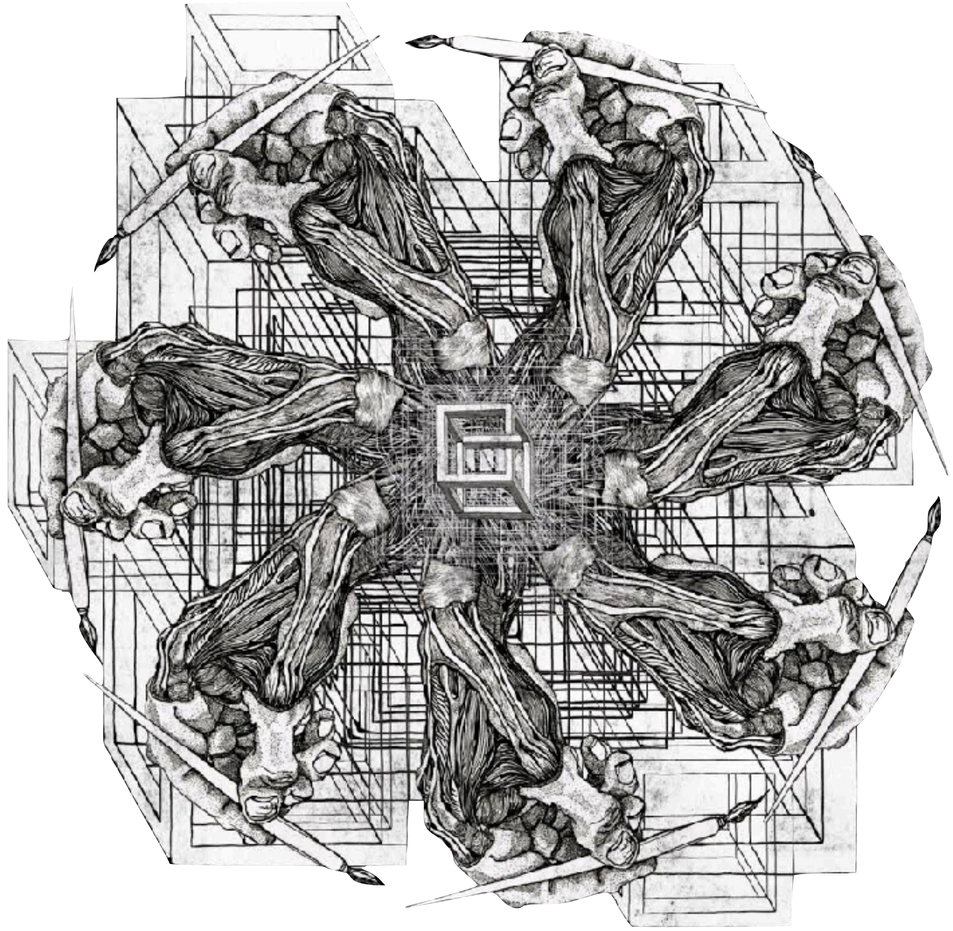
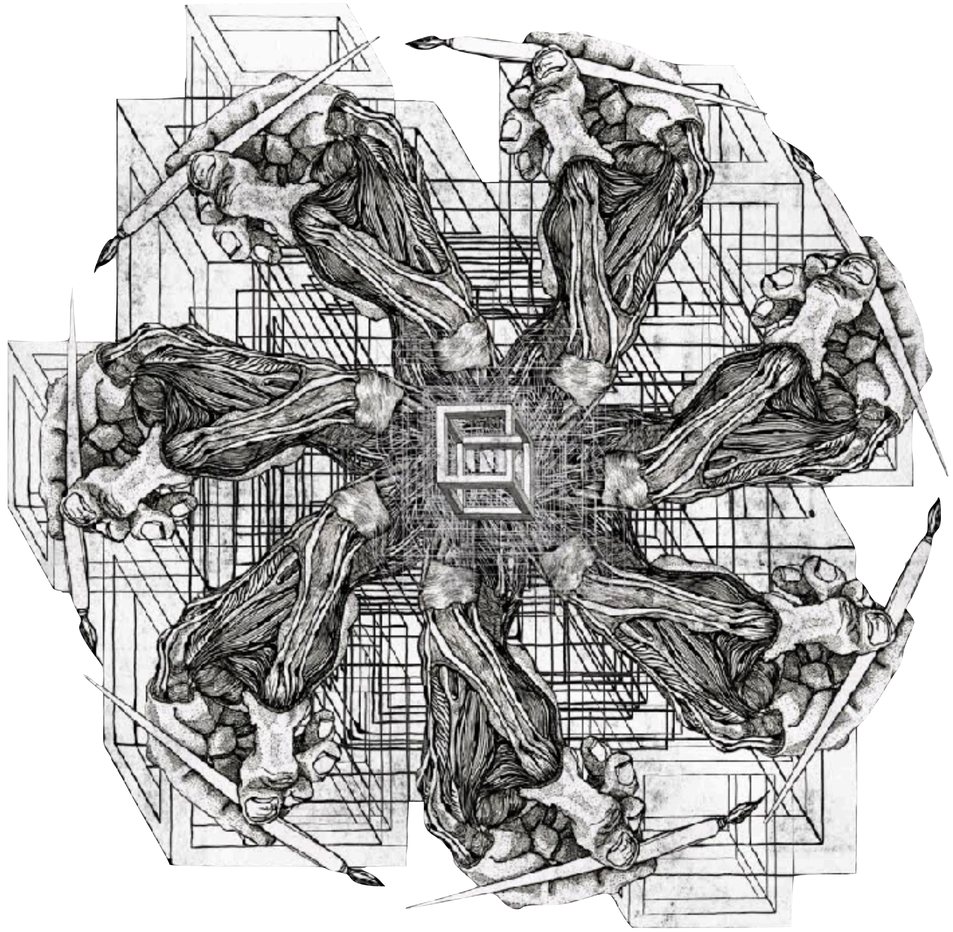


Visual Polymath

Amir R. Zamir



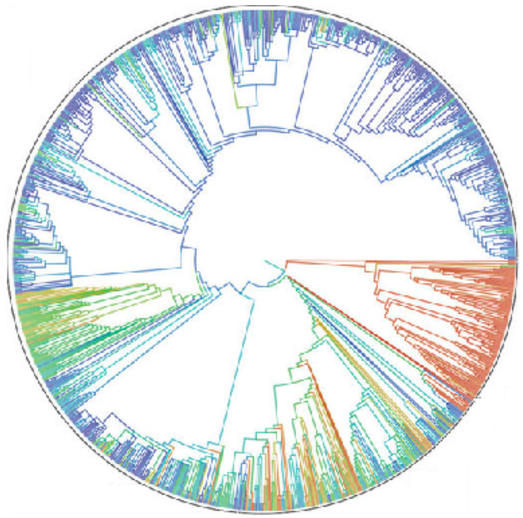
Towards a Human-like Comprehensive Perception

Amir R. Zamir

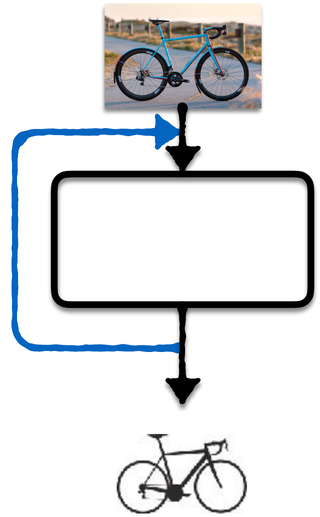
Intelligence as Efficiency

- Yielding higher value for less resources.

