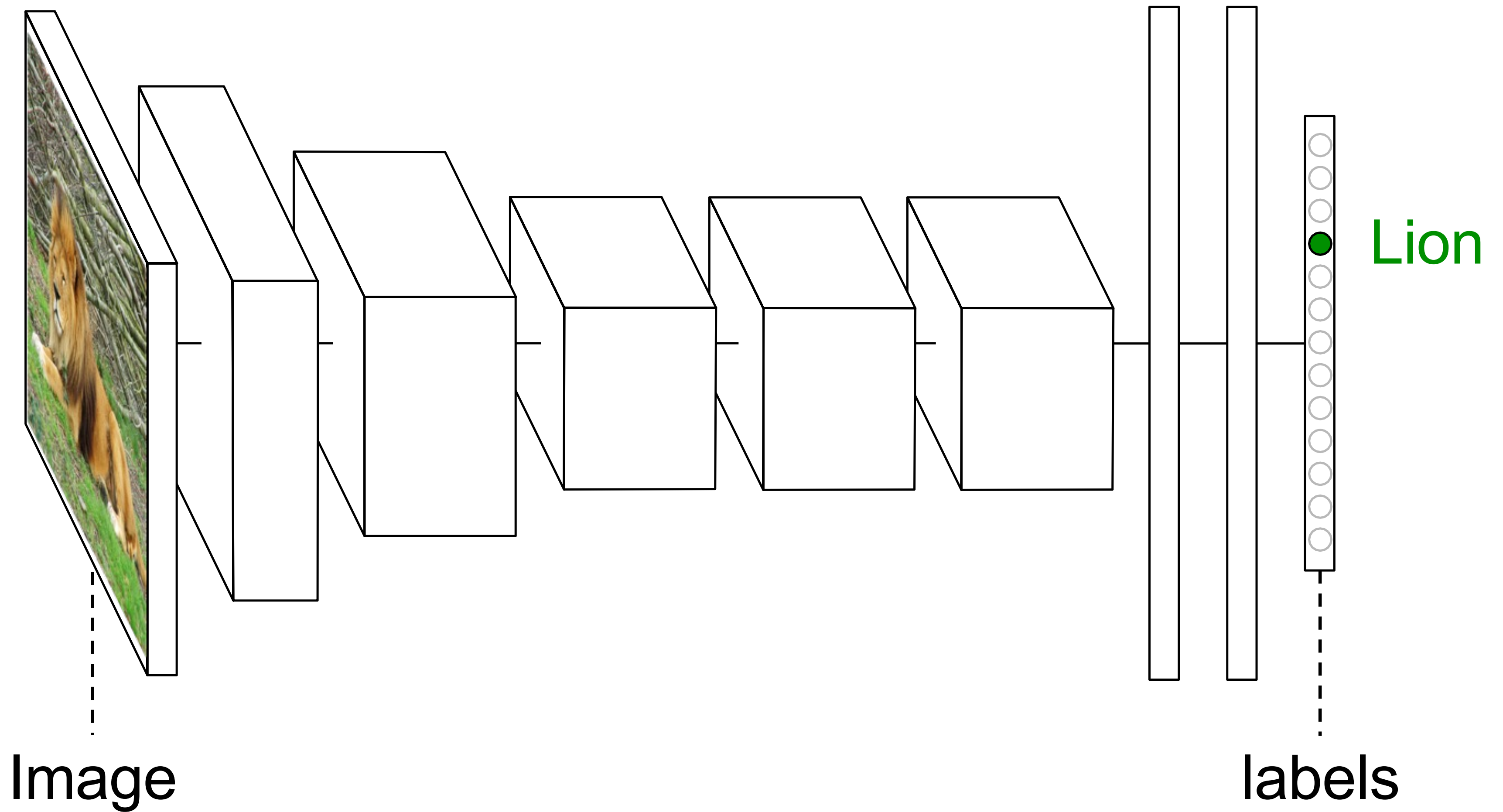
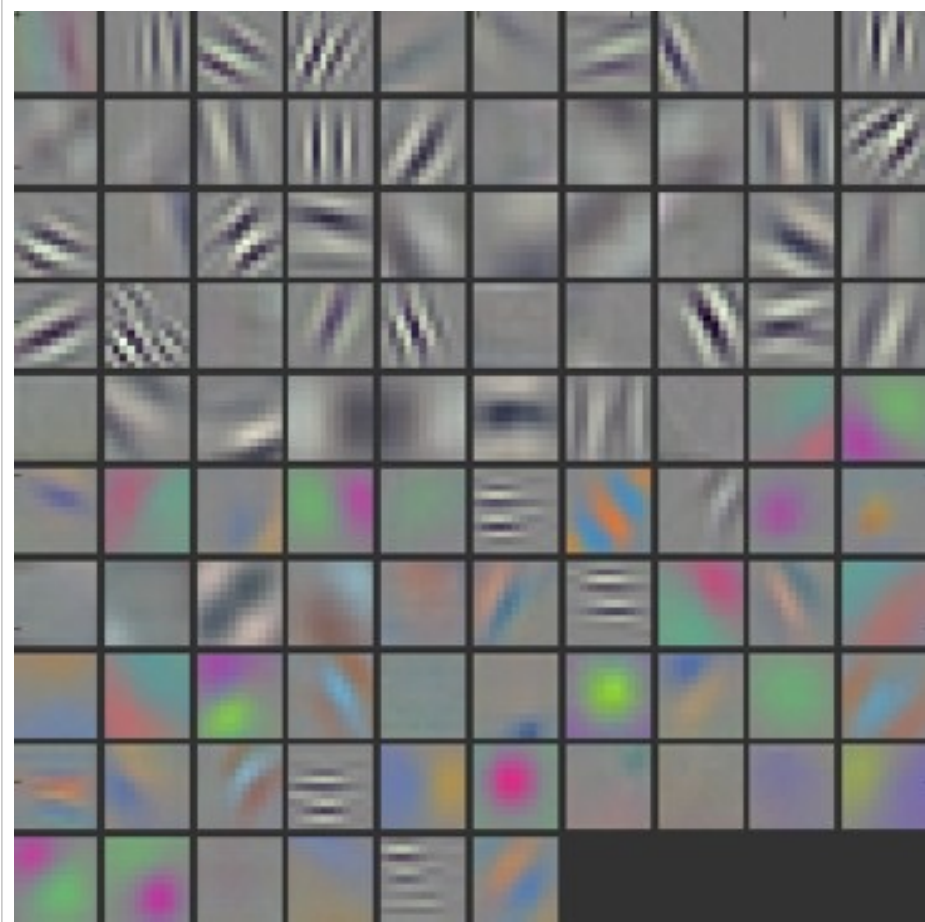


The Bridge: Transferable Feature towards Advanced Mechanism

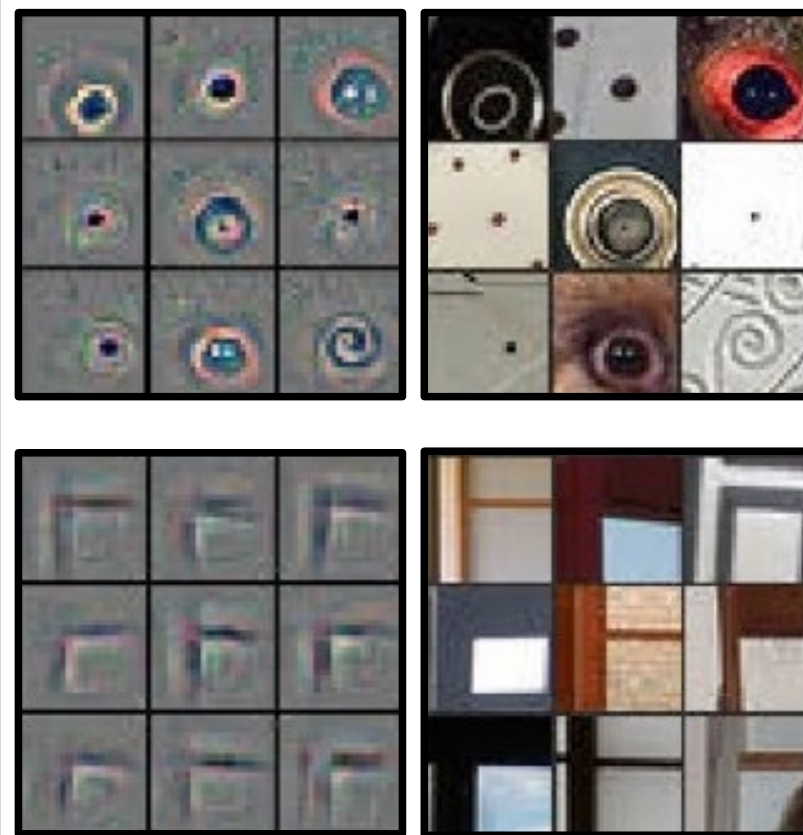
AlexNet



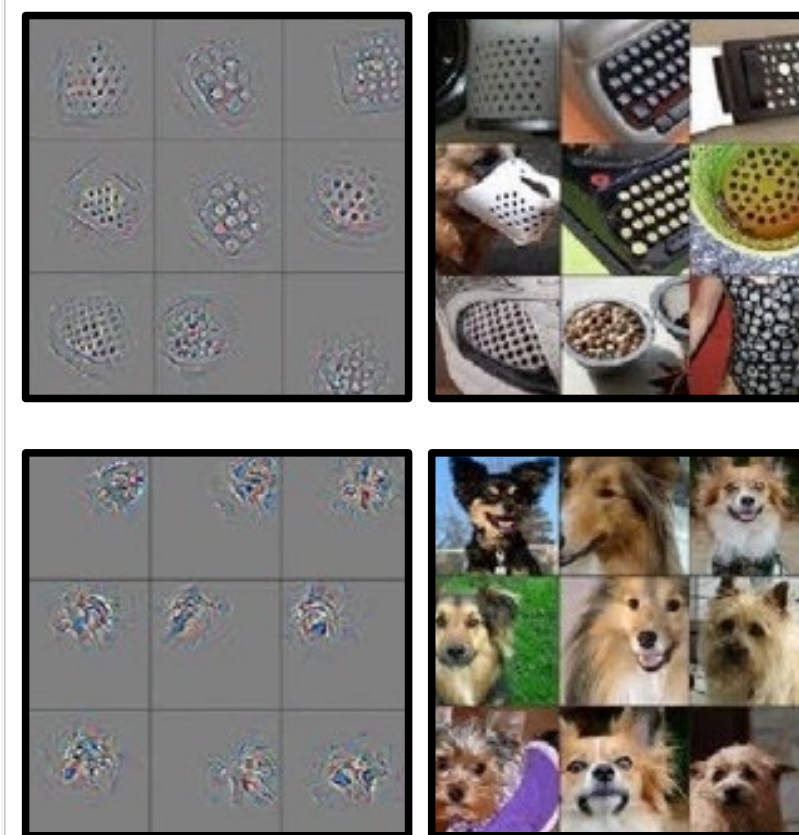
Krizhevsky, Sutskever, Hinton — NIPS 2012



