

# Modelling the World Logically

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- Why we need logic?

# How to model real world objects?

- Things, or data
- Database
- How data are modelled in database?
- Knowledge representation
- Now try this!

# Case Study



# How can machine understand?

Canid  $\sqsubseteq$  Mammal

Dog  $\sqsubseteq$  Canid

Fox  $\sqsubseteq$  Canid

Wolf  $\sqsubseteq$  Canid

Human  $\sqsubseteq$  Hominin

.....

Felid  $\sqsubseteq$  Mammal

Cat  $\sqsubseteq$  Felid

Lion  $\sqsubseteq$  Felid

Tiger  $\sqsubseteq$  Felid

Human  $\sqsubseteq$  Primate

.....

# How about now?



**Domesticated?**

# Can machine understand now?

Dog  $\sqsubseteq \exists \text{hasBodyPart.Leg}$

Cat  $\sqsubseteq \exists \text{hasBodyPart.Wisker}$

Cat  $\sqsubseteq \exists \text{hasBodyPart.Leg}$

Human  $\sqsubseteq \exists \text{hasBodyPart.Leg}$

Cat  $\sqsubseteq \exists \text{hasStatus.DomesticatedStatus}$

.....

# Other situations?

- What if you have a pet cat, called Bob?

Cat(Bob)

- How can a machine know your pet Bob is not a gorilla?

$\text{Cat} \sqcap \text{Gorilla} \sqsubseteq \perp$

- How about when Bob is a kitten?

$\text{Kitten} \equiv \text{Cat} \sqcap \text{Young}$

# Knowledge representation

- KR is hard
  - Experts
  - Consistence
  - Sharable
  - Semantics
  - Large
- KR is useful
  - Find hidden information
  - Theorem proving
  - SNOMED CT - NHS Digital
  - Artificial Intelligence



**SNOMED CT Browser**

Release: United Kingdom Edition 20181001
Perspective: Full
About

Leading healthcare terminology worldwide

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Taxonomy
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Concept Details

**Taxonomy**

Inferred view Descendants Count: Off

- >
● SNOMED CT Concept
  - > ● Body structure (body structure)
  - > ● Clinical finding (finding)
  - > ● Environment or geographical location (environment / location)
  - > ● Event (event)
  - > ● Observable entity (observable entity)
  - > ● Organism (organism)
  - > ● Pharmaceutical / biologic product (product)
  - > ● Physical force (physical force)
  - > ● Physical object (physical object)
  - > ● Procedure (procedure)
  - > ● Qualifier value (qualifier value)
  - > ● Record artifact (record artifact)
  - > ● Situation with explicit context (situation)
  - > ● SNOMED CT Model Component (metadata)
  - > ● Social context (social concept)
  - > ● Special concept (special concept)
  - > ● Specimen (specimen)
  - > ● Staging and scales (staging scale)
  - > ● Substance (substance)

**Concept Details**

Summary Details Diagram Expression Refsets Members References

Classification Map

**Parents**

- ● SNOMED CT Concept (SNOMED RT+CTV3)

Stated
Inferred

●

**Clinical finding (finding)**

SCTID: 404684003

404684003 | Clinical finding (finding) |

Clinical finding (finding)

Clinical finding

No attributes

**Children (35)**

35 Children