Efficient at learning



Efficient at testing

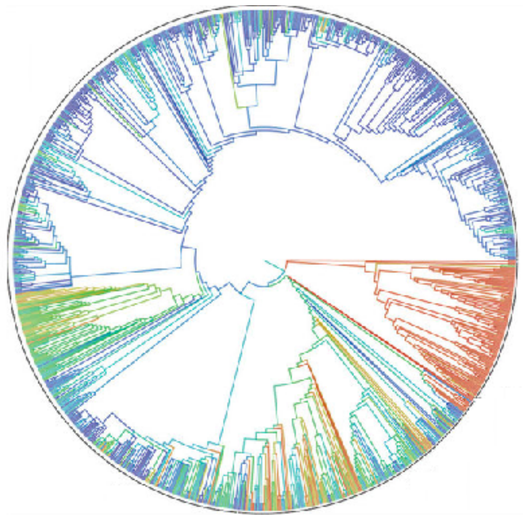


Yudkowsky, Efficient Cross-Domain Optimization, 2008.

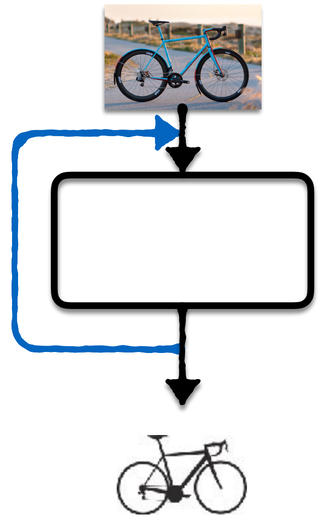
Intelligence as Efficiency

- Yielding higher value for less resources.

Efficient at learning



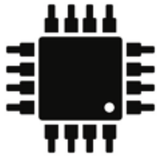
Efficient at testing



Yudkowsky, Efficient Cross-Domain Optimization, 2008.