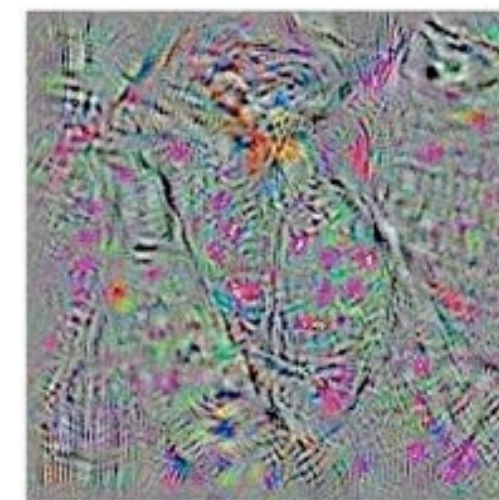
Layer 1
Gabor +
color blobs



Layer 2



Layer 5



Windsor tie: 0.998959



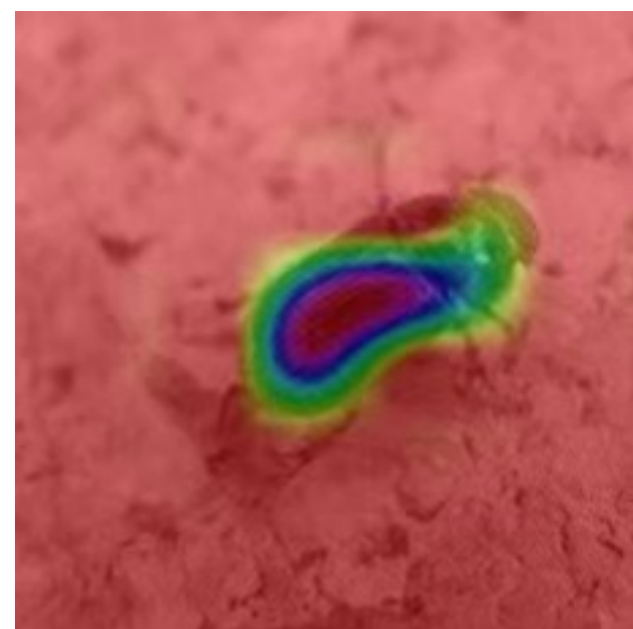
Windsor tie: 0.992462

Last
Layer

Zeiler et al.
arXiv 2013, ECCV 2014

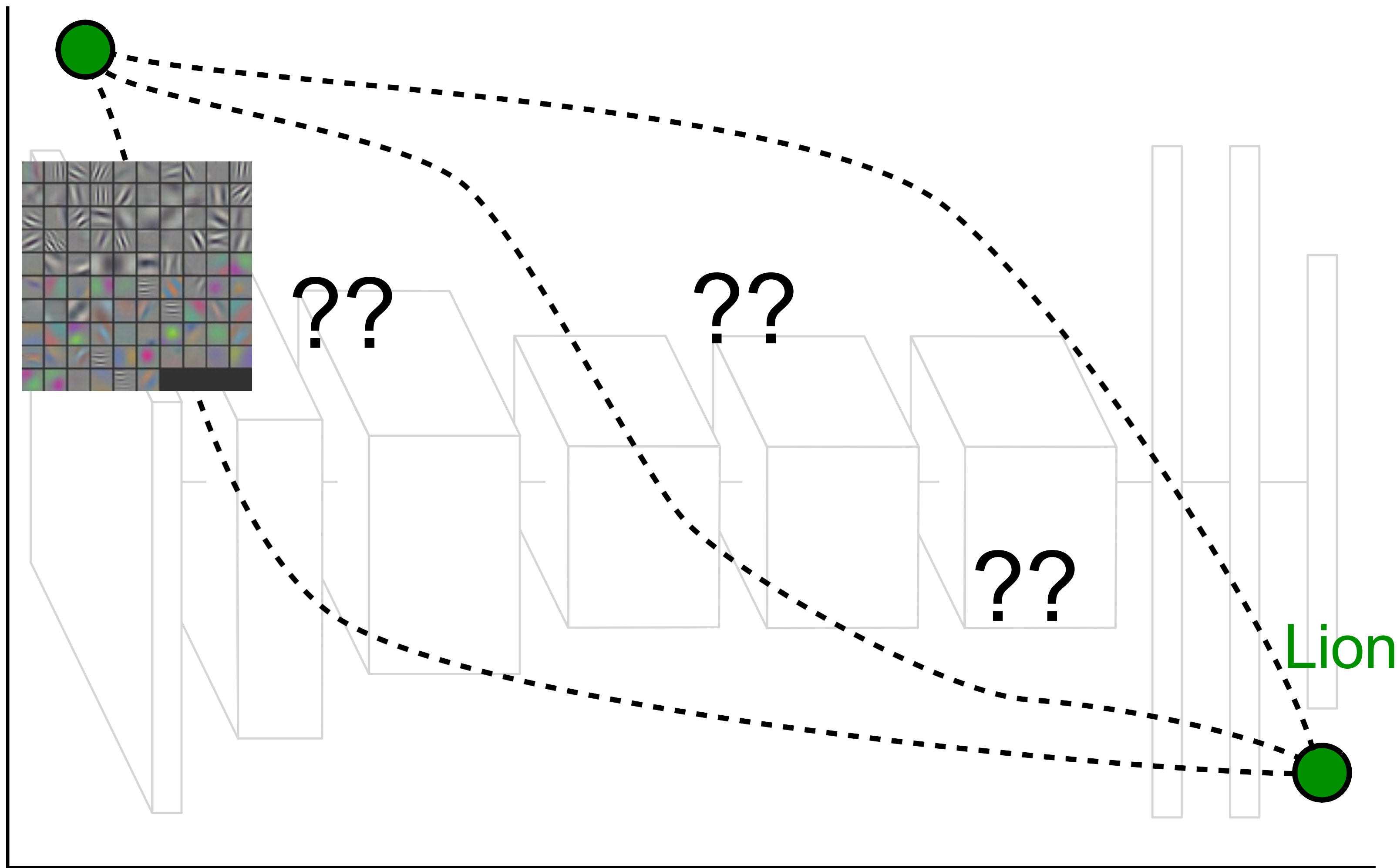
Nguyen et al.
arXiv 2014

Activation



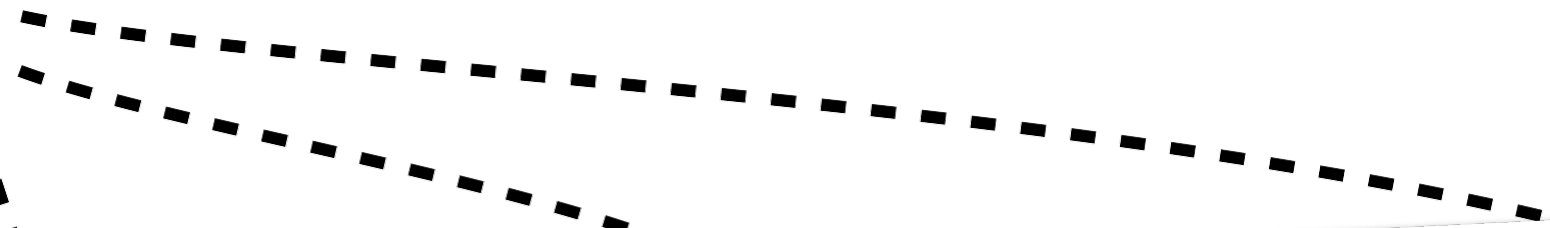
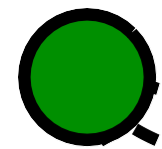
general

specific



Layer number

general



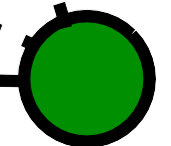
Main idea:
Quantify the *general* to *specific* transition
by using transfer learning.

Depends on tasks A and B.

Very useful to know!

