

# Completing LOM - How Additional Axioms Increase the Utility of Learning Object Metadata Long version

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## Abstract

Learning Objects Metadata describing educational resources in order to allow better reusability and retrieval. Unfortunately, annotating complete courses thoroughly with LOM metadata can be a tedious task. In this paper we show how additional inference rules can make this task easier, and allows us to derive additional metadata from existing ones. Additionally, using these rules as integrity constraints helps us to define the constraints on LOM fields, thus taking an important step towards a complete axiomatization of LOM metadata (with the goal of transforming the LOM definitions from a simple syntactical description into a complete ontology). In this paper we will use RDF metadata descriptions and an inference language explicitly developed for RDF (TRIPLE) to represent metadata and axioms. We show how these rules can be applied for the extensions of course metadata, the creation of views onto the metadata or metadata consistency checking. In the appendix you find the complete LOM table extended with inference rules and the metadata description of an example course as a RDF file.

## 1 Motivation

### 1.1 LOM Metadata

For the description of (digital) resources several metadata standards have emerged. One of the most important standards, which can be applied independently of any particular domain, is the Dublin Core metadata element set [1]. The Dublin Core element set defines a set of basic metadata elements for cataloguing conventional library items and also arbitrary electronic resources. A description of resources can be provided with

metadata elements such as Title, Creator, Subject or Description, thus this limited number of Dublin Core metadata elements already provides some quite important metadata to implement search and retrieval functionality.

To describe e-learning resources, the Learning Objects Metadata Standard has evolved in the past few years to an official IEEE standard (since July 2002 [9]). Learning Objects Metadata, or LOM for short, comprise 46 elements to provide a more comprehensive description of learning resources than Dublin Core could achieve. This higher semantic density possible with a LOM description can then be used for more specific queries, taking learning specific attributes into account. All Dublin Core metadata elements can be mapped onto the related LOM metadata elements.

LOM elements are categorized into the nine categories General, Life Cycle, Meta-Metadata, Technical, Educational, Rights, Relation, Annotation and Classification. For several metadata elements LOM provides vocabulary sets with recommended values. One example is the description of the kind of relationship between one resource and another one, where the IEEE LOM vocabulary includes the elements {IsPartOf, HasPart, IsVersionOf, HasVersion, IsFormatOf, HasFormat, References, IsReferencedBy, IsBasedOn, IsBasisFor, Requires, IsRequiredBy}, which has been directly adopted from Dublin Core [14].

We have annotated several courses in Hannover and Braunschweig (such as *Signal Transmission II* in Braunschweig [3] and *Artificial Intelligence I* in Hannover [5]) with a subset of Dublin Core and LOM metadata, using the following bindings:

- Dublin Core
- Dublin Core Qualifiers
- LOM Classification
- LOM
- vCard

Our metadata elements have been encoded in RDF (Resource Description Framework) and RDF Schema. The full RDF description of the course *Artificial Intelligence I* can be found in the appendix, for the full RDF descriptions of the course *Signal Transmission II* cf. [4]. In addition to the trivial metadata elements (such as title, creator, description etc.) structural relationships between parts of the courses have been described with the Dublin Core terms qualifying the relationship between two resources. For a complete description of the metadata set we use to annotate courses we refer to [11] or [12].

## 1.2 Motivation and Problem Description

Our motivation in describing the courses with LOM metadata was to achieve better retrieval results when searching for educational content and to allow more precise queries. This requires that all resources of a given course are accurately described by structural relationships and relationships in terms of logical sequences of content (see Figure 1).

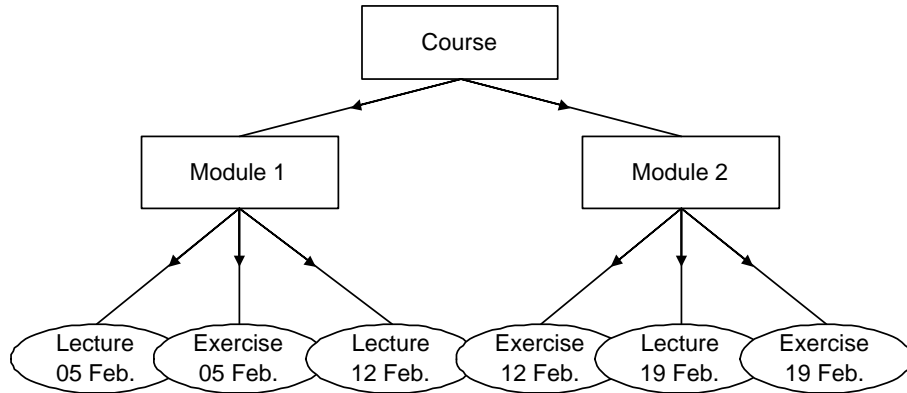


Figure 1: Hierarchical structure of a course defined via *dcterms:hasPart*

Doing that, the first thing we noticed was that several fields are redundant in that they can be easily derived from other fields. In some cases, metadata elements are simply inverse attributes to other ones: The qualified relationship "hasPart" between two resources implies the inverse relationship "isPartOf" where RDF subject and object are interchanged (i.e. the directed RDF arc between both is reversed). What is necessary here is clearly a set of logical rules, which can be processed by an inference engine to create all these implicit metadata elements or RDF statements from the existing ones and add them to get complete annotations.

In this paper, we will use TRIPLE [10], a modular rule language that has been designed for querying and transforming RDF statements, which makes it very suitable for our purposes.

