



# Welcome to AAAI-MAKE 2019!

#AAAIMAKE

AAAI-  
MAKE

AAAI 2019 Spring Symposium on

## Combining Machine Learning with Knowledge Engineering

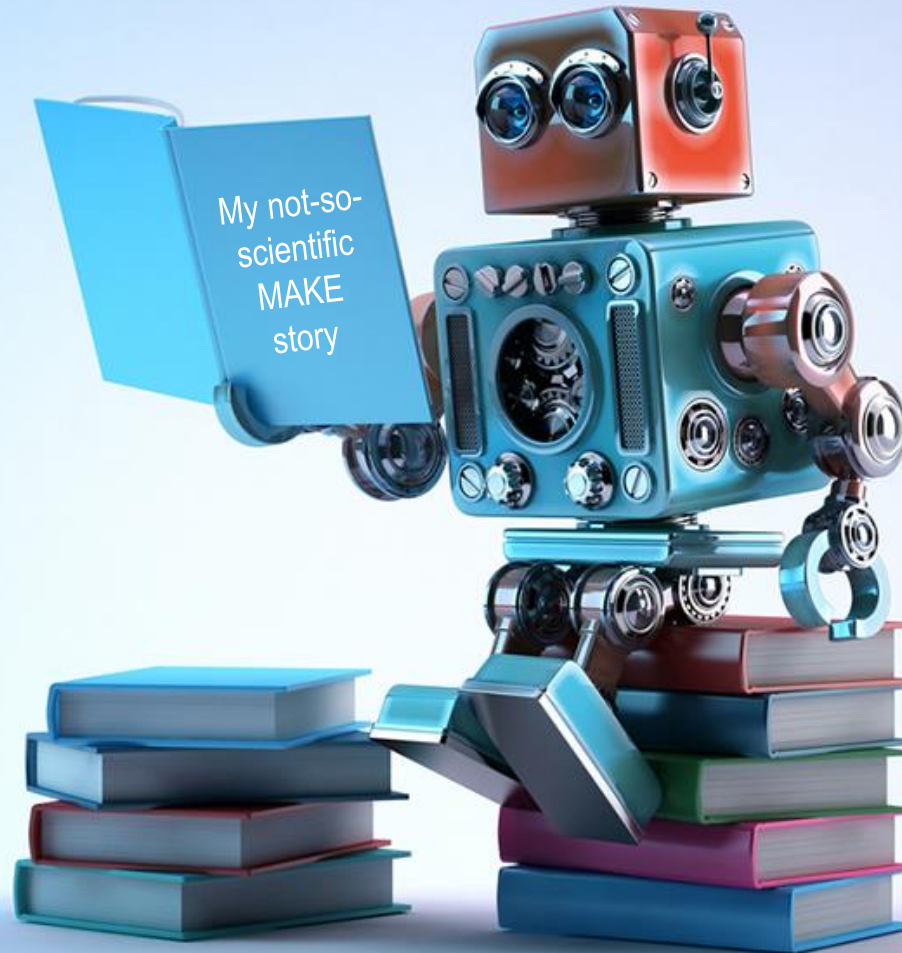
March 25–27, 2019 @ Stanford University, Palo Alto, California, USA

### DISCLAIMER

*Mind the gap:*  
between research and  
my observations.

*Preferred use:*  
coffee breaks!

*Caution:*  
might contain  
exaggerations!





