

**TraininG towards a society of data-saVvy inforMation
prOfessionals to enable open leadership INnovation**



Welcome

**Video and Search Technologies for OER
Text processing and search technologies for OER**

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www.moving-project.eu

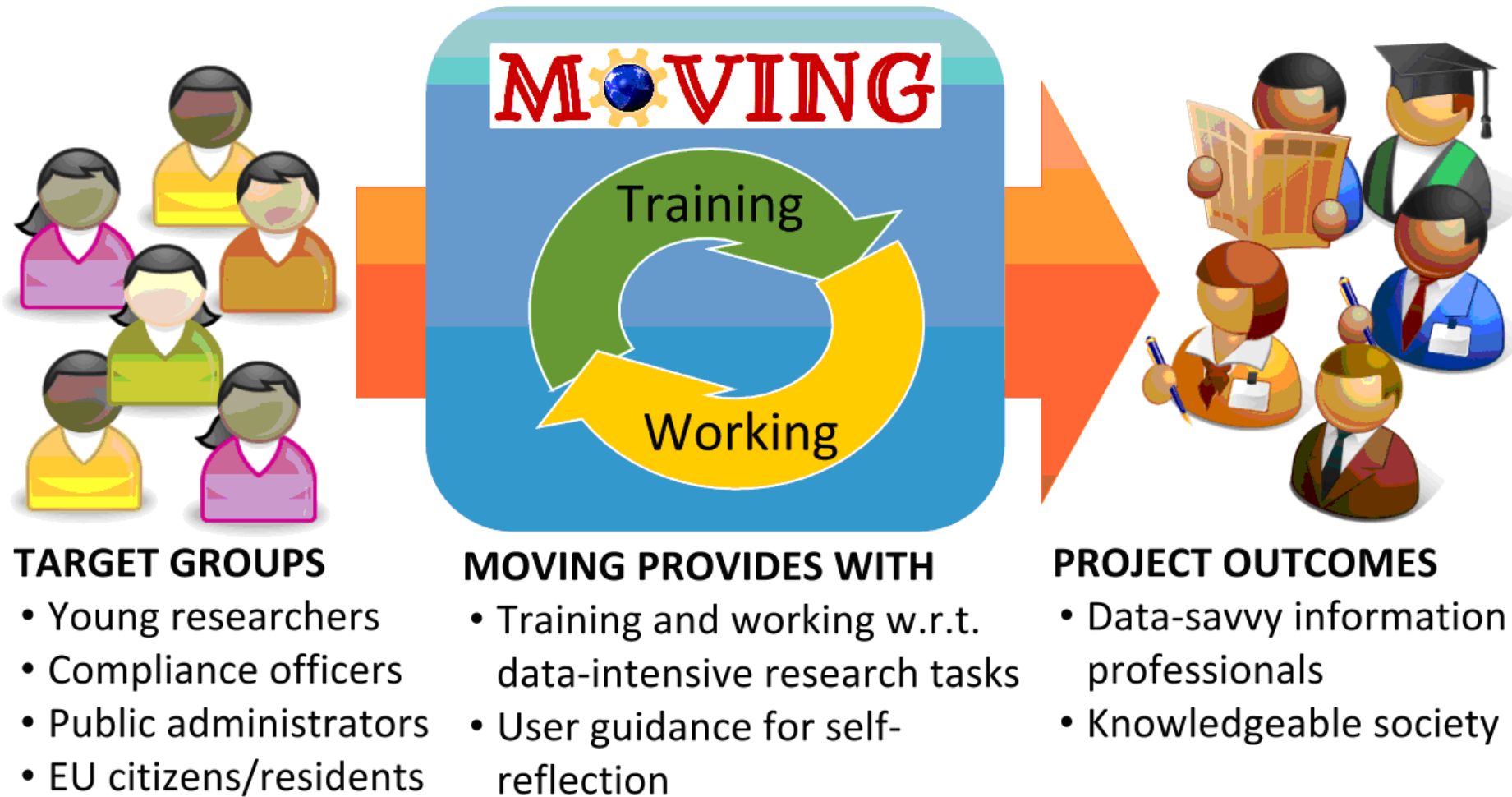
- Introduction to MOVING
 - Motivation
 - Goals
 - Overall approach
 - Use-cases and examples
- Video understanding and search technologies for OER
 - Harvesting data from open data sources
 - Video understanding technologies (+demo)
 - Video search and retrieval technologies
 - Example application: linking lecture and non-lecture videos for enhancing the educational experience (demo)
- Text processing and search technologies for OER
 - Semantic profiling
 - Titles vs full text in retrieval setting
 - Title-based semantic document annotation
- MOVING platform demo and hands-on session

