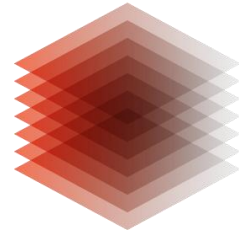

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TIB

Visual Concept Detection and Linked Open Data at the TIB AV- Portal

Felix Saubier, Matthias Springstein
Hamburg, November 6
SWIB 2017

Agenda

- 1. TIB and TIB AV-Portal**
- 2. Automated Video Analysis**
- 3. Visual Concept Detection**
- 4. Data Quality**
- 5. Data Model**
- 6. Data Publication & Reuse**

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Technische Informationsbibliothek (TIB)

- German National Library of Science and Technology
- University Library at Hannover
- The world's largest science and technology library
- An infrastructure provider for the whole scientific work process
- TIB strategy: **Move beyond text**
- **Competence Centre for Non-Textual Materials**
- **Visual Analytics Research Group**



TIB AV-Portal (av.tib.eu)



- Platform for **quality-tested scientific videos**
- Online since April 2014
- Developed by TIB and Hasso Plattner Institute
- **Automatic metadata enrichment**, DOI/MFID, long-term preservation, semantic search
- **11,500** Videos (December 2017)
- Conference recordings, lectures, experiments, video abstracts, simulations, animations
- Videos predominantly under open access licenses

The screenshot displays the TIB AV-Portal interface. At the top, there is a search bar and a 'Suchen' button. Below this, the main content area features a video player with a color-coded velocity field visualization. The player includes a progress bar and a 'Zurück des Filmmaterials' link. To the right of the player is an 'Automatisierte Medienanalyse' (Automated Media Analysis) section, which is currently in 'BETA' status. This section contains several buttons for 'Anschauen', 'Teilen', and 'Abmelden', along with checkboxes for 'Geschwindigkeit' and 'Komplexität'. Below the player, there is a 'Metadaten' section with two columns: 'Formale Metadaten' and 'Inhaltliche Metadaten'. The 'Formale Metadaten' column lists fields such as 'Titel', 'Alternative Titel', 'Serientitel', 'Anzahl der Teile', 'Autor', 'Lizenz', 'DOI', 'MFID', 'Hersteller', 'Erscheinungsjahr', 'Sprache', 'Produzent', and 'Publikationsjahr'. The 'Inhaltliche Metadaten' column provides a detailed description of the video content, including a summary and a list of keywords.

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1. TIB and TIB AV-Portal
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Video Analysis – Process



Scene Recognition (SBD)



Speech Recognition (ASR)



Text Recognition (OCR)



Image Recognition (VCD)

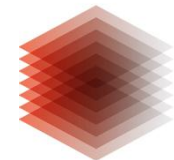


Named Entity Linking (NEL)



The screenshot shows the TIB AV-Portal interface. At the top left is the 'TIB AV-PORTAL' logo and a search bar with the placeholder text 'Search for people, places, topics ...'. Below the search bar is a video player with the title 'What is good scientific practice for research software?'. The video player shows a man speaking at a podium. To the right of the video player is the 'Automated Media Analysis' section, which is currently in 'BETA' mode. This section has two tabs: 'Recognized Entities' (selected) and 'Speech transcript'. Below the tabs is a search bar and three buttons: 'Speech', 'Text in the video', and 'Image content'. The 'Recognized Entities' section displays a list of tags for the video segment, including 'Compilation album', 'Data analysis', 'Dew point', 'Meeting/Interview', 'Maxima and minima', 'Code', 'Mathematical analysis', 'Computer animation', 'Database', 'Software', 'Utility software', 'Estimation', 'Protein', 'Heat transfer', 'Scripting language', 'Demo (music)', 'Maize', 'Partition (number theory)', 'Simultaneous localization and mapping', 'Data structure', 'Mereology', 'Mass', 'Species', 'Sheaf (mathematics)', and 'Real number'. Below the tags is a 'Citation of segment' field with the URL 'https://doi.org/10.5446/31028#t=04:26.04:34' and an 'Embed Code' section with the corresponding HTML code.