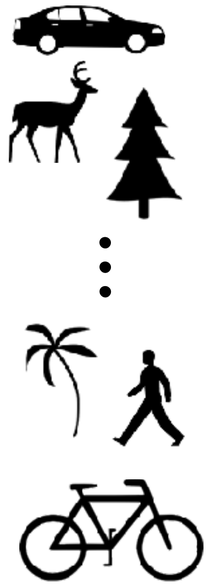
Practice: Prediction on a Budget

Time



Resources

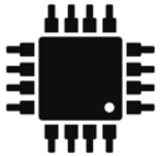
65 mph



1 second
40 meters

Practice: Prediction on a Budget

Time



Resources

A tradeoff game

65 mph

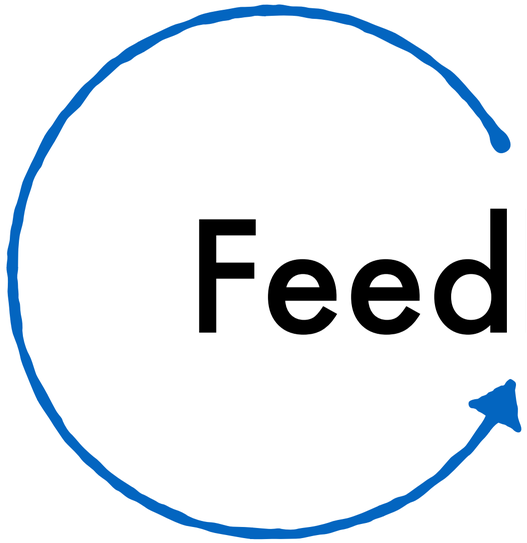
✗ foliage

tandem bike

✓ wheeled vehicle

road bike

flat bar bike



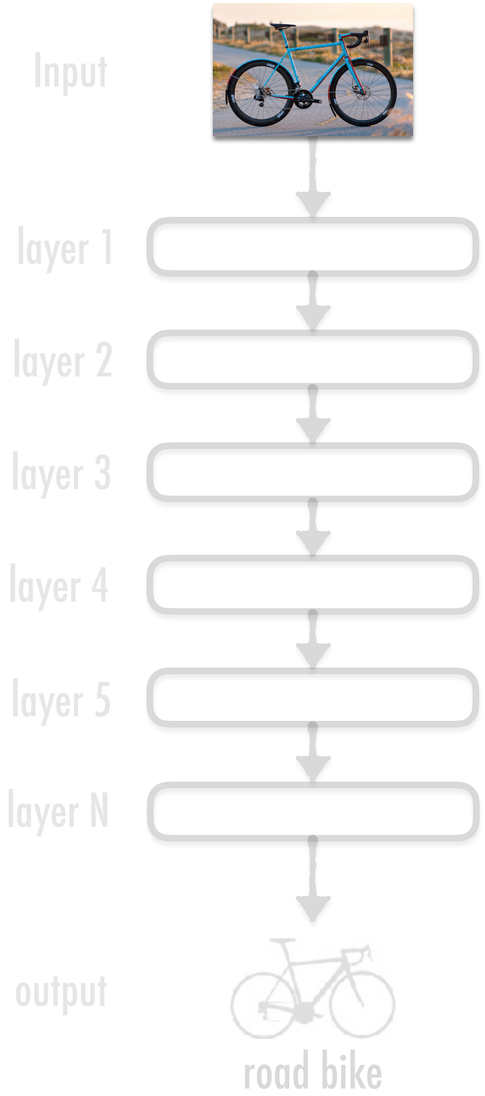
Feedback networks

Amir Zamir, Te-Lin Wu*, Lin Sun, William Shen, Bertram Shi,*

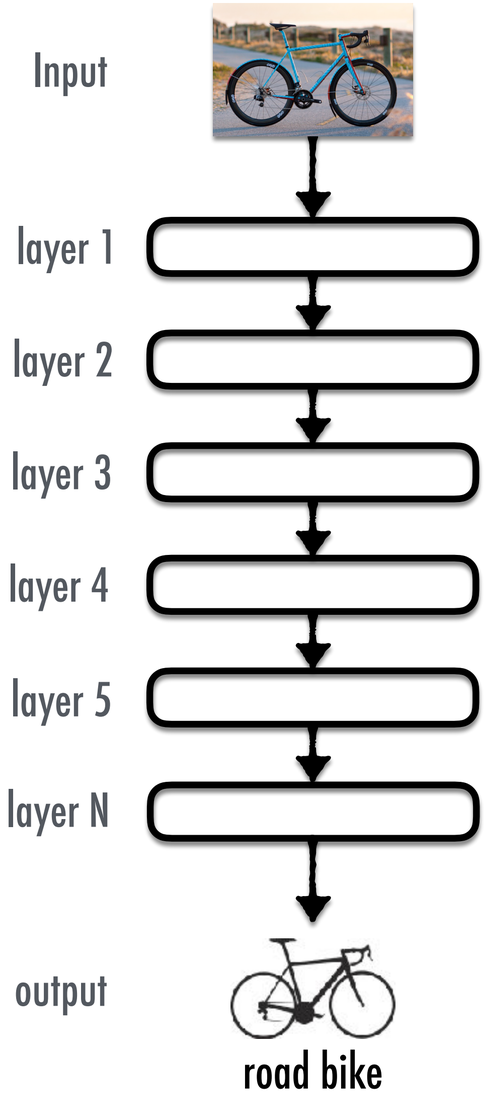
Jitendra Malik, Silvio Savarese

CVPR 2017

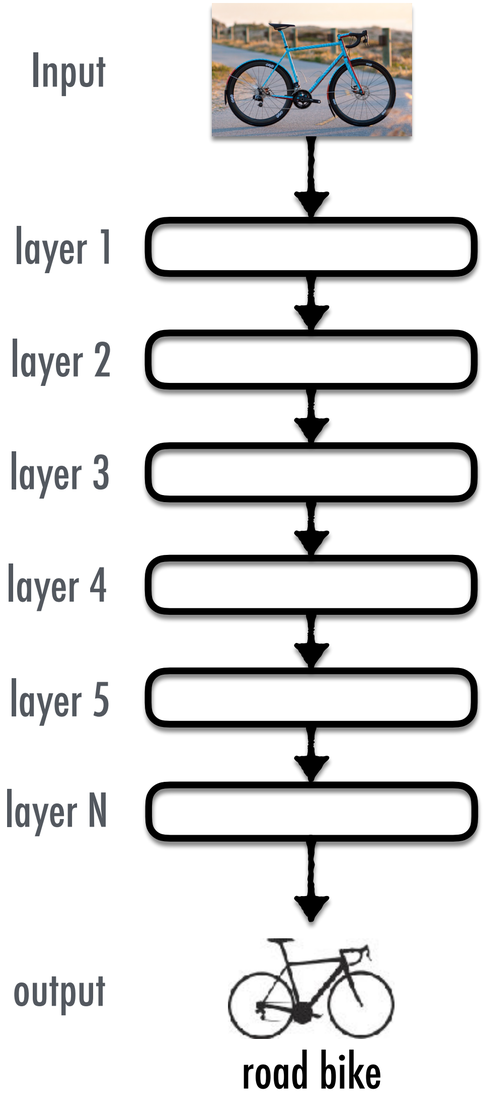
http://feedbacknet.stanford.edu



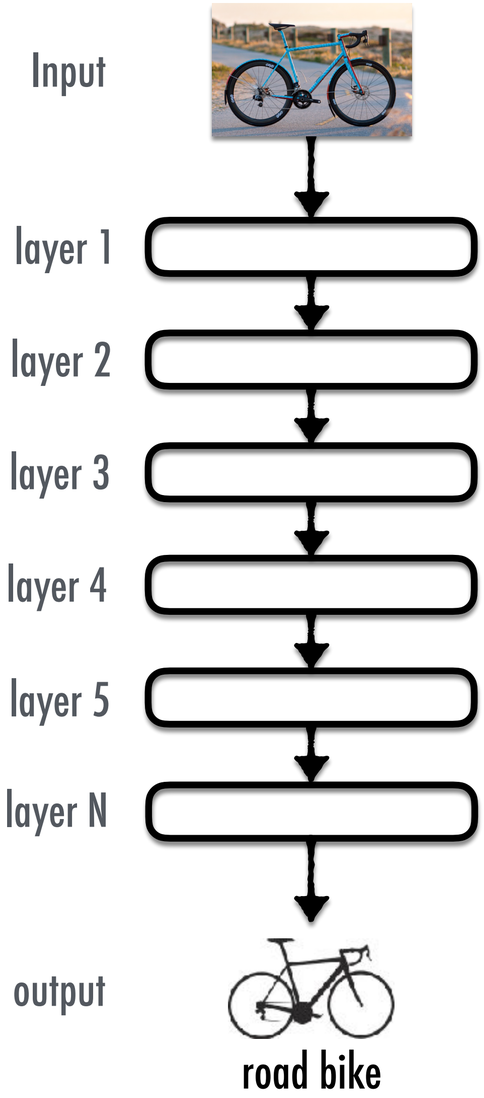
Feedforward model.

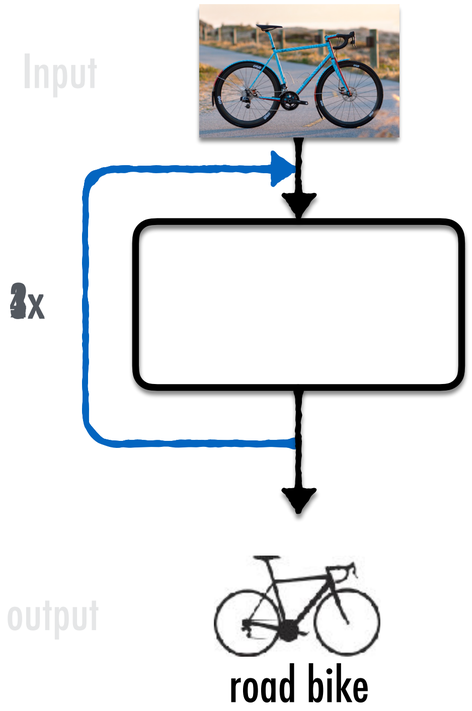


Feedforward model.



