FOL translation examples

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COGS 543: Computational Semantics
METU, Informatics

A sample was contaminated.

x There was a contaminated sample.

S

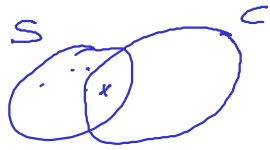
C

$\exists_x \; Sx \wedge Cx$ =

$M = D \{\ldots, d, \ldots\}$

$S = \{\ldots, d, \ldots\}$

$C = \{\ldots, d, \ldots\}$



=

Everything ends.

$\forall x\, Ex \quad = \neg \exists x \neg Ex$

$\forall x = \neg \exists x \neg$

$D = \{ \ldots \}$

$E = \{ \ldots \}$

$E = D$

Every semester ends.

$\forall_n \; Sx \wedge Ex$

$[\forall x.\; Sx \rightarrow Ex]$ ✓

$[\neg \exists x \; Sx \wedge \neg Ex]$ ✓

$D = \{d_1, d_2, d_3, d_4\}$

$M = \{d_1\}$

$S = \{d_2, d_3\}$

$E = \{d_2, d_3, d_4\}$

Every student admires some movie.

$\forall x \left(Sx \rightarrow \exists y \left(My \wedge Lxy \right) \right)$

Antecedent

I → TF

✓

✗ $\forall x \; Sx \rightarrow \exists y (\ldots)$

$\exists x \left(Mx \wedge \forall y \left(Sy \rightarrow Lyx \right) \right)$

S =

M =

$L = \{ \langle d_1, d_5 \rangle, \langle d_2, d_7 \rangle, \langle d_4, d_5 \rangle \}$

Two important points

1. $S = \{\}$

$\{d_1, d_2, d_3\}$

2. $\{d_1, d_2, d_3, d_4, d_5, d_6\}$

$S = \{d_1, d_2, d_4\}$

$M = \{d_5, d_6\}$

$L = \{\langle d_1, d_5 \rangle, \langle d_2, d_6 \rangle, \langle d_4, d_5 \rangle\}$

If an instructor fails, every student passes.

$$\exists y (I_y \wedge F_y) \rightarrow \forall x (S_x \rightarrow \neg F_x)$$

No student failed.

$\neg \exists x \; Sx \wedge Fx$

$\forall x (Sx \rightarrow \neg Fx)$

Some humans love math, but not all who love math are humans.

L : love math

H : human

p but q

p and q

$\exists x(Hx \wedge Lx) \wedge \exists y(Ly \wedge \neg Hy)$

No book is worth reading, except if it is written before 1900.

$$\forall x \left(B_x \wedge w_x \rightarrow \underline{Big}\, x \right) \wedge \forall y \left(B_y \wedge Big\, y \rightarrow W_y \right)$$

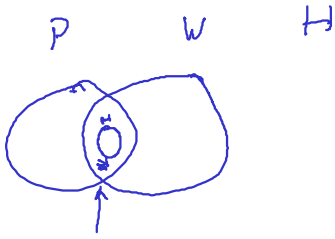
People without friends are unhappy unless they love reading.

$\forall x(Px \wedge Wx \wedge Hx \rightarrow Lx)$

$\forall x(Px \wedge Wx \wedge Lx \rightarrow Hx)$

Only people without friends are happy.

$\forall x \left(Hx \rightarrow Px \wedge Wx \right)$



All but one student failed.

$(\neg F)$

$=$ equality

Exy

$x = y$

$\exists x \Big(Sx \wedge Px \wedge \forall y \big(Sy \wedge Py \rightarrow x = y \big) \Big)$