

Modeliranje z DL

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DL in FOL

Izražali bomo nekatere gradnike ostalih podatkovnih modelov z DL in FOL

Pogledali si bomo:

- Semantične mreže

- Objekte in razrede

- Atribute (lastnosti) objektov

- Omejevanje lastnosti objektov

- Entitete in razmerja

Objects: classes

Oseba	
Ime:	[String]
naslov:	[String]
izbral:	[Predmet]

$$\{x \mid \text{Student}(x)\} =$$
$$\{x \mid \text{Person}(x) \wedge (\exists y.\text{NAME}(x,y) \wedge \text{String}(y)) \wedge$$
$$((\exists z.\text{ADDRESS}(x,z) \wedge \text{String}(z)) \wedge$$
$$((\exists w.\text{ENROLLED}(x,w) \wedge \text{Course}(w)))\}$$
$$\text{Student} = \text{Person} \sqcap$$
$$\quad \exists \text{NAME.String} \sqcap$$
$$\quad \exists \text{ADDRESS.String} \sqcap$$
$$\quad \exists \text{ENROLLED.Course}$$

Objects: instances

s1: Student
Ime: "Janez"
naslov: "Kosovelova..."
izbral: cs415

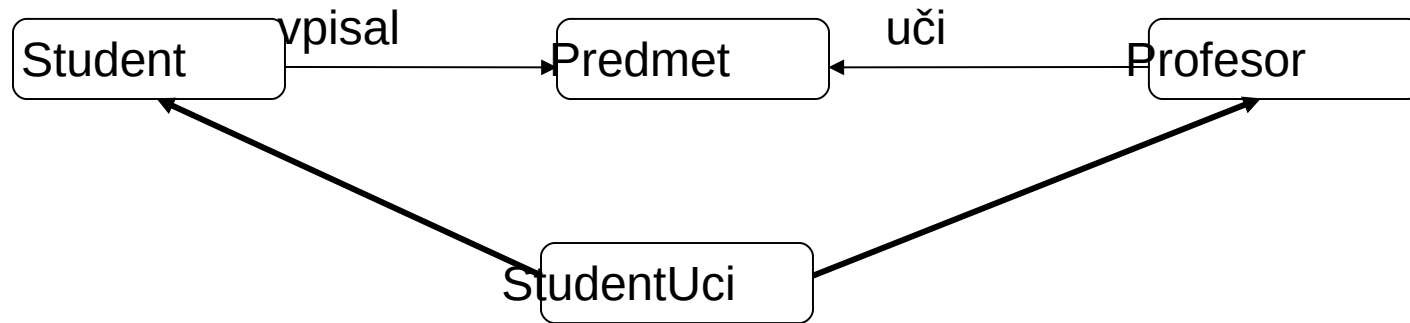
Student(s1) \wedge

NAME(s1,"janez") \wedge String("janez") \wedge

ADDRESS(s1,"kosovelova") \wedge String("kosovelova") \wedge

ENROLLED(s1,cs415) \wedge Course(cs415)

Semantične mreže



$\forall x. \text{Student}(x) \rightarrow$
 $\exists y. \text{VPISAL}(x,y) \wedge \text{Predmet}(y)$
 $\forall x. \text{Profesor}(x) \rightarrow$
 $\exists y. \text{UČI}(x,y) \wedge \text{Predmet}(y)$
 $\forall x. \text{StudentUci}(x) \rightarrow$
 $\text{Student}(x) \wedge \text{Profesor}(x)$

$\text{Student} \sqsubseteq \exists \text{VPISAL}.\text{Predmet}$
 $\text{Profesor} \sqsubseteq \exists \text{UČI}.\text{Predmet}$
 $\text{StudentUci} \sqsubseteq \text{Student}$
 $\text{StudentUci} \sqsubseteq \text{Profesor}$

Kvantifikacija



Žaba \sqsubseteq \exists BARVA.Zelena
Vsaka žaba je tudi zelena.

Žaba \sqsubseteq \forall BARVA.Zelena
Vsaka žaba je samo zelena.

Kvantifikacija: eksistenčna



Vsaka žaba je tudi zelena,.

Žaba \sqsubseteq \exists BARVA.Zelena

$\forall x. \text{Žaba}(x) \rightarrow \exists y. (\text{BARVA}(x,y) \wedge \text{Zelena}(y))$

Naloga: Je to model?

Žaba(oskar)

BARVA(zelena)

BARVA(oskar,zelena)

BARVA(rdeča)

BARVA(oskar,rdeča)

Kvantifikacija: univerzalna



Vsaka žaba je samo zelena,.

Žaba \sqsubseteq \forall BARVA.Zelena

$\forall x. \text{Žaba}(x) \rightarrow \forall y. (\text{BARVA}(x,y) \wedge \text{Zelena}(y))$

Naloga: je to model?