→ *Feedforward model.*

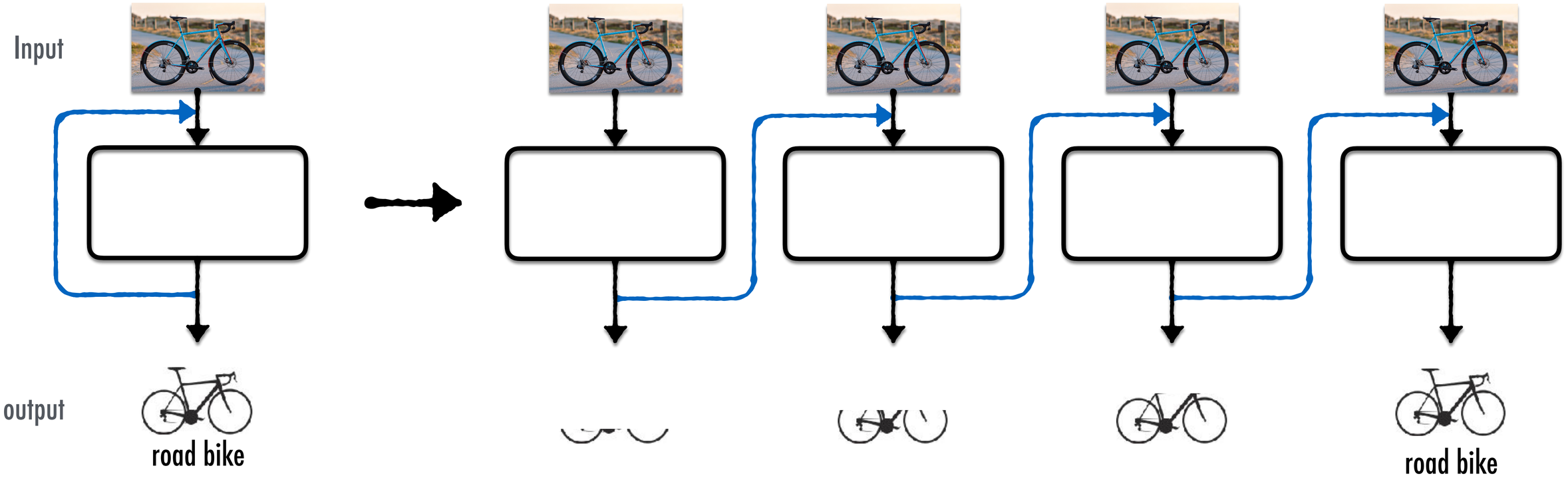




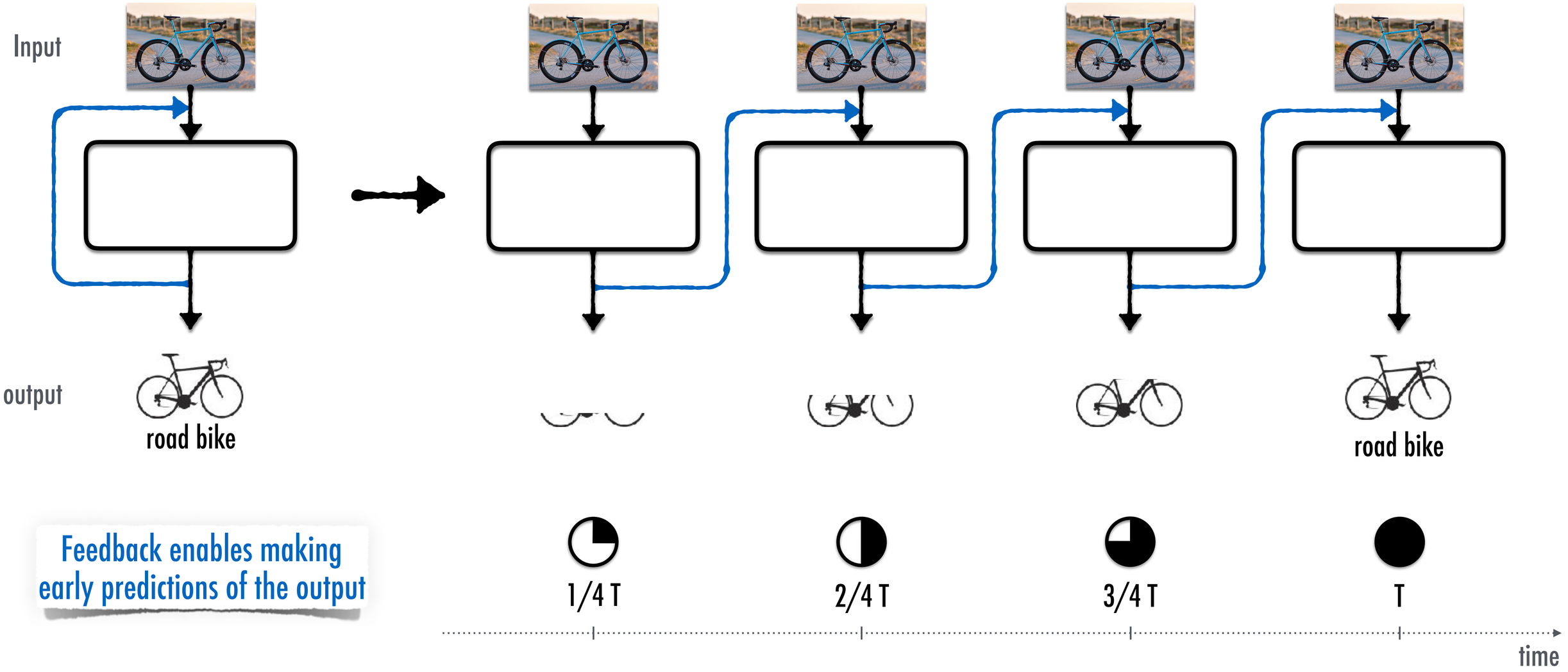
an alternative with several advantages

Feedforward model.

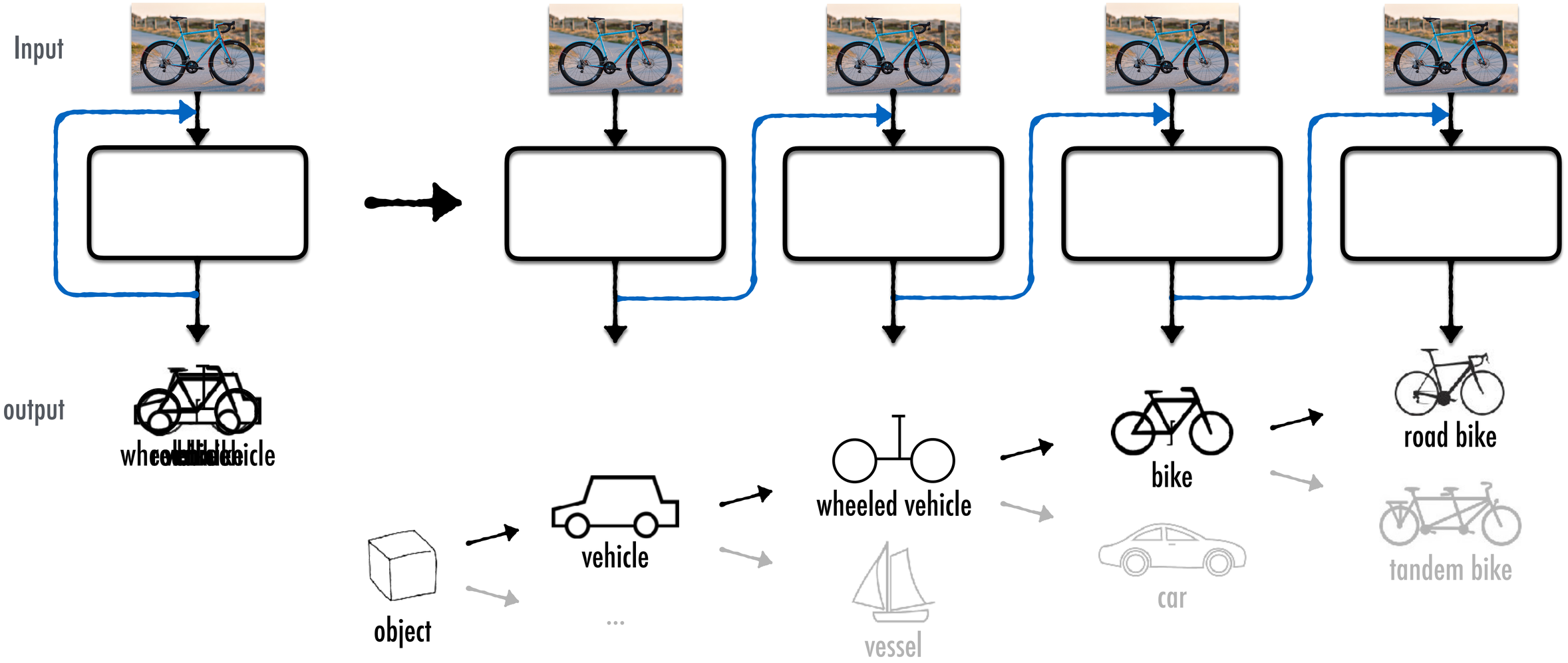
Feedback model.



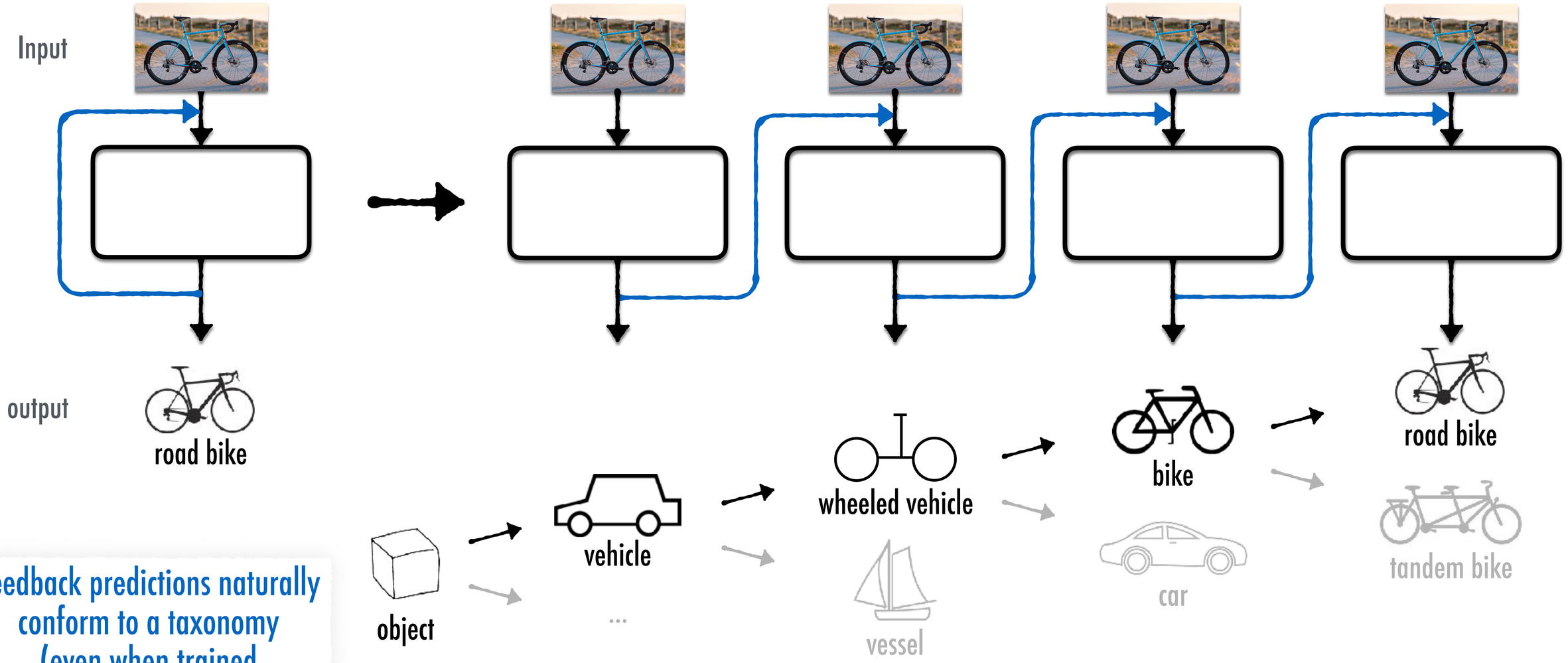
Feedback model unrolled.