Another point to notice is, that the specifications for LOM data model are mainly on the syntactical level, but leave out important semantical information. What is needed here are axioms (we can use the inference rules mentioned above as integrity constraints) which provide a formal basis for a more precise description of the usage of all LOM elements. One example is the *is Part Of* relationship between two resources. In our definition this relationship describes the hierarchical structure in terms of course modules. If we have an exercise that is part of a course module then the subject of the exercise can be inherited to the course module along the *is Part Of* relationship, see figure 1.

However one could use a "is Part Of" qualifier in terms of temporal relationship as shown in figure 2. Often the sequence of topics in both lecture and exercise are not completely synchronised, so that inheriting subject attributes along the relationship is not reasonable. At this point, adding axioms (which hold for our interpretations but not for other ones) is an important means for adding semantical information and thus clarifying how we use the LOM metadata elements in our context, thus improving the exchangeability of LOM metadata records between different applications. Informally, our use of these relations is defined in the following table, we will show appropriate

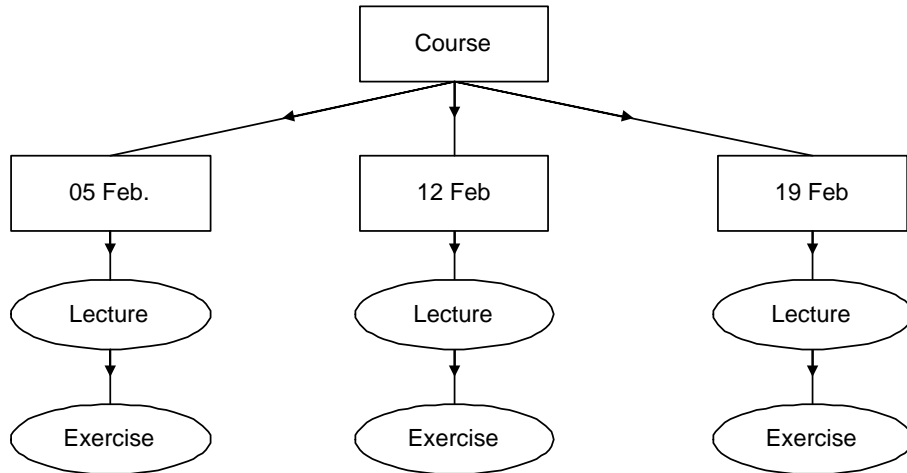


Figure 2: Temporal structure of a course defined via *dcterms:hasPart*

axioms formalizing this meaning in a later section.

Relationship	Description
<i>dcterms:hasPart</i> <i>dcterms:isPartOf</i>	The hierarchical structure of a course is defined with this relationship. See figure 1
<i>dcterms:hasVersion</i> <i>dcterms:isVersionOf</i>	Resources use this relationship, if they are versions of the same content, but differ for example in the creator, or the language. It is possible, that one resource has different versions.
<i>dcterms:hasFormat</i> <i>dcterms:isFormatOf</i>	Resources are formats of each other, if they only differ in their technical format, e.g. the slides and the video capture of the same lecture.

### 1.3 Ontologies

Ontologies, which have recently got a lot of attention in the context of the Semantic Web, provide a shared and common understanding of a domain that can be communicated between people and application systems like agents. They are developed to facilitate knowledge sharing and reuse [7]. In the simplest case, an ontology describes a hierarchy of concepts related by subsumption relationships. In more sophisticated ontologies, suitable axioms are added in order to express other relationships between concepts and to constrain their intended interpretation [8].

In our context we start from a comprehensive though not complete description of learning resources by metadata elements. These metadata elements (represented in

RDF, the main language of the Semantic Web) provide a specific model of our learning resources in terms of (hierarchical) structure and using attributes to express keywords and creator information. Adding axioms here helps both in completing our metadata annotations, as well as checking their consistency with regards to an intended interpretation.

## 1.4 TRIPLE

The rule language TRIPLE has especially been designed for applications in need of RDF reasoning and transformation and is therefore an very good choice for the definition of our rules and axioms. For a complete description of TRIPLE we refer to [10]. As we see in the next section, TRIPLE can also be used for a formal description of LOM elements. The TRIPLE core language is based upon Horn logic which is syntactically extended to support RDF primitives like namespaces, resources and statements (triples, which gave TRIPLE its name). Namespaces are declared via clause-like constructs of the form `nsabbrev.:= namespace`. A RDF statement (triple) is inspired by F-Logic object syntax written as

```
subject [ predicate → object ]
```

TRIPLE uses the usual set of connectives and quantifiers for building formulae from statements and Horn atoms, i.e. AND, OR, NOT, FORALL, EXISTS,  $\leftarrow$ ,  $\rightarrow$ , etc. The following example shows how we can use TRIPLE for inferencing:

```

rdf:="http://www.w3.org/...rdf-syntax-ns#" .
dc:="http://purl.org/dc/elements/1.0/"
dfki:="http://www.dfki.de"

@dfki:documents{
  dfki:d\\_01\\_01 \\[
    dc:title→ "TRIPLE" ;
    dc:creator→ "Michael Sintek" ;
    dc:creator→ "Stefan Decker" ;
    dc:subject→ "RDF" ;
    dc:subject→ "triples; ... \\].

inheritance\\_along\\(dcterms:hasPart,dc:language\\).

FORALL S, D search\\(S, D\\) ←
  D\\[dc:subject → S\\].

FORALL D1, L D1\\[dc:language →L\\]← EXISTS D2
  \\(D1\\[dcterms:hasPart → D2\\] AND
  D2\\[dc:language → L\\] AND
  inheritance\\_along\\(dcterms:hasPart,dc:language\\)\\).

FORALL D2, S D2\\[dc:subject → S\\] ← EXISTS D1
  \\(D1\\[dc:subject → S\\] AND
  D2\\[dcterms:isFormatOf → D1\\]\\).
}

```

In this example, first we define three namespaces for RDF, Dublin Core and for the domain <http://www.dfki.de/>. A document with the reference ID `d_01_01` is then being

described with Dublin Core metadata, e.g. `dfki:d_01_01 [dc:title→"TRIPLE"]` (several statements can be abbreviated as shown in the above example). The subject of the related RDF statement is `d_01_01`, the predicate is `dc:title` and the object is `"TRIPLE"`. The example includes three rules: The first searches for documents *D* having the specified subject *S*. The second rule inherits the DC language attribute from one document *D2* that is part of the document *D1* to the latter. The last rule inherits the subject attribute to documents that are available in other technical formats.

