Small-data in the Big-data Era
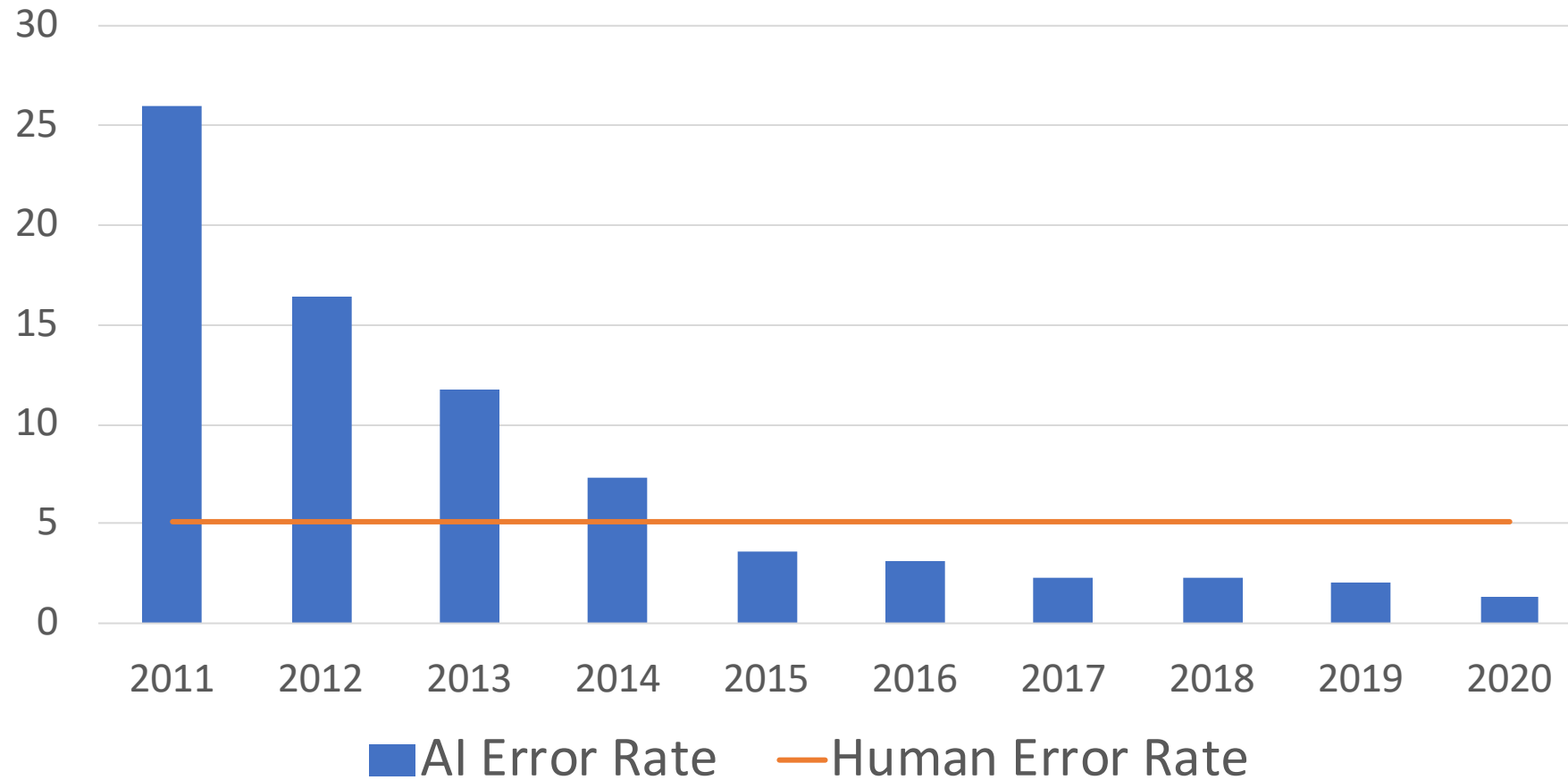
Eli Schwartz