- Information literacy: a key skill in today's world!
 - Internet is full of valuable information, but there is "information overload"
 - Drift to majority; loss of completeness; decay of information; just too much information, e.g. global scientific output doubles every nine years (1)
 - We need advanced qualitative data analysis tools and techniques, and to know how to use them!
- ...but not so easy to acquire and maintain
 - Vocational training costs are high
 - For a service company, a training day has high direct costs per employee
 - To train a master-degree student to work on an executive position in middle-management, costs over 10 yearly salaries in total
 - Less than half of all employees of European enterprises take part in further education offers

(1) <http://blogs.nature.com/news/2014/05/global-scientific-output-doubles-every-nine-years.html>

*“MOVING is building an **innovative training platform** that will enable users from various societal sectors (companies, universities, public administration) to fundamentally **improve their information literacy** by training how to choose, use and evaluate data mining methods in connection with their daily research tasks and to become data-savvy information professionals“*

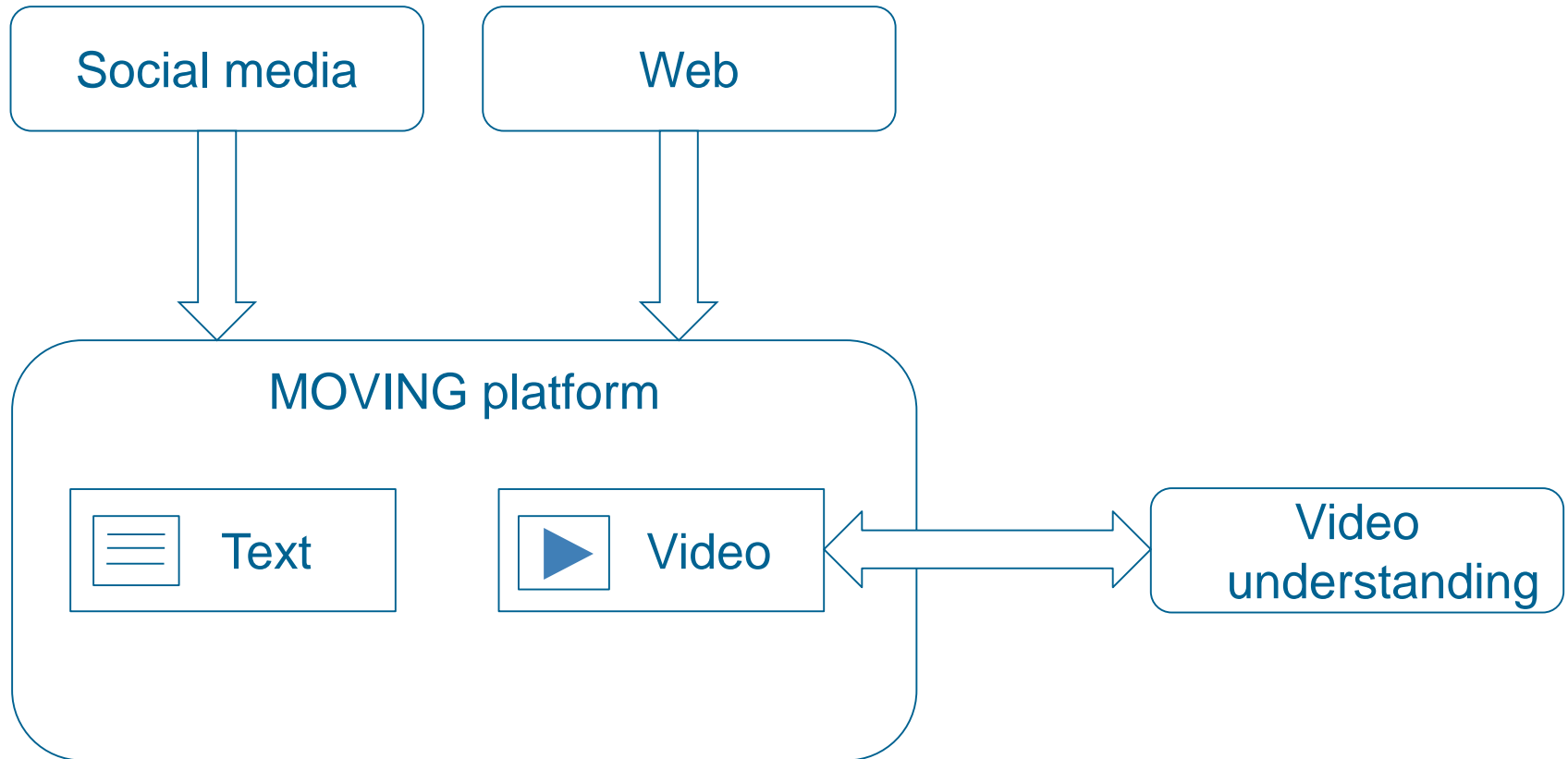
- This platform is:
 - Getting access to an extensive source inventory
 - Using search and visualisation methods
 - Generating knowledge that cannot be derived from existing solutions
 - Supporting its users through
 - A detailed and scientifically proven help system
 - An individually configurable training program
 - A community of people from different sectors of society