How can these rules help with the creation and processing of RDF-encoded LOM records? We present in this paper three applications using TRIPLE. We can define rules that can be processed in order to check metadata consistency, allow semi-automatic metadata creation and enrich search results. As a beneficial side effect we can provide a more formal definition of LOM elements extending the one provided in [9].

## 1.5 Project Background

Our courses have been created in previous eLearning and research projects financed by the Federal Ministry of Education and Research, Germany, and the Ministry for Science and Culture of Lower Saxony, Germany. These resources support several lectures at our universities and are organised as hierarchically structured courses written primarily in HTML, using some additional embedded multimedia elements. We are currently using these resources also as test beds for various other projects that focus on intelligent applications to support e-learning. In one of these projects, the Edutella Project [2], we develop a peer-to-peer infrastructure for learning (and other digital) resources. To allow better reusability and retrieval of these resources in a peer-to-peer network all resources are with LOM metadata. Other applications processing these metadata records include digital libraries systems and learning management systems (LMS).

## 2 Inference rules / Axioms for a formal description of LOM

You will find the complete table of LOM elements in the appendix, expanded with their inference rules. In this section we will only discuss the rules and some examples.

### 2.1 Rules

In the following rules, we use *R, R1, R2, ..* as abbreviation for learning resources. *P, P1, P2, ..* represent predicates from the LOM standard, *O, O1, ..* are values of a predicate. The metadata attributes from *dcterms* that define relations between resources as *dcterms:hasPart*, *dcterms:hasVersion*, etc. play an important role in our annotation, because most of our inference rules are especially useful when we take the relations between learning resources into account. In the following, we use `ATTRIBUTE` as a placeholder, since many of the rules work for different attributes.

### 2.1.1 Inverse attributes

The first rules, quite obvious, describe the fact, that some attributes have inverse attributes. If there is a *dcterms:hasPart* relationship between resource1 and resource2, than there has to be also a *dcterms:isPartOf* relationship between resource2 and resource1. Inverse predicates are marked in the LOM table with *inverse(Attribute1,Attribute2)*. The rule is defined as:

```
FORALL R1, R2, ATTRIBUTE1
  R1 [ATTRIBUTE1->R2 ]<- EXISTS ATTRIBUTE2
  (R2[ATTRIBUTE2->R1]AND
  (inverse(ATTRIBUTE2, ATTRIBUTE1) OR
  inverse(ATTRIBUTE1, ATTRIBUTE2))).
```

### 2.1.2 Transitive attributes

Transitive attributes, like *dcterms:hasPart*, are marked in the LOM table with *transitive(attribute)*. The rule is defined as:

```
FORALL R1,R3,ATTRIBUTE
  R1[ATTRIBUTE ->R3]<- EXISTS R2
  (R2[ATTRIBUTE ->R3]AND
  R1[ATTRIBUTE ->R2]AND
  transitive(ATTRIBUTE)).
```

### 2.1.3 Inheritance

Predicates can also be inherited along certain attributes. As the attribute *dcterms:hasPart* and *dcterms:isPartOf* are used to structure a course, a lot of predicates like *1.3 Language*, *1.5 Keyword*, *2.2 Status*, etc. can be inherited from a lecture-unit to the whole lecture, expressed via the following inference rule:

```
FORALL R1,P,O
  R1[P ->O]<- EXISTS R2, ATTRIBUTE
  R1[ATTRIBUTE ->R2]AND
  (R2[P ->O]AND
  inheritance_along(ATTRIBUTE,P)).
```

(Predicates that are inherited in such a way along a certain attribute are marked in the LOM table with ***inheritance\_along(ATTRIBUTE,P)***).

A special situation occurs for the predicate *7.1 Relation Kind* where the metadata instance *dcterms:requires* is used, to describe the background knowledge for a learning resource. The value of this predicate is only inherited along a *dcterms:hasPart* for example, if the learning resource providing the background knowledge is not also connected via *dcterms:hasPart*. Situations like this can be handled with the following inference rule:

```
FORALL R1,R3,P
  R1[P ->R3]<- EXISTS R2,ATTRIBUTE
```

```

(R1[ATTRIBUTE ->R2]AND
R2[P ->R3]AND
NOT R1[ATTRIBUTE ->R3]AND
outwardInheritance_along(ATTRIBUTE,P)).

```

(Predicates that are inherited in such a way along a certain Attribute are marked in the LOM table with **outwardInheritance\_along(ATTRIBUTE,Predicate)**).

Some inverse relationships like between *dcterm:hasFormat* and *dcterm:isFormatOf* are so strong, that every predicate value from on resource is inherited to its related resource. The following inference rule describes this fact:

```

FORALL R1,P,O
R1[P ->O]<- EXISTS R2,ATTRIBUTE,ATTRIBUTE2
(R1[ATTRIBUTE ->R2])OR (R1[ATTRIBUTE2 ->R2])
AND R2[P ->O]AND
(inverse(ATTRIBUTE,ATTRIBUTE2) OR
inverse(ATTRIBUTE2,ATTRIBUTE)) AND
inverseInheritance_along(ATTRIBUTE,P).