Video Analysis – Results



Video Segments



Audio Transcript

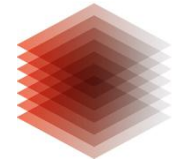
02:46
 hitting science well about what people images that in software to crimes this data right
 you need these tools there is no signs without software today and minus catching
 maybe bottflies that at some point you would use this to a generator a database of the
 butterflies again and researchers need maybe to classify all this so software is essential
 for science today the it can also

Named Entities

02:44

Resultant	Point (geometry)	Database	Service (economics)
Information	Whiteboard	Computer animation	Software
Software	Right angle	Sign (mathematics)	Game controller
Medical imaging	Function (mathematics)		

Video Analysis – Results (VCD)



Video Keyframes

Nitrosoethane – $\text{CH}_3\text{CH}_2\text{NO}$

O=N
|
C—C—H
| | | |
H H H H

Molecular Structure

Sir Harold Kroto
Lecture on Science and Creativity

20:39 | 39:06

Visual Concepts

20:33

Nitroverbindungen	Molecular geometry	Hydrierung	Cycloxygenase
Emission spectrum	Carbon (fiber)	Chemical structure	River source
Molecule	Molecule		

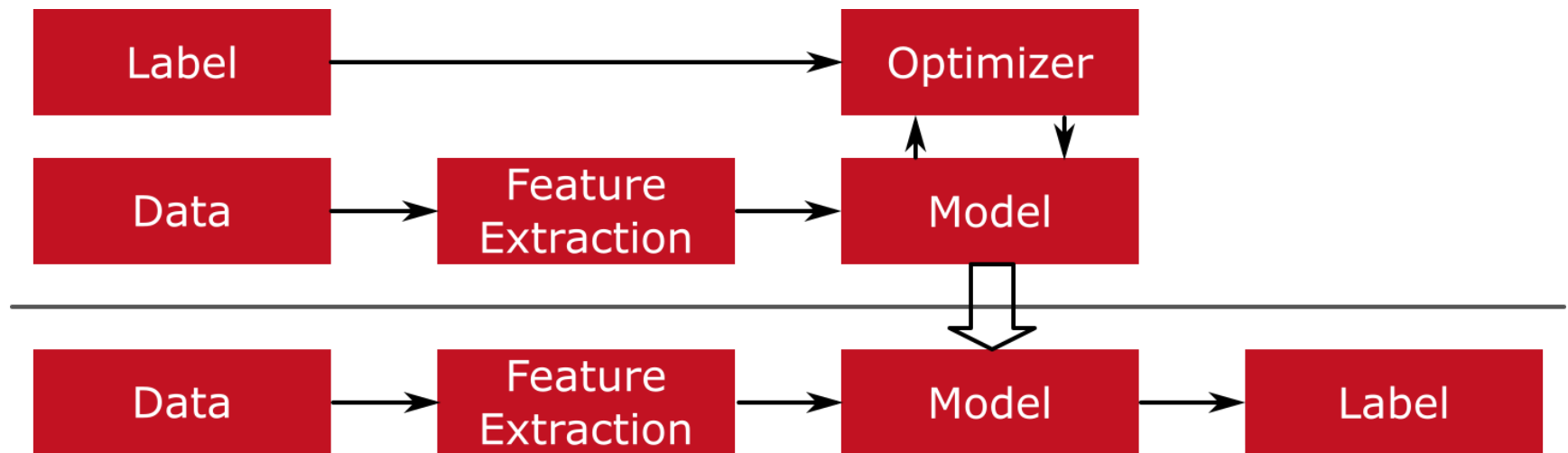
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Visual Concept Detection – Supervised Learning

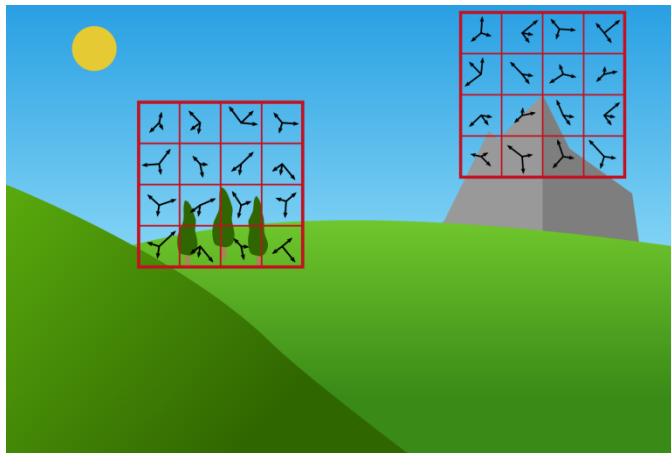
▪ Supervised Learning Pipeline

- Training: Modify the model parameters to reduce the classification loss
- Prediction: Use the trained model to propagate the label of new data