specific

Lion



Layer number

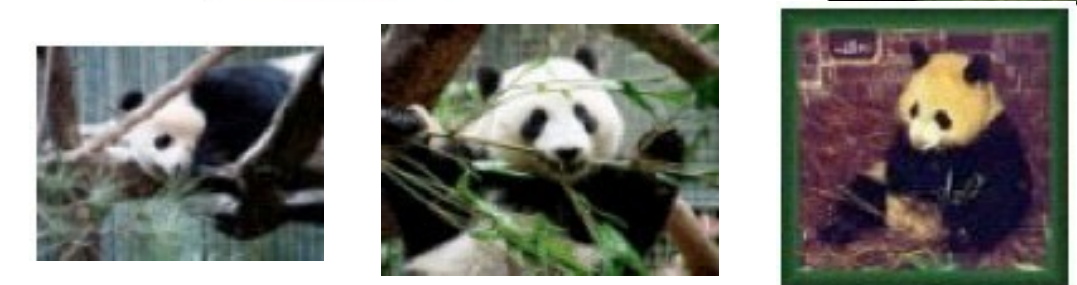
ImageNet



1000 Classes

dataset

A



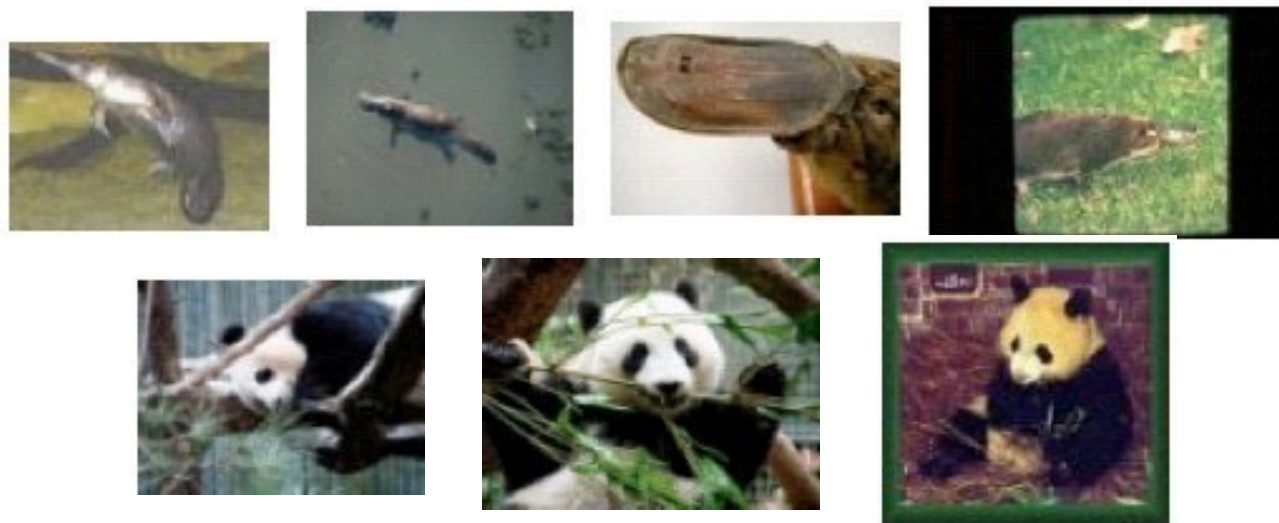
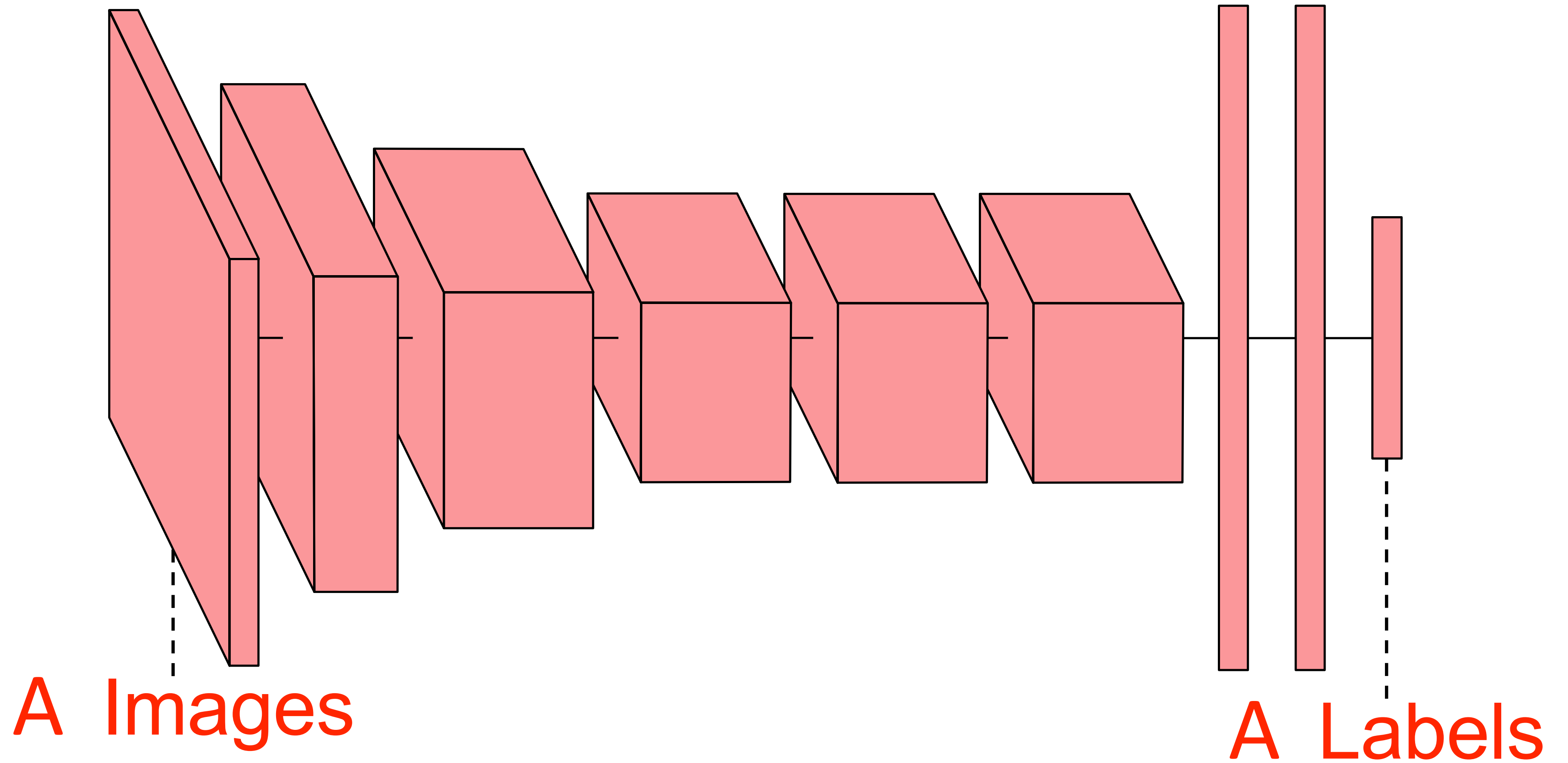
500 Classes

dataset

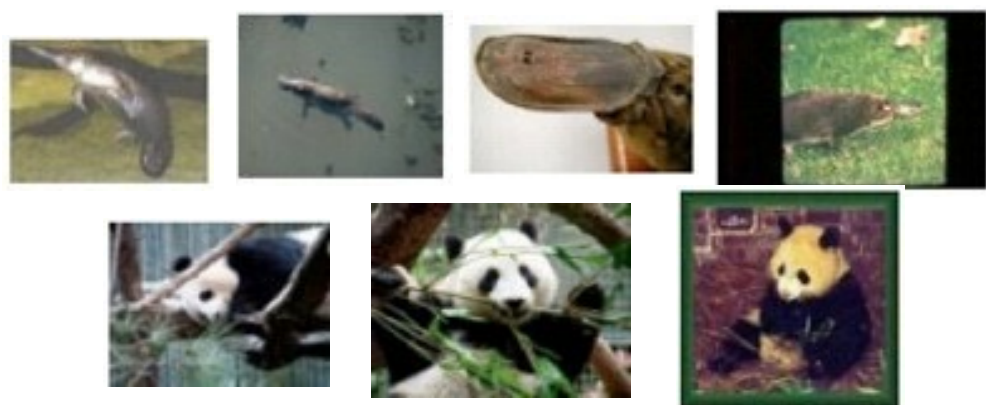
B



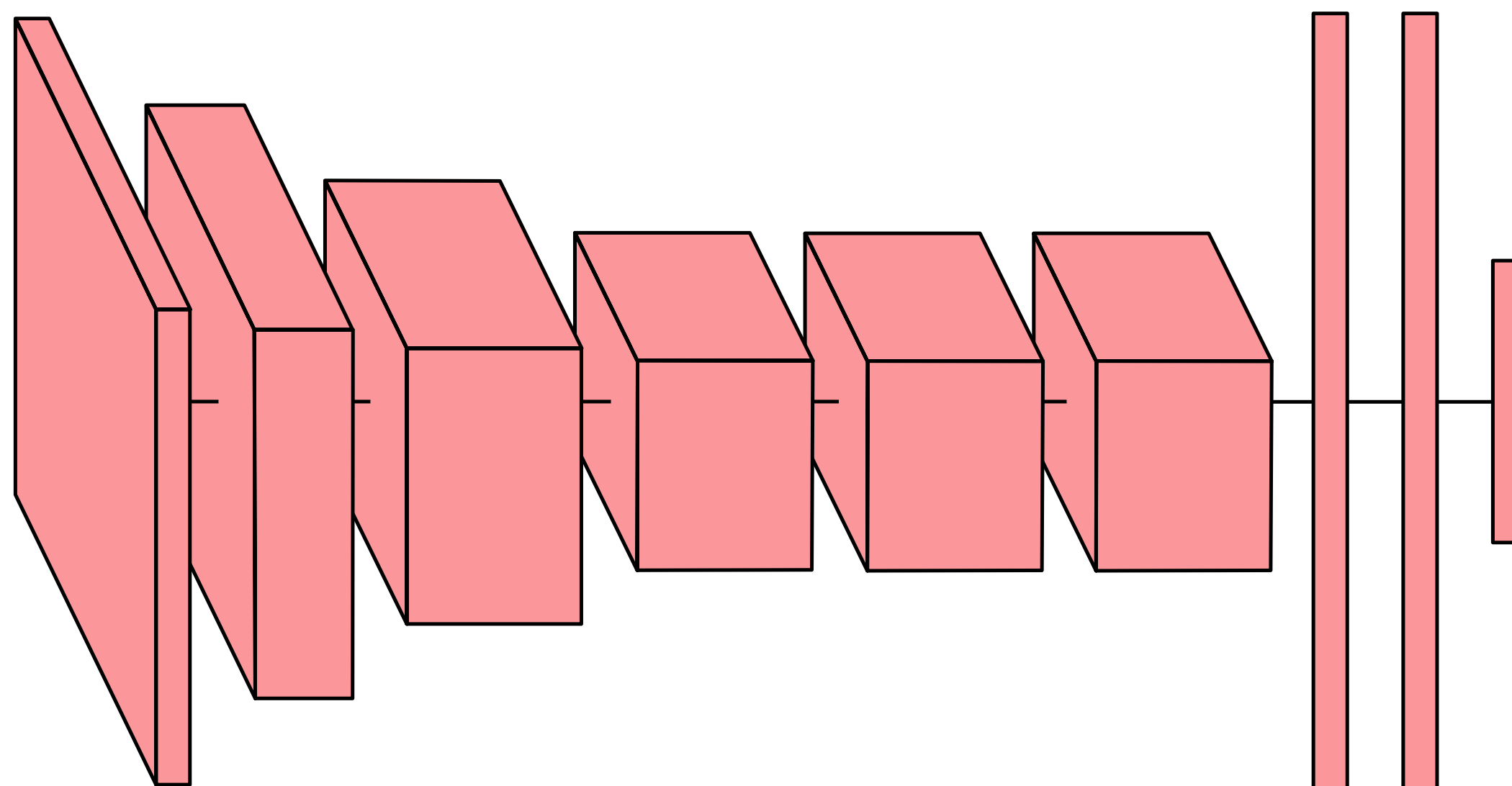
500 Classes



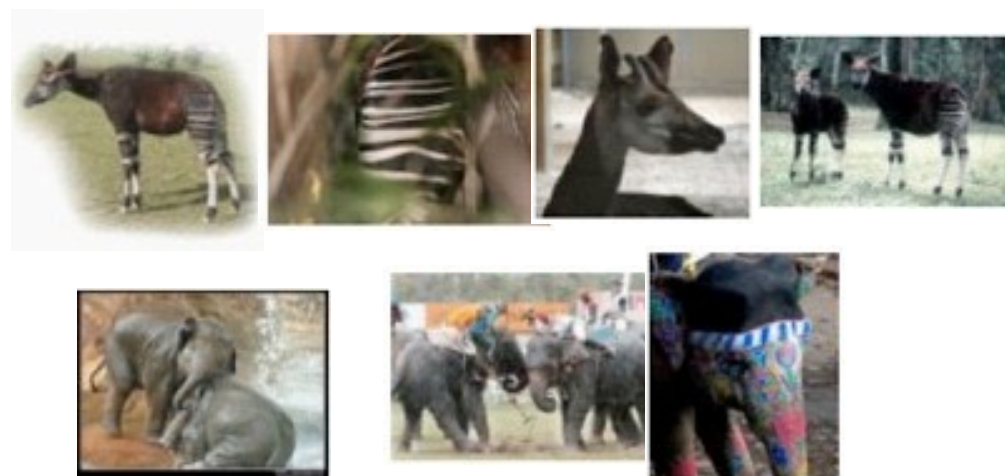
Train using Caffe framework (Jia et al.)