```

(Predicates that are inherited in such a way along a certain Attribute are marked in the LOM table with **inverseInheritance\_along(ATTRIBUTE,P)**).

#### 2.1.4 Summation

Sometimes the value of a predicate is a sum of values from predicates from other resources. If a resource is separated in different parts via *dcterm:hasPart*, the size of the resource as defined with the predicate *4.2 Size* for example is the sum of the parts' sizes.

```

FORALL R,P,Oi
R[P ->SUM(Oi)]<- EXISTS Ri,ATTRIBUTE
(R[ATTRIBUTE->Ri]AND
Ri[P ->Oi]AND
summation_along(ATTRIBUTE,P)).

```

Predicates that are added in such a way along a certain Attribute are marked in the LOM table with **summation\_along(ATTRIBUTE,P)**.

For Boolean values, the summation corresponds to a Boolean OR. This is used for example, when a resource is divided into several parts and we want to determine whether the whole resource is copyrighted or not, based on the copyright annotations of its parts. In this case, we use *dcterm:hasPart* and infer the copyright status based on the values of the different parts (values "yes" or "no" for the predicate *6.2. Copyright and other restrictions*).

```

FORALL R,P,Oi
R[P ->O1 OR ... OR Oi]<- EXISTS Ri,ATTRIBUTE
(R[ATTRIBUTE->Ri]AND Ri[P ->Oi]AND
booleanSummationOR_along(ATTRIBUTE,P)).

```

Predicates that are aggregated in such a way along a certain Attribute are marked in the LOM table with **booleanSummationOR\_along(ATTRIBUTE,P)**.

The aggregation level of a resource for example (predicate *1.8 Aggregation level*) is a value from 1 to 5. Since a collection of level 1 resources is defined by the LOM standard to have level 2 as value, the value of this predicate for a resource that has certain child resources identified via *dcterms:hasPart* can be defined as the maximum predicate value of the child resources plus 1.

```
FORALL R,P,Oi
  R[P ->MAX(Oi+1)]<- EXISTS Ri.ATTRIBUTE
  (R[ATTRIBUTE->Ri]AND Ri[P ->Oi]AND
  maxSummation_along(ATTRIBUTE,P)).
```

Predicates that are aggregated in such a way along a certain Attribute are marked in the LOM table with `maxSummation_along(ATTRIBUTE,P)`.

## 2.2 Inference rules for content classification

To classify the content of a learning object the IMS binding guide [13] suggests to link the attribute *dc:subject* to an ontology that is available as a RDF file in the internet and structured using the attribute *lom.cls:taxon*. A detailed description about the use of ontologies for the content classification of learning resources can be found in [11]. If this structure can also be accessed by our TRIPLE engine, we have the following inference rule for content classification, using the fact that a resource, which covers a certain topic, must also cover all its subtopics.

```
FORALL Resource,O2
  Resource[dc:subject ->O2]<- EXISTS O1
  (Resource[dc:subject ->O1]AND
  O1[lom.cls:taxon ->O2]).
```

## 3 Usage

Now that we have given a rules / axioms to LOM attributes, what have we gained? We see two major fields of application: validation and semi-automatic creation of metadata annotations, and enrichment of search results using TRIPLE views. Let us have a closer look on these possibilities.

### 3.1 Supporting the creation of course descriptions

If we use the set of rules given as integrity constraints, we can test whether a set of metadata attributes for a course is well-defined with respect to our intended meaning. Such a "validator" for metadata course-descriptions based on TRIPLE could be part of any tools used for creating these descriptions, and could also be used to check whether metadata to be merged from different resources follow the same semantics.

If we use our rules as inference rules, we can use them for a semi-automatic annotation / extension of course metadata. As the inference rules for the *hasPart* relationship

define that an attribute like `dc:creator` is inherited from a learning-resource to the module and the course it is a part of, we can extend our metadata using this rule the other way around. The creator of the metadata descriptions can then annotate the top course element with an author field using `dc:creator` and the annotation tool will use the inference rules to suggest the use of this author as a default setting for every learning resource.

### 3.2 TRIPLE views

One major feature of the TRIPLE language is the possibility to create different views of metadata sets using inference rules. Since we have already written our rules in TRIPLE, we can use them to create different views over existing metadata sets. Let us assume, that we have a course description *course* in which we search for learning resources with a certain `dc:subject` entry. If the results we received are not enough for our purpose, we can expand the search on a special *contentview* of the description, created via:

```
FORALL course @ contentview(course){
  FORALL S,P,O
    S [P ->O ]<-
    S [P ->O ]@ course.
  FORALL Resource,Content2
    Resource[dc:subject ->Content2]<- EXISTS Content1
    (Resource[dc.subject ->Content1]AND
    Content1[lom_cls:taxon ->Content2]).
  FORALL Resource1,Content
    Resource1[dc:subject ->Content]<- EXISTS Resource2
    (Resource1[dcterms:hasVersion ->Resource2]AND
    R2[dc:subject ->Content]).
  FORALL Resource1,Content
    Resource1[dc:subject ->Content]<- EXISTS Resource2
    ((Resource1[dcterms:hasFormat ->Resource2]OR
    Resource1[dcterms:isFormatOf ->Resource2]) AND
    Resource2[dc:subject ->Content]).
  FORALL Resource1,Content
    Resource1[dc:subject ->Content]<- EXISTS Resource2
    (Resource1[dcterms:hasPart ->Resource2]AND
    Resource2[dc:subject ->Content]).
}
```

This view is created from the original description using every inference rule that concerns the *dc:subject* attribute. A search on this expanded view will also find resources that cover super topics of the original `dc:subject` entry. We also find resources that have parts that cover this topic, that are formats of resources covering this topic etc.