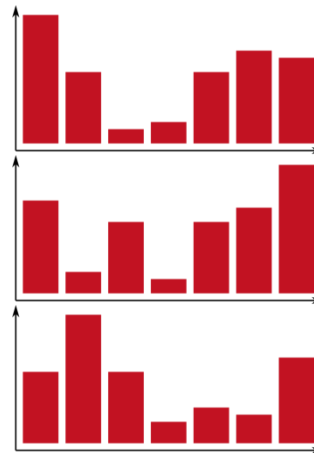


Visual Concept Detection – Previous Approach

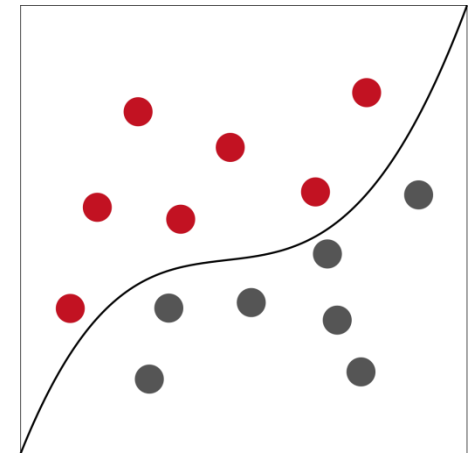
- System is trained on a manually annotated dataset with over 8000 images
- Classification of 49 visual concepts (16 deployed)



