Mathematical Logics
Applications of Description Logic

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**Originally by Luciano Serafini and Chiara Ghidini*
Modified by Fausto Giunchiglia and Mattia Fumagalli

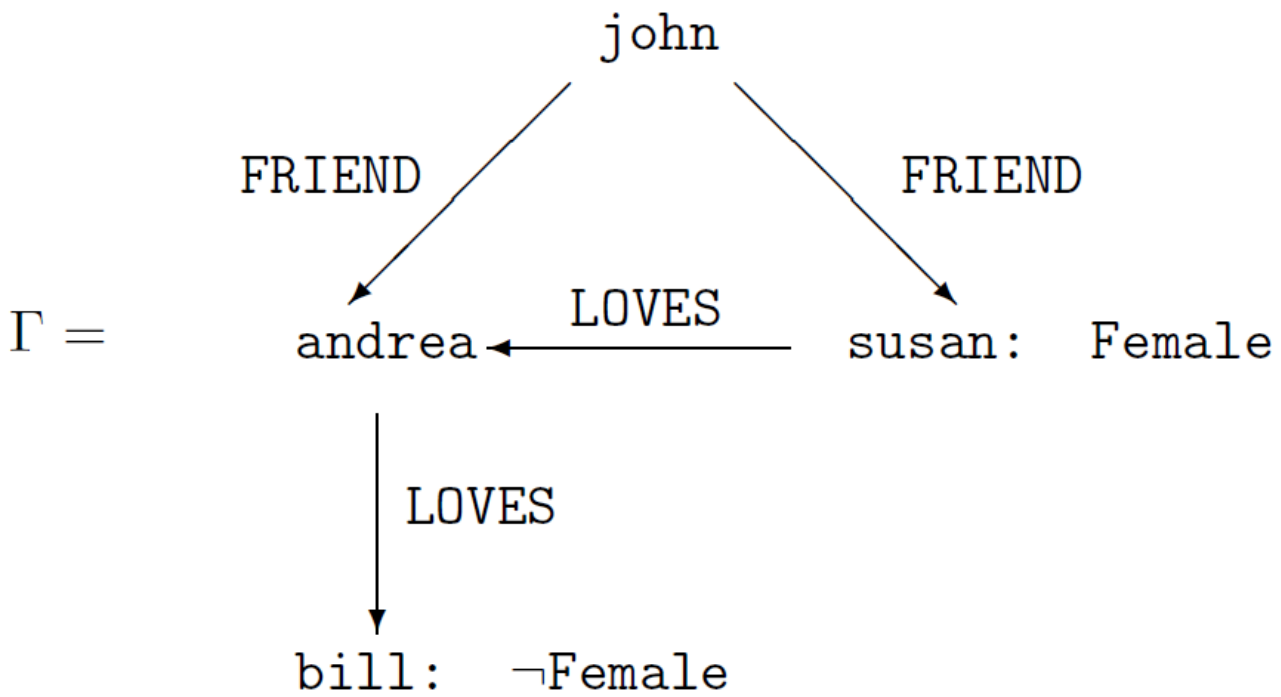
Motivation of uses of DL

1. Relational databases: Enterprise DB consistency, constrained Q/A
2. ER models: automatic validation of requirements
3. Knowledge Graphs: consistency, constrained Q/A in Data Integration, Web applications