## 4 Conclusion and Further Work

We have shown in these paper how to complement LOM metadata by suitable rules and axioms expressed in the TRIPLE language, and have discussed how extending the

purely syntactic definition given in the LOM specifications by such rules and axioms can help us in various ways: Inference rules can help us avoid redundant metadata annotation and derive additional metadata from existing ones. Using these rules as integrity constraints helps us to define the constraints on LOM fields, making clear our intended meaning and use of these LOM fields, resulting in easier exchange of LOM metadata between different applications and contexts. Finally, we have shown how we can use the view mechanism of TRIPLE to extend existing metadata sets to provide more complete answers to our queries.

We are working to include these technologies in the context of an annotation tool suggesting default values to course authors based on the rules defined in this paper, and are also exploring the connection between our TRIPLE axioms and OWL definitions [15] for these constraints.

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## A The Learning Objects Metadata Standard Schema

### LOM - extended with inference rules

Nr	Name	Value space	Inference Rules
1	<b>General</b>		
1.1	Identifier	-	none
1.2	Title	-	none
1.3	Language	LanguageID = Langcode	inheritance_along( <b>dcterms:hasPart</b> ,Language).
1.4	Description	-	inheritance_along( <b>dcterms:hasPart</b> ,Description).
1.5	Keyword	-	inheritance_along( <b>dcterms:hasPart</b> ,Keyword). inverseInheritance_along( <b>dcterms:format</b> ,Keyword). inheritance_along( <b>dcterms:hasVersion</b> ,Keyword).
1.6	Coverage	-	inheritance_along( <b>dcterms:hasPart</b> ,Coverage). inverseInheritance_along_ <b>dcterms:format</b> (Coverage). inheritance_along( <b>dcterms:hasVersion</b> ,Coverage).
1.7	Structure	atomic, collection, networked, hierarchical linear	none, should be defined by the author
1.8	Aggregation Level	1,2,3,4	maxSummation_along ( <b>dcterms:hasPart</b> ,AggregationLevel).
2	<b>Life Cycle</b>		
2.1	Version	-	none
2.2	Status	draft, final revised, unavailable	inheritance_along( <b>dcterms:hasPart</b> ,Status).
2.3	<i>Contribute</i>		
2.3.1	Role	author, publisher, unknown, ...	inheritance_along( <b>dcterms:hasPart</b> ,Role).
2.3.2	Entity	vCard	inheritance_along( <b>dcterms:hasPart</b> ,Entity).
2.3.3	Date	Datatype: DateTime	inheritance_along( <b>dcterms:hasPart</b> ,Date).
3	<b>Meta-Metadata</b>		
3.1	Identifier	-	none
3.3	<i>Contribute</i>		
3.2.1	Role	creator, validator	inheritance_along( <b>dcterms:hasPart</b> ,Role).
3.2.2	Entity	vCard	inheritance_along( <b>dcterms:hasPart</b> ,Entity).
3.2.3	Date	Datatype: DateTime	inheritance_along( <b>dcterms:hasPart</b> ,Role).
3.3	Metadata Schema	Repertoire of ISO/IEC 10646-1:2000	inheritance_along ( <b>dcterms:hasPart</b> ,Metadata Schema).
3.4	Language	see 1.3	inheritance_along( <b>dcterms:hasPart</b> ,Language).
4	<b>Technical</b>		
4.1	Format	MIME types	inheritance_along( <b>dcterms:hasPart</b> ,Format).
4.2	Size	ISO/IEC 646:1991	summation_along( <b>dcterms:hasPart</b> ,Size).
4.3	Location	Repertoire of ISO/IEC 10646-1:2000	none
4.4	Requirement	see LOM-Standard	inheritance_along( <b>dcterms:hasPart</b> ,Requirement).
4.5	Installation Remarks	-	inheritance_along ( <b>dcterms:hasPart</b> ,Installation Remarks).
4.6	Other Platform	- Requirements	inheritance_along ( <b>dcterms:hasPart</b> ,Other Platform Requirements).
4.7	Duration	Datatype: Duration	summation_along( <b>dcterms:hasPart</b> ,Duration).