SIFT



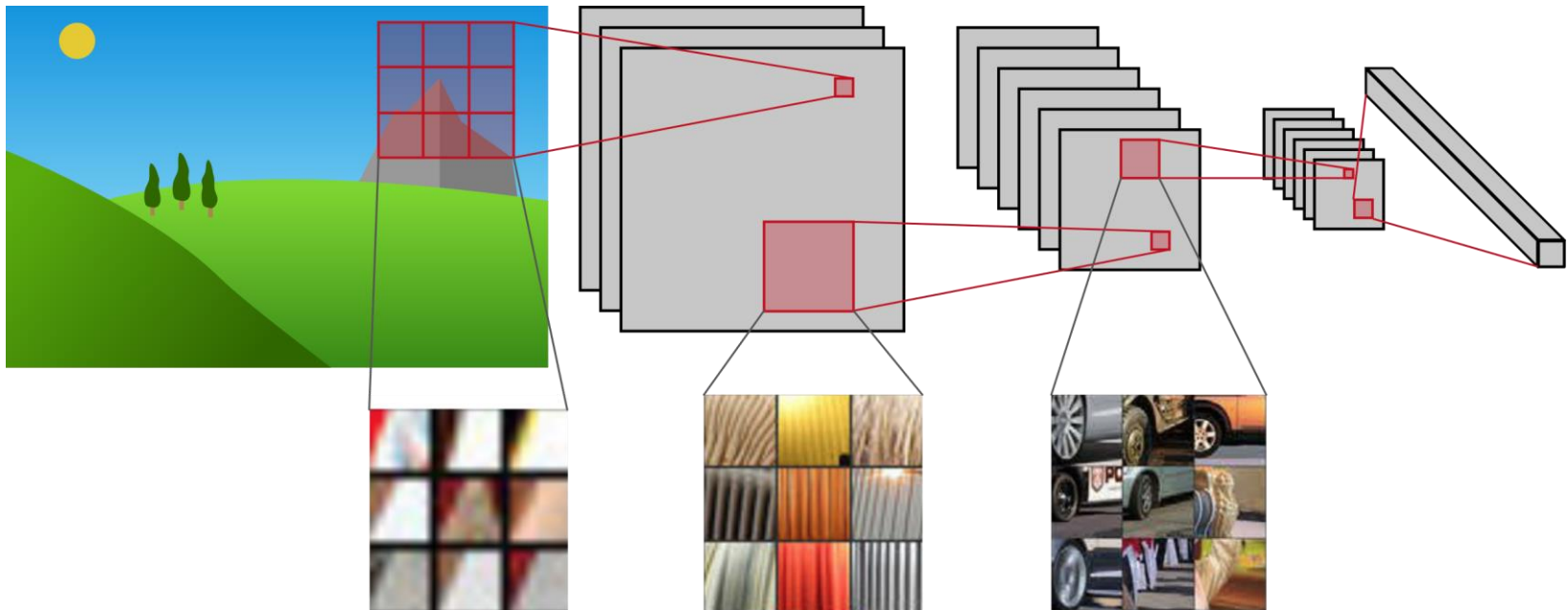
BoVW



SVM

Visual Concept Detection – Current Approach

- Utilizing a deep learning approach (Convolutional Neural Network)
- Training feature extraction and classifier model together



Visual Concept Detection – Current Approach

- **Dataset**

- System is trained on a semi-supervised dataset with 50,000 images
- Utilizing Google Image Search to find training samples

- **VCD Modul**

- Using Inception-Resnet-v2 network structure designed by Google
- Neural network pre-trained with one million images
- Classification of 73 visual concepts
- Trained for 40 epochs

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4. **Data Quality**
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Data Quality

- **Validation during training**
 - Using 1100 manually annotated images
 - Estimate the mean average precision for each concept
 - **0.33 mAP over all concepts**
 - Compute the F1-Score to determine thresholds for the binary label
- **Testing**
 - Separate testing for the whole processing pipeline
- **Future Work**
 - Adjust the threshold
 - Filter noisy images in the training dataset

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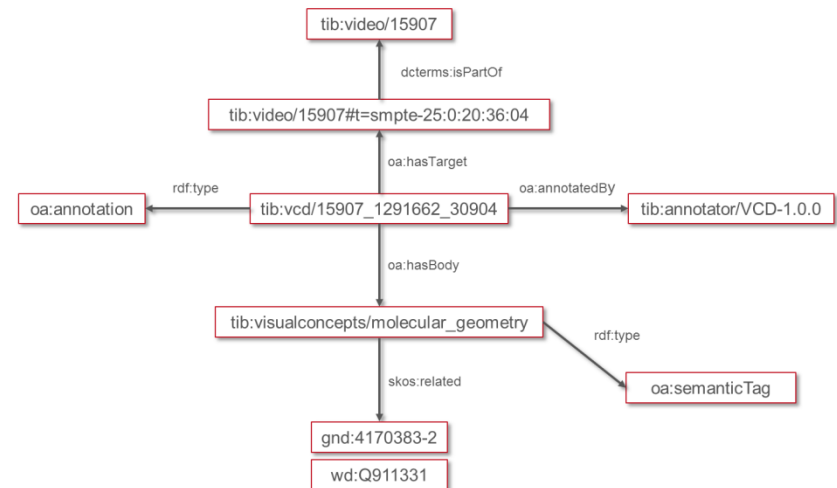
Data Model

Resource Description Framework (RDF)

