

Unit 11 - Week 8

Course outline
How does an NPTEL online course work?
Week 0
Week 1
Week 2
Week 3
Week 4
Week 5
Week 6
Week 7
(Optional) Knowledge Structures
Week 8
<ul style="list-style-type: none"> Introduction Normalisation Structure Matching Structure Matching - Example Classification A-box reasoning Quiz : Assignment 8
<ul style="list-style-type: none"> Artificial Intelligence: Knowledge Representation And Reasoning: Week 8 Feedback form
Week 9
Week 10
Week 11
Week 12
Text Transcripts
DOWNLOAD VIDEOS
Books

Assignment 8

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-03-25, 23:59 IST.

This assignment covers description language (\mathcal{DL}) discussed in week-8. \mathcal{DL} is described in "Knowledge Representation and Reasoning" by Brachman and Levesque, and also in "A First Course in Artificial Intelligence" by Deepak Khemani.

A \mathcal{DL} knowledge base (a \mathcal{DL} KB) is a collection of statements written in \mathcal{DL} language

1) What do you recall about the description language \mathcal{DL} discussed in this course? 1 point

- The syntactic elements are punctuations, positive integers, concept-forming operators, connectives, concepts, roles and constants
- Constants in the domain are also known as individuals or objects
- AND, ALL, EXISTS and FILLS** are concept forming operators
- Connectives " \sqsubset ", " \sqsupset " and " $\sqsupset\sqsupset$ " are statement forming operators
- Concepts are formed by placing restrictions on roles (role count, role filler and role filler type restriction).
- Concepts are unary predicates
- Roles are binary relations
- \mathcal{DL} allows variable free notation for writing concept descriptions (expressions)

No, the answer is incorrect.
Score: 0

Accepted Answers:
The syntactic elements are punctuations, positive integers, concept-forming operators, connectives, concepts, roles and constants
Constants in the domain are also known as individuals or objects
AND, ALL, EXISTS and FILLS are concept forming operators
Connectives " \sqsubset ", " \sqsupset " and " $\sqsupset\sqsupset$ " are statement forming operators
Concepts are formed by placing restrictions on roles (role count, role filler and role filler type restriction).
Concepts are unary predicates
Roles are binary relations
 \mathcal{DL} allows variable free notation for writing concept descriptions (expressions)

2) What can you say about Description Logics? 1 point

- Description Logics is not a single language but a collection of languages
- \mathcal{DL} is a member of Description Logics
- Description Logics are decidable fragments of FOL
- Description Logics are used to describe concepts
- Description Logics are used to build concept taxonomies

No, the answer is incorrect.
Score: 0

Accepted Answers:
Description Logics is not a single language but a collection of languages
 \mathcal{DL} is a member of Description Logics
Description Logics are decidable fragments of FOL
Description Logics are used to describe concepts
Description Logics are used to build concept taxonomies

3) \mathcal{DL} language has two parts/sections: logical and non-logical. What do you think about these sections? 1 point

- Components that are applicable in every domain are grouped under logical section
- Components that are applicable to specific domains are grouped under non-logical section
- Logically correct formulas are grouped under logical section
- Logically incorrect formulas are grouped under non-logical section

No, the answer is incorrect.
Score: 0

Accepted Answers:
Components that are applicable in every domain are grouped under logical section
Components that are applicable to specific domains are grouped under non-logical section

4) A \mathcal{DL} knowledge base has an interpretation domain. What is true about that domain? 1 point

- Its elements are individuals, concepts and roles
- It contains only individuals
- It is a superset of all individuals from all concepts in the knowledge base
- It forms the non-logical part of \mathcal{DL} language
- It forms the logical part of \mathcal{DL} language

No, the answer is incorrect.
Score: 0

Accepted Answers:
It contains only individuals
It is a superset of all individuals from all concepts in the knowledge base

5) Choose the correct statements about \mathcal{DL} concepts 1 point

- A concept describes a class of individuals with some common characteristics
- Thing is a super-concept which subsumes all other concepts
- Thing is an atomic concept
- \mathcal{DL} concepts correspond to unary predicates in FOL
- \mathcal{DL} concepts correspond to sets in the domain-of-interpretation