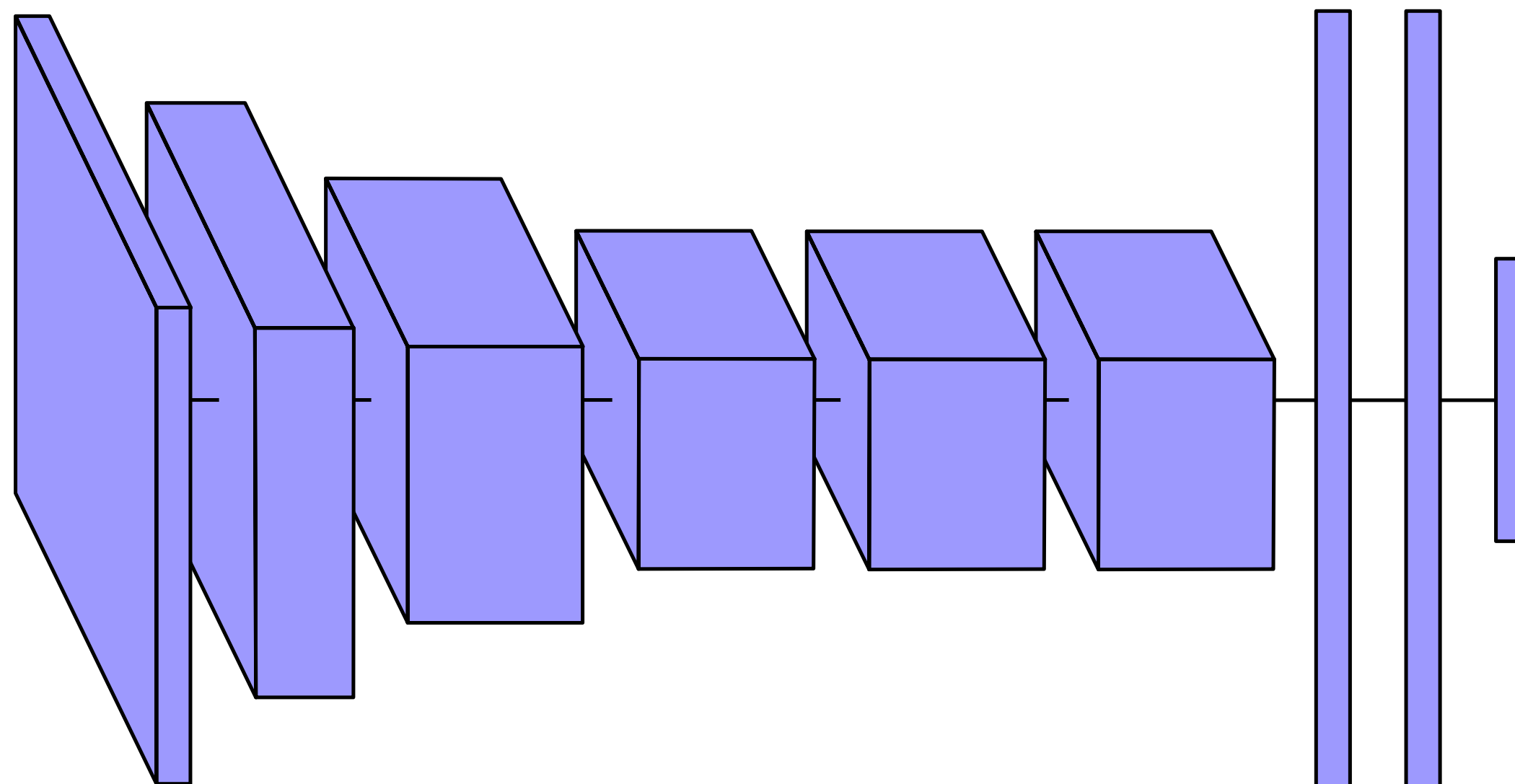
A Images



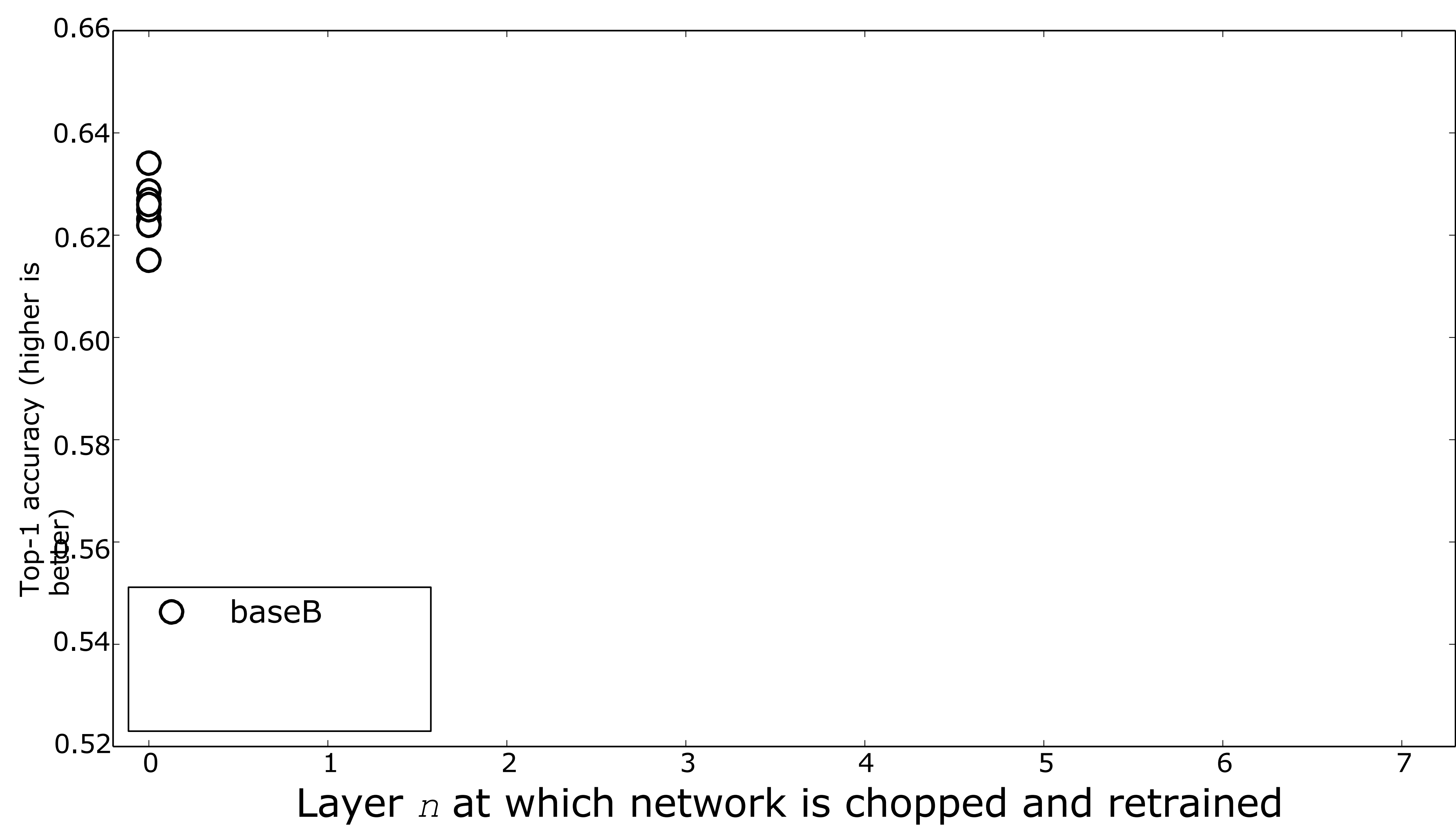
baseA

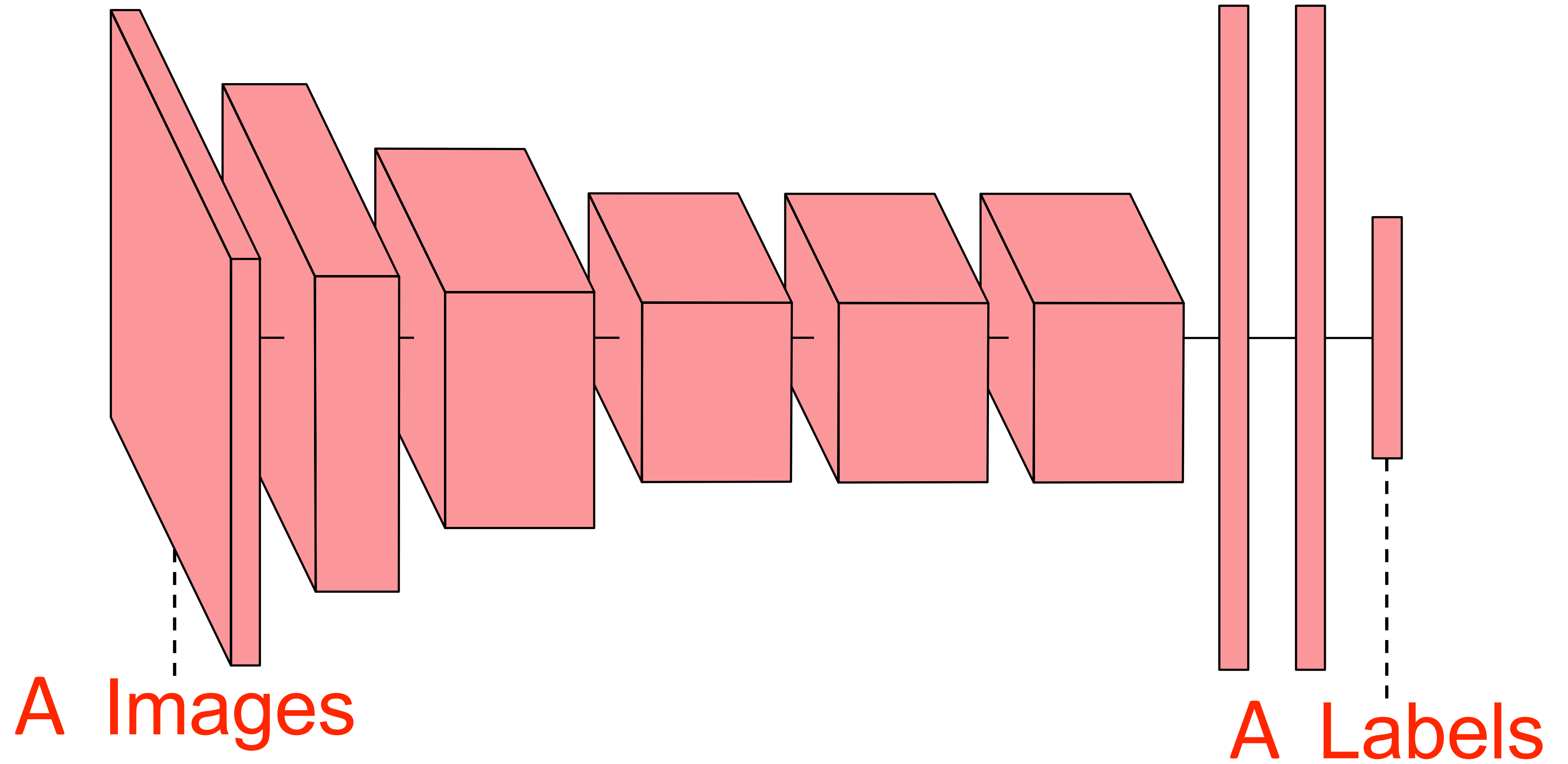