Tel Aviv University; IBM Research AI

AI for Object Recognition
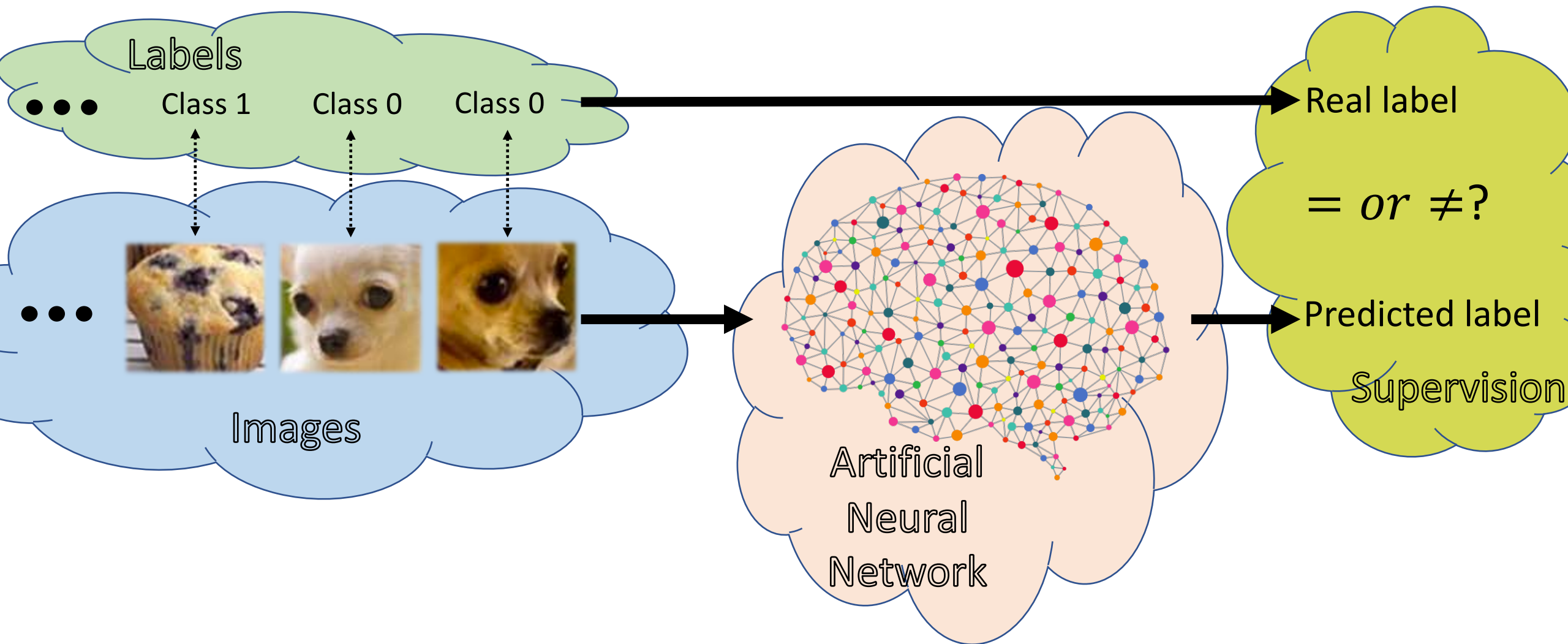
Object Recognition Performance
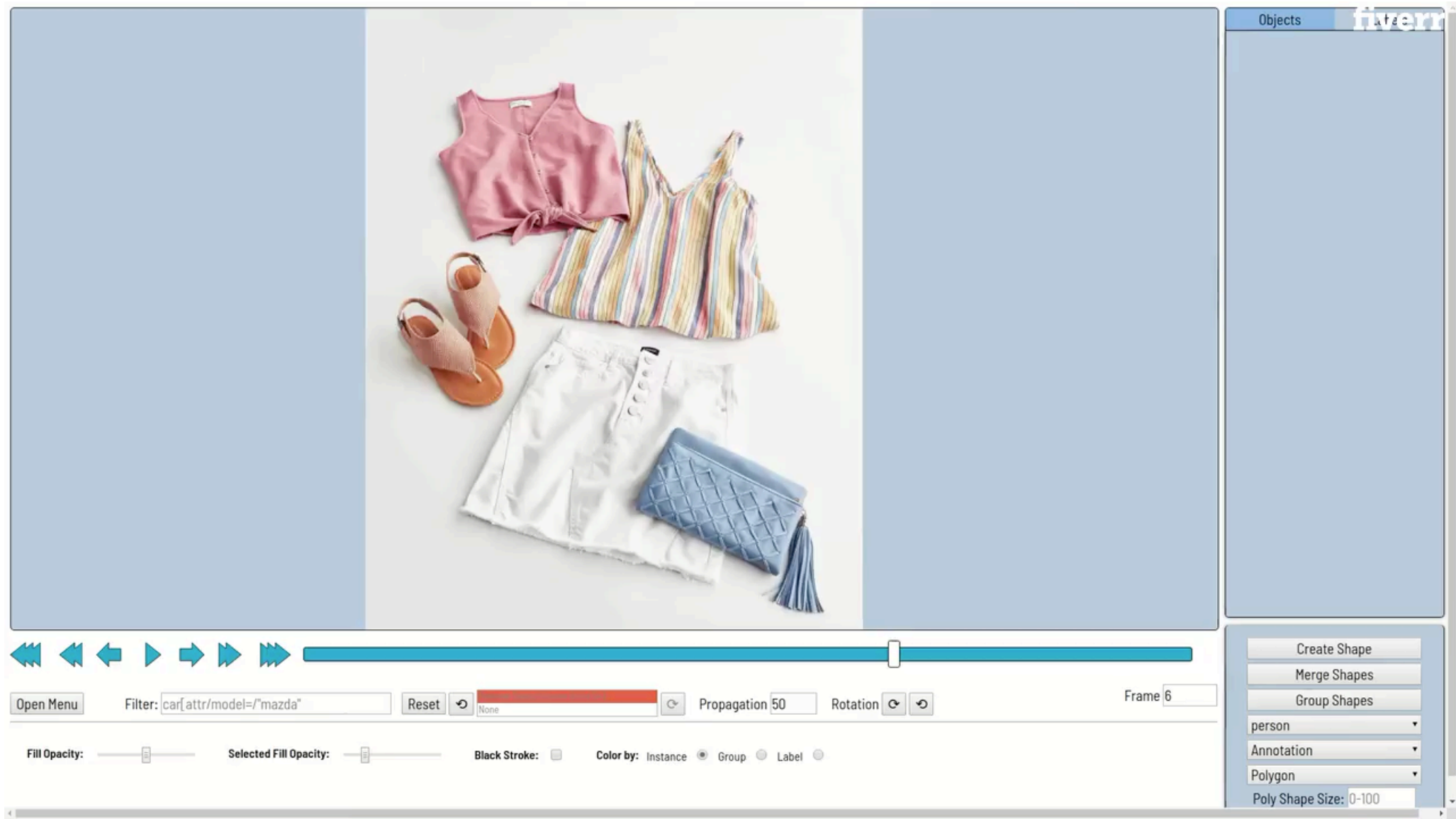