- Research on business information by public administrators
 - Understand complex situations
 - Increase compliance with current laws and regulations
 - Specific case of public administrators considered in MOVING: financial auditors
- Managing and mining research information
 - Reduce information overload
 - Assist in evaluating and selecting relevant information resources
 - Specific case considered in MOVING: young researchers and graduate students

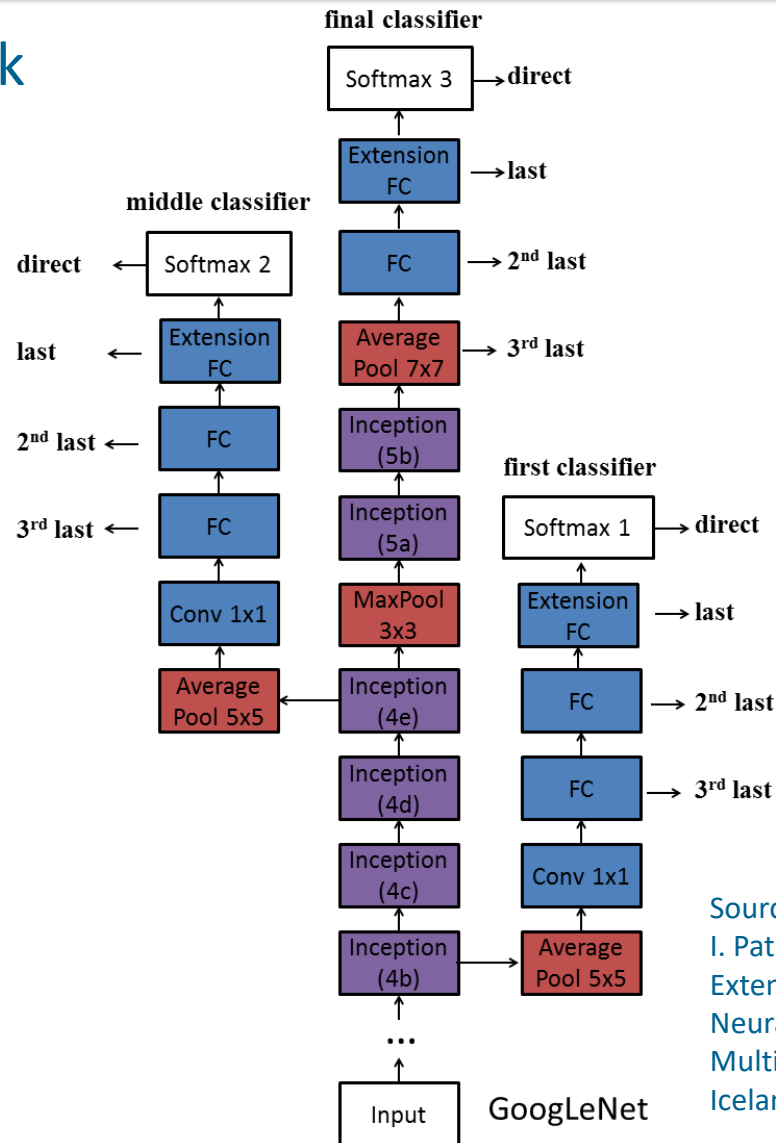


- Motivation: huge volume of online potentially-useful materials
 - Massive open online courses (MOOCs) available on the web
 - Lecture videos on VideoLectures.net etc., non-lecture videos on YouTube and other social media platforms
 - Textual documents (e.g. scientific publications, laws) and text entries in web pages and social media platforms
- Data crawling
 - By topic, in social platforms (e.g. Twitter, Google+, YouTube) and on the Web (via web search, using the Google custom search API)
 - E.g. “Game Theory”, “Decision Analysis”, “Cryptography”, “Constitutional Law”
 - By specific web domain
 - E.g. “https://open.hpi.de/”, “https://www.edx.org/”