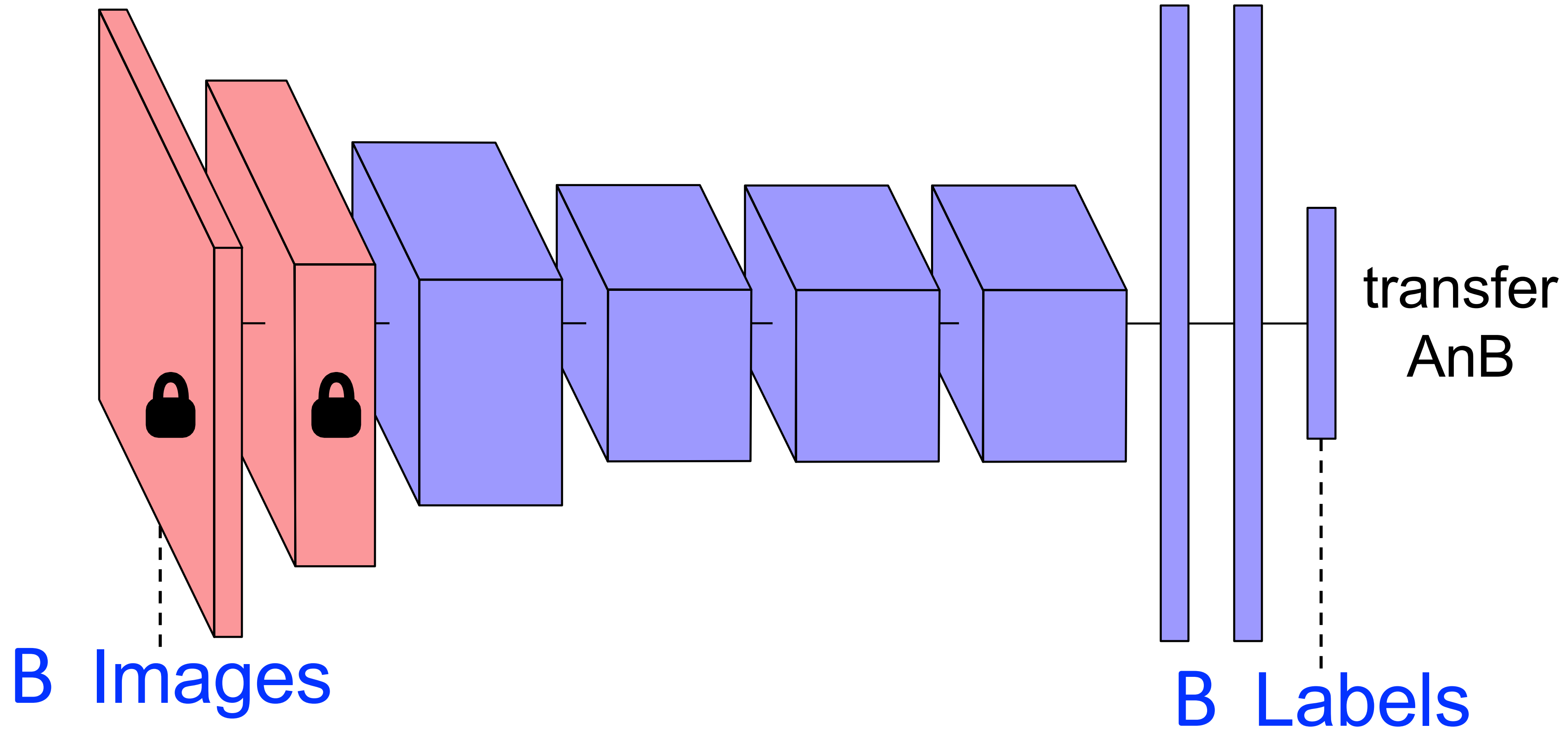
B Images

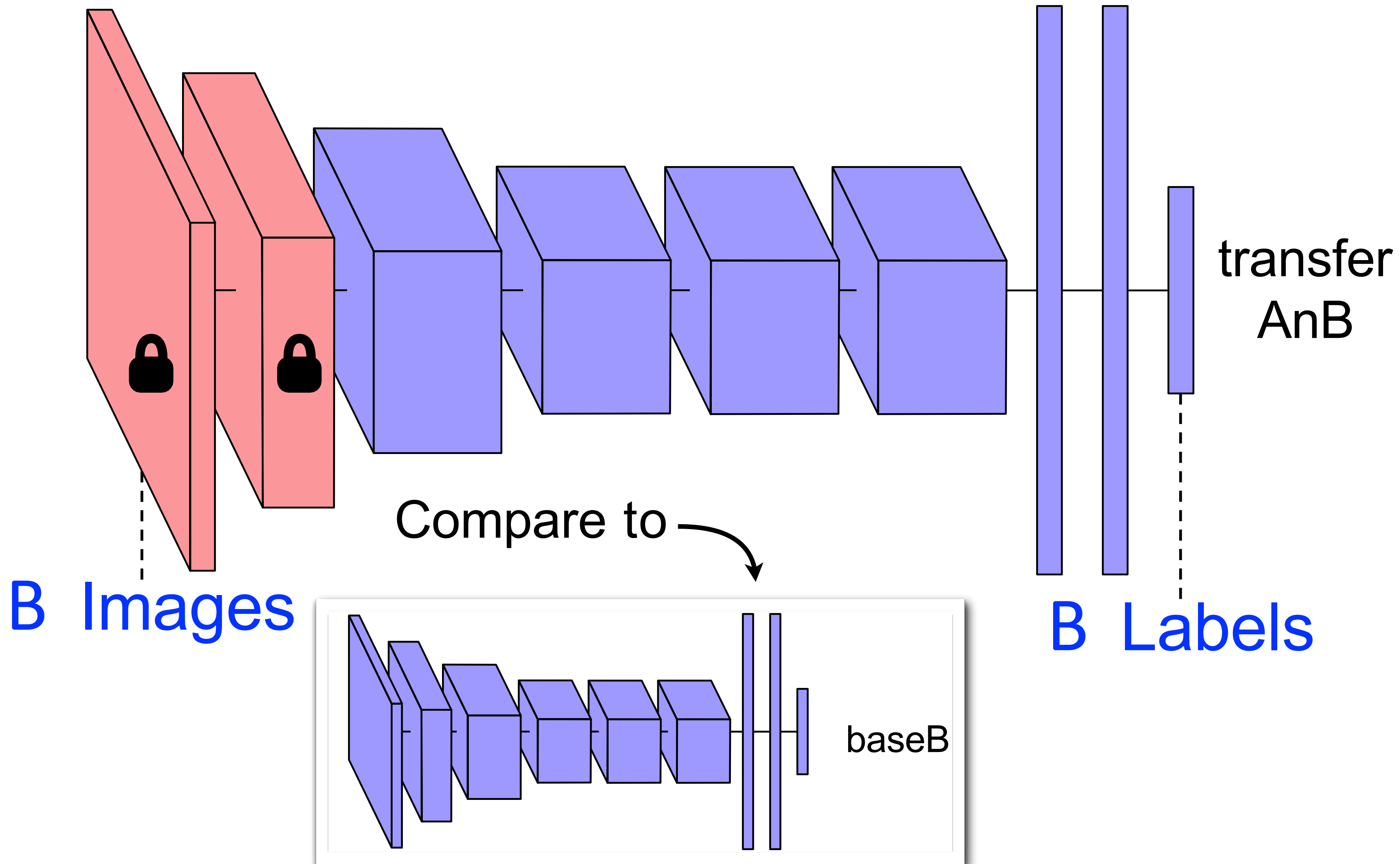