Legend: ■ AI Error Rate — Human Error Rate

Years: 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020

Y-axis: 0, 5, 10, 15, 20, 25, 30

Big-Data

Supervised Learning 101

Labeling is Hard

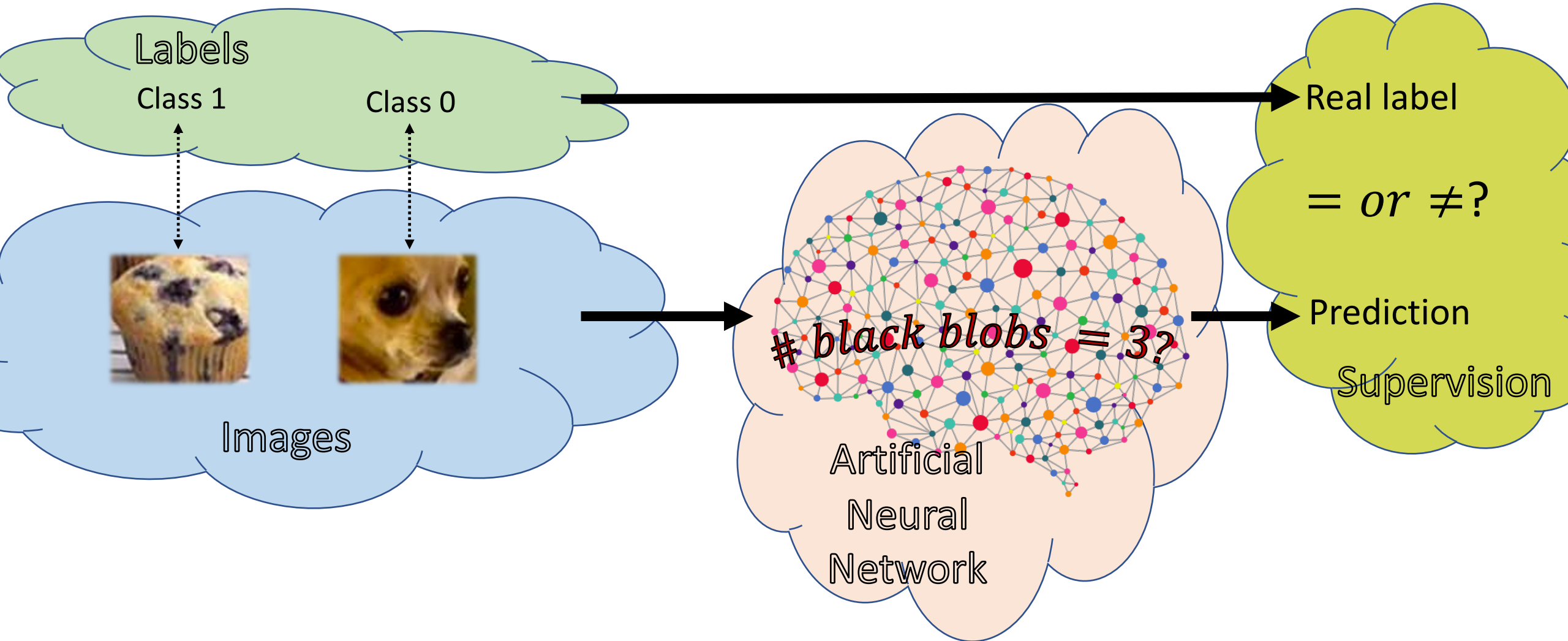# Labeling is Hard and costly

Humans need much less supervision

Humans need much less supervision

Standard training breaks for small-data

One-Shot Learning

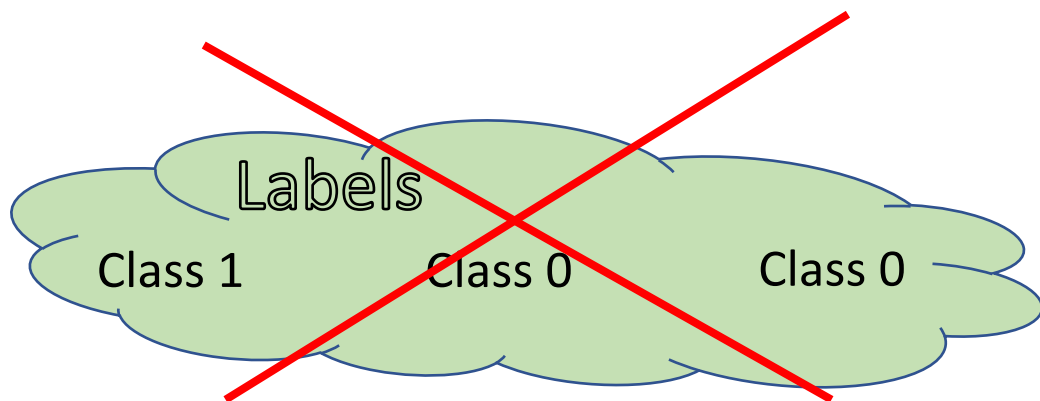Phase 1 – Training:
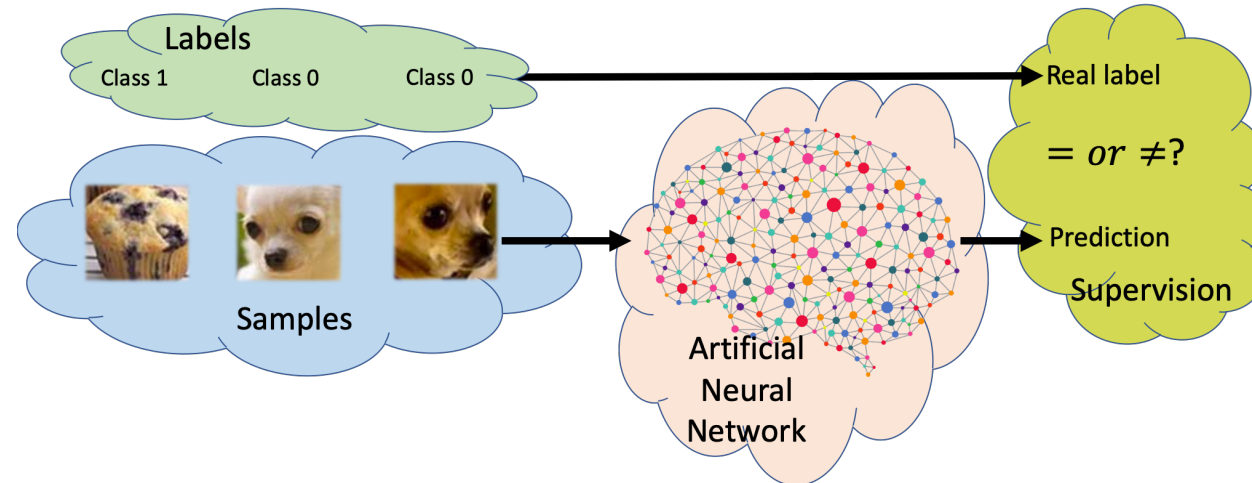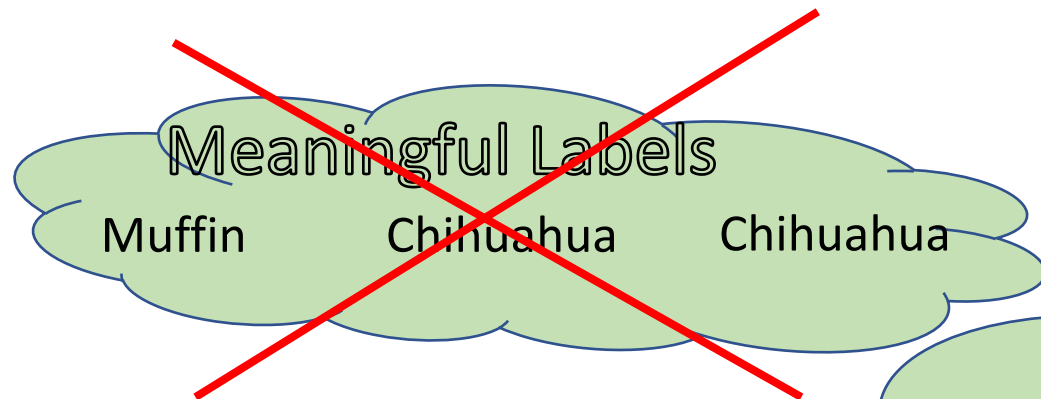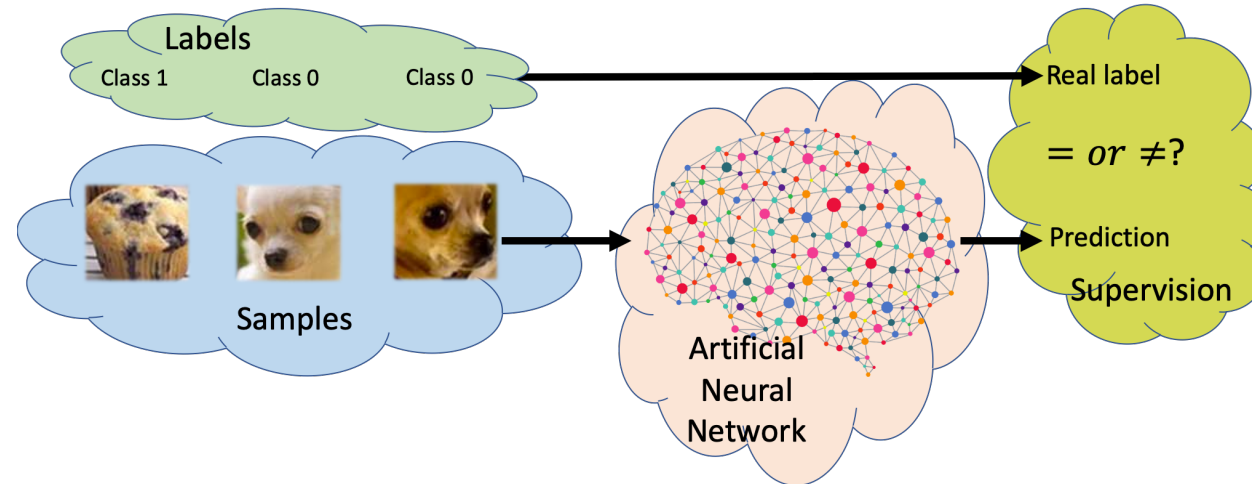
One-Shot Learning

Phase 1 – Training:

Adaptation

Phase 2 – Adapting to novel classes:

Improving the labels

Schwartz*, Karlinsky*, Feris, Giryes and Bronstein, CVPR 2019 (Workshop)

Improving the labels

Labels
Class 1   Class 0   Class 0   → Real label
= or ≠?
Samples
Prediction
Supervision
Artificial Neural Network