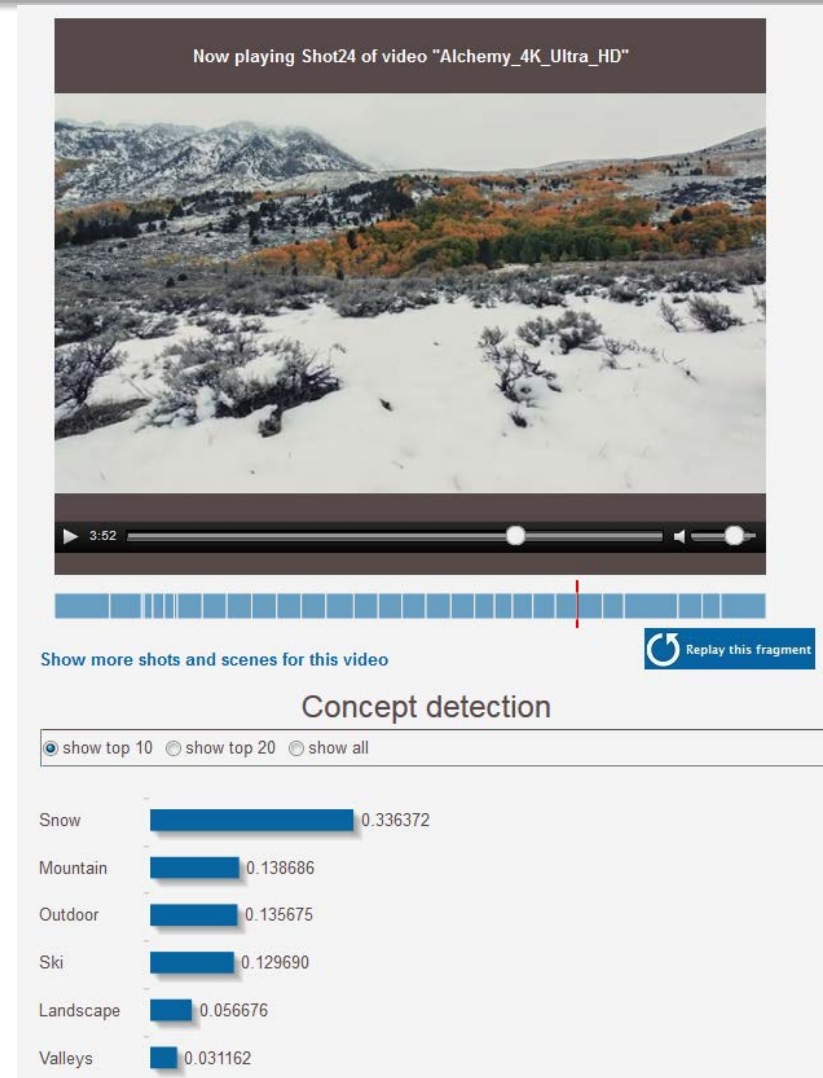
- Video viewing/playback
 - To a human viewer: full of meaning! (objects, actions, interactions between objects, logical temporal units, events, sentiments,...)
 - To the computer: just an endless, meaningless displaying of pixel values: ...
153 223 062 213 135 172 076 088 115 178 155 033 026 188 181 045 098 ...
- Video understanding tech: help the computer understand the video just like humans do
 - Detect logical temporal units -> temporal fragmentation
 - Detect objects, concepts, actions, events -> annotation
- How
 - Signal processing
 - Machine learning (especially Deep Learning)

- Deep network example architecture



Source: N. Pittaras, F. Markatopoulou, V. Mezaris, I. Patras, "Comparison of Fine-tuning and Extension Strategies for Deep Convolutional Neural Networks", Proc. 23rd Int. Conf. on MultiMedia Modeling (MMM'17), Reykjavik, Iceland, Springer LNCS vol. 10132, Jan. 2017.

- Demo (video)
 - Fragmentation
 - Concept-based annotation
 - Concept-based search



Now playing Shot24 of video "Alchemy_4K_Ultra_HD"