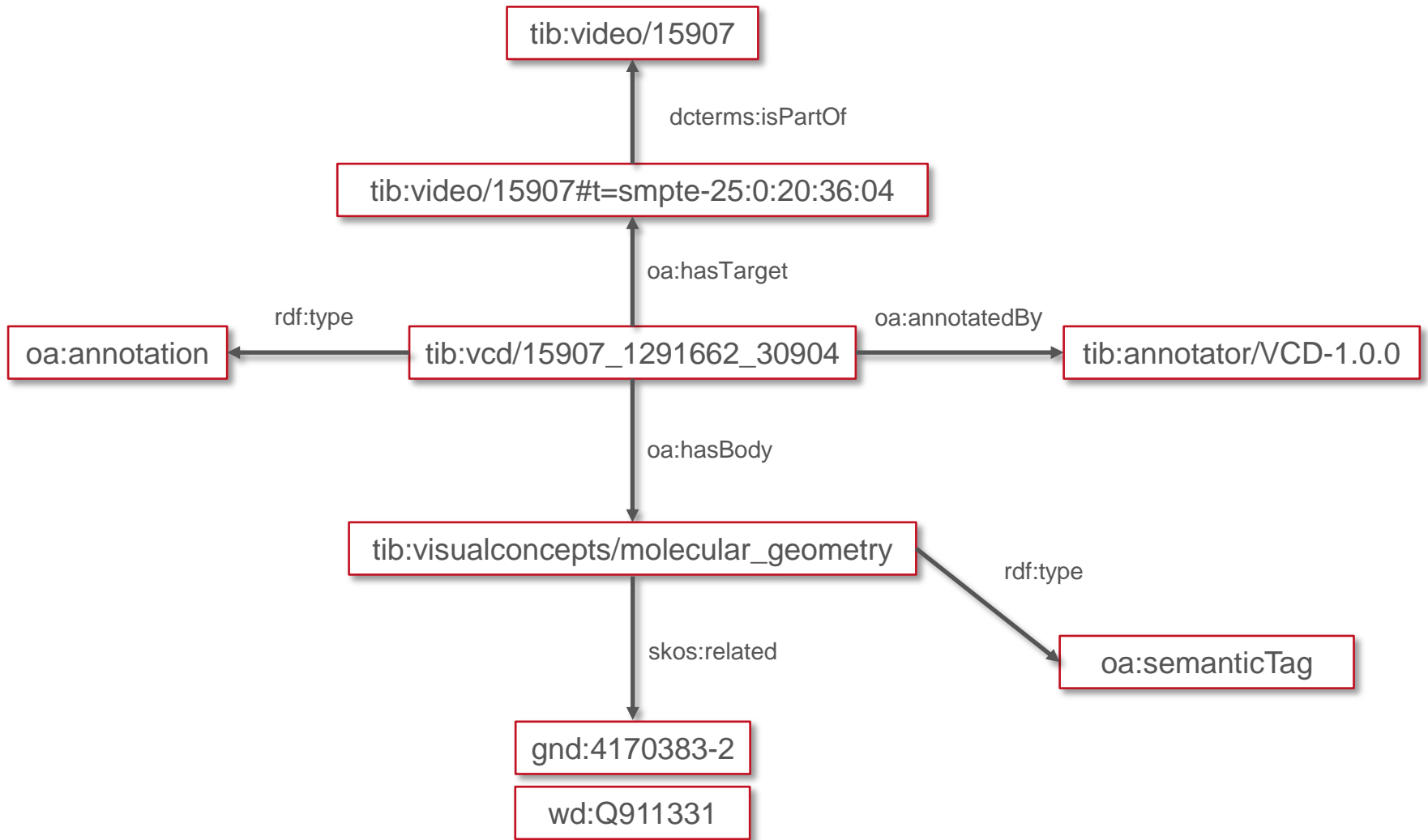
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tib:visualconcepts/molecular_geometry skos:related gnd:4170383-2 .
```

Vocabularies

- Bibframe Vocabulary
- DCMI Metada Terms
- DCMI Type Vocabulary
- Friend of a Friend Vocabulary
- **Open Annotation Data Model**
- NLP Interchange Format
- Internationalization Tag Set (ITS) Ontology



Data Model



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6. **Data Publication & Reuse**

Metadata Publication & Linked Open Data

- CC0 RDF dumps
- Dereferencable URIs & content negotiation with LodView
- LDF server at <https://labs.tib.eu/ldf>
- Planned: public SPARQL endpoint

DATASETS

TOTAL

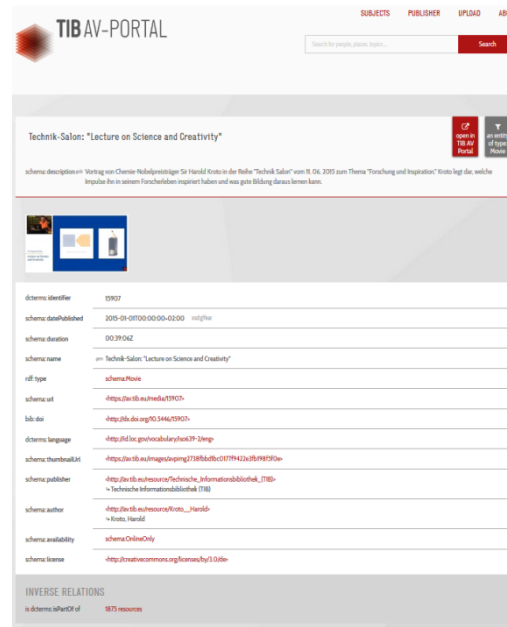
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tib-av-portal-export-1.0.3.nt.zip	text/n-triples	146M (unzipped 2109M)	16.06.2017	1.0.3
tib-av-portal-export-1.0.3.ttl.zip	text/turtle	142M (unzipped 1431M)	16.06.2017	1.0.3

TIB SUBJECTS: ENGINEERING AS WELL AS ARCHITECTURE, CHEMISTRY, INFORMATION TECHNOLOGY, MATHEMATICS AND PHYSICS
These dumps are a subset of the total stock. They only contain the videos of the TIB subjects engineering as well as architecture, chemistry, information technology, mathematics and physics.

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tib-av-portal-export-tib-subjects-1.0.3.ttl.zip	text/turtle	141M (unzipped 1426M)	16.06.2017	1.0.3

DUMPS OF PUBLISHER IWF WISSEN UND MEDIEN GGMBH I.L.
These dumps are a subset of the total stock. They only contain the videos of the publisher IWF Wissen und Medien gGmbH i.L.