Meaningful Labels

Muffin   Chihuahua   Chihuahua
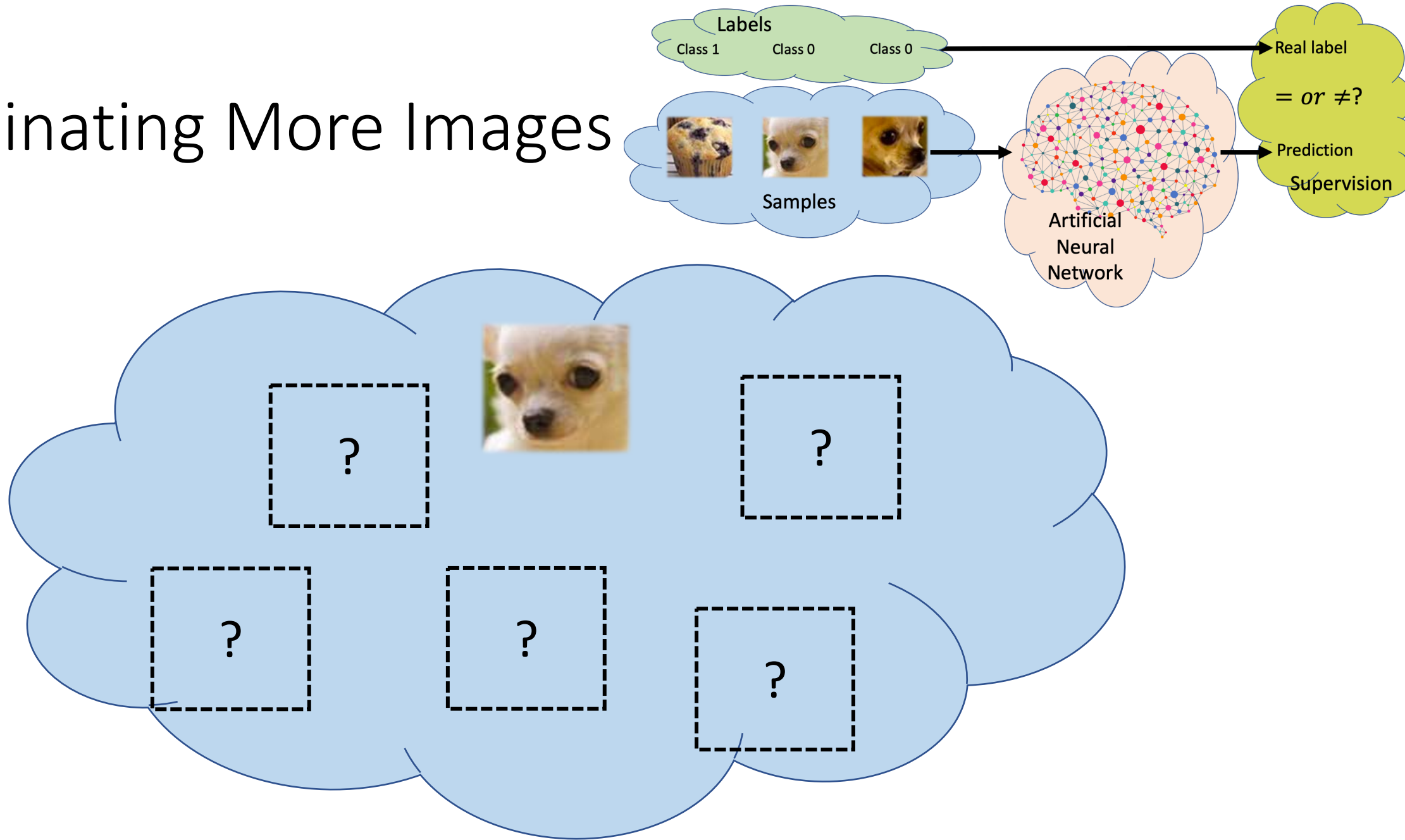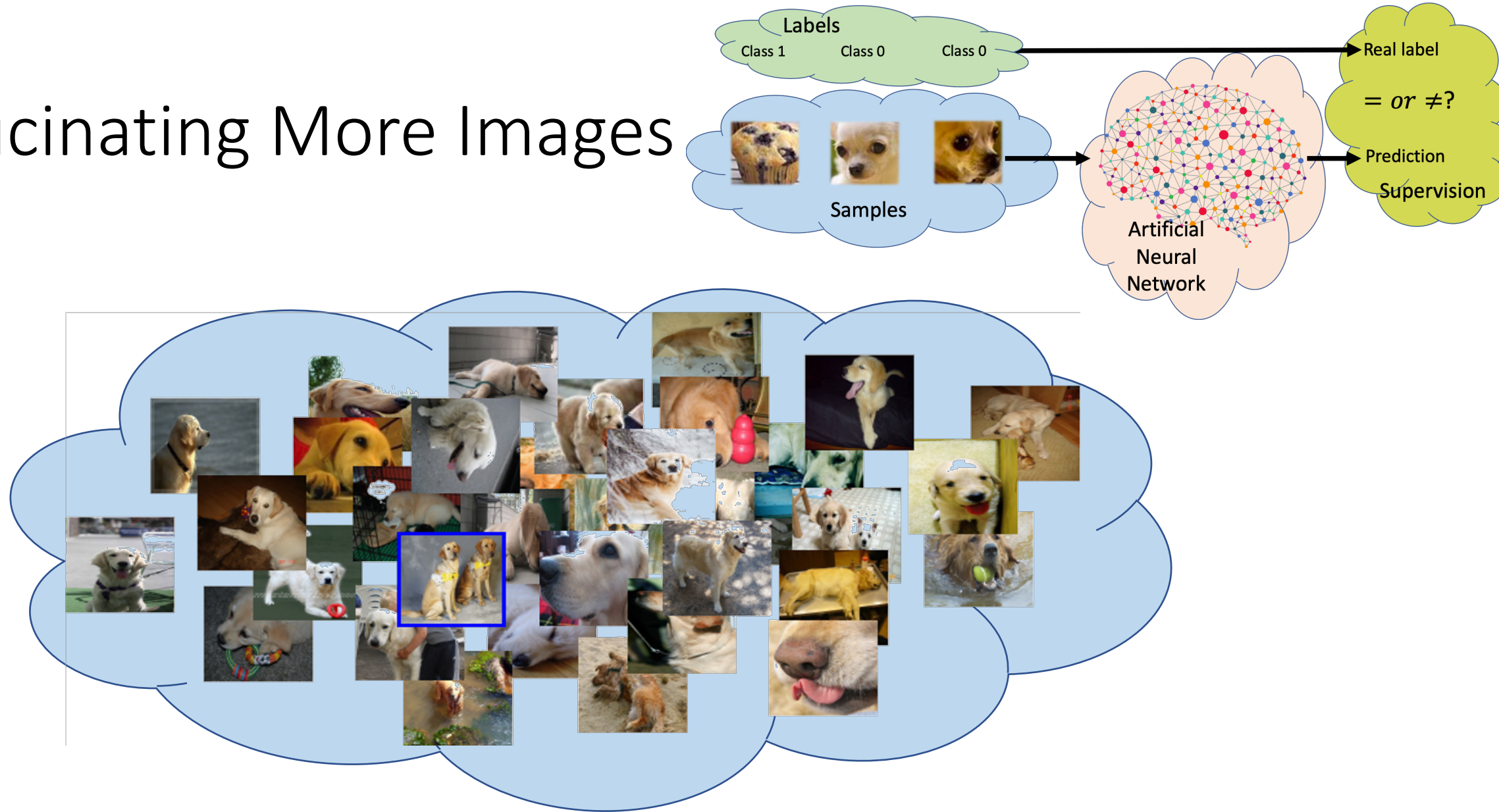
Natural Language Descriptions