3:52

Show more shots and scenes for this video

Replay this fragment

Concept detection

show top 10 show top 20 show all

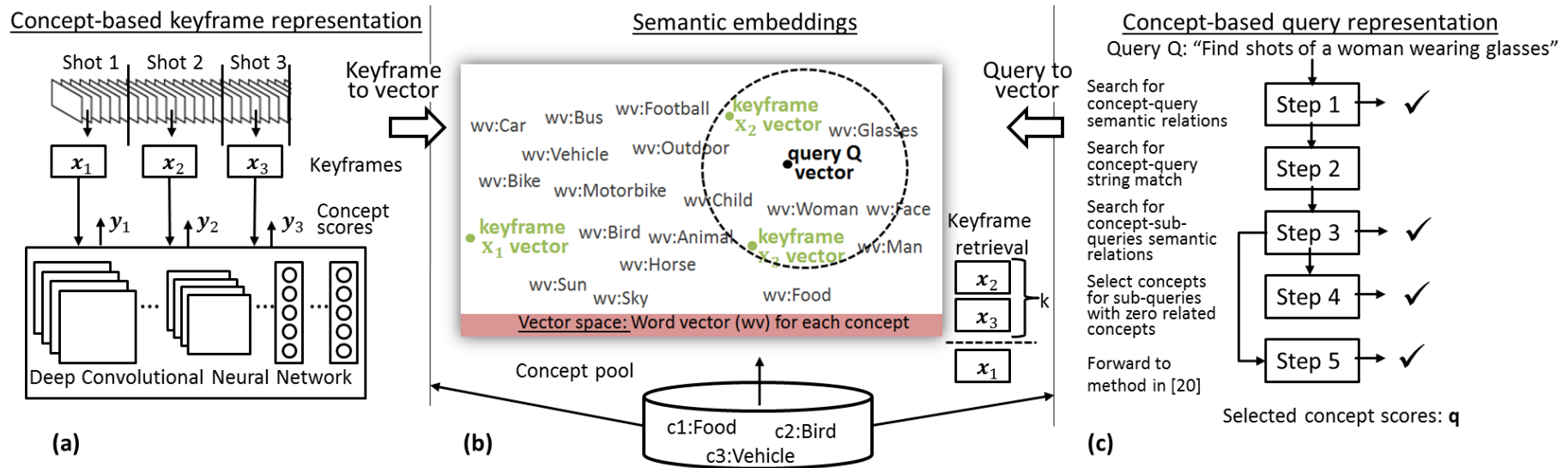
Snow	0.336372
Mountain	0.138686
Outdoor	0.135675
Ski	0.129690
Landscape	0.056676
Valleys	0.031162

Try it yourself at:

<http://multimedia2.iti.gr/onlinevideoanalysis/service/start.html>

- Based on video analysis results
 - E.g. Concept-based retrieval of video fragments
- Video analysis alone not enough
 - Not straightforward to answer complex queries, e.g. “Find shots of a person talking behind a podium wearing a suit outdoors during daytime”
- Combination of text analysis and machine learning comes to the rescue
 - Detect key terms in the text; map them to concepts/objects that we can detect in the video; evaluate the match between a set of concepts (+scores) describing the textual query and a similar set of concepts describing a video

- Example approach for answering complex queries



Source: F. Markatopoulou, D. Galanopoulos, V. Mezaris, I. Patras, "Query and Keyframe Representations for Ad-hoc Video Search", Proc. ACM ICMR 2017, Bucharest, Romania, June 2017.

Example application (demo)

- Linking lecture and non-lecture videos
 - Automatic analysis of audio transcripts (lecture videos)
 - Automatic analysis of visual signal (non-lecture videos)
- Find and watch relevant videos that augment the learning experience of the lecture



Home About

This interactive web interface links lecture videos, using general purpose concepts that were produced from textual analysis of their transcripts, with non-lecture videos, using their visual analysis results such as automatically detected shots, scenes, and visual concepts. The user is able: (a) to select a lecture video by clicking the corresponding thumbnail from the list below; (b) during playback of the selected lecture video, the automatically detected concepts that characterize it are shown on the screen, and by clicking on any one of them additional temporal segments of non-lecture videos that are related to, the selected concept are presented to the user; (c) to see the temporal segment (shots and scenes) structure of the all non-lecture videos, by clicking the "See all non-lecture videos collection" link.

Shots subset retrieved for concept Whale



Now playing Shot1 of video
"20_Ton_Canaries_The_Great_Whales_of_the_North_Atlantic"

0:07

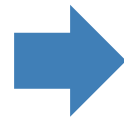
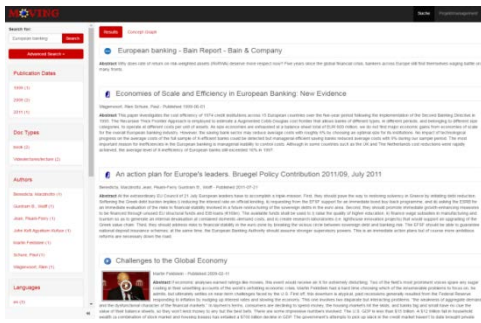
Concept detection (from audio transcripts)

show top 10 show top 20 show all



- Problem Match documents to a query or user profile
- Application Document retrieval or recommendation

Query=“ Open innovation”



Management

Innovation Management

Open Innovation

Management

Innovation Management

Open Innovation

Influence of Time on User Profiling and Recommending Researchers in Social Media

Chafiq Nadeem, Gregor Grosse-Bilbing, Arango Scherp, Jochen Koenig, and Gregor Roth. *Journal of Intelligent Information Systems*, 2014.

Keywords: user profiling, social networks, temporal models

1. INTRODUCTION

The paper introduces an user model for understanding the influence of time on user profiling and recommending researchers in social media. The model is based on temporal models and is designed to capture the changes in user interests over time. The model is evaluated on a dataset of research papers and is shown to outperform existing methods.