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tib-av-portal-export-iwf-1.0.3.ttl.zip	text/turtle	4M (unzipped 34M)	16.06.2017	1.0.3



TIB AV-PORTAL

Technik-Salon: "Lecture on Science and Creativity"

schema:description "Vortrag von Chemie-Nobelpreisträger Sir Harold Kroto in der Reihe "Technik-Salon" vom 11. Okt. 2015 zum Thema "Forschung und Inspiration". Kroto legt dar, welche Regeln die in seinem Forschungslabor existieren und was ganz Bildung daraus lernen kann."

dt:identifier 15907

schema:datePublished 2015-01-01T00:00:00-02:00

schema:duration 00:39:06Z

schema:name "Technik-Salon: "Lecture on Science and Creativity"

rdf:type schema:Movie

schema:url <https://av.tib.eu/media/15907/>

lib:doi <https://doi.org/10.5446/15907>

dt:language <http://id.loc.gov/vocabulary/iso639-2> eng

schema:thumbnailUrl <https://av.tib.eu/images/orig/2718f8bb45c1177413c39f98950>

schema:publisher http://dx.tib.eu/resource/Technische_Informationsbibliothek_TIB-2 Technische Informationsbibliothek (TIB)

schema:author http://dx.tib.eu/resource/Kroto_Harold Kroto, Harold

schema:availability schema:OnlineOnly

schema:license <http://creativecommons.org/licenses/by/3.0/de/>

INVERSE RELATIONS

is dt:resource of 1872 resources

AV-Portal Linked Data Fragments Server

#LD
Linked Data Fragments

TIB AV-Portal

Query TIB AV-Portal by triple pattern

subject: <http://av.tib.eu/resource/video/15907>

predicate: _____

object: _____

Find matching triples