No, the answer is incorrect.
Score: 0

Accepted Answers:
A concept describes a class of individuals with some common characteristics
Thing is a super-concept which subsumes all other concepts
Thing is an atomic concept
 \mathcal{DL} concepts correspond to unary predicates in FOL
 \mathcal{DL} concepts correspond to sets in the domain-of-interpretation

6) Choose the correct statements about \mathcal{DL} roles 1 point

- Roles exist independent of concepts
- Roles are used to define concepts
- Roles are binary relations
- A role may be used in the definition of many concepts

No, the answer is incorrect.
Score: 0

Accepted Answers:
Roles exist independent of concepts
Roles are used to define concepts
Roles are binary relations
A role may be used in the definition of many concepts

7) What can you say about a \mathcal{DL} taxonomy in a \mathcal{DL} knowledge base? 1 point

- \mathcal{DL} taxonomy is a network of nodes. Each node is either a concept, a role or an individual
- \mathcal{DL} taxonomy is a network of nodes. Each node is a concept
- Thing is the topmost node
- \mathcal{DL} taxonomy is a concept-subconcept (class-subclass) hierarchy
- \mathcal{DL} taxonomy is a subsumption hierarchy
- \mathcal{DL} taxonomy is produced by the classification algorithm

No, the answer is incorrect.
Score: 0

Accepted Answers:
 \mathcal{DL} taxonomy is a network of nodes. Each node is a concept
Thing is the topmost node
 \mathcal{DL} taxonomy is a concept-subconcept (class-subclass) hierarchy
 \mathcal{DL} taxonomy is a subsumption hierarchy
 \mathcal{DL} taxonomy is produced by the classification algorithm

8) Which of the following are true about subsumptions in DL? 1 point

- If $D \sqsubset C$ then $\text{members}(D) \sqsubset \text{members}(C)$ in every interpretation of a domain
- if $\text{members}(D) \sqsubset \text{members}(C)$ in every interpretation of a domain then $D \sqsubset C$
- If $[\text{AND } A \text{ B}] \sqsubset C$ then $(\text{members}(A) \cap \text{members}(B)) \sqsubset \text{members}(C)$ in every interpretation of a domain
- For a concept $[\text{AND } C \text{ D}]$ the two subsumptions $C \sqsubset [\text{AND } C \text{ D}]$ and $D \sqsubset [\text{AND } C \text{ D}]$ are always true

No, the answer is incorrect.
Score: 0

Accepted Answers:
If $D \sqsubset C$ then $\text{members}(D) \sqsubset \text{members}(C)$ in every interpretation of a domain
if $\text{members}(D) \sqsubset \text{members}(C)$ in every interpretation of a domain then $D \sqsubset C$
If $[\text{AND } A \text{ B}] \sqsubset C$ then $(\text{members}(A) \cap \text{members}(B)) \sqsubset \text{members}(C)$ in every interpretation of a domain

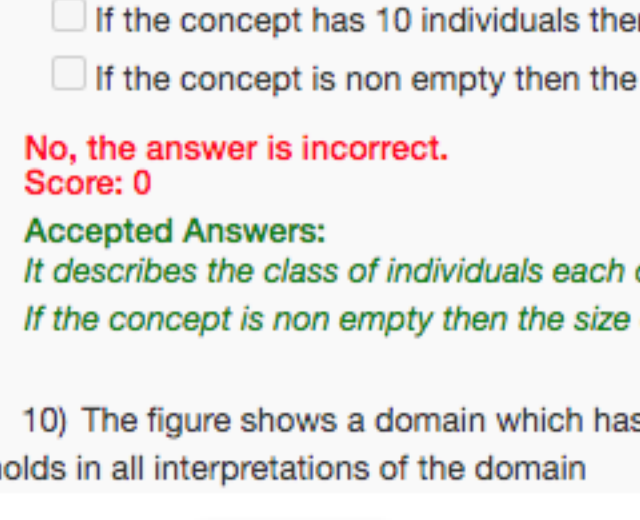
9) $[\text{EXISTS } 4 : \text{OwnsCar}]$ is a concept. Which of the following are true about that concept? 1 point

