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Modelling the World Logically

- Why we need logic?

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How to model real world objects?

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

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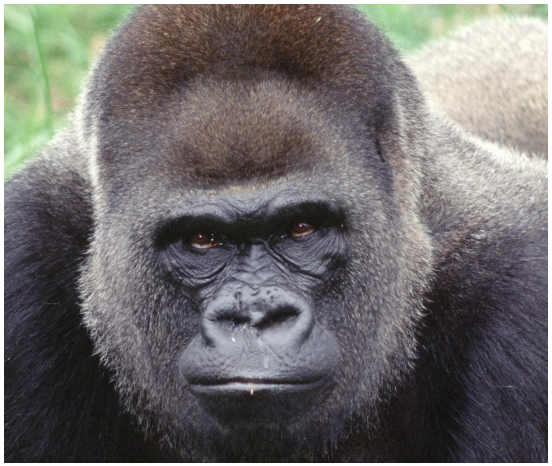
Case Study



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How can machine understand?

$\text{Canid} \sqsubseteq \text{Mammal}$

$\text{Dog} \sqsubseteq \text{Canid}$

$\text{Fox} \sqsubseteq \text{Canid}$

$\text{Wolf} \sqsubseteq \text{Canid}$

$\text{Human} \sqsubseteq \text{Hominin}$

……

$\text{Felid} \sqsubseteq \text{Mammal}$

$\text{Cat} \sqsubseteq \text{Felid}$

$\text{Lion} \sqsubseteq \text{Felid}$

$\text{Tiger} \sqsubseteq \text{Felid}$

$\text{Human} \sqsubseteq \text{Primate}$

……

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How about now?








Domesticated?

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Can machine understand now?

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

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

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

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

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

……

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Other situations?

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

  $\mathsf{Cat}(\mathsf{Bob})$

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

  $\mathsf{Cat} \sqcap \mathsf{Gorilla} \sqsubseteq \bot$

- How about when Bob is a kitten?

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

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Knowledge representation

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

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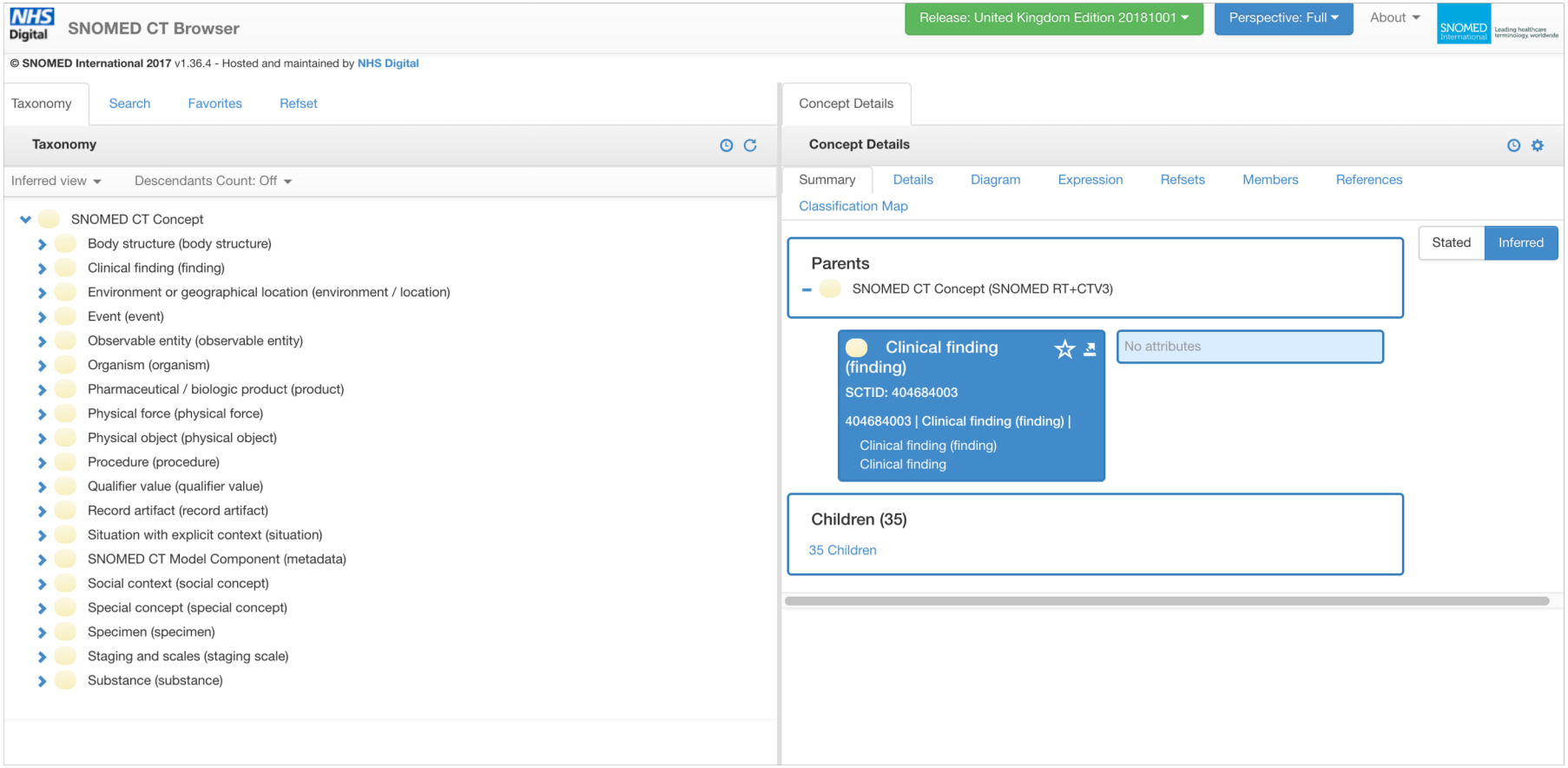

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