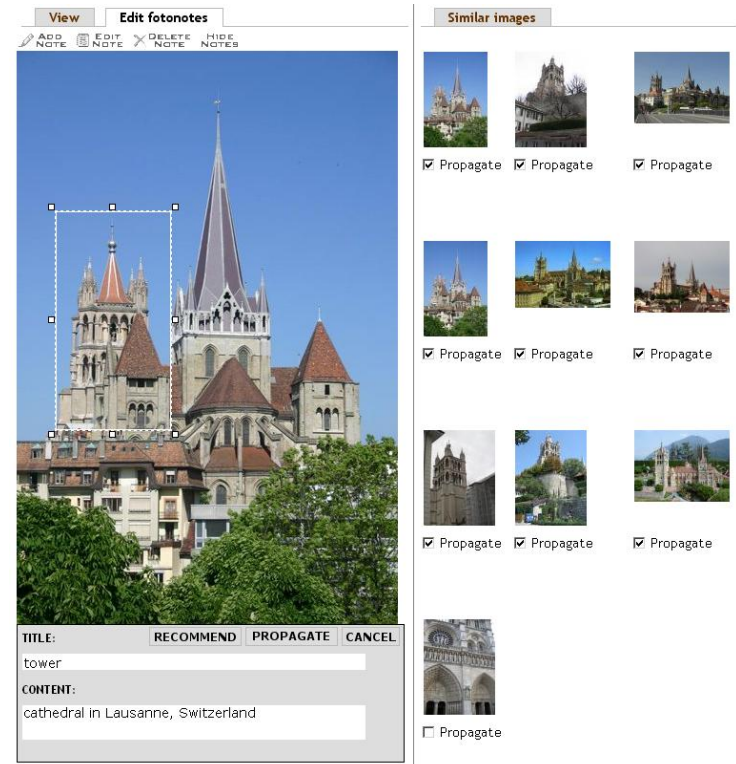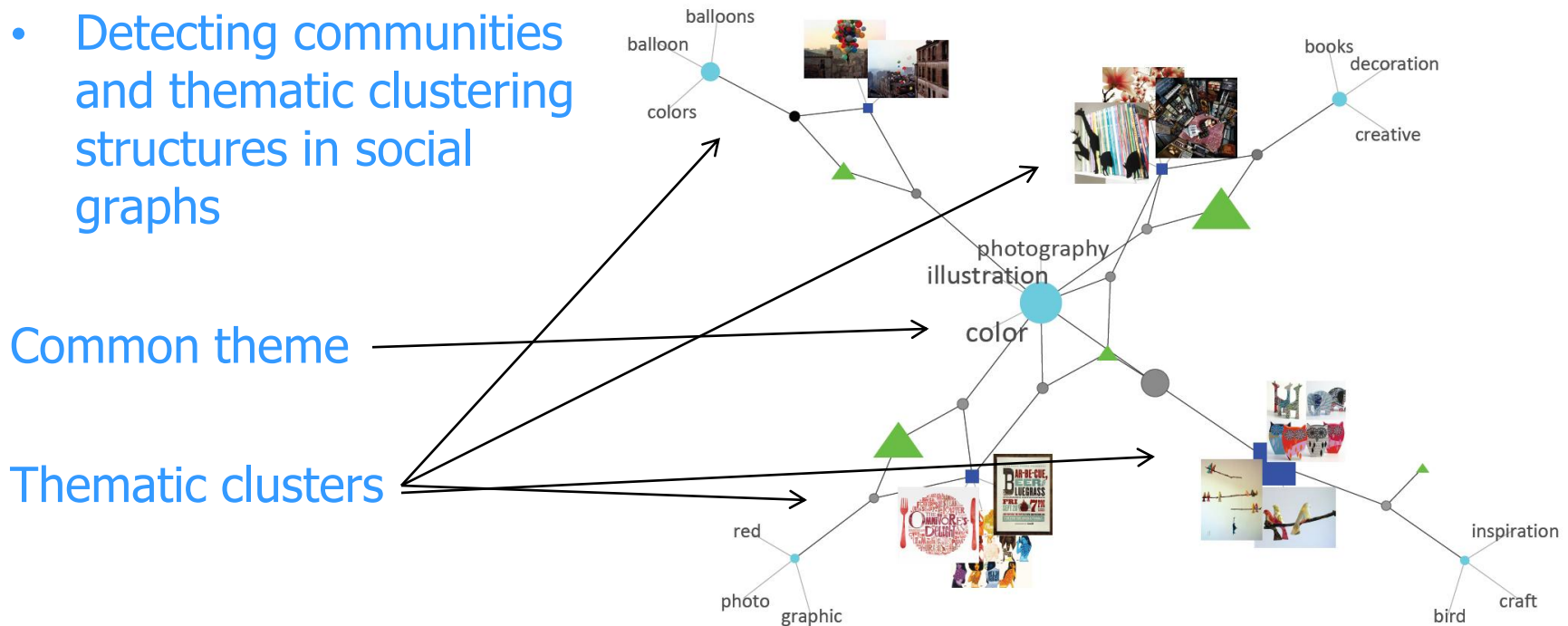
Understanding the Social Network