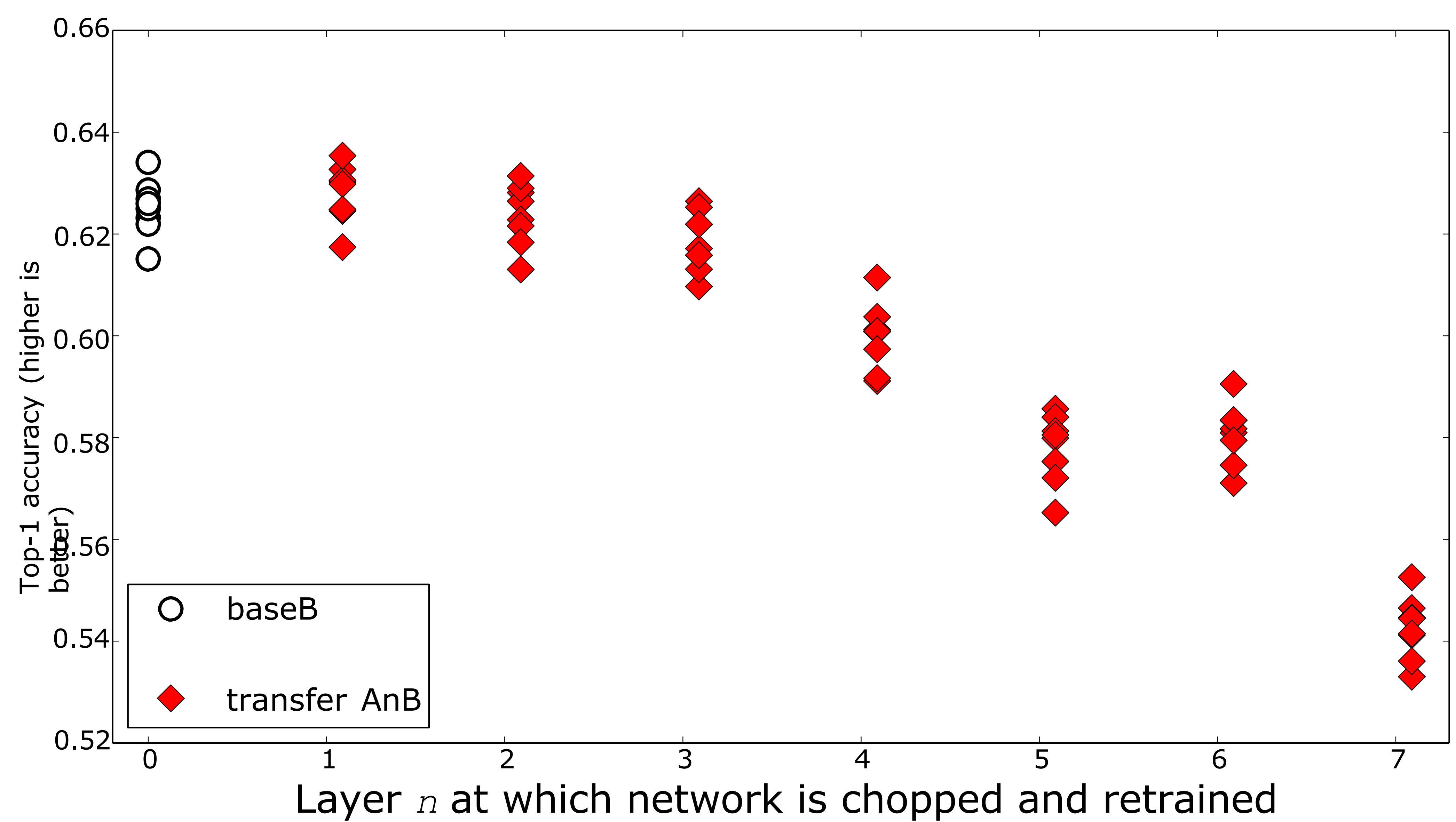
baseB

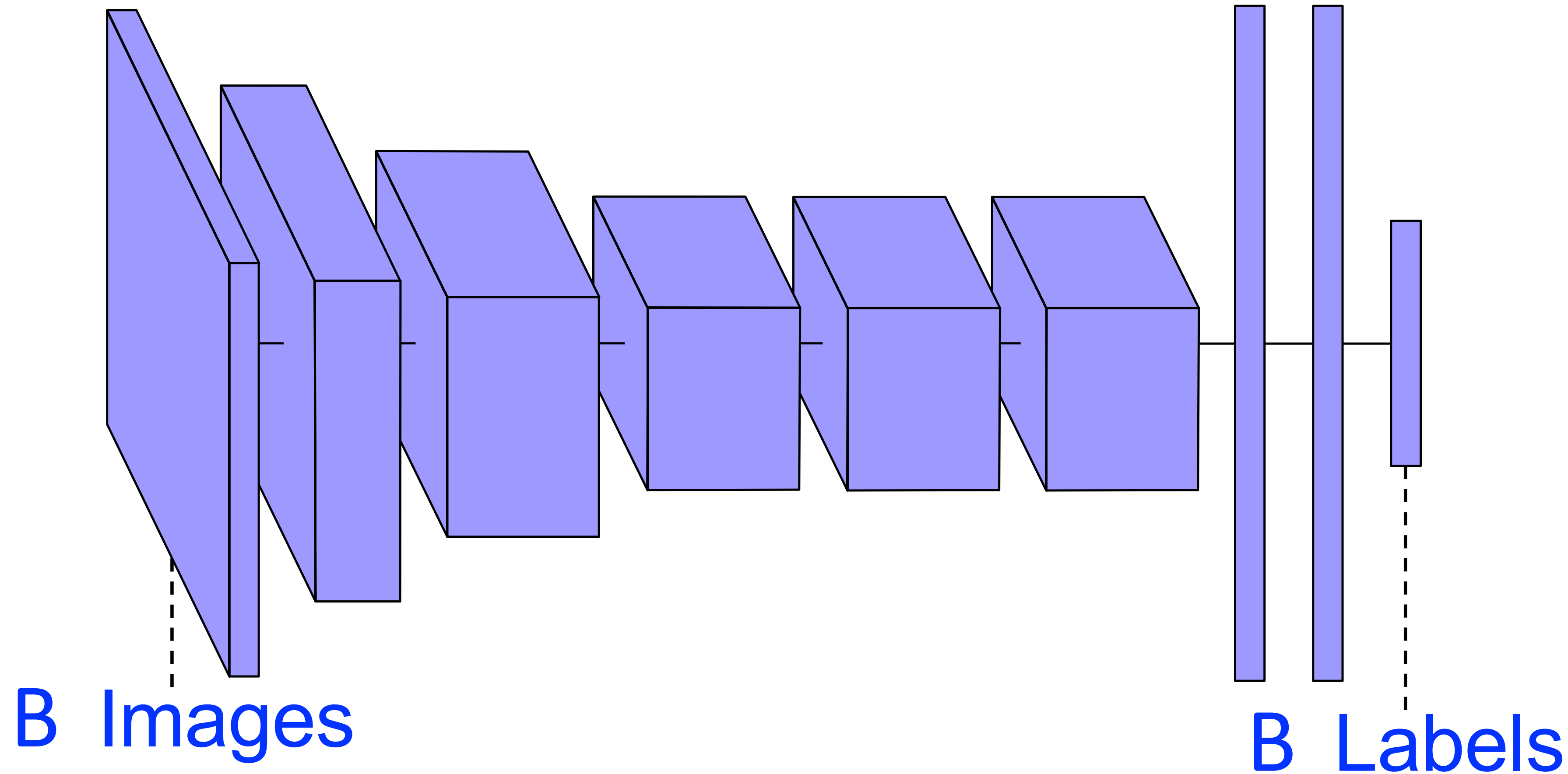


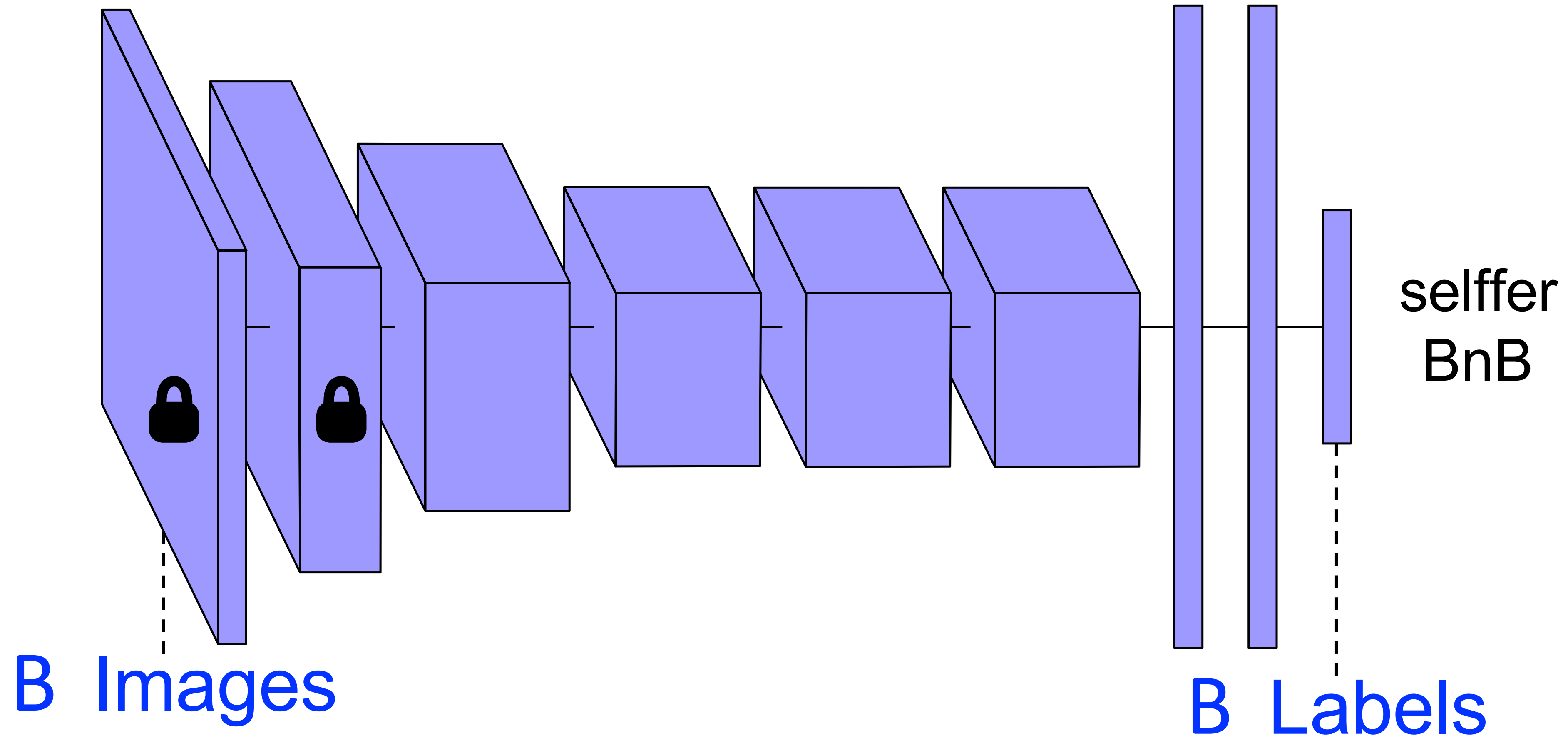