Advantage I: Early Prediction



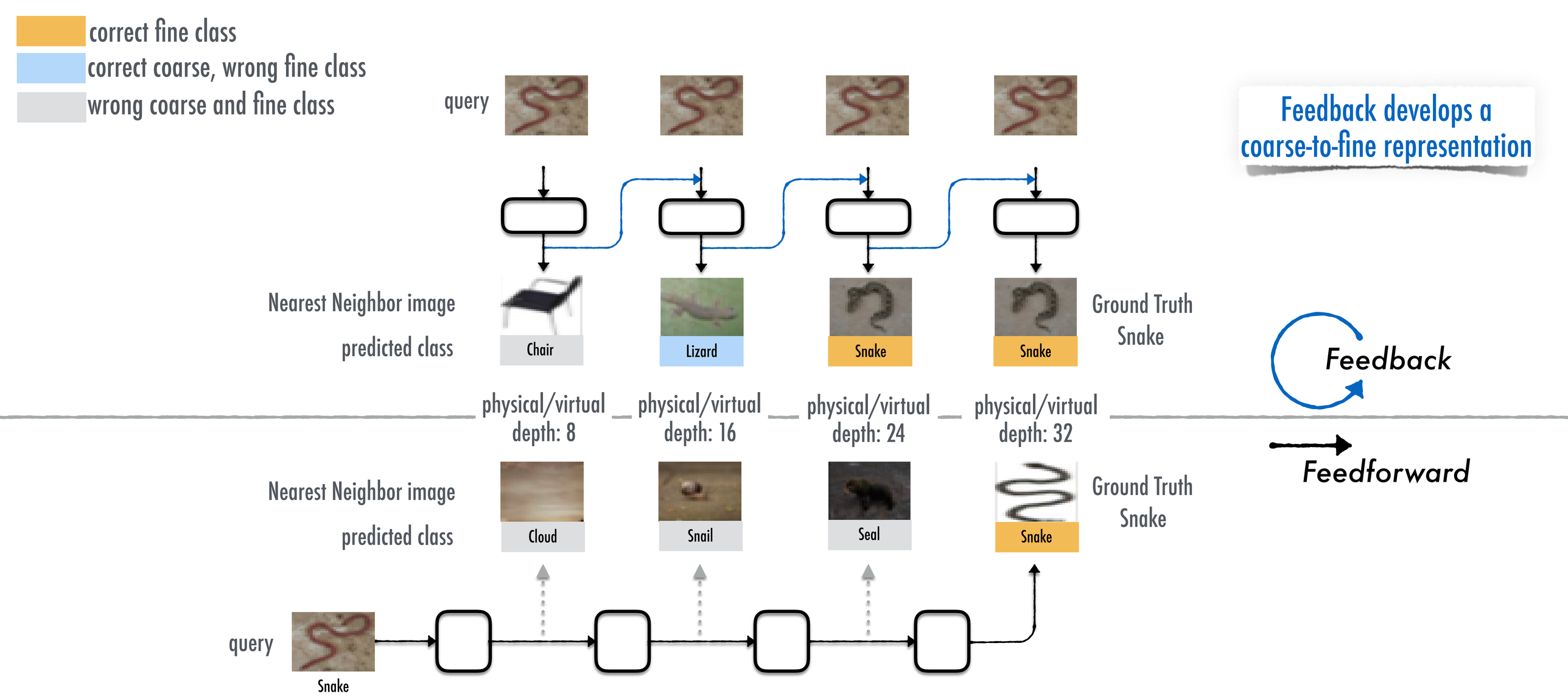
Advantage II: Taxonomic Prediction



Feedback predictions naturally conform to a taxonomy (even when trained without a taxonomy)

Advantage II: Taxonomic Prediction

Experimental Results

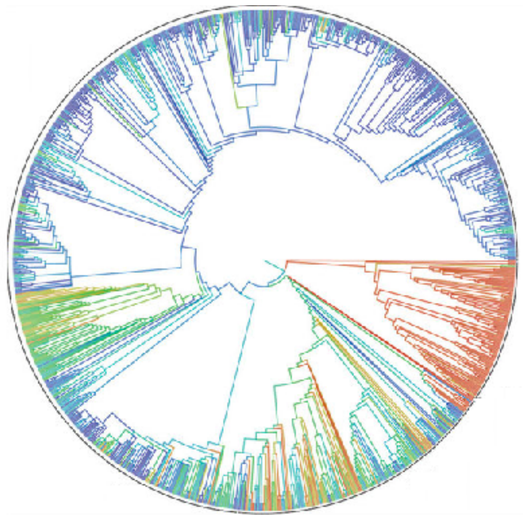


Qualitative results on CIFAR100 test set

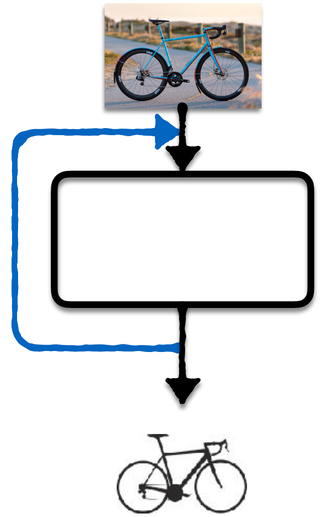
Intelligence as Efficiency

- Yielding higher value with less resources.

Efficient at learning

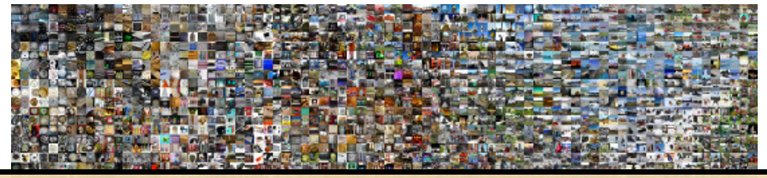


Efficient at testing



Yudkowsky, Efficient Cross-Domain Optimization, 2008.

An Exciting Time!



Fully Supervised Learning

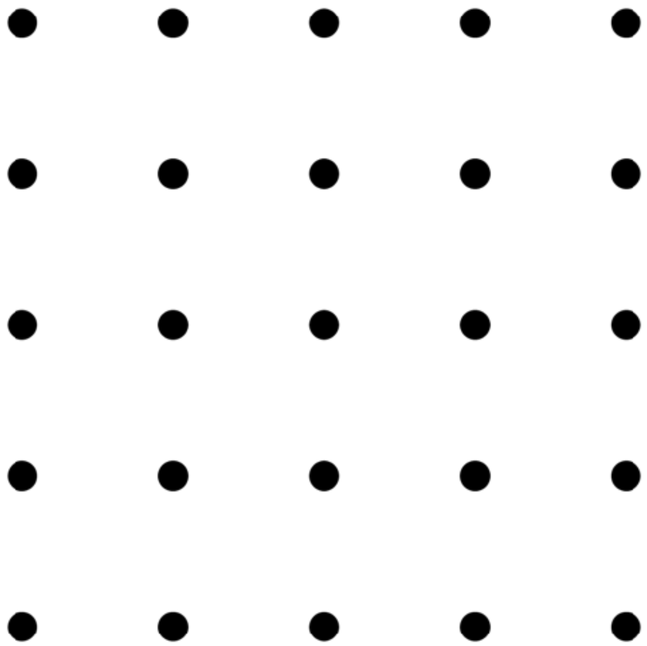
AlphaGo

IMAGENET

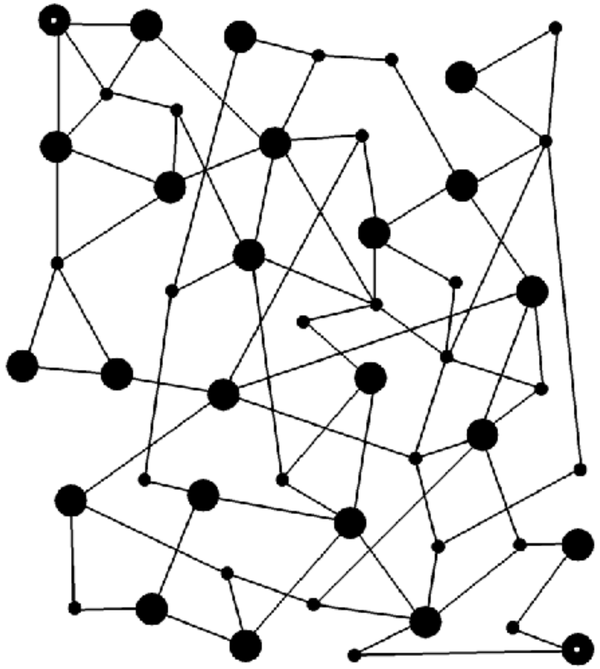
DEEPMIND

Fully Supervised Learning

Isolation ~ “Idiot Savant”

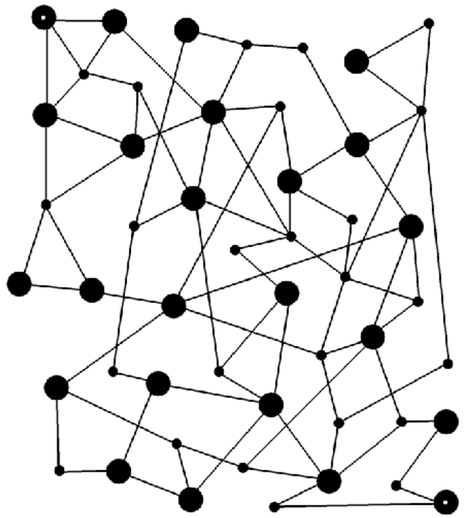


Task Interplay



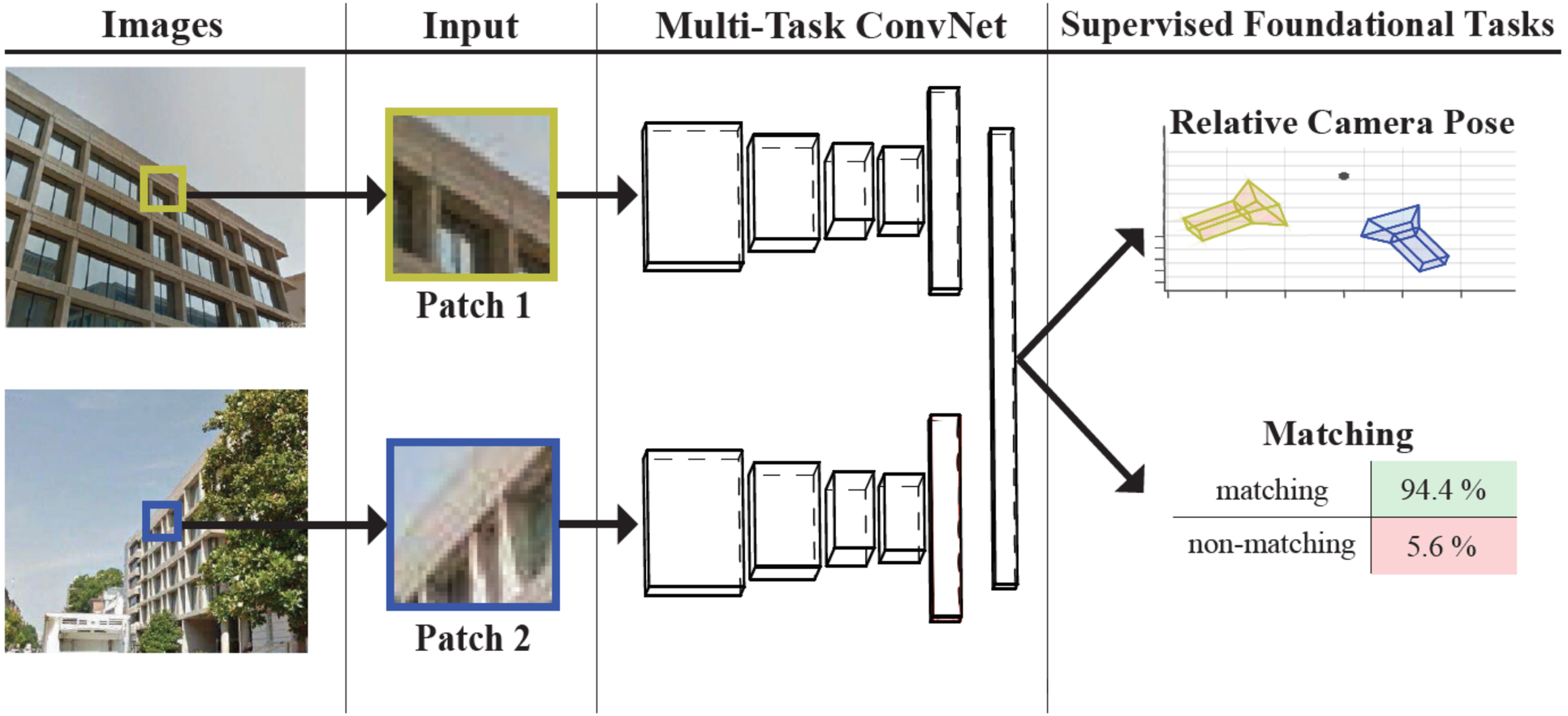
Task Interplay

Colorization → Object Detection



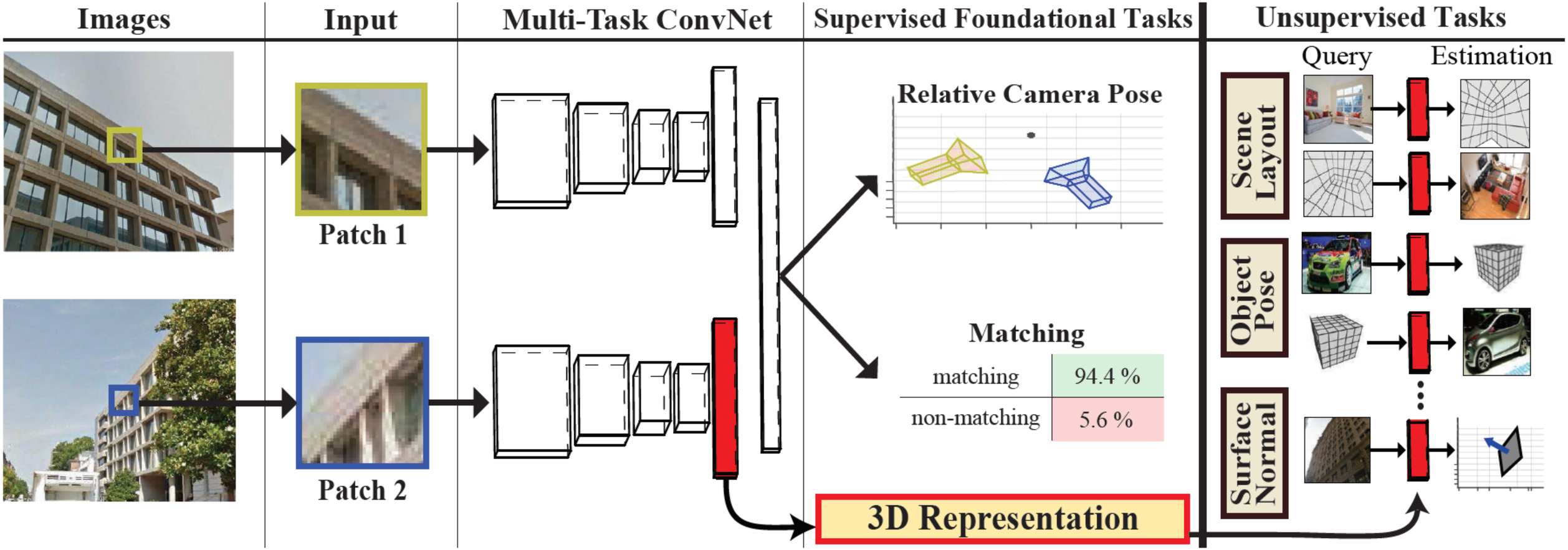
Zhang et al., Colorful Image Colorization, 2016.

Generic 3D Representation Learning



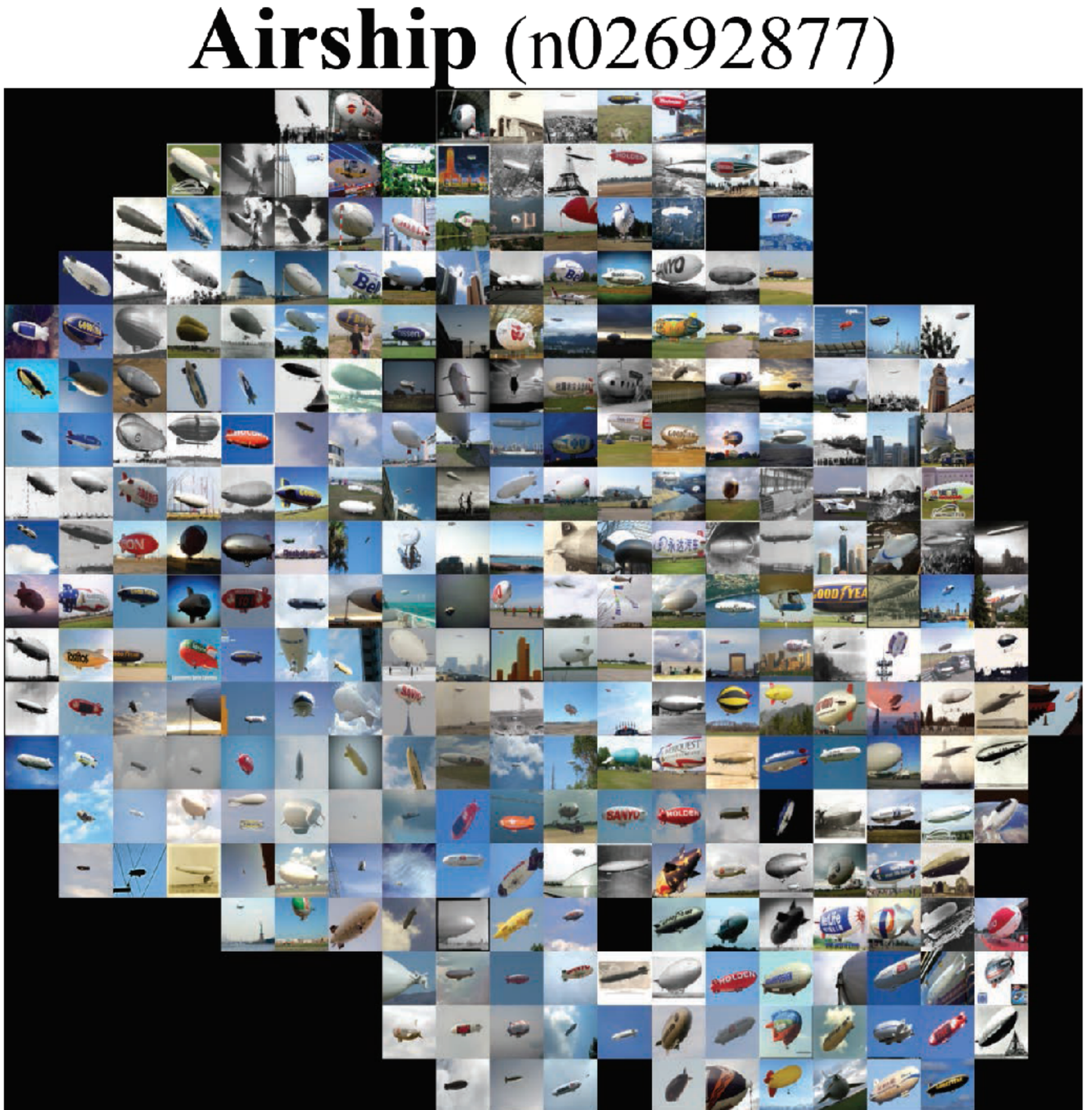
Generic 3D Representation via Pose Estimation and Matching.
Amir Zamir, Tilman Wekel, Pulkit Agrawal, Colin Wei, Jitendra Malik, Silvio Savarese.
ECCV 2016.

Generic 3D Representation Learning



Generic 3D Representation via Pose Estimation and Matching.
Amir Zamir, Tilman Wekel, Pulkit Agrawal, Colin Wei, Jitendra Malik, Silvio Savarese.
ECCV 2016.

3D Object Pose - ImageNet



Demo

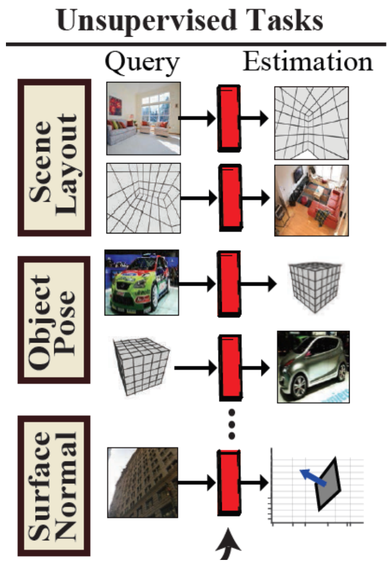
http://3drepresentation.stanford.edu/

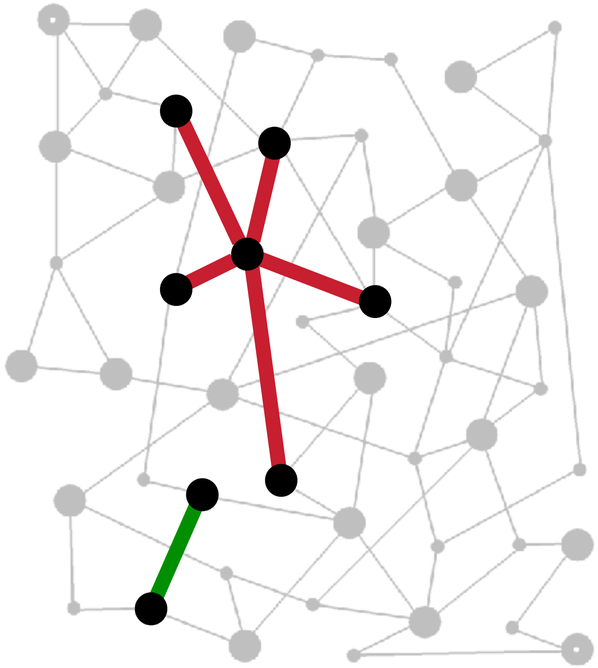
Query Image

Generic 3D Representation

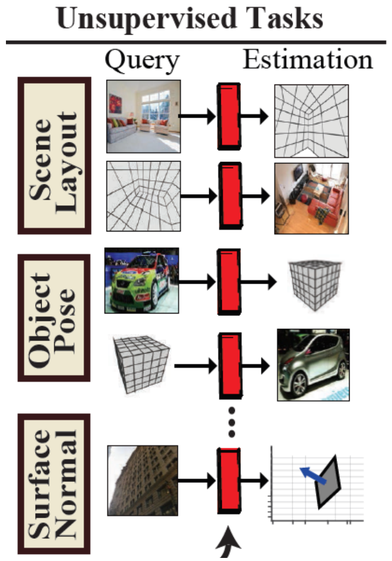
ImageNet (AlexNet)

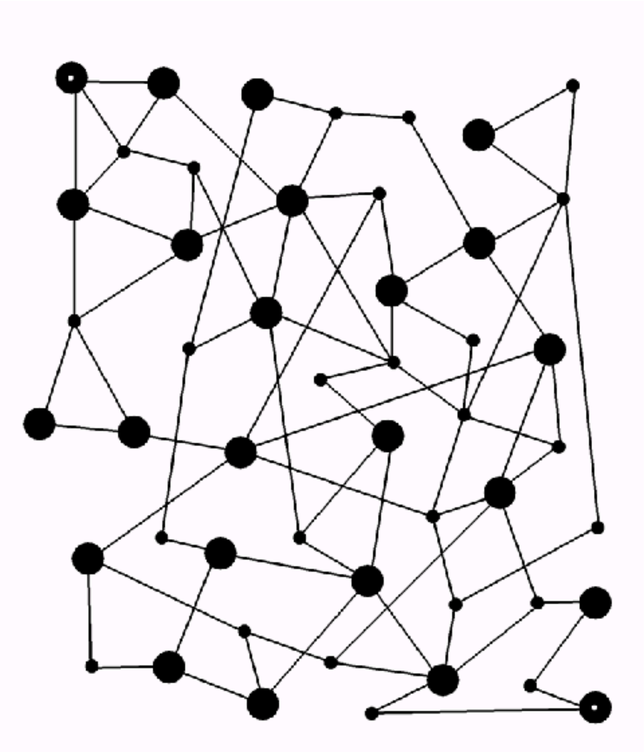
Task Interplay





Task Interplay



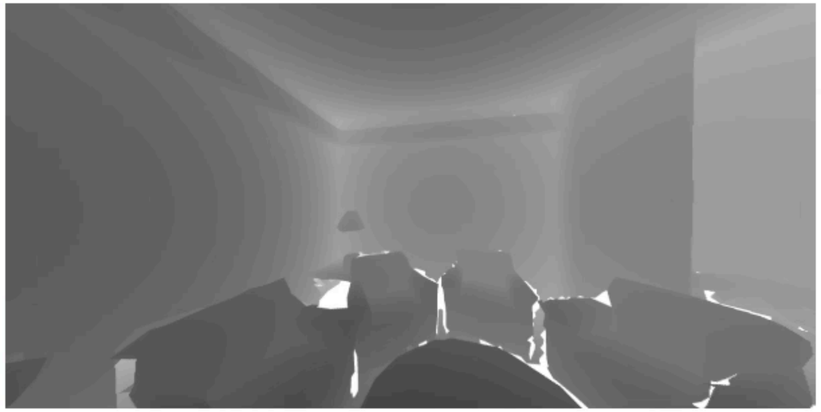


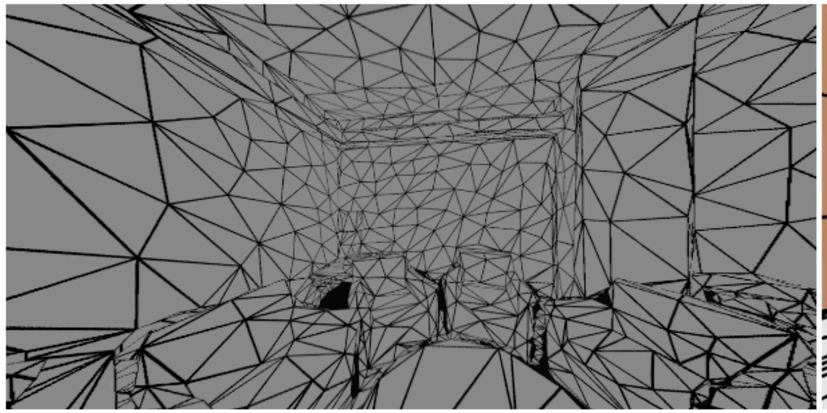
Unpublished Content

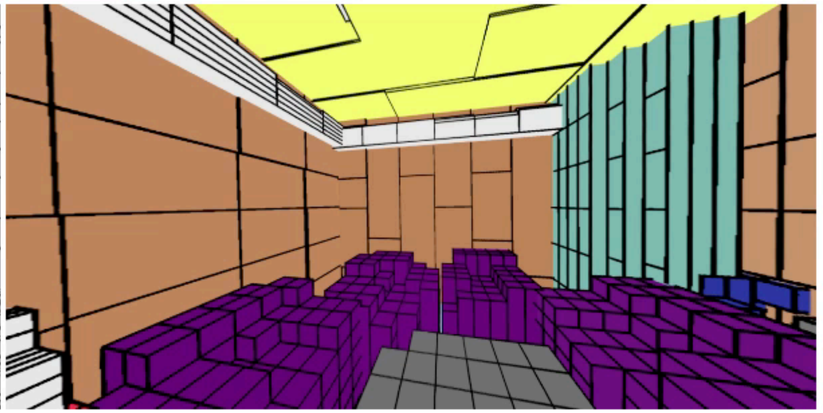
RGB image

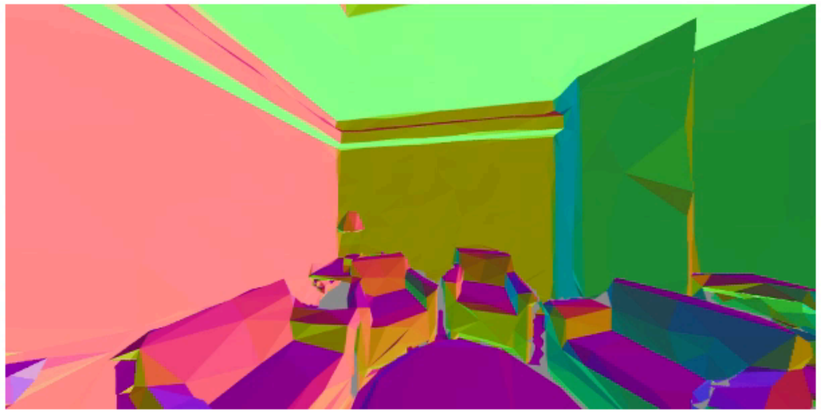
Semantics in 2D

Depth









3D Mesh

Semantics in 3D

Surface Normals

Sasha Sax

William Shen

Te-Lin Wu

Jerry He

Leonidas Guibas

Jitendra Malik

Silvio Savarese

Thank you!

Amir R. Zamir
zamir@cs.stanford.edu