5	<b>Educational</b>		
5.1	Interactivity Type	-	inheritance_along ( <b>dcterms:hasPart</b> ,Interactivity Type).
5.2	Learning Resource Type	exercise, simulation, questionnaire, ...	inheritance_along ( <b>dcterms:hasPart</b> ,Learning Resource Type).
5.3	Interactivity Level	low, medium, high, very high	none, should be defined by the author
5.4	Semantic Density	low, medium, high, very high	none, should be defined by the author
5.5	Intended End User Role	teacher, author, learner, manager	none
5.6	Context	school, higher education , training, other	none
5.7	Typical Age Range	-	none
5.8	Difficulty	easy, medium, difficult, very difficult	none
5.9	Typical Learning Time	Datatype: Duration	
5.10	Description	-	none
5.11	Language	LanguageID = Langcode	none
6	<b>Rights</b>		
6.1	Cost	yes,no	BooleanSummationOR_along ( <b>dcterms:hasPart</b> ,lom-rights:cost).
6.2	Copyright and Other Restrictions	-	inheritance_along ( <b>dcterms:hasPart</b> ,Copyright and Other Restrictions ).
6.3	Description	-	inheritance_along( <b>dcterms:hasPart</b> ,Description).
7	<b>Relation</b>		
7.1	Kind	<b>dcterms:</b> hasPart,isPartOf requires, isRequiredBy hasVersion, isVersionOf hasFormat, isFormatOf references, isReferencedBy isBasedOn, isBasisFor	inverse( <b>dcterms:hasPart</b> , <b>dcterms:isPartOf</b> ). inverse( <b>dcterms:requires</b> , <b>dcterms:isRequiredBy</b> ). inverse( <b>dcterms:hasVersion</b> , <b>dcterms:isVersionOf</b> ). inverse( <b>dcterms:hasFormat</b> , <b>dcterms:isFormatOf</b> ). inverse( <b>dcterms:references</b> , <b>dcterms:isReferencedBy</b> ). inverse( <b>dcterms:isBasedOn</b> , <b>dcterms:isBasisFor</b> ). outwardInheritance_along ( <b>dcterms:hasPart</b> , <b>dcterms:requires</b> ). inverseInheritance_along ( <b>dcterms:hasFormat</b> , <b>dcterms:requires</b> ). OutwardInheritance_along ( <b>dcterms:hasVersion</b> , <b>dcterms:requires</b> ). transitive( <b>dcterms:hasPart</b> ). transitive( <b>dcterms:isPartOf</b> ).
8	<b>Annotation</b>		
8.1	Entity	vCard	inheritance_along( <b>dcterms:hasPart</b> ,Entity).
8.2	Date	Datatype: DateTime	inheritance_along( <b>dcterms:hasPart</b> ,Date).
8.3	Description	-	inheritance_along( <b>dcterms:hasPart</b> ,Description).

9	<b>Classification</b>		
9.1	Purpose	discipline, idea, prerequisite, etc. see the LOM Standard	inheritance_along(dcterms:hasPart,Purpose). inverseInheritance_along(dcterms:hasFormat,Purpose). inheritance_along(dcterms:hasVersion,Purpose).
9.2	<i>Taxon Path</i>		
9.2.1	Source	Repertoire of ISO/IEC 10646-1:2000	inheritance_along(dcterms:hasPart,Source). inverseInheritance_along(dcterms:hasFormat,Source). inheritance_along(dcterms:hasVersion,Source).
9.2.2	<i>Taxon</i>	-	
9.2.2.1	Id	Repertoire of ISO/IEC 10646-1:2000	inheritance_along(dcterms:hasPart,Id). inverseInheritance_along(dcterms:hasFormat,Id). inheritance_along(dcterms:hasVersion,Id).
9.2.2.2	Entry		inheritance_along(dcterms:hasPart,Entry). inverseInheritance_along(dcterms:hasFormat,Entry). inheritance_along(dcterms:hasVersion,Entry).
9.3	Description		inheritance_along(dcterms:hasPart,Description). inverseInheritance_along(dcterms:hasFormat,Description). inheritance_along(dcterms:hasVersion,Description).
9.4	Keyword		inheritance_along(dcterms:hasPart,Keyword). inverseInheritance_along(dcterms:hasFormat,Keyword). inheritance_along(dcterms:hasVersion,Keyword).