Neubauer & Obermayer, NIPS 2009.

- Detecting communities and thematic clustering structures in social graphs

Common theme

Thematic clusters

Off-the-beaten-track aware location augmentation

Rudinac, Larson, Hanjalic, ACM Multimedia 2011

- Goal is to create visual summary of a given location
- Emphasis on jointly optimizing representativeness and diversity
- Social graph modeled and deployed as the source of explicit (visual) and implicit (via users and metadata) similarity relations among images
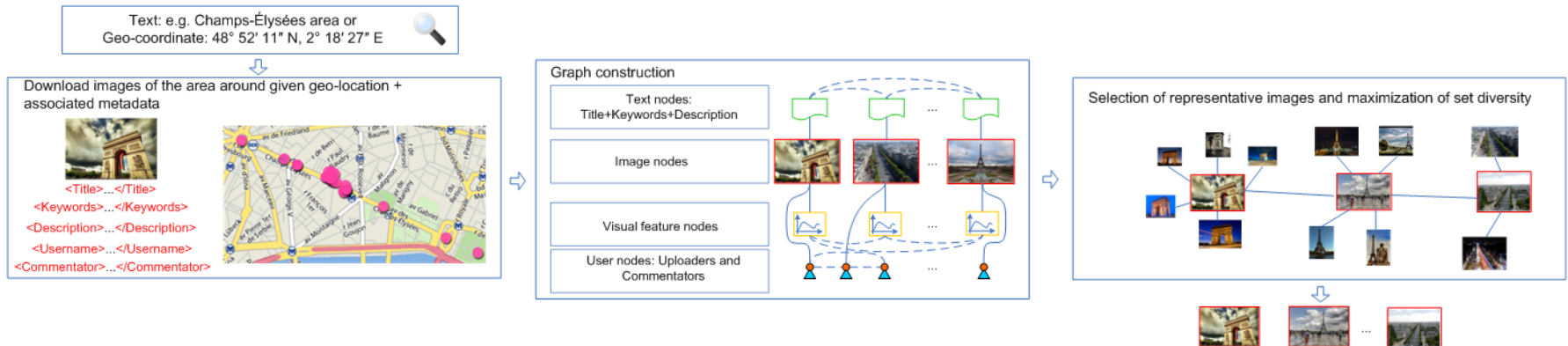
PetaMedia Contribution

- Community building and dissemination
  - Graduate School on Social Media Retrieval
  - MediaEval International Evaluation Benchmark
  - Tutorials and special sessions at ACM Multimedia/ICMR
- Goal:
  - Push the 3SP to become the key paradigm in the international MIR research agenda

2nd Summer School on Social Media Retrieval
June 26 - July 1 2011
Antalya, Turkey

1st Spring School on Social Media Retrieval
February 22nd - 25th 2010
Interlaken, Switzerland

MediaEval Benchmark

PetaMedia Legacy:
Virtual Center of Excellence (VCE)

	Maximize triple synergy impact	Explore triple synergy challenges
Academia	✓ Content and tools portal. ✓ Summer school.	✓ Content and tools portal. ✓ MediaEval benchmark. ✓ Triple synergy grand challenge. ✓ Ideas market.
Company	✓ Content and tools portal. ✓ Technology demonstrations and transfer.	

VCE in 2011 combined with EIT ICT Labs OpenSEM activity

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Thank You!