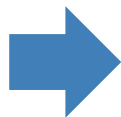
Title = “Is Open Innovation Re-inventing Innovation Policy for catching up Economies”

Comparing Trust Classifications by Authors' Rankings, Machine Learning, and Human Annotators

Yi Ma, Yizhen Wang, and Xiangliang Xu. *Proceedings of the 2014 ACM Conference on Recommender Systems*, 2014.

This paper compares trust classifications by authors' rankings, machine learning, and human annotators. The study shows that machine learning methods can effectively capture trust relationships, but human annotations provide valuable insights into the underlying reasons for trust.

Title = “Risk and uncertainty in innovation management”

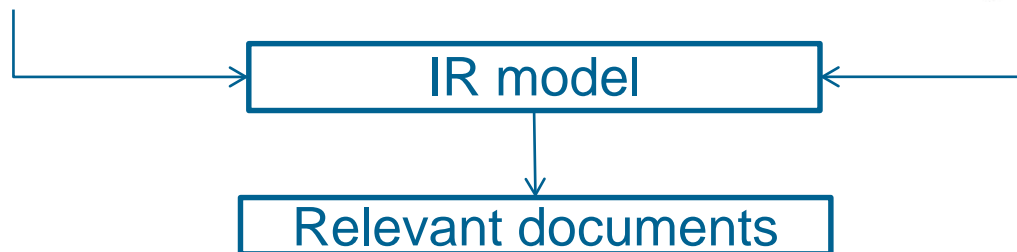
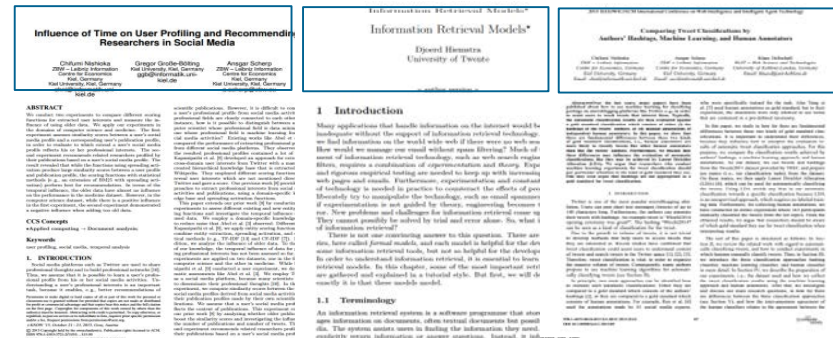
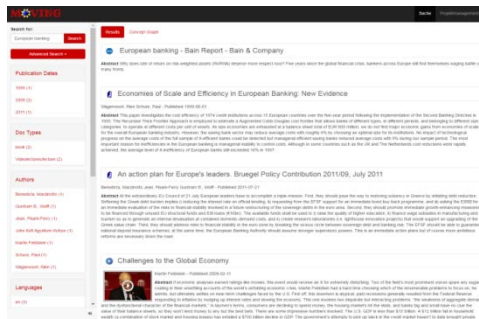


Titles vs full text in retrieval setting

- Question Can titles be sufficient for information retrieval task?
- Motivation Full-text not always available
- Goal Develop novel IR models for search over title data vs. full text
- Method Advanced machine learning methods, e.g. neural networks