Lecture index

1. Introduction
2. Relational databases
3. ER models
4. Knowledge Graphs

Answering Queries via graph reasoning

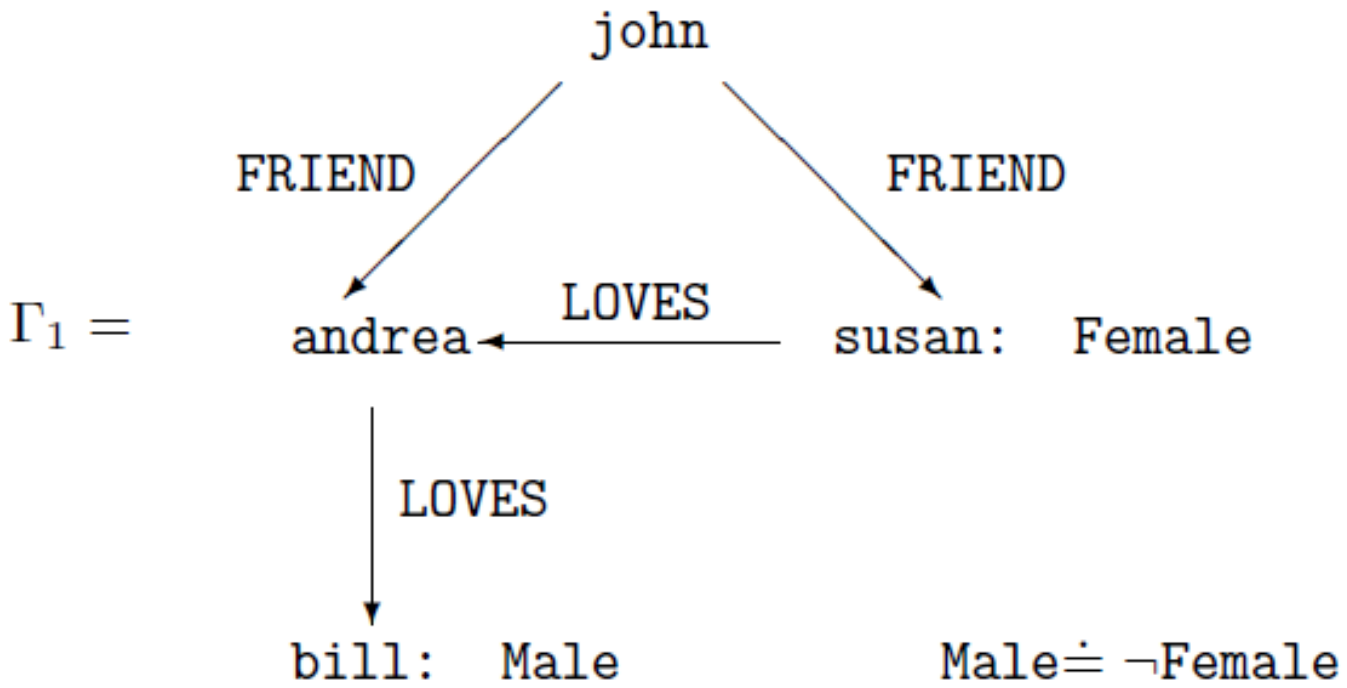


NL Query: Does John have a female friend who has a friend loving a not female?

DL Query: $\Gamma \models \exists$FRIEND.(Female $\sqcap$ ($\exists$LOVES. $\exists$LOVES .$\neg$Female))(john)

YES!

Answering Queries via graph reasoning

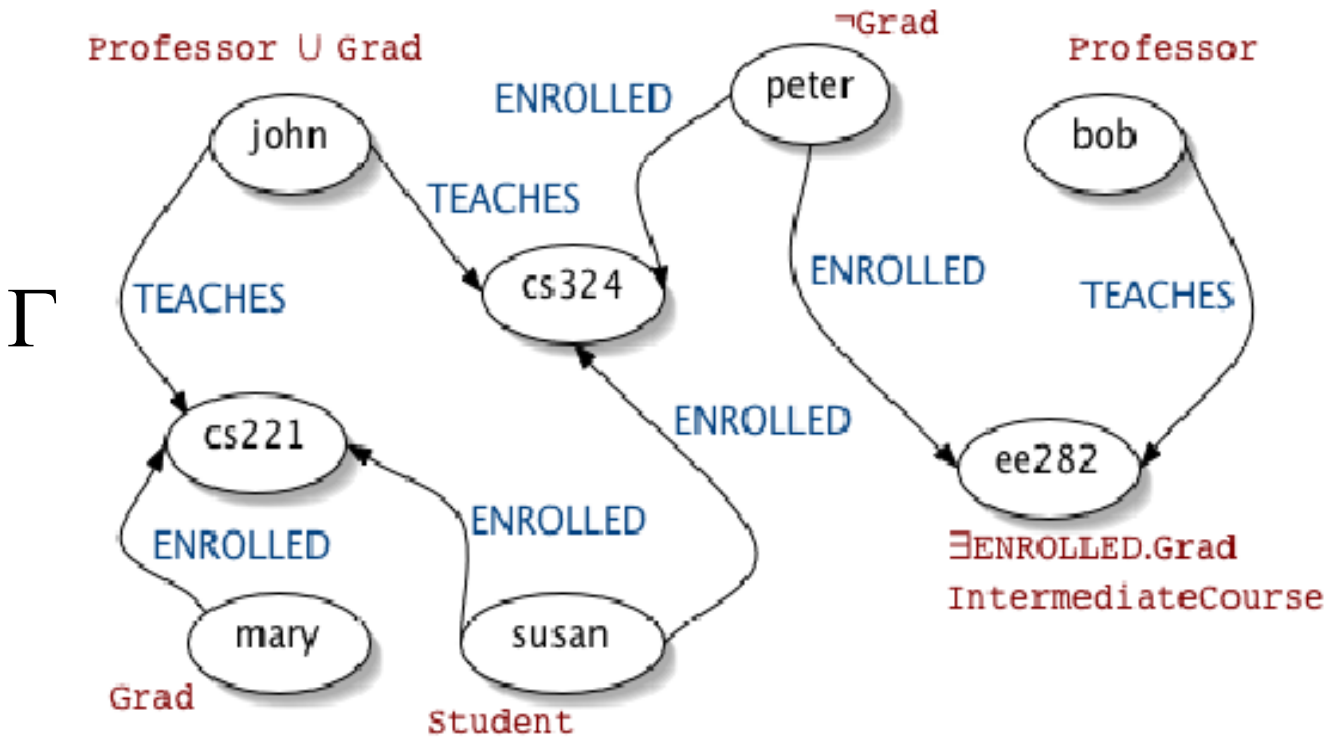


NL Query: Does John have a female friend who has a friend loving a male?

DL Query: $\Gamma_1 \models \exists$FRIEND.(Female $\sqcap$ ($\exists$LOVES. $\exists$LOVES. Male))(john)

YES! (this is because the TBOX allows the substitution of the equivalence)

Provide the answer for the queries



Γ ⊨ ENROLLED(Mary, cs221) **YES!**
Γ ⊨ Grad(peter) **NO!**
Γ ⊨ Grad(Susan) **NO (CWA)!**
Γ ⊨ ∃ ENROLLED.Grad (ee282) **YES!**
Γ ⊨ ∀ TEACHES. IntermediateCourse(bob) **YES!**
Γ ⊨ Grad ⊓ ∃ TEACHES.⊤ **YES**

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