**«Yes, the cliché is (almost: ~ 100 mi) TRUE – I come from there...»**



# As a little boy (or girl) – it's all about ... :

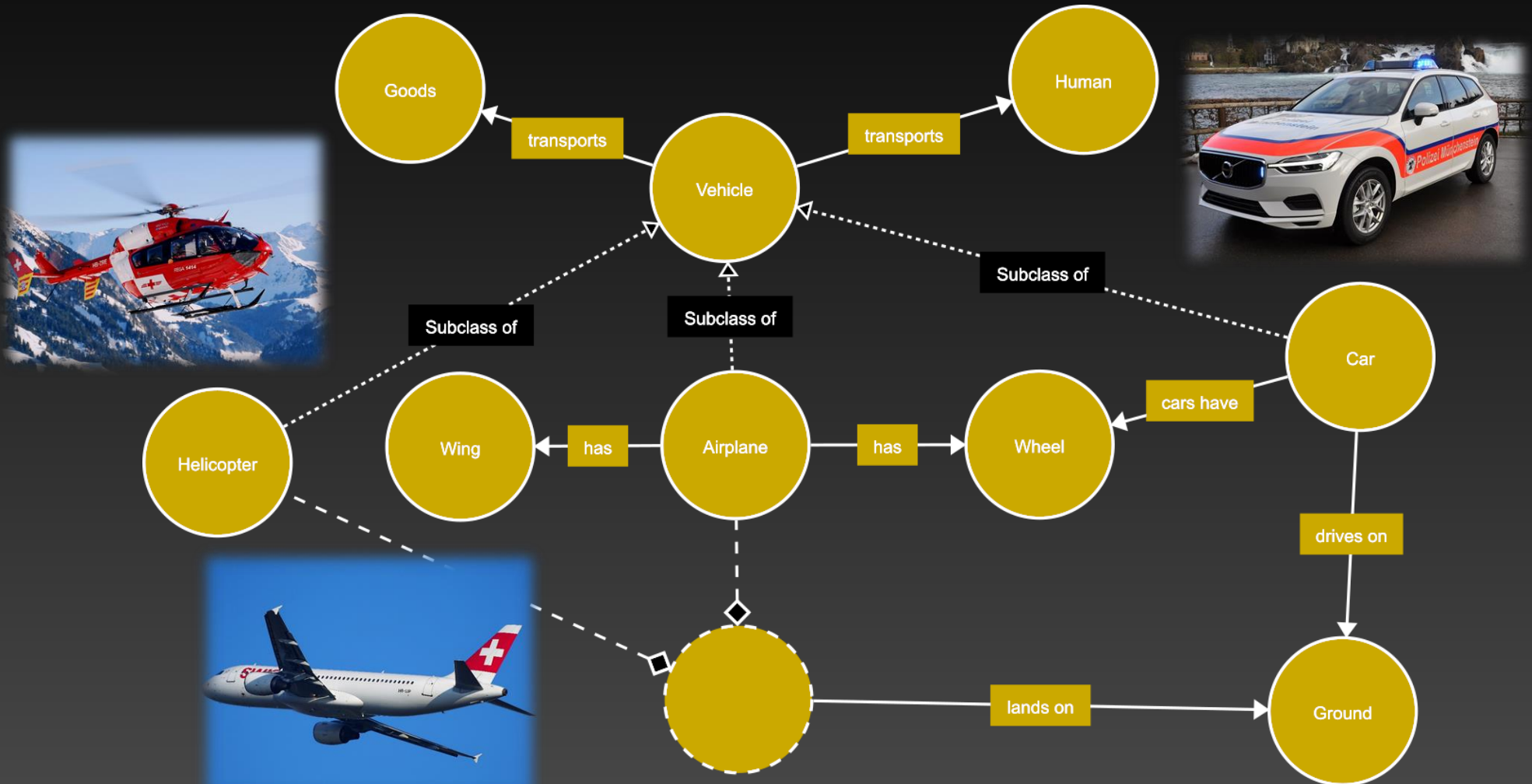


Images: Alf van Beem [public domain] | Matthias Zepper [CC BY-SA 3.0]