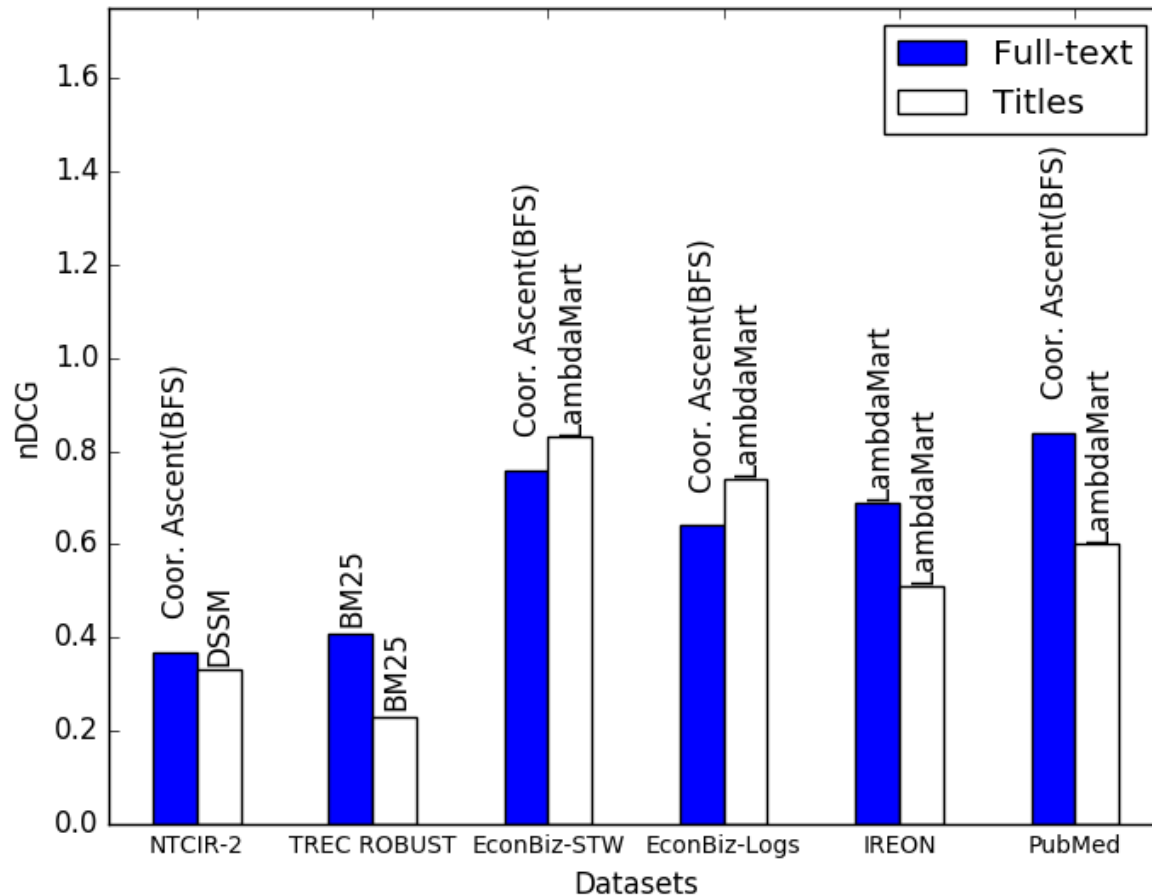
Query

Document collection



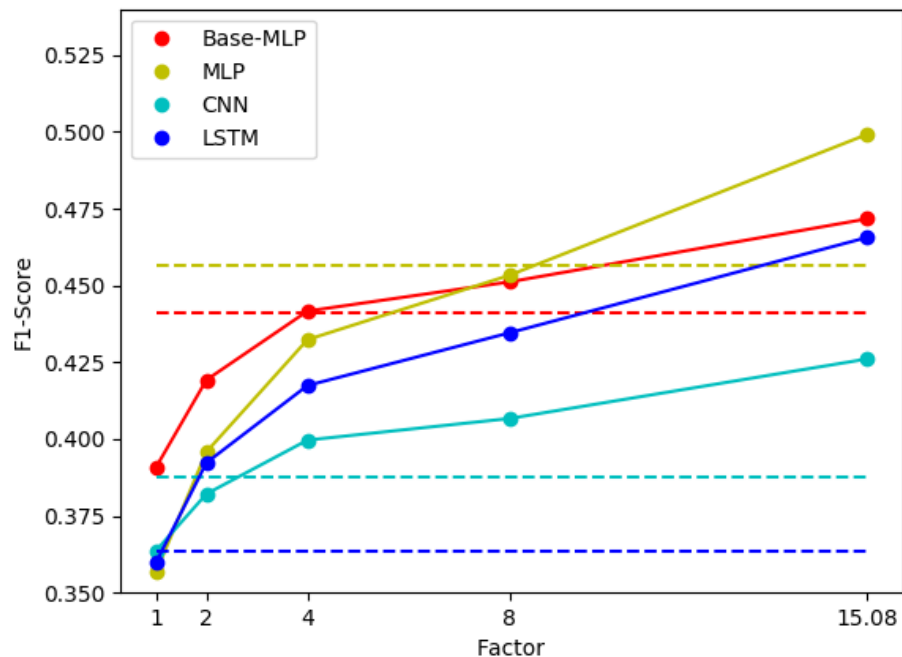
Titles vs full text in retrieval setting

- Aggregating the best nDCG values over all datasets and configurations, the best full-text-based retrieval models attains only 6.6% more than the best titles-based retrieval models