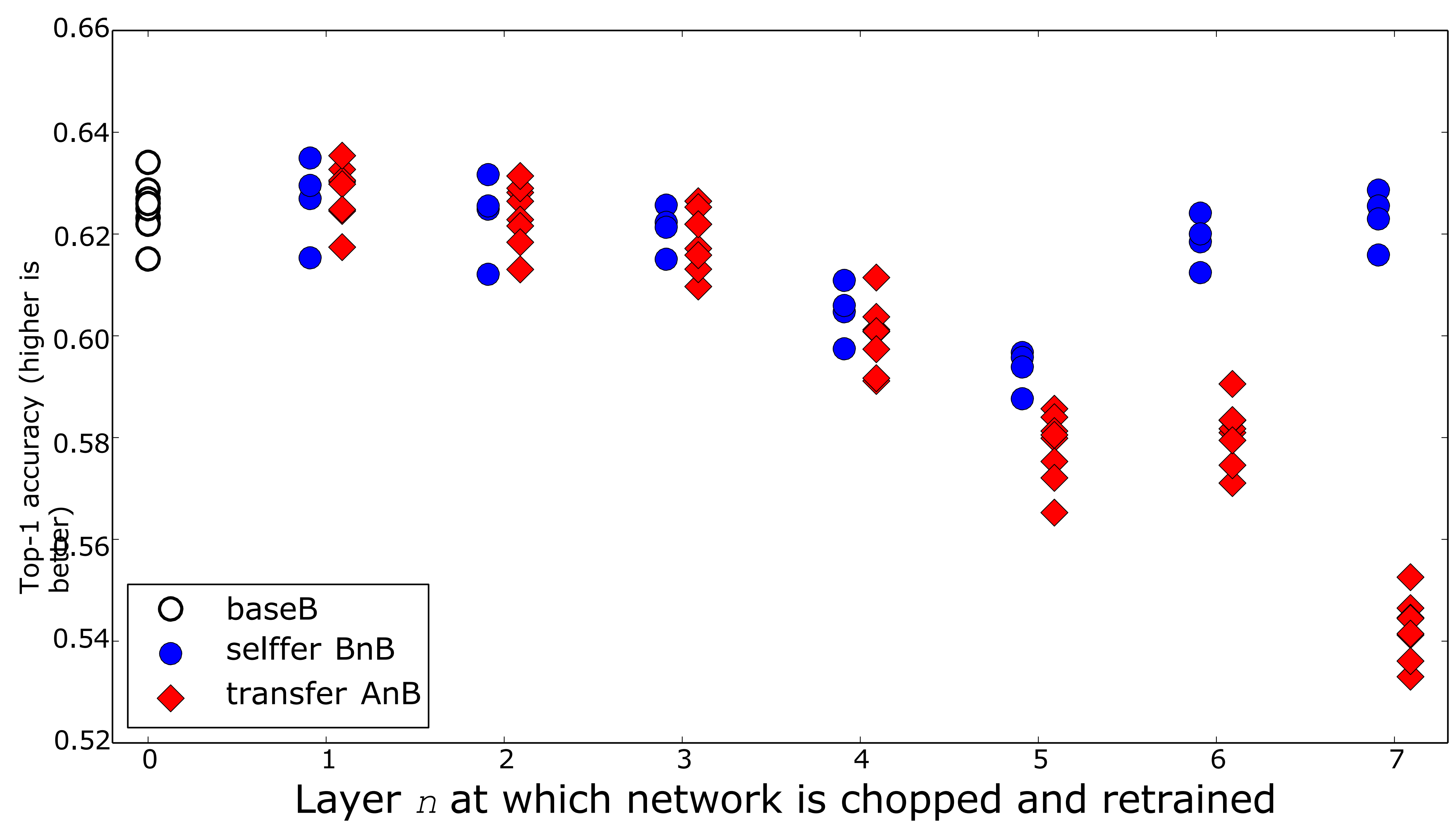


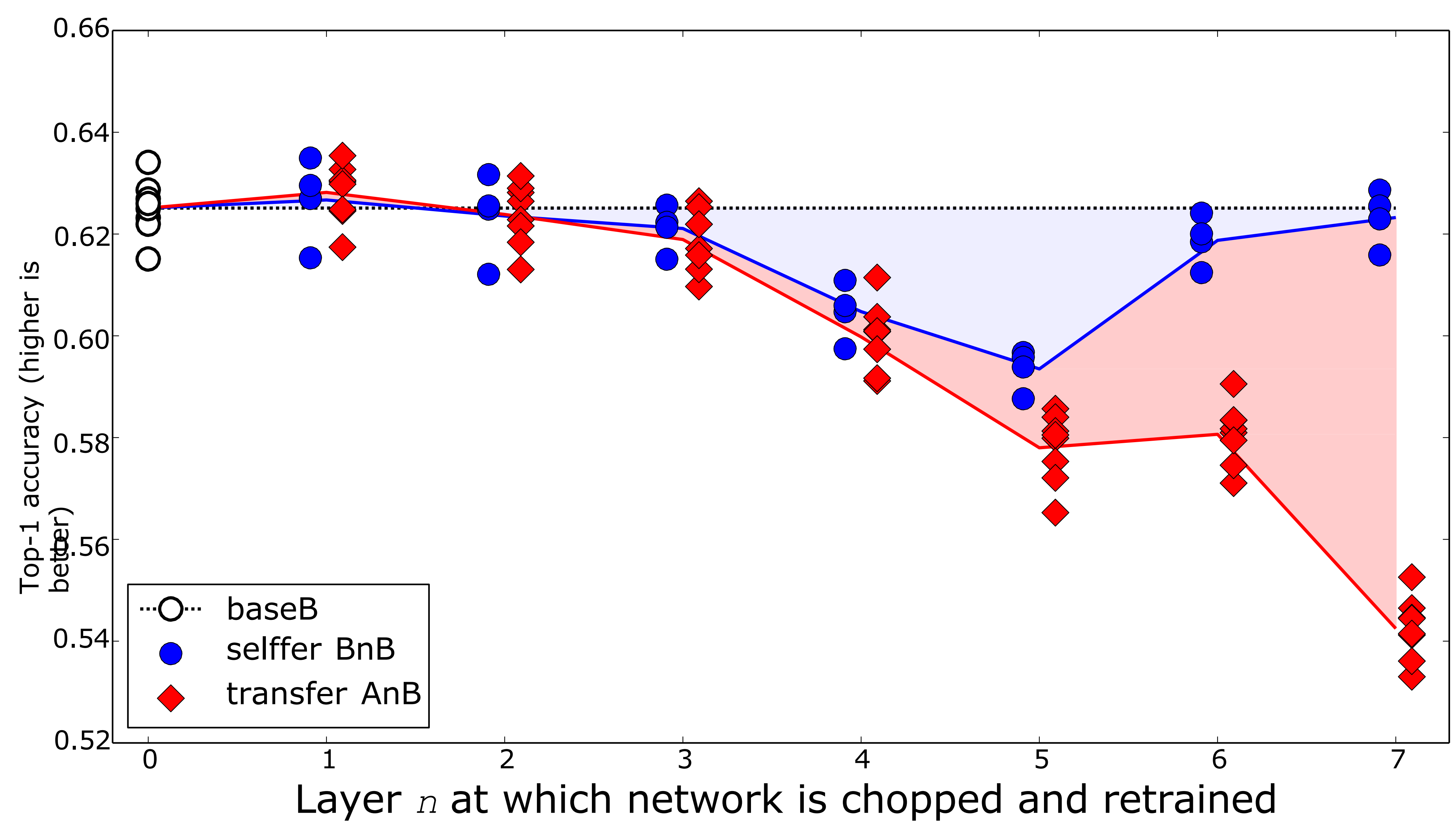


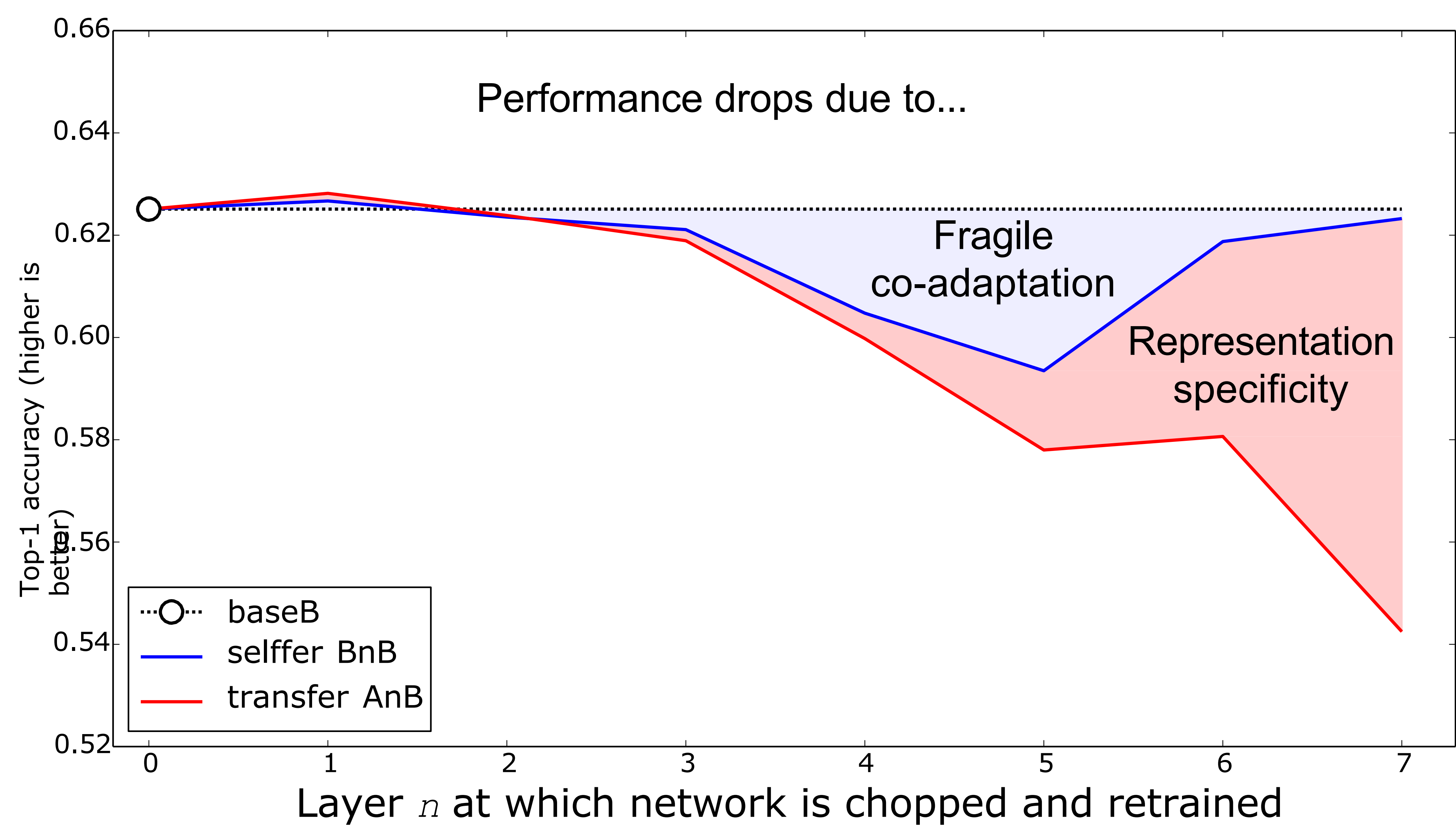