Žaba(oskar),BARVA(zelena),

BARVA(oskar,zelena)

BARVA(rdeča),

BARVA(oskar,rdeča)

Primer ontologije

Avtor: Peter F. Patel-Schneider

Majhna OWL ontologija

Ljudje in njihovi ljubljenci (people&pets: pp)

Primer bomo prepisali tudi v OWL

Primer: Terminologija

bone $\sqsubseteq \top$

brain $\sqsubseteq \top$

white+thing $\sqsubseteq \top$

plant $\sqsubseteq \top$

grass \sqsubseteq plant

tree \sqsubseteq plant

leaf $\sqsubseteq \forall \text{part_of. tree}$

male $\sqsubseteq \top$

female $\sqsubseteq \top$

young $\sqsubseteq \top$

adult $\sqsubseteq \top$

elderly \sqsubseteq adult

pet $\sqsubseteq \exists \text{is_pet_of. } \top$

animal $\sqsubseteq \exists \text{eats. } \top$

vegetarian \equiv animal \cap

$\forall \text{eats. } \neg \text{animal}$ \cap

$\forall \text{eats. } \neg (\exists \text{part_of. animal})$

duck \sqsubseteq animal

cat \sqsubseteq animal

tiger \sqsubseteq animal

dog $\sqsubseteq \exists \text{eats. bone}$

sheep \sqsubseteq animal \cap

$\forall \text{eats. grass}$

giraffe \sqsubseteq animal $\cap \forall \text{eats. leaf}$

cow \sqsubseteq vegetarian

mad+cow \equiv cow $\cap \exists \text{eats.}$

$(\text{brain} \cap \exists \text{part_of. sheep})$

Primer: Terminologija

mad+cow \equiv cow \sqcap \exists eats.
(brain \sqcap \exists part_of.sheep)

person \sqsubseteq animal

kid \equiv young \sqcap person

man \equiv person \sqcap male \sqcap adult

woman \equiv female \sqcap person \sqcap
adult

old+lady \equiv elderly \sqcap female \sqcap
person

old+lady \sqsubseteq \forall has_pet.cat \sqcap
 \exists has_pet.animal

grownup \equiv person \sqcap adult

animal+lover \equiv person \sqcap
 >3 has_pet

pet+owner \equiv
 \exists has_pet.animal \sqcap person

cat+liker \equiv \exists likes.cat \sqcap
person

cat+owner \equiv person \sqcap
 \exists has_pet.cat

dog+liker \equiv \exists likes.dog \sqcap
person

dog+owner \equiv \exists has_pet.dog
 \sqcap person

Primer: Aksiomi

$\text{dog} \sqcap \text{cat} \sqsubseteq \perp$

$\text{young} \sqcap \text{adult} \sqsubseteq \perp$

$(\text{animal} \sqcup \exists \text{part_of}.\text{animal}) \sqcap (\text{plant} \sqcup \exists \text{part_of}.\text{plant}) \sqsubseteq \perp$

Primer: Lastnosti

$\exists \text{likes.T} \sqsubseteq \text{T}$

$\exists \text{eaten_by.T} \sqsubseteq \text{T}$

$\exists \text{eats.animal} \sqsubseteq \text{T}$

($\text{eats} \equiv \text{eaten_by}^{-1}$)

$\exists \text{works_for.T} \sqsubseteq \text{T}$

$\exists \text{has_parent.T} \sqsubseteq \text{T}$

$\exists \text{has_father.man} \sqsubseteq \text{T}$

$\exists \text{has_mother.woman} \sqsubseteq \text{T}$

$\exists \text{has_child.T} \sqsubseteq \text{T}$

$\exists \text{has_pet.animal} \sqsubseteq \text{T}$
($\text{domain}=\text{animal}$)

$\exists \text{is_pet_of.T} \sqsubseteq \text{T}$

($\text{is_pet_of} \equiv \text{has_pet}^{-1}$)

$\exists \text{part_of.T} \sqsubseteq \text{T}$

$\exists \text{has_part.T} \sqsubseteq \text{T}$

($\text{has_part} \equiv \text{part_of}^{-1}$)

$\text{has_mother} \sqsubseteq \text{has_parent}$

$\text{has_pet} \sqsubseteq \text{likes}$

$\text{has_father} \sqsubseteq \text{has_parent}$

Primer: Individualni objekti

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Thing(Tom)
duck(Dewey)
duck(Huey)
duck(Louie)
dog(Fido)
cow(Flossie)
tiger(Fluffy)
dog(Rex)
is_pet_of(Rex,Mick)
cat(Tibbs)
person(Kevin)
person(Fred)
has_pet(Fred,Tibbs)
person(Joe)
has_pet(Joe,Fido)
male(Mick)
male(Minnie)
female(Minnie)
has_pet(Minnie,Tom))
person(Walt)
has_pet(Walt,Huey)
has_pet(Walt,Louie)
has_pet(Walt,Dewey)
```