Matches in TIB AV-Portal for { <http://av.tib.eu/resource/video/15907> ?p ?o }
Showing triples 1 to 15 of 15 with 100 triples per page.

15907 doi 15907.

15907 identifier "15907".

15907 language eng.

15907 subject Chemistry.

15907 author Kroto_Harold.

15907 availability OnlineOnly.

15907 datePublished "2015-01-01T00:00:00+02:00".

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15907 duration "00:39:06Z".

15907 license de.

15907 name "Technik-Salon: "Lecture on Science and Creativity".

15907 publisher Technische_Informationsbibliothek_%2BTIB%29.

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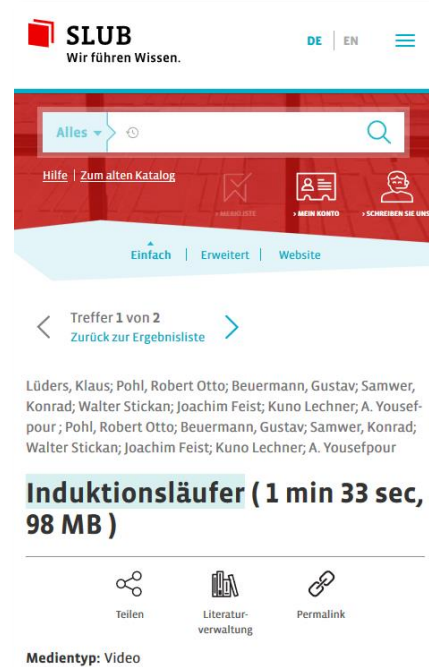
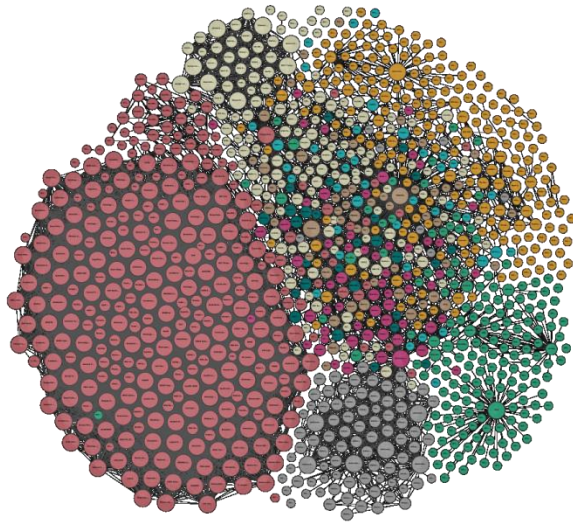
15907 type Movie.

About TIB AV-Portal
TIB AV-Portal - AV Portal 1.0.3

Powered by a Linked Data Fragments Server ©2013–2017 Ghent University – imec

Reuse

- Library catalogues & discovery services
- Virtual libraries
- Interlinking & Mash-Up



SLUB
Wir führen Wissen. DE | EN

Alles

Hilfe | Zum alten Katalog

Einfach | Erweitert | Website

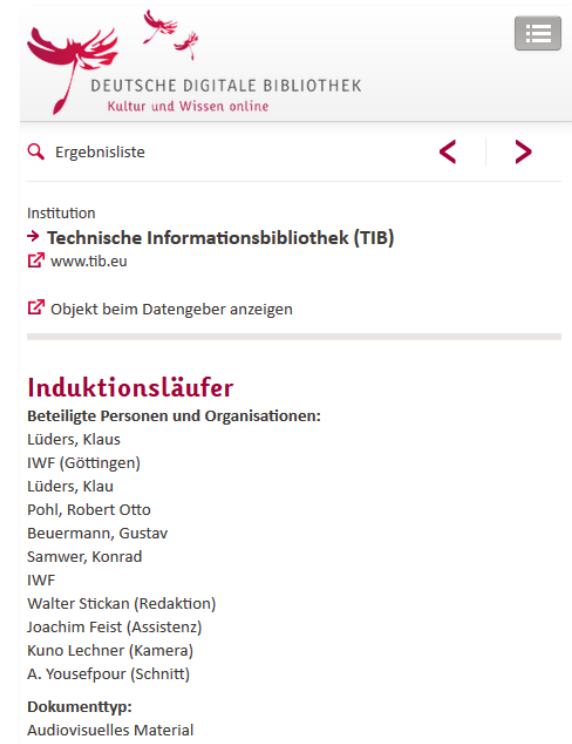
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Induktionsläufer (1 min 33 sec, 98 MB)

Teilen | Literaturverwaltung | Permalink

Medientyp: Video



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www.tib.eu

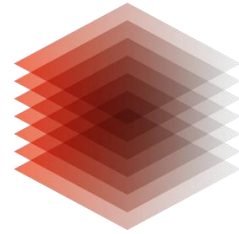
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IWF (Göttingen)
Lüders, Klau
Pohl, Robert Otto
Beuermann, Gustav
Samwer, Konrad
IWF
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