First Order Logic

- In propositional logic, we can only represent the facts, which are either true or false. e.g. “It is raining”
- But Propositional logic is not sufficiently expressive to represent the following statements

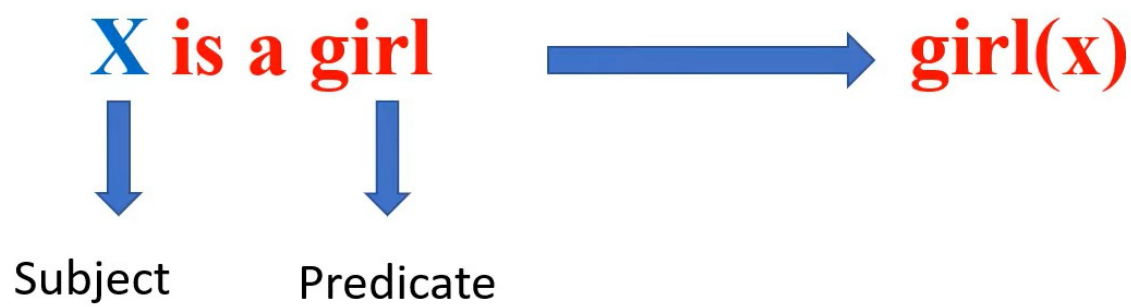
  "Some humans are intelligent"

  “All mangoes are sweet“
- First-order logic is capable of expressing facts about some or all objects in the universe.
- FOL specifies objects, relations and functions.
- First-order logic is also known as **Predicate logic.**

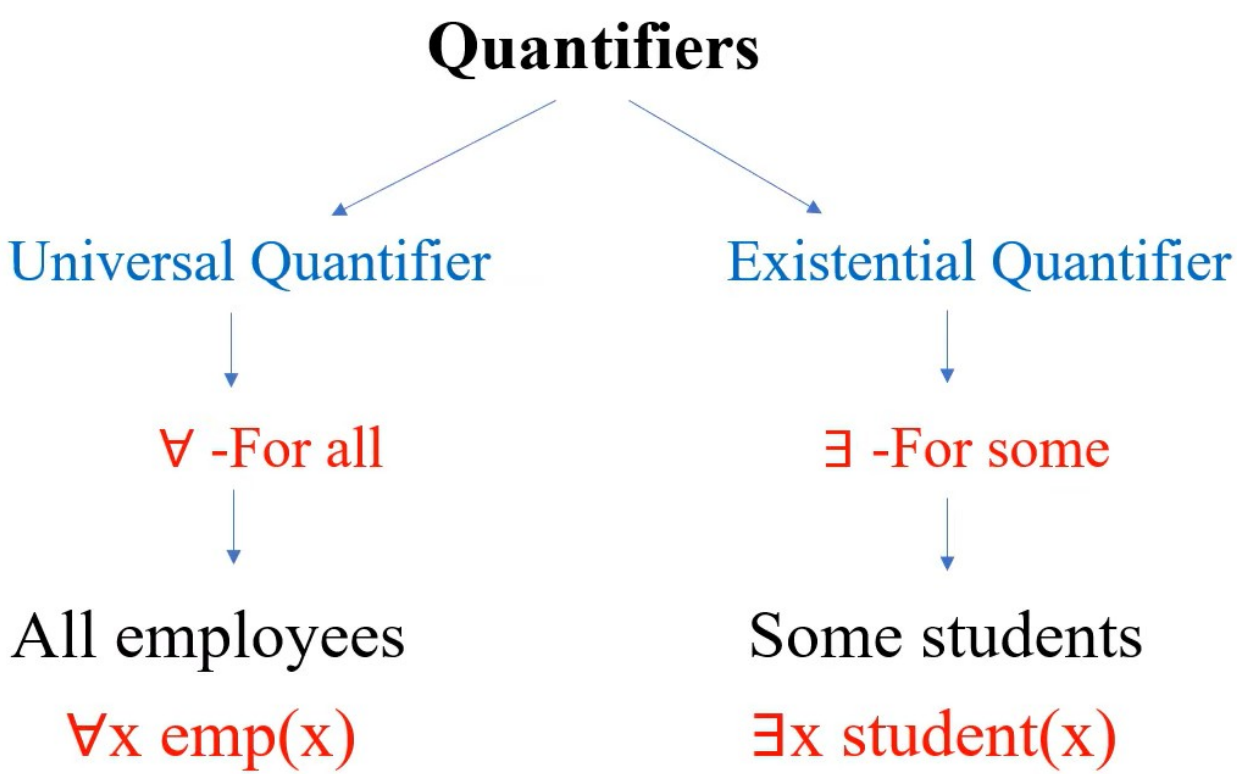
First Order Logic

- Syntax: function (term1,term 2,...,term n)

  Predicate (term1, term2, ..., term n)



Quantifiers



FOL-Example

- **Sam is tall**

  tall(Sam)
- **John likes cricket.**

  likes(John, cricket).
- **Everyone likes cricket.**

  ∀x likes(x, cricket)
- **All students like cricket.**

  ∀x (student(x) → like(x, cricket))
- **Some boys are intelligent**

  ∃x(boys(x) ∧ intelligent(x))
- **Some integers are even and some are odd**

  ∃x even(x) ∧ ∃x odd(x)
- **Not all students like both Mathematics and Science.**

  ¬∀ (x) (student(x) → like(x, Mathematics) ∧ like(x, Science))

∧	AND
∨	OR
~	NOT
→	IF..THEN
⇔	IF AND ONLY IF

∀	→
∃	∧

Elements of FOL

Constant	1, 2, A, John, Mumbai, cat
Variables	x, y, z, a, b, etc.,
Predicates	Greater(5,3), Student(boy, girl).
Function	Mother-of(John) , Colour-of (Basket)
Connectives	∧, ∨, ¬, ⇒, ⇔
Equality	==
Quantifier	∀,(universal quantifier) ∃,(existential quantifier)

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