## B The RDF description for the course Artificial Intelligence I

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Vererbung, Constraint Propagation, Logik und Resolution, PROLOG und Maschinelles
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skript/modul2/rawdata/Aussagenlogik.pdf"/>
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<dcq:isRequiredBy rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul2/rawdata/Wumpus_in_FOL.pdf"/>
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skript/modul2/rawdata/Praedikatenlogik.pdf">
<dc:title>Vorlesung Künstliche Intelligenz WS 2002 : Stichworte zum Thema Praedikatenlogik
</dc:title>
<dc:description>Ein kurzer Überblick über Syntax und Semantik der Praedikatenlogik
</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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skript/modul2/rawdata/Praedikatenlogik_und_PROLOG.pdf"/>
<dcq:isRequiredBy rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul2/rawdata/Wumpus_in_FOL.pdf"/>
<dcq:isRequiredBy rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul3/rawdata/Praedikatenlogik2.pdf"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul2/rawdata/Praedikatenlogik_und_PROLOG.pdf">
<dc:title>Vorlesung Künstliche Intelligenz WS 2002 : Stichworte zum Thema Praedikatenlogik
und PROLOG</dc:title>
<dc:description>Ein kurzer Überblick über den Zusammenhang zwischen Praedikatenlogik und
PROLOG</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
<dcq:requires rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul2/rawdata/Praedikatenlogik.pdf"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul2/rawdata/Hornklauseln.pdf">
<dc:title>Vorlesung Künstliche Intelligenz WS 2002 : Stichworte zum Thema Hornklauseln
</dc:title>
<dc:description>Ein kurzer Überblick über Hornklauseln und ihre Auswertung </dc:description>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul2/rawdata/Wumpus_in_FOL.pdf">
<dc:title>Vorlesung Künstliche Intelligenz WS 2002 : Repraesentation der Wumpus
world in Praedikatenlogik</dc:title>
<dc:description>Wie laesst sich die Wumpus world in PRAedikatenlogik darstellen?
</dc:description>
<dcq:requires rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul2/rawdata/Wumpus_english.pdf"/>
<dcq:requires rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul2/rawdata/Praedikatenlogik.pdf"/>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
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<dc:title>Einige Fragen zum Thema Syntax und Semantik</dc:title>
<dc:description>Fragen, die Ihnen helfen sollen, den Stoff besser zu verstehen
</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul2/weiter.htm">
<dc:title>Weiterführende Materialien</dc:title>
<dc:description>Eine Sammlung von weiterführenden lnks zum Thema Syntax und Semantik
</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul2/aufgaben.htm">
<dc:title>Aufgaben zu Syntax und Semantik</dc:title>
<dc:description>Aufgaben, um den Stoff des Moduls zu vertiefen</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul3/rawdata/Praedikatenlogik2.pdf">
<dc:title>Vorlesung Künstliche Intelligenz WS 2002 : Inferenz und Reasoning mit
Praedikatenlogik</dc:title>
<dc:description>Ein kurzer Überblick über Inferenz und Reasoning</dc:description>
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<dcq:requires rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul2/rawdata/Praedikatenlogik.pdf"/>
<dcq:isRequiredBy rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul3/rawdata/Praedikatenlogik3.pdf"/>
<dc:subject rdf:resource="http://www.kbs.uni-hannover.de/Uli/ACM_CCS.rdf#I.2.3.2"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails
/skript/modul3/rawdata/Praedikatenlogik3.pdf">
<dc:title>Vorlesung Künstliche Intelligenz WS 2002 : Umwandlung in KNF</dc:title>
<dc:description>Wie wandele ich Sätze der Praedikatenlogik in Konjungtive Normalform um
</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
<dcq:requires rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul3/rawdata/Praedikatenlogik2.pdf"/>
<dcq:isRequiredBy rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul3/rawdata/Resolution.pdf"/>
<dc:subject rdf:resource="http://www.kbs.uni-hannover.de/Uli/ACM_CCS.rdf#I.2.4.2.1"/>
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skript/modul3/rawdata/Praedikatenlogik3.pdf"/>
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skript/modul3/rawdata/Theorem_Provers.pdf"/>
<dc:subject rdf:resource="http://www.kbs.uni-hannover.de/Uli/ACM_CCS.rdf#I.2.3.7"/>
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<dc:description>Ein kurzer Überblick über Architektur und Funktionalität von Theorem
Provers</dc:description>
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skript/modul3/rawdata/Theorem_Provers.pdf"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
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<dc:title>Einige Fragen zum Thema Reasoning</dc:title>
<dc:description>Fragen, die Ihnen helfen sollen, den Stoff besser zu verstehen
</dc:description>
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skript/modul3/weiter.htm">
<dc:title>Weiterführende Materialien</dc:title>
<dc:description>Eine Sammlung von weiterführenden lnks zum Thema Reasoning
</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul3/aufgaben.htm">
<dc:title>Aufgaben zu Reasoning</dc:title>
<dc:description>Aufgaben, um den Stoff des Moduls zu vertiefen</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul4/rawdata/Datalog.pdf">
<dc:title>Vorlesung Künstliche Intelligenz WS 2002 : Ein kurzer Ausflug zu Datalog
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</dc:title>
<dc:description>Ein kurzer Überblick über die Sprache Datalog</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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skript/modul4/rawdata/Datalog_Beispiel.pdf"/>
<dcq:isPartOf rdf:resource="#Modul4"/>
</rdf:Description>

<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul4/rawdata/Datalog_Beispiel.pdf">
<dc:title>Vorlesung Künstliche Intelligenz WS 2002 : Wissensmanagement mit Datalog
</dc:title>
<dc:description>Ein Beispiel für Wissensmanagement mit Datalog</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
<dcq:requires rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul4/rawdata/Datalog.pdf"/>
<dcq:isRequiredBy rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/rawdata/Lernen5.pdf"/>
<dcq:isPartOf rdf:resource="#Modul4"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails
/skript/modul4/rawdata/Semantische_Netze.pdf">
<dc:title>Vorlesung Künstliche Intelligenz WS 2002 : Stichworte zum Thema
Semantische Netze </dc:title>
<dc:description>Was sind Semantische Netze?</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
<dc:subject rdf:resource="http://www.kbs.uni-hannover.de/Uli/ACM_CCS.rdf#I.2.4.6"/>
<dcq:isPartOf rdf:resource="#Modul4"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul4/rawdata/Article.html">
<dc:title>Vorlesung Künstliche Intelligenz WS 2002 : Sematic Web article von Lee,
Handler und Lassila</dc:title>
<dc:description>Eine Vorstellung des Semantischen Webs aus Scientific America (2001)
</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#en"/>
<dcq:isRequiredBy rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul4/rawdata/semantic_web_smolorz[1].ppt"/>
<dcq:isPartOf rdf:resource="#Modul4"/>
</rdf:Description>

<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul4/rawdata/semantic_web_smolorz[1].ppt">
<dc:title>Vorlesung Künstliche Intelligenz WS 2002 : Zusammenfassung des Artikels
"Semantic Web"</dc:title>
<dc:description>Zusammenfassung des Artikels "Semantic Web" aus Scientific america
2001 im Rahmen der Vorlesung KI2 SS 2002</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul4/rawdata/RDF.pdf">