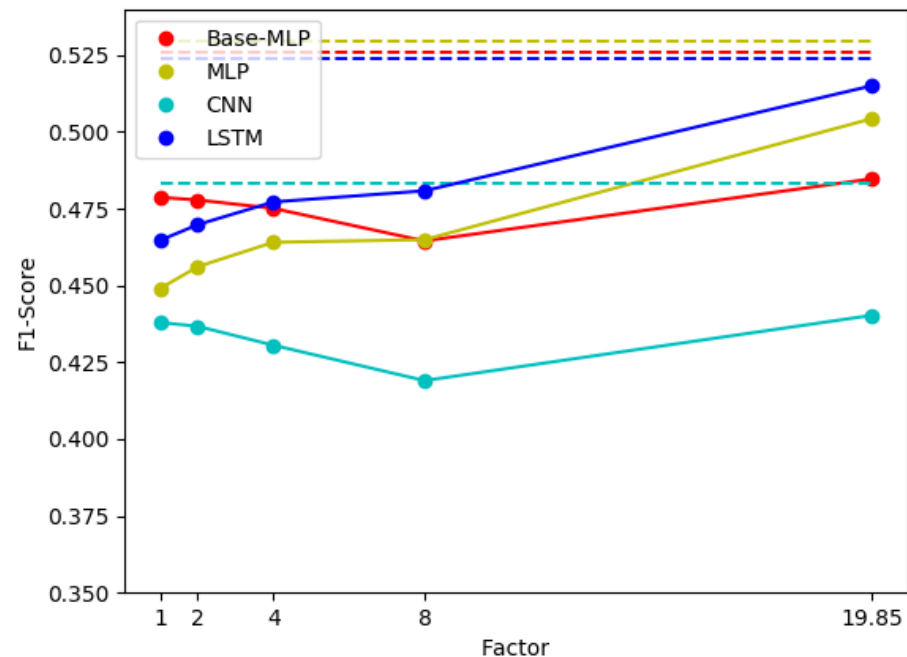
- **Question** Can we build a novel model for semantic document annotation which use only title data and compare it to full-text based methods?
- **Motivation** For semantic subject indexing in digital libraries: much more labeled title data than labeled full-text data
- **Method** Neural networks, since they work well with very large datasets and are state-of-the-art on full-text as well.
- **Experiments**
 - Two datasets from scientific digital libraries (EconBiz and PubMed)
 - Three deep learning classifier (MLP, LSTM, CNN)
 - One baseline (Base-MLP, previous state-of-the-art).

EconBiz



- All title-based methods outperform full-text ones
- Best title-based method is 9.4% better than the best full-text method

PubMed



- All full-text methods outperform title-based ones
- The difference between best title-based method and best full-text method is only 2.9%

- We now have well-performing technologies for
 - Collecting lots of (relevant, selected) data that is out there
 - Making sense out of these data (esp. by means of video understanding)
 - Searching for and finding the desired bits and pieces of information that we need, in an ocean of complex data (videos, texts, ...)
- In MOVING we are using these technologies
 - For developing a joint working-and-training platform
 - For applying them and the whole platform in two specific use cases (financial auditors; young researchers)
- What other uses of these technologies in the open education domain can you think of?

Platform Demo and hands-on session

The screenshot shows the MOVING web platform interface. At the top, there is a navigation bar with the MOVING logo and links for Search, Project management, Learning environment, Contacts, and My account. The main content area is divided into several sections:

- Search for:** A search bar containing "Machine Learning" and a "Search" button. Below it is an "Advanced Search" button.
- Doc Types:** A list of document types with their respective counts: Videolectures/lecture (590), evt (153), Videolectures/Invited talk (113), Videolectures/tutorial (92), book (60), esn (39), and Videolectures/keynote (35).
- Results:** A section titled "Concept Graph" showing "1199 results have been found." Below this is a "Machine Learning" section with a play button icon. It features a video thumbnail from "NIPS Workshops 09 - Whistler" published on 2009-12-11. The abstract discusses "Large-Scale Machine Learning: Parallelism and Massive Datasets" and mentions physical and economic limitations.
- Adaptive Training Support:** A section titled "MOVING feature usage" with a bar chart showing usage from 0 to 100. Below the chart is a section for "Average number of keywords" with two progress bars for "Me:" and "All:" both at 0.0%. A text prompt asks: "Think about your feature usage. Did you improve search behavior over time?"

The screenshot shows the MOVING mobile app interface. At the top, there is a navigation bar with the MOVING logo and a hamburger menu icon. The main content area is divided into several sections:

- Search for:** A search bar containing "Machine Learning" and a "Search" button. Below it is an "Advanced Search" button.
- Results:** A section titled "Concept Graph" showing "1146 results have been found." Below this is a "Machine learning" section with a play button icon. It features a video thumbnail from "NIPS Workshops 09 - Whistler" published on 2016-09-05 by Blaž Fortuna.
- Machine Learning:** A section with a play button icon. It features a video thumbnail from "NIPS Workshops 09 - Whistler" published on 2009-12-11. The abstract discusses "Large-Scale Machine Learning: Parallelism and Massive Datasets" and mentions physical and economic limitations.

<http://platform.moving-project.eu/>

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Thank you for your attention!

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