- The constant 4 appearing in the concept description is an element of the domain
- It describes the class of individuals each of whom owns at least 4 cars
- It describes the class of individuals each of whom are linked to at least 4 objects via the OwnsCar role
- If the concept has 10 individuals then the size of OwnsCar relation is at least 400
- If the concept is non empty then the size of OwnsCar relation is at least 4

No, the answer is incorrect.
Score: 0

Accepted Answers:
It describes the class of individuals each of whom are linked to at least 4 objects via the OwnsCar role
If the concept is non empty then the size of OwnsCar relation is at least 4

10) The figure shows a domain which has many many individuals but only six are shown (i, j, k, m, n, o). Furthermore, the subset relation in the figure holds in all interpretations of the domain 1 point



Identify the statements that are true in this domain

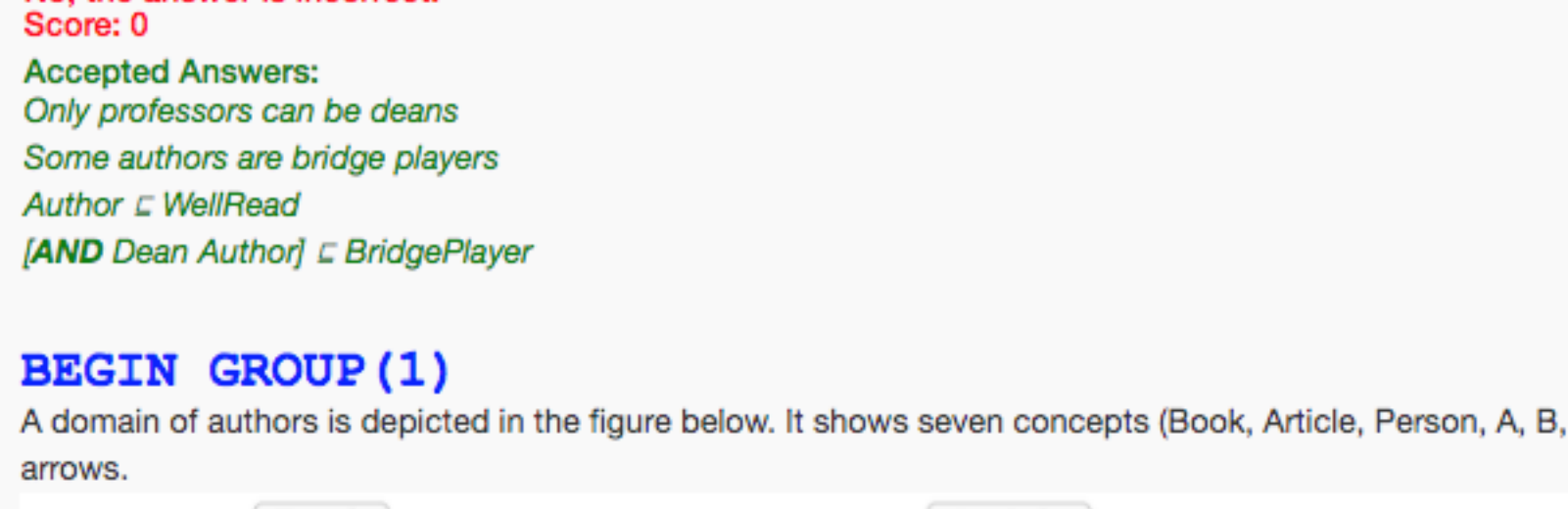
- Only professors can be deans
- Authors are bridge players
- Some authors are bridge players
- Author \sqsubset WellRead
- $[\text{AND } \text{Dean } \text{Author}] \sqsubset \text{BridgePlayer}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
Only professors can be deans
Some authors are bridge players
Author \sqsubset WellRead
 $[\text{AND } \text{Dean } \text{Author}] \sqsubset \text{BridgePlayer}$

BEGIN GROUP (1)

A domain of authors is depicted in the figure below. It shows seven concepts (Book, Article, Person, A, B, C, D) and a binary relation (author-of) indicated by arrows.