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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul4/lernziele.htm">
<dc:title>Einige Fragen zum Thema Wissensmanagement</dc:title>
<dc:description>Fragen, die Ihnen helfen sollen, den Stoff besser zu verstehen
</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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<dc:title>Weiterführende Materialien</dc:title>
<dc:description>Eine Sammlung von weiterführenden lnks zum Thema Wissensmanagement
</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul4/aufgaben.htm">
<dc:title>Aufgaben zu Wissensmanagement</dc:title>
<dc:description>Aufgaben, um den Stoff des Moduls zu vertiefen</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul5/rawdata/Problemloesen.pdf">
<dc:title>Problemloesen durch Suchen</dc:title>
<dc:description>Wofür werden Suchstrategien benoetigt?</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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skript/modul5/rawdata/Suchen1.pdf"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul5/rawdata/Suchen1.pdf">
<dc:title>Uninformierte Suchstrategien</dc:title>
<dc:description>Vorstellung der uninformierten Suchstrategien</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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skript/modul5/rawdata/Problemloesen.pdf"/>
<dcq:isRequiredBy rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul5/rawdata/Suchen2.pdf"/>
<dc:subject rdf:resource="http://www.kbs.uni-hannover.de/Uli/ACM_CCS.rdf#I.2.8.3.0"/>
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<dc:subject rdf:resource="http://www.kbs.uni-hannover.de/Uli/ACM_CCS.rdf#I.2.8.3.1"/>
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<dc:description>Weitere Suchstrategien</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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skript/modul5/rawdata/Suchen1.pdf"/>
<dcq:isRequiredBy rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul5/rawdata/GradientenAbstieg.pdf"/>
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skript/modul5/GradientenAbstieg.pdf">
<dc:title>Zusatzinformationen zur Bergsteiger-Suche</dc:title>
<dc:description>Fragen, die Ihnen helfen sollen, den Stoff besser zu verstehen
</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
<dcq:requires rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul5/rawdata/Suchen2.pdf"/>
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<dc:description>Fragen, die Ihnen helfen sollen, den Stoff besser zu verstehen
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<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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<dc:title>Lernen mit Entscheidungsbaeumen</dc:title>
<dc:description>Grundlagen des Lernens und Repraesentationen durch Entscheidungsbaeume
</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
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skript/modul6/rawdata/Entropie.pdf"/>
<dcq:isRequiredBy rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/rawdata/FallbasSchliessen.pdf"/>
<dcq:isRequiredBy rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/rawdata/Lernen4.pdf"/>
<dc:subject rdf:resource="http://www.kbs.uni-hannover.de/Uli/ACM_CCS.rdf#E.1.6"/>
<dcq:isPartOf rdf:resource="#Modu6"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/rawdata/Entropie.pdf">
<dc:title>Entropien</dc:title>
<dc:description>Hintergrund: Entropien zum Ermitteln des Informationsgehalts
</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
<dcq:requires rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/rawdata/Lernen1.pdf"/>
<dcq:isPartOf rdf:resource="#Modul6"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/rawdata/Lernen2.pdf">
<dc:title>Neuronale Netze</dc:title>
<dc:description>Lernen mit neuronalen Netzen</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
<dcq:requires rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul5/rawdata/GradientenAbstieg.pdf"/>
<dcq:isRequiredBy rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/rawdata/Beispiel.pdf"/>
<dc:subject rdf:resource="http://www.kbs.uni-hannover.de/Uli/ACM_CCS.rdf#F.1.1.4"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/Beispiel.pdf">
<dc:title>Beispielprogramm</dc:title>
<dc:description>Ein Beispielprogramm in PROLOG fuer neuronale Netze</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
<dcq:requires rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/rawdata/Lernen2.pdf"/>
<dc:subject rdf:resource="http://www.kbs.uni-hannover.de/Uli/ACM_CCS.rdf#F.1.1.4"/>
<dcq:isPartOf rdf:resource="#Modul6"/>
</rdf:Description>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/FallbasSchliessen.pdf">
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<dc:title>Fallbasiertes Schliessen</dc:title>
<dc:description>Lernen durch fallbasiertes Schliessen</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
<dcq:requires rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/rawdata/Lernen1.pdf"/>
<dcq:isPartOf rdf:resource="#Modul6"/>
</rdf:Description>

<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/Lernen3.pdf">
<dc:title>Version-space learning</dc:title>
<dc:description>Lernen durch Verbesserung des Hypothesen- und Versionenraums
</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
<dcq:isPartOf rdf:resource="#Modul6"/>
</rdf:Description>

<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/Lernen4.pdf">
<dc:title>Bayessches Lernen</dc:title>
<dc:description>Lernen mit Ungenauigkeiten und Bayessche Klassifizierer</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
<dcq:requires rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/rawdata/Lernen1.pdf"/>
<dcq:isPartOf rdf:resource="#Modul6"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/Lernen5.pdf">
<dc:title>Explanation-based learning</dc:title>
<dc:description>Lernen von neuen Regeln</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
<dcq:requires rdf:resource="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul4/rawdata/Datalog_Beispiel.pdf"/>
<dcq:isPartOf rdf:resource="#Modul6"/>
</rdf:Description>

<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/lernziele.htm">
<dc:title>Einige Fragen zum Thema Lernen</dc:title>
<dc:description>Fragen, die Ihnen helfen sollen, den Stoff besser zu verstehen
</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
<dcq:isPartOf rdf:resource="#Modul6"/>
</rdf:Description>

<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/
skript/modul6/weiter.htm">
<dc:title>Weiterführende Materialien</dc:title>
<dc:description>Eine Sammlung von weiterführenden lnks zum Thema Lernen
</dc:description>
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>
<dcq:isPartOf rdf:resource="#Modul6"/>
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<rdf:Description about="http://www.kbs.uni-hannover.de/Lehre/KI1/WS02/trails/

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skript/modul6/aufgaben.htm">  
<dc:title>Aufgaben zu Lernen</dc:title>  
<dc:description>Aufgaben, um den Stoff des Moduls zu vertiefen</dc:description>  
<dc:language rdf:resource="http://www.kbs.uni-hannover.de/Uli/lang.rdf#de"/>  
<dcq:isPartOf rdf:resource="#Modul6"/>  
</rdf:Description>  
  
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