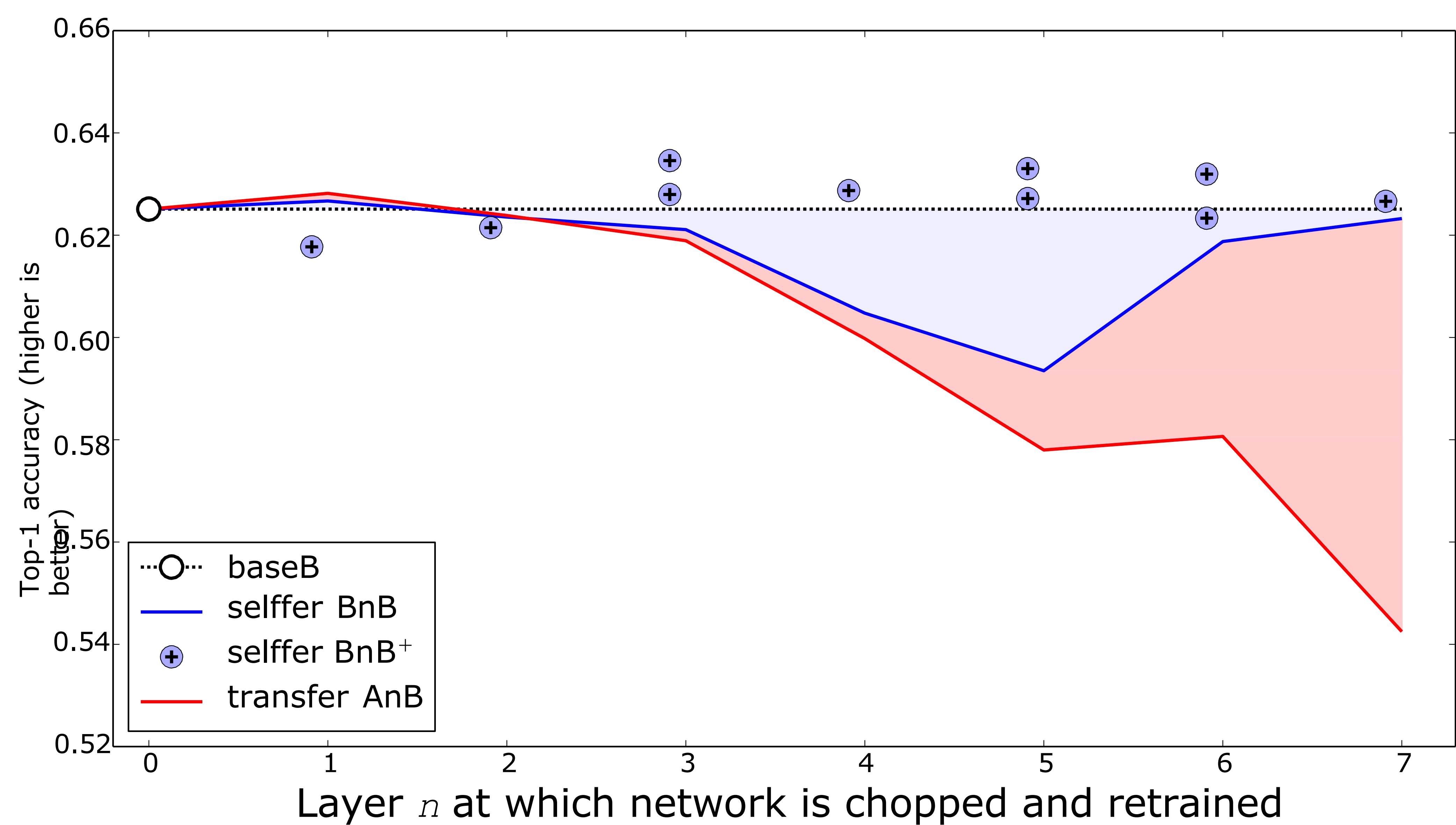


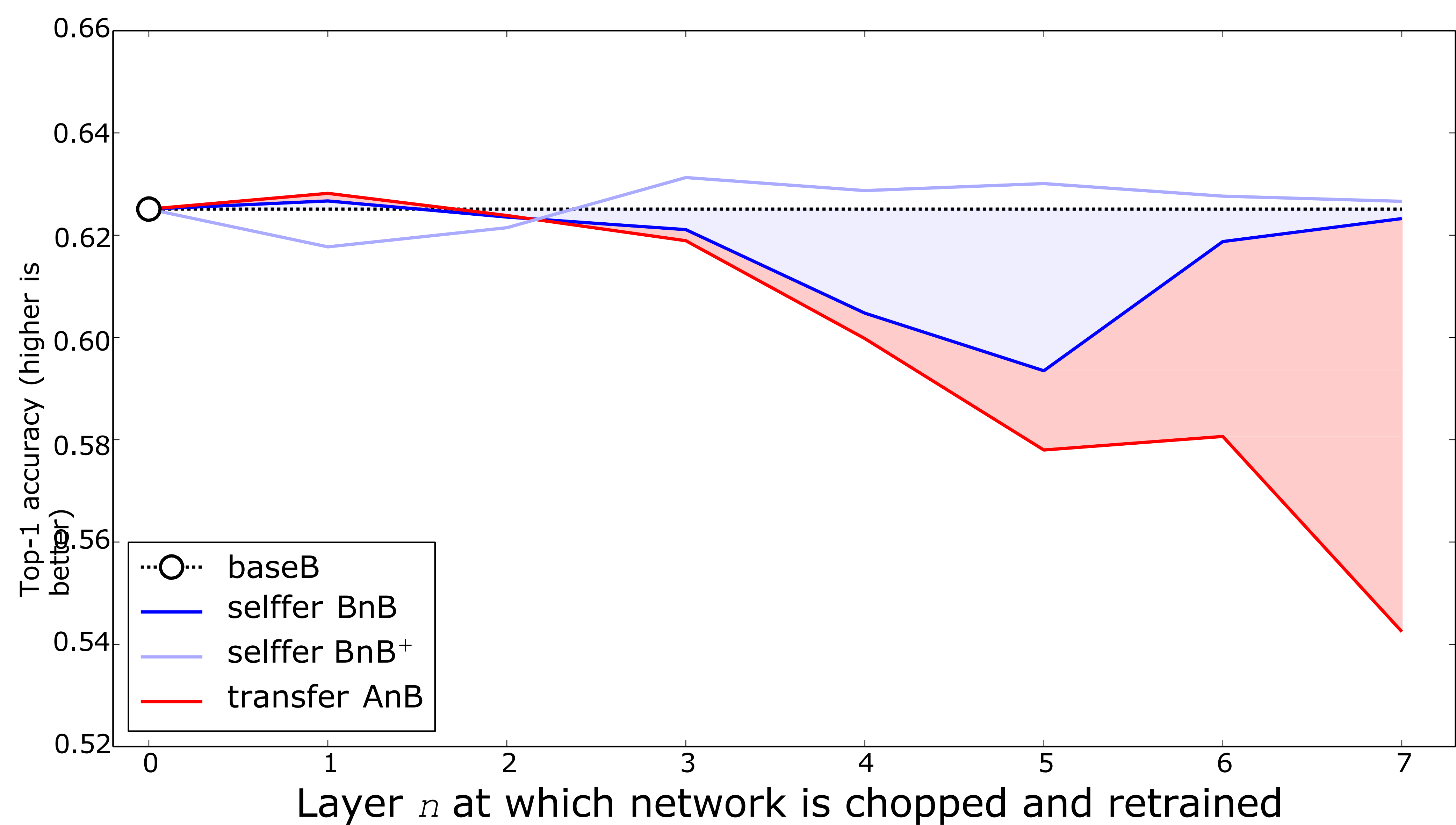


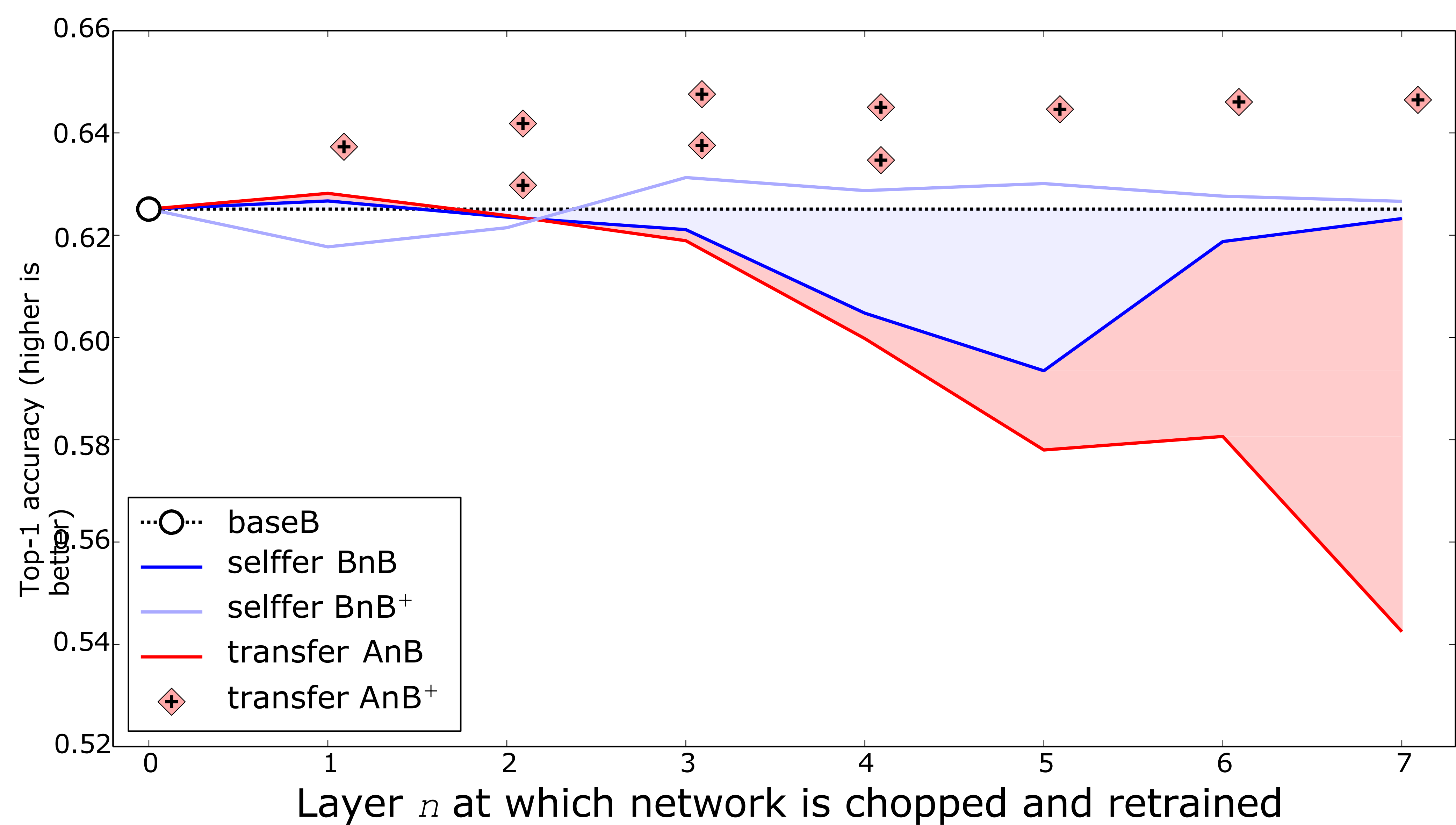