Muffin - A muffin is an individual-sized, cupcake-like baked product.
Chihuahua – Chihuahua is the smallest breed of dog.
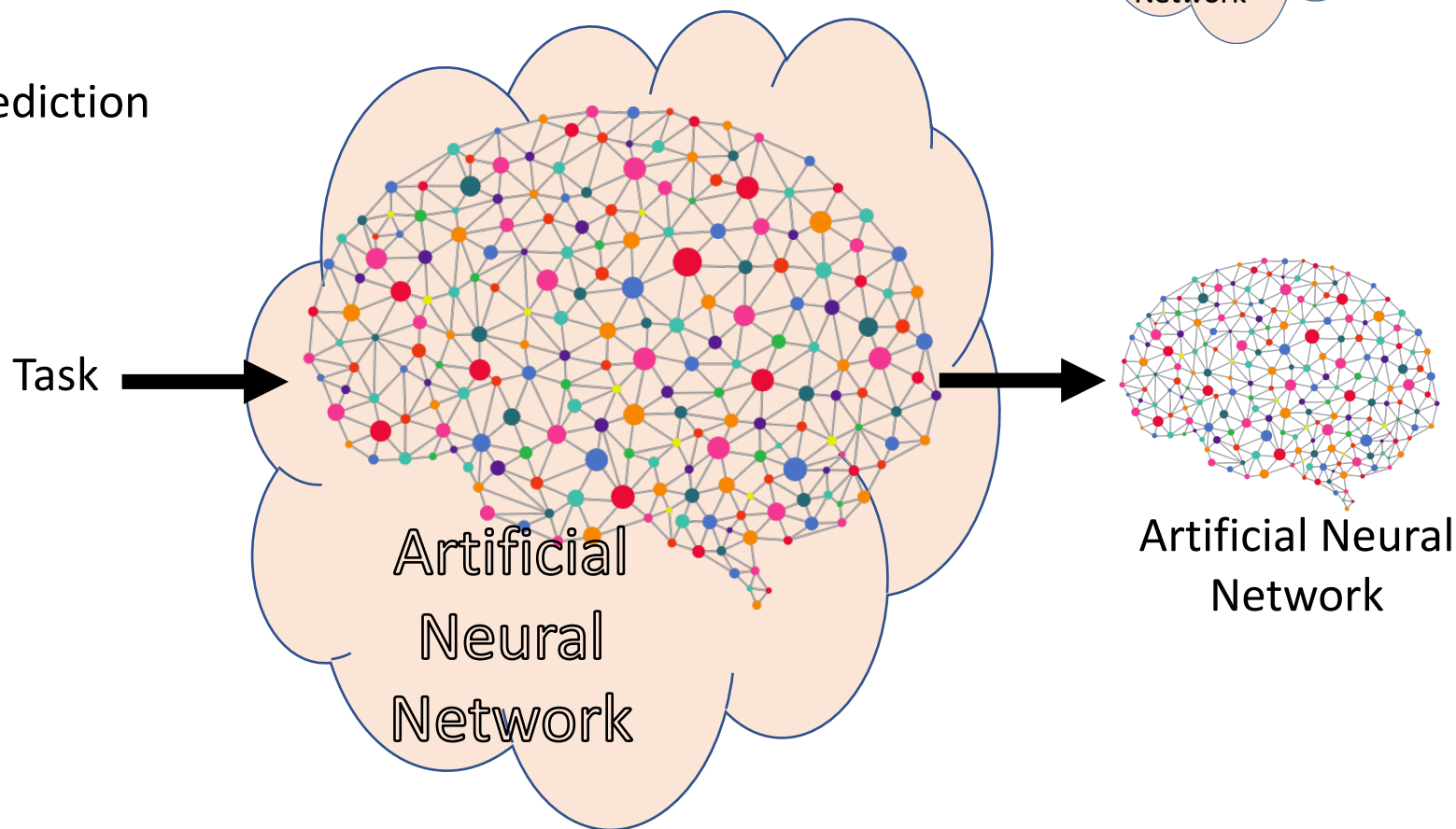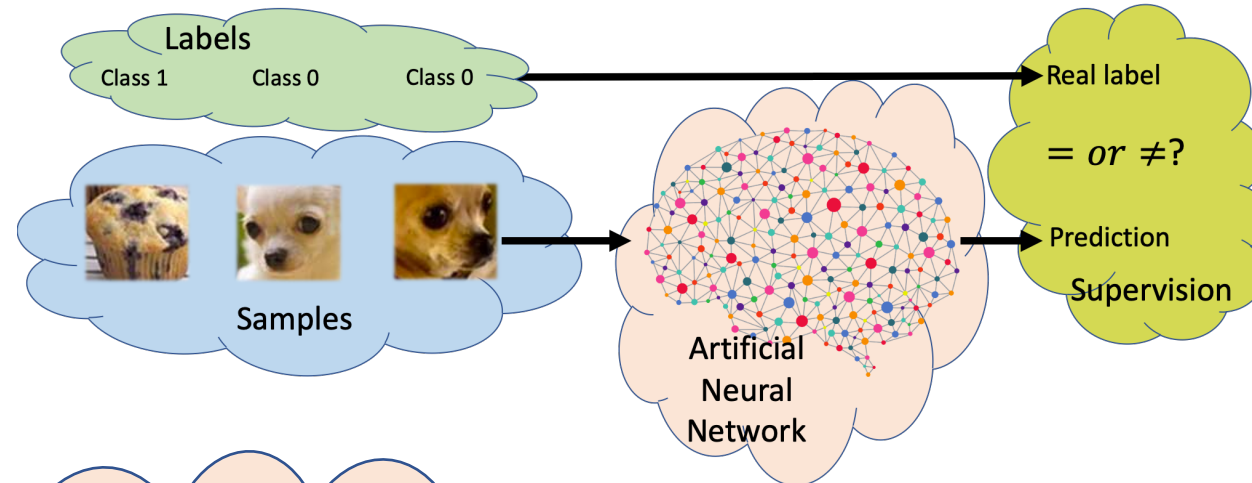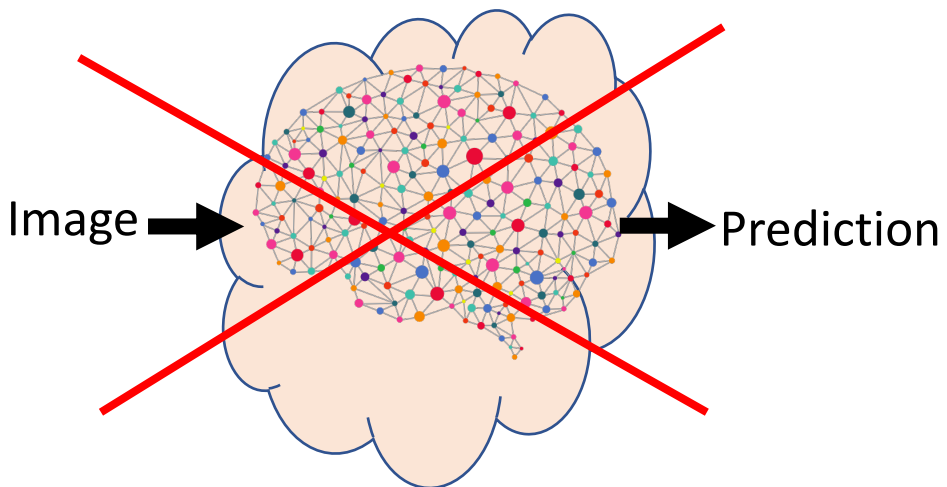
Schwartz*, Karlinsky*, Feris, Giryes and Bronstein, CVPR 2019 (Workshop)