# Knowledge Engineering

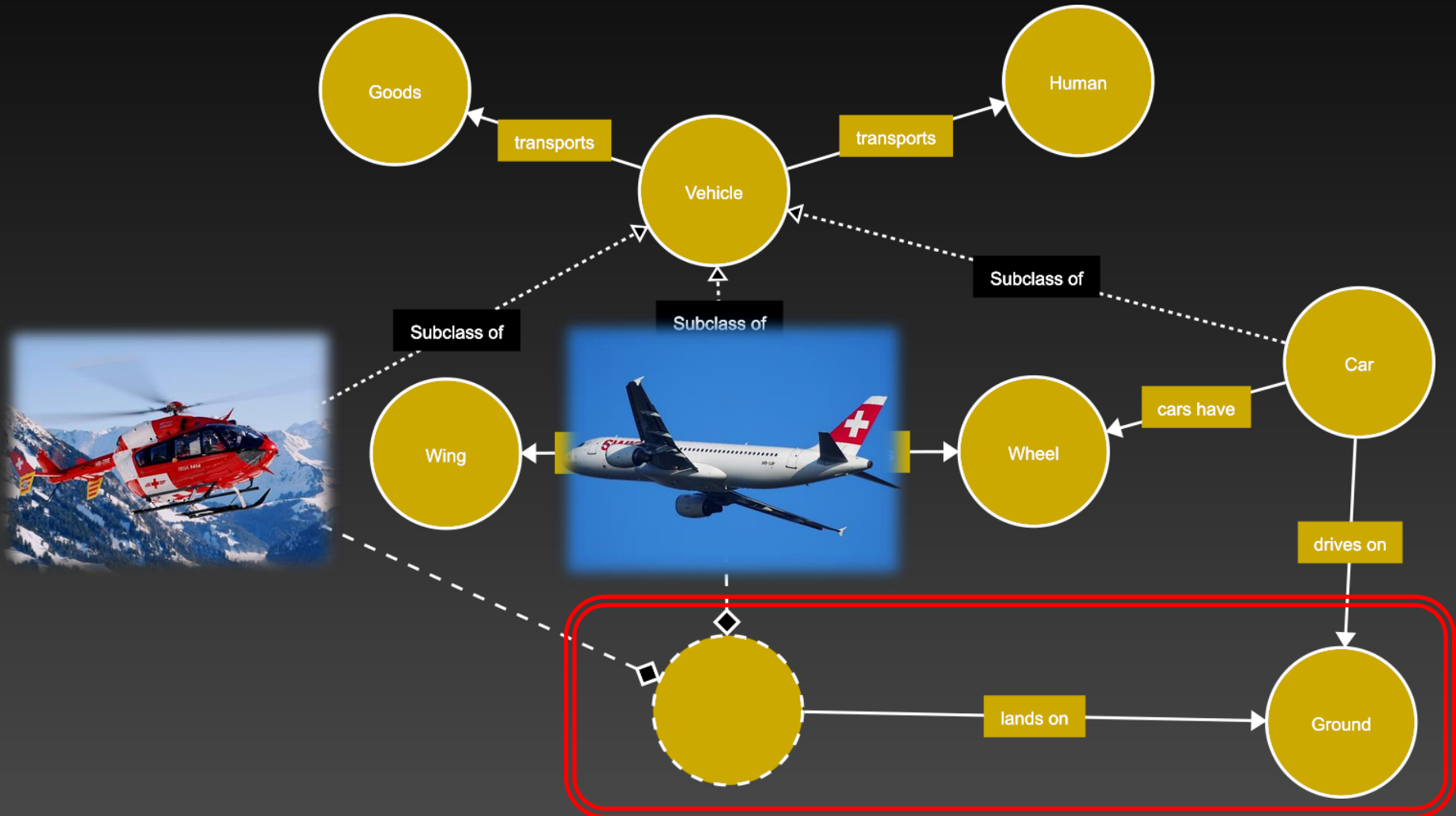


# You are starting with building knowledge bases...

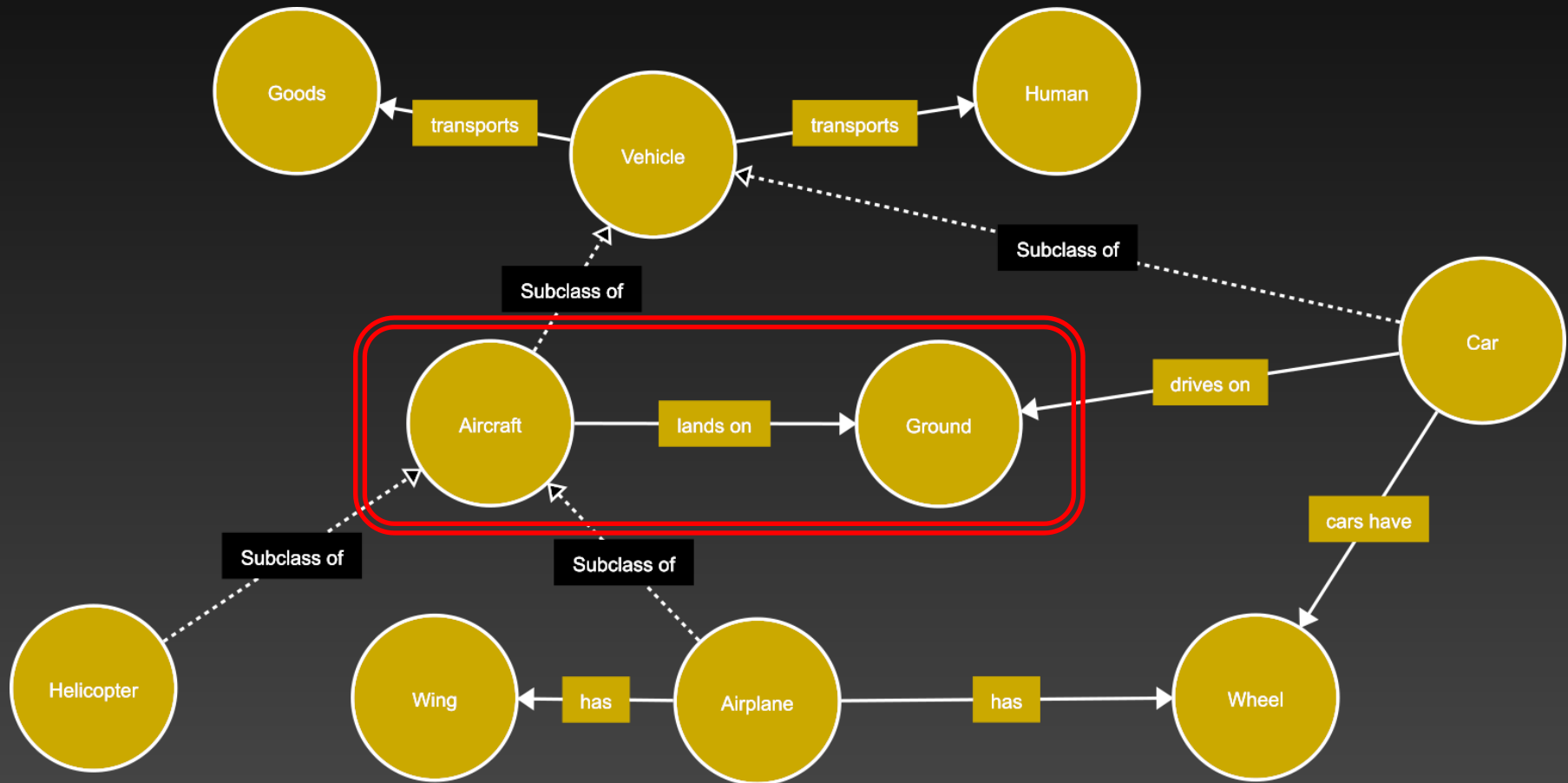


<https://www.martyag.com/referenzen/polizeifahrzeuge/polizei-m%C3%BCnchenstein-volvo-xc60>

## ... and re-thinking what you see...

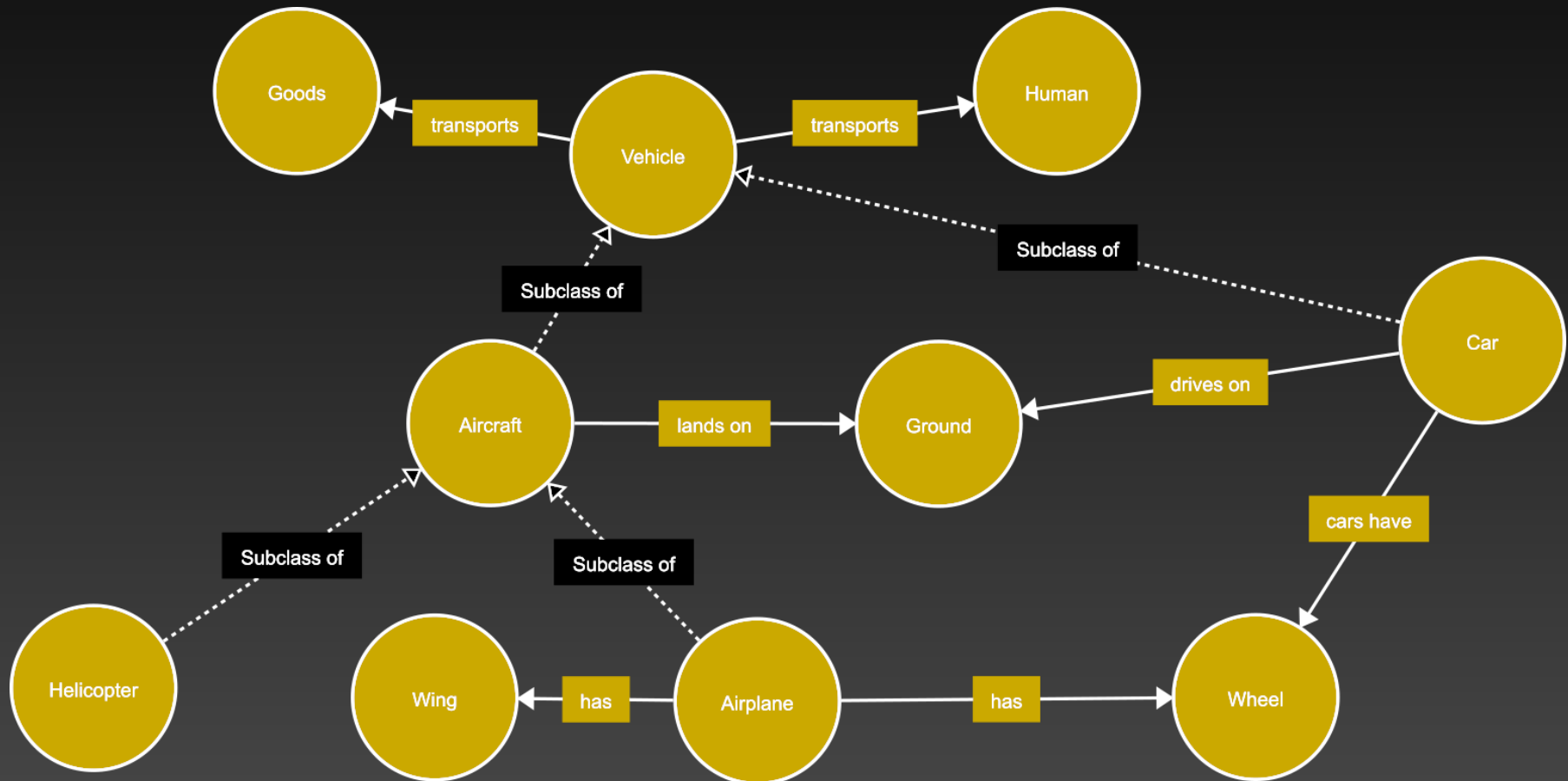


... and you uncover new things (and generalize) ...