11) Which of the following concepts subsume concept A? 1 point

- $[\text{AND } \text{Person } [\text{ALL} : \text{AuthorOf } \text{Book}]]$
- $[\text{AND } \text{Person } [\text{ALL} : \text{AuthorOf } \text{Article}]]$
- $[\text{AND } \text{Person } [\text{EXISTS } 1 : \text{AuthorOf}]]$
- $[\text{AND } \text{Person } [\text{EXISTS } 2 : \text{AuthorOf}]]$
- $[\text{AND } \text{Person } [\text{FILLS} : \text{AuthorOf } \text{harry-potter}]]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $[\text{AND } \text{Person } [\text{ALL} : \text{AuthorOf } \text{Book}]]$
 $[\text{AND } \text{Person } [\text{EXISTS } 1 : \text{AuthorOf}]]$

12) Which of the following concepts subsume concept B? 1 point

- $[\text{AND } \text{Person } [\text{ALL} : \text{AuthorOf } \text{Article}]]$
- $[\text{AND } \text{Person } [\text{ALL} : \text{AuthorOf } \text{Book}]]$
- $[\text{AND } \text{Person } [\text{EXISTS } 1 : \text{AuthorOf}]]$
- $[\text{AND } \text{Person } [\text{EXISTS } 2 : \text{AuthorOf}]]$
- $[\text{AND } \text{Person } [\text{FILLS} : \text{AuthorOf } \text{harry-potter}]]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $[\text{AND } \text{Person } [\text{EXISTS } 1 : \text{AuthorOf}]]$
 $[\text{AND } \text{Person } [\text{EXISTS } 2 : \text{AuthorOf}]]$
 $[\text{AND } \text{Person } [\text{FILLS} : \text{AuthorOf } \text{harry-potter}]]$

13) Which of the following concepts subsume concept C? 1 point

- $[\text{AND } \text{Person } [\text{ALL} : \text{AuthorOf } \text{Book}]]$
- $[\text{AND } \text{Person } [\text{ALL} : \text{AuthorOf } \text{Article}]]$
- $[\text{AND } \text{Person } [\text{EXISTS } 1 : \text{AuthorOf}]]$
- $[\text{AND } \text{Person } [\text{EXISTS } 2 : \text{AuthorOf}]]$
- $[\text{AND } \text{Person } [\text{FILLS} : \text{AuthorOf } \text{harry-potter}]]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $[\text{AND } \text{Person } [\text{ALL} : \text{AuthorOf } \text{Article}]]$
 $[\text{AND } \text{Person } [\text{EXISTS } 1 : \text{AuthorOf}]]$

14) Which of the following concepts subsume concept D? 1 point

- $[\text{AND } \text{Person } [\text{ALL} : \text{AuthorOf } \text{Book}]]$
- $[\text{AND } \text{Person } [\text{ALL} : \text{AuthorOf } \text{Article}]]$
- $[\text{AND } \text{Person } [\text{EXISTS } 1 : \text{AuthorOf}]]$
- $[\text{AND } \text{Person } [\text{EXISTS } 2 : \text{AuthorOf}]]$
- $[\text{AND } \text{Person } [\text{FILLS} : \text{AuthorOf } \text{harry-potter}]]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $[\text{AND } \text{Person } [\text{ALL} : \text{AuthorOf } \text{Book}]]$
 $[\text{AND } \text{Person } [\text{ALL} : \text{AuthorOf } \text{Article}]]$

15) Which of the following concepts CANNOT be expressed in \mathcal{DL} ? Here, Person and People have the same meaning 1 point

- Publication is a union of Books and Authors
- People who have authored something other than books
- People who have authored at most 2 books
- People who have authored at least 2 books
- People who have authored at least 2 things
- People who authored Harry Potter

No, the answer is incorrect.
Score: 0

Accepted Answers:
Publication is a union of Books and Authors
People who have authored something other than books
People who have authored at most 2 books
People who have authored at least 2 books

END GROUP (1)