Hallucinating More Images

Labels

Class 1   Class 0   Class 0

Samples

Artificial Neural Network

Real label

$= or \neq$?

Prediction

Supervision

?   ?

?   ?

?

Schwartz*, Karlinsky*, Shtok, Harary, Marder, Feris, Kumar, Giryes and Bronstein, NeurIPS 2018

Hallucinating More Images

Labels

Class 1   Class 0   Class 0

Samples

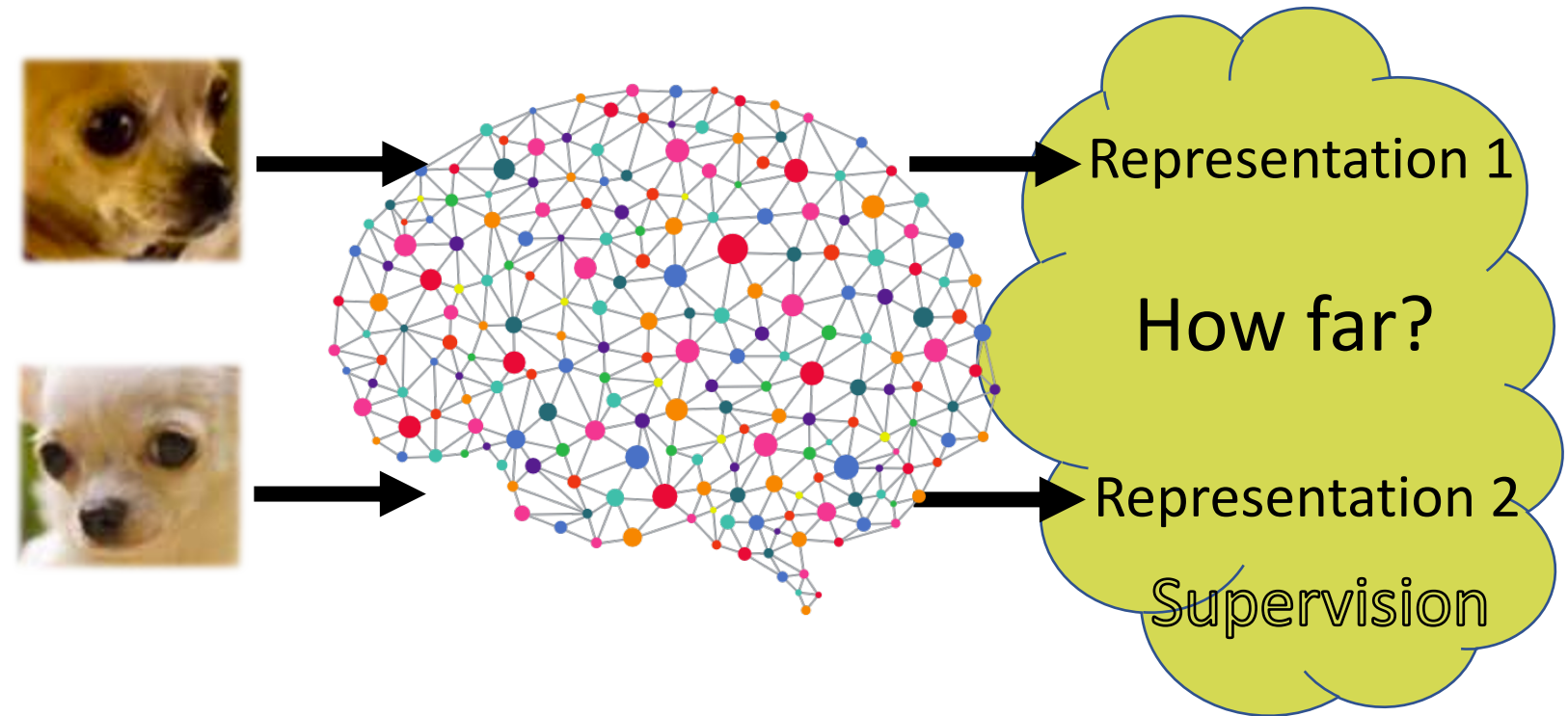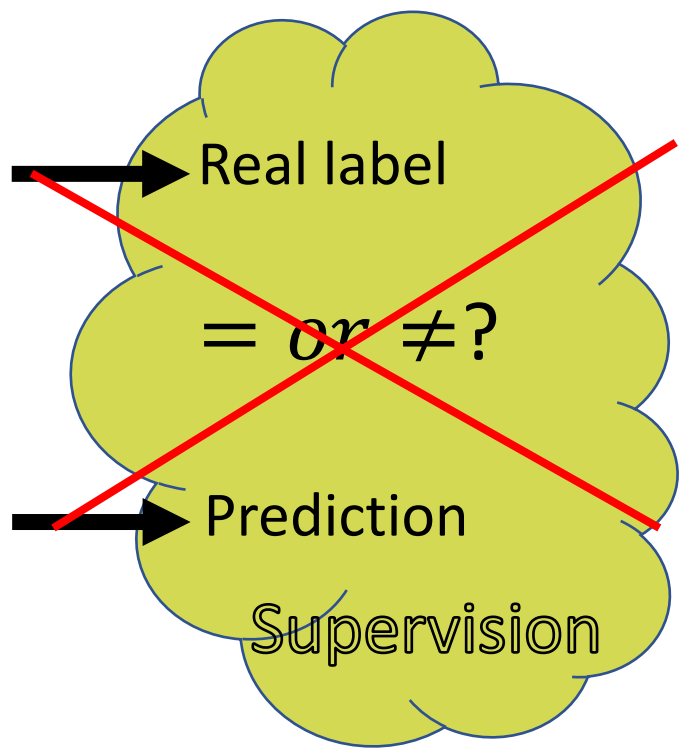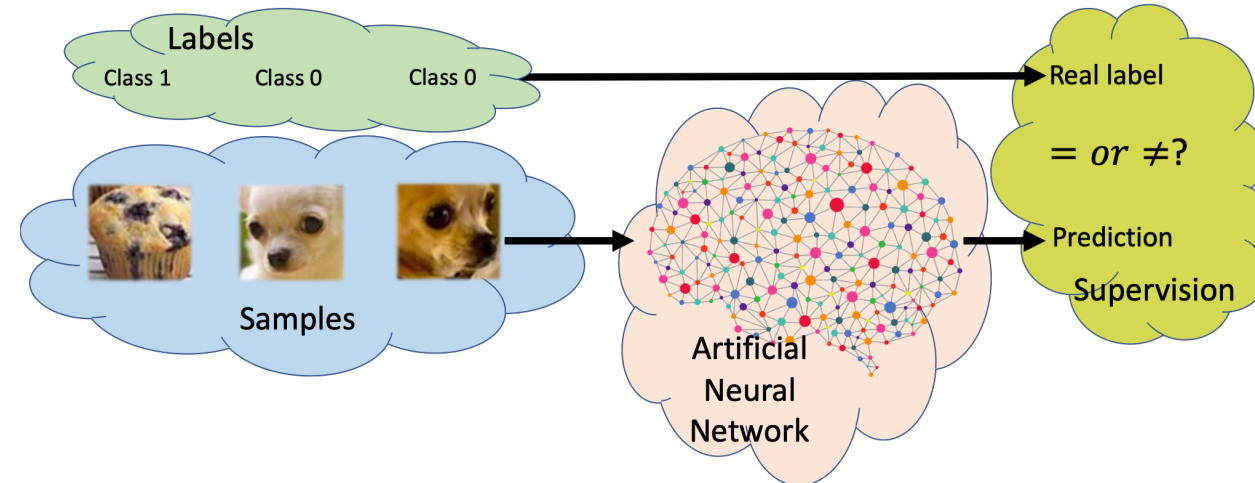Artificial Neural Network

Real label

$= or \neq$?

Prediction

Supervision

Schwartz*, Karlinsky*, Shtok, Harary, Marder, Feris, Kumar, Giryes and Bronstein, NeurIPS 2018

"Meta-Learning" or "Learning to Learn"

Doveh*, Schwartz*, Xue, Feris, Bronstein, Giryes and Karlinsky, 2020

Asking the Right Question

Karlinsky*, Shtok*, Harary*, Schwartz*, Marder, Pankanti, Feris, Kumar, Giryes and Bronstein, CVPR 2019

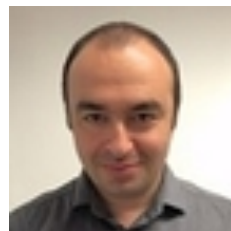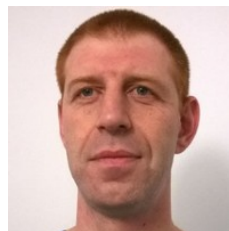# Learning from a single example performance

Questions?

Thank you!
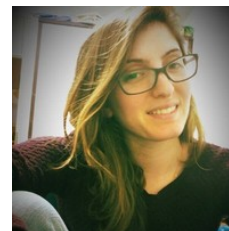
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