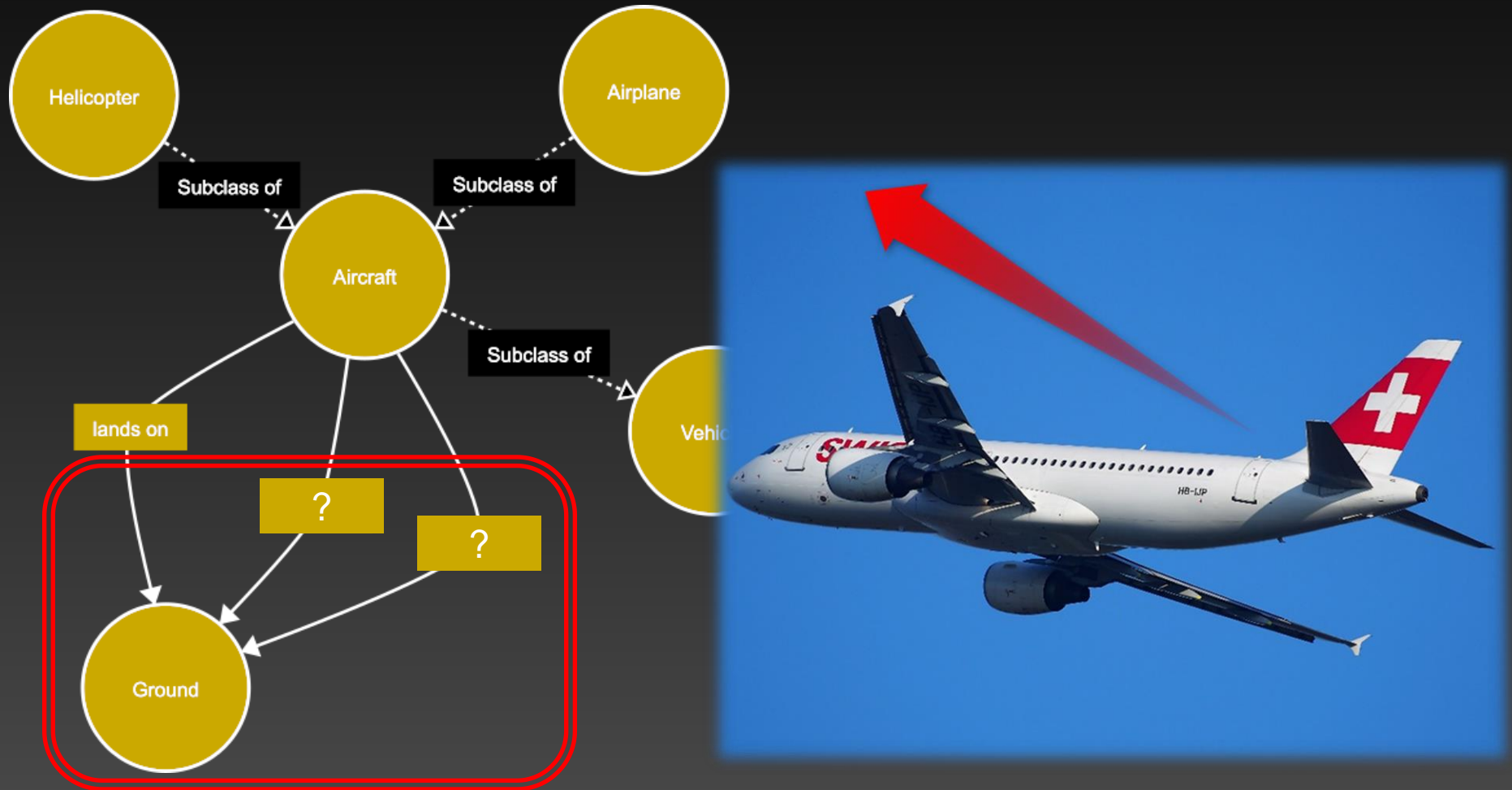




# Natural (maybe) and artificial intelligence is about building ontologies.



# What about things you don't know?



# Identify patterns ... play with language ... extend ontology ...

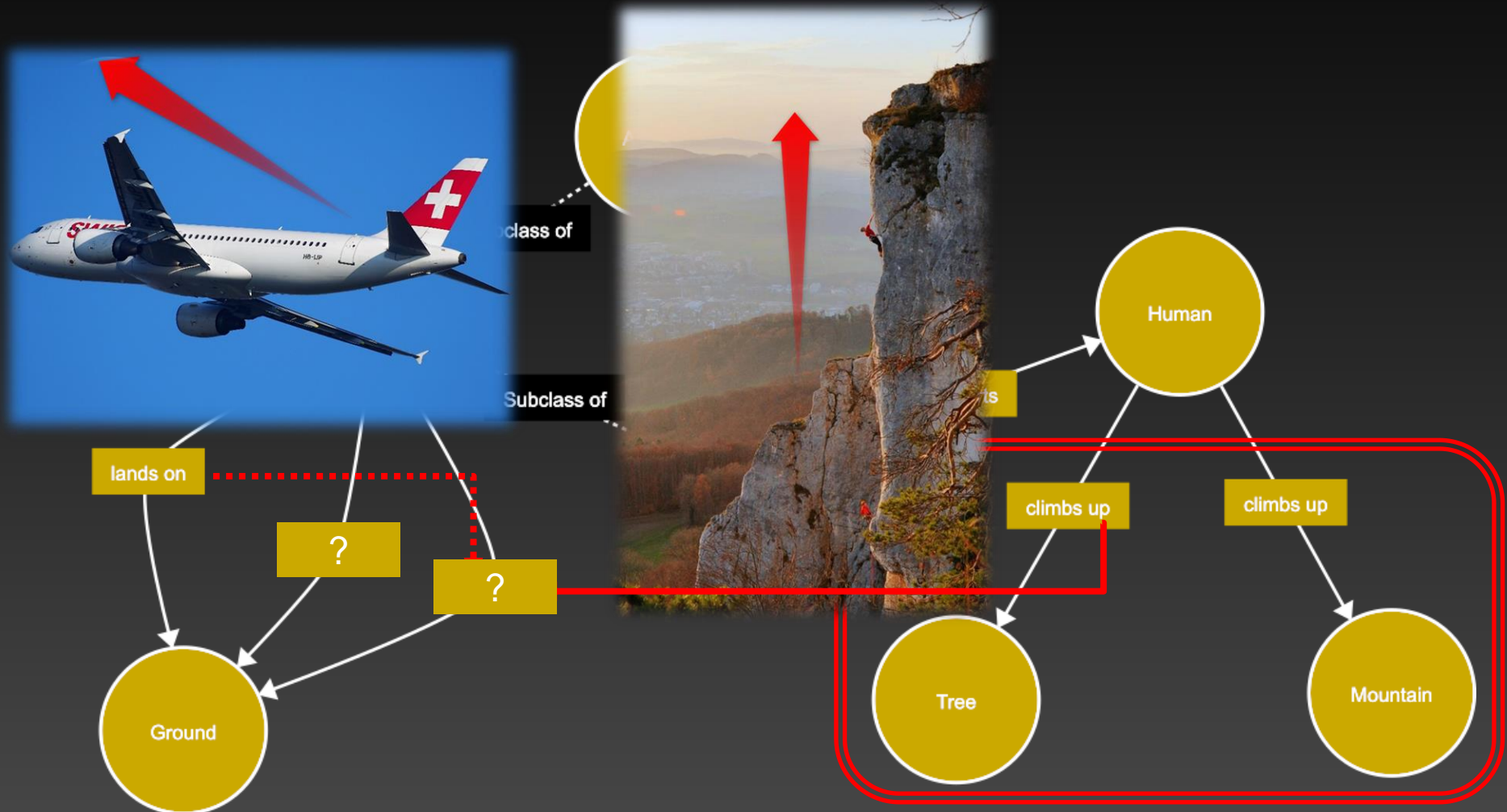
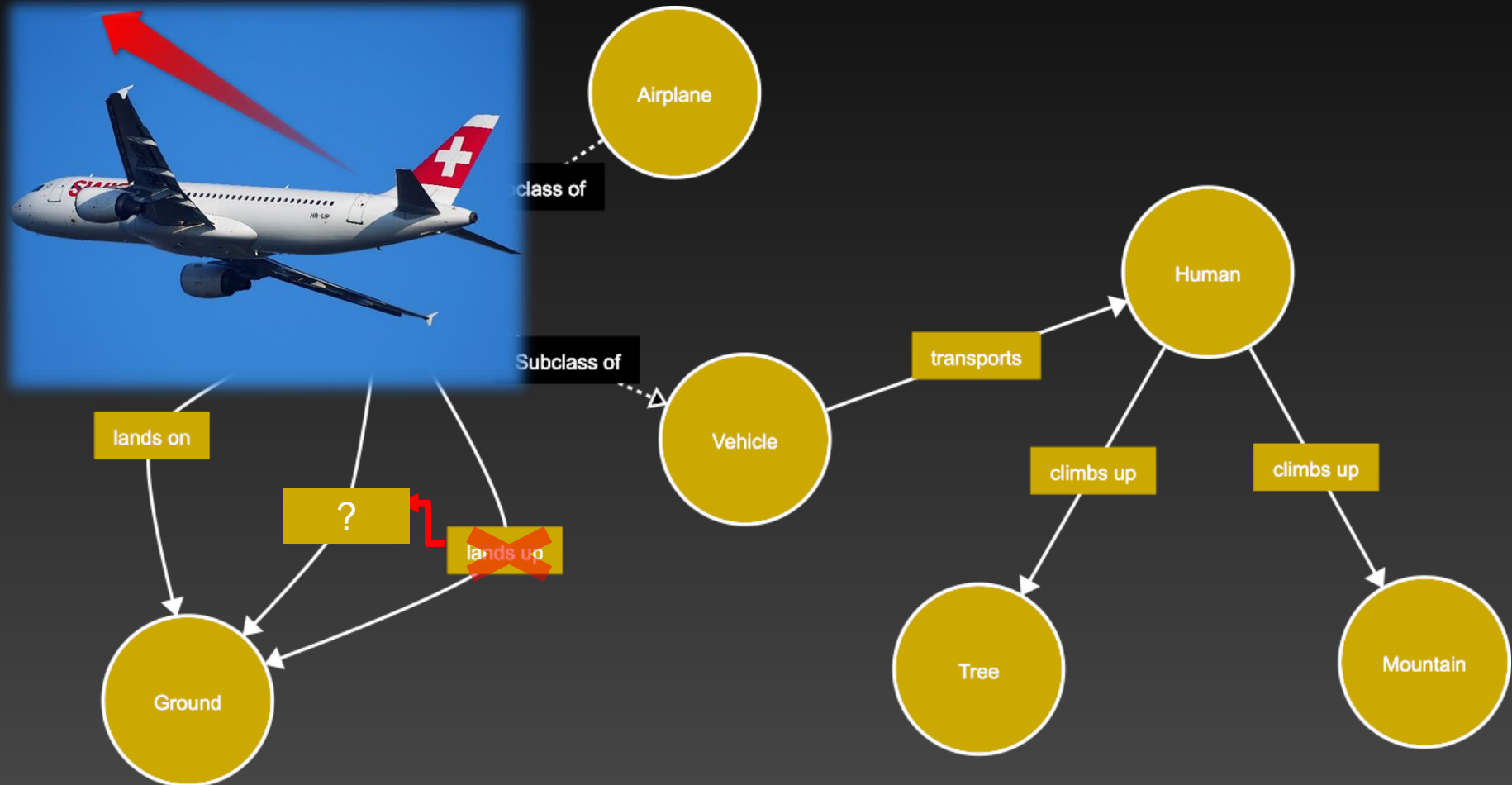


Image: <http://climbapedia.org/content/gempen-gempenfeiler>

## Extension and population based on machine magic learning...





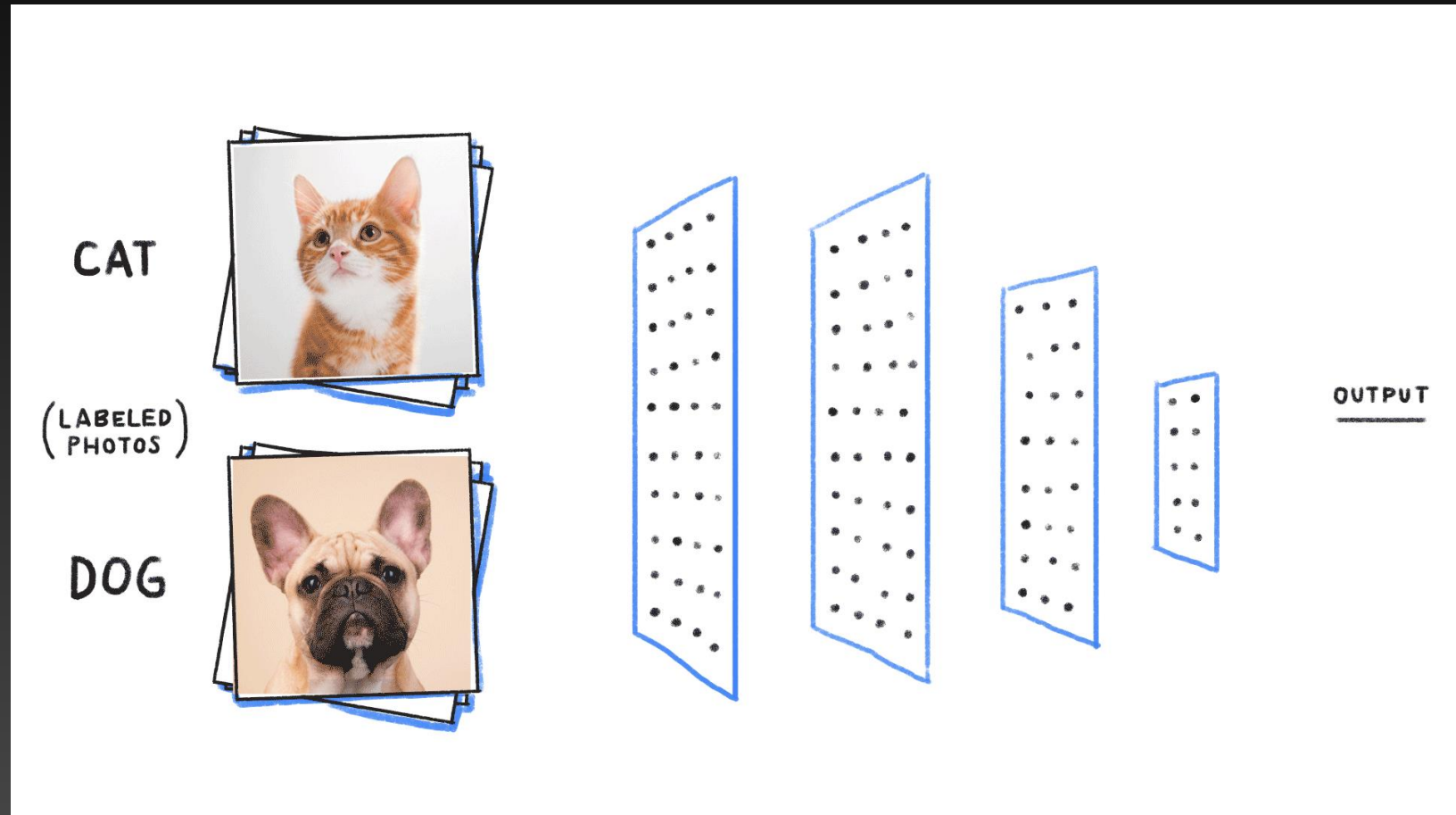
# Machine Learning

# Machine learning ... powerful and impressive ...



Image by Gerd Altmann from Pixabay

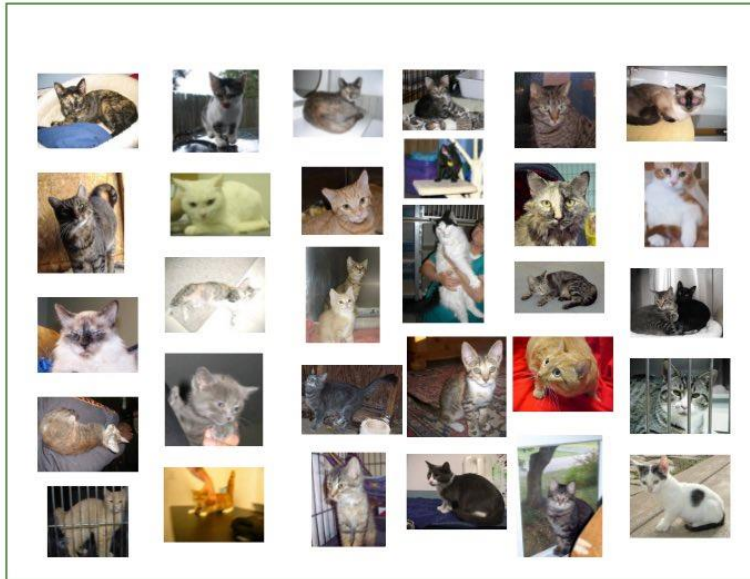
## So maybe we want to distinguish ...



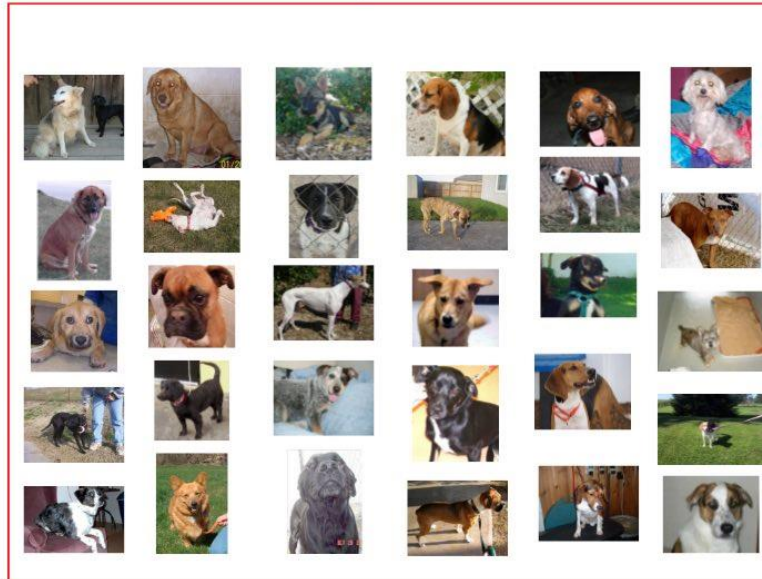


# What we need is a vast set of labelled training data!

Cats



Dogs



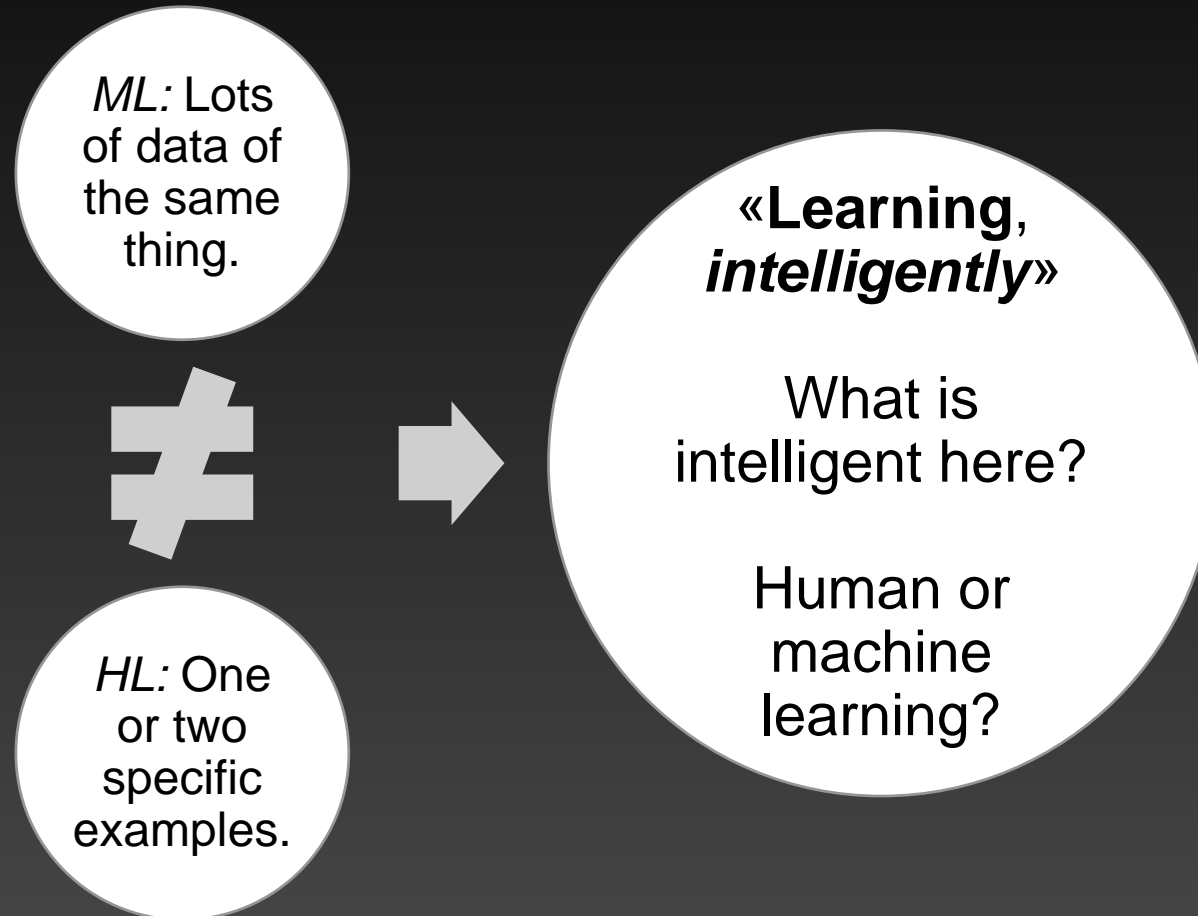
Sample of cats & dogs images from Kaggle Dataset



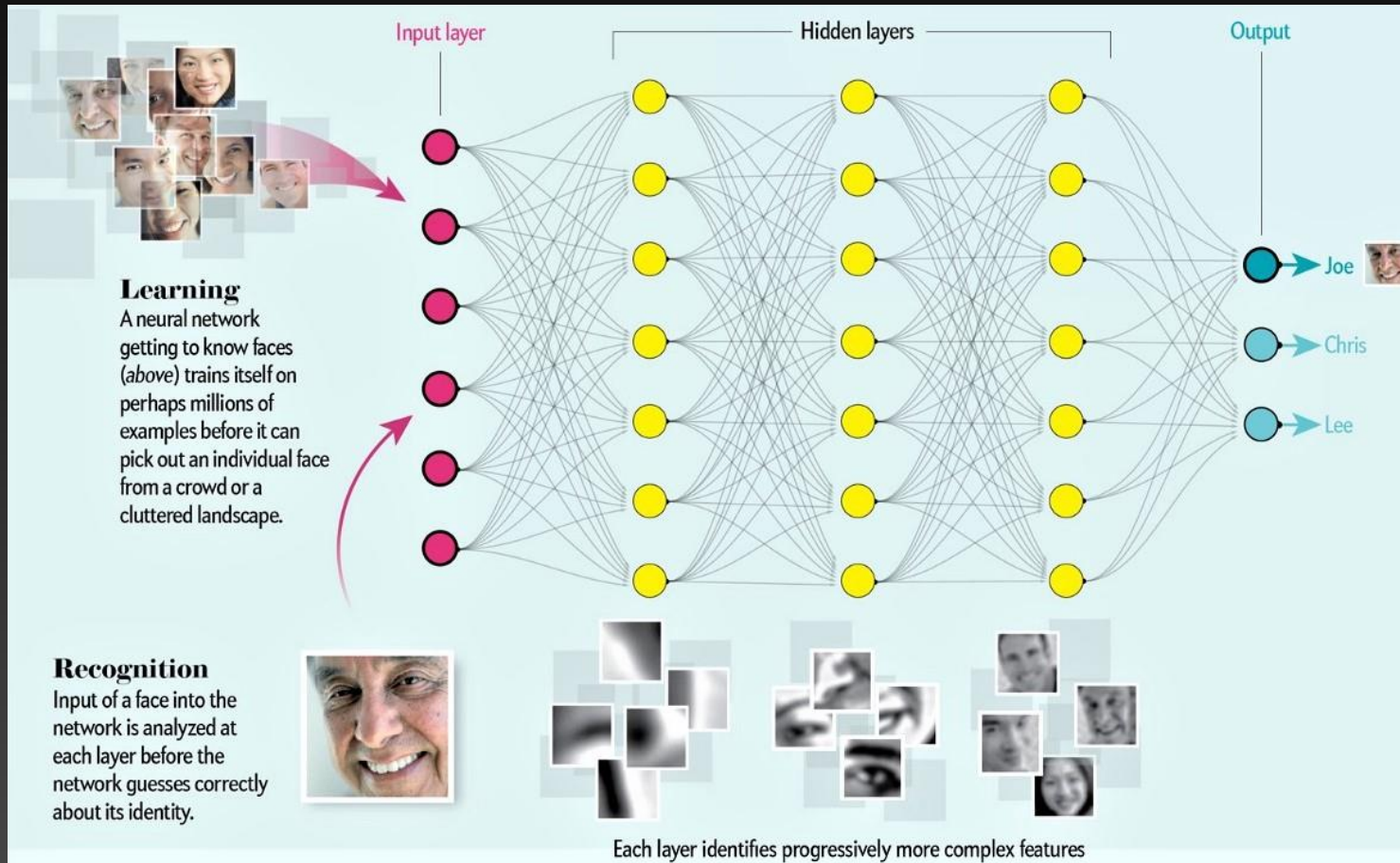
## He needs a good example ...



## «Learning intelligently»



# Algorithm/model is hardly able to explain anything ...

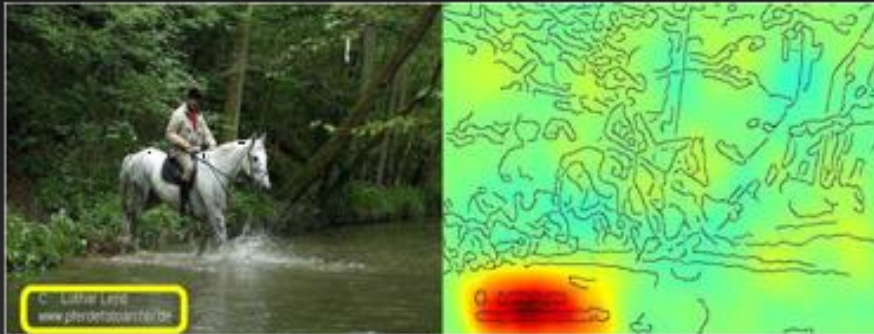


<https://www.scientificamerican.com/article/springtime-for-ai-the-rise-of-deep-learning/>



# And it is maybe even learning the wrong thing:

Horse-picture from Pascal VOC data set



Source tag  
present



Classified  
as horse

Artificial picture of a car



No source  
tag present



Not classified  
as horse



Lapuschkin, S., Wäldchen, S., Binder, A., Montavon, G., Samek, W., & Müller, K.-R. (2019). Unmasking Clever Hans predictors and assessing what machines really learn. *Nature Communications*, 10(1), 1096. <https://doi.org/10.1038/s41467-019-08987-4>



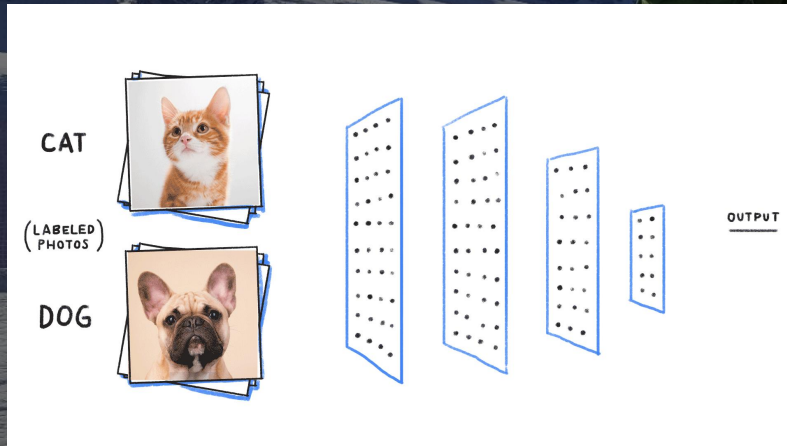
## We are able to explain and confirm ...



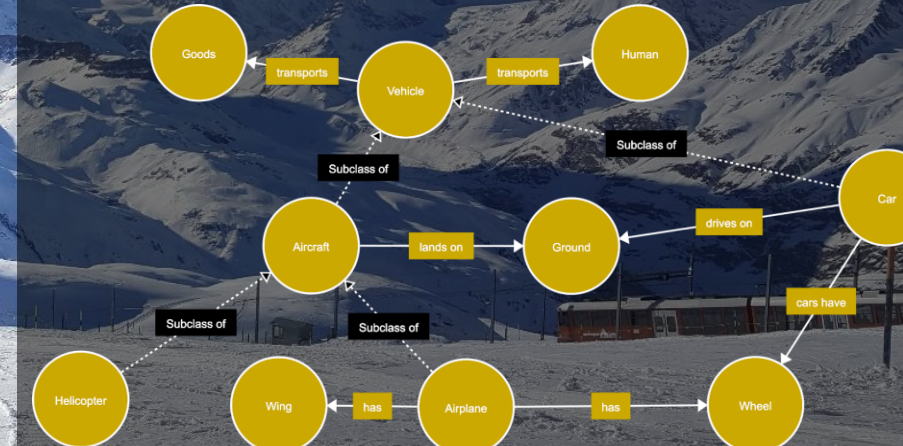
# Let's combine Machine Learning with Knowledge Engineering!

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E.g. use magic *machine learning* for  
*extending* an *ontology*



E.g. use an *ontology* to *explain* and  
*direct* the *learning*





### WISH-LIST

How are ML and KE  
combined in our  
approaches?

How can we make ML and  
KE more intelligent?

tacit knowledge

self-aware and  
external knowledge

**Learned  
Knowledge**

**Engineered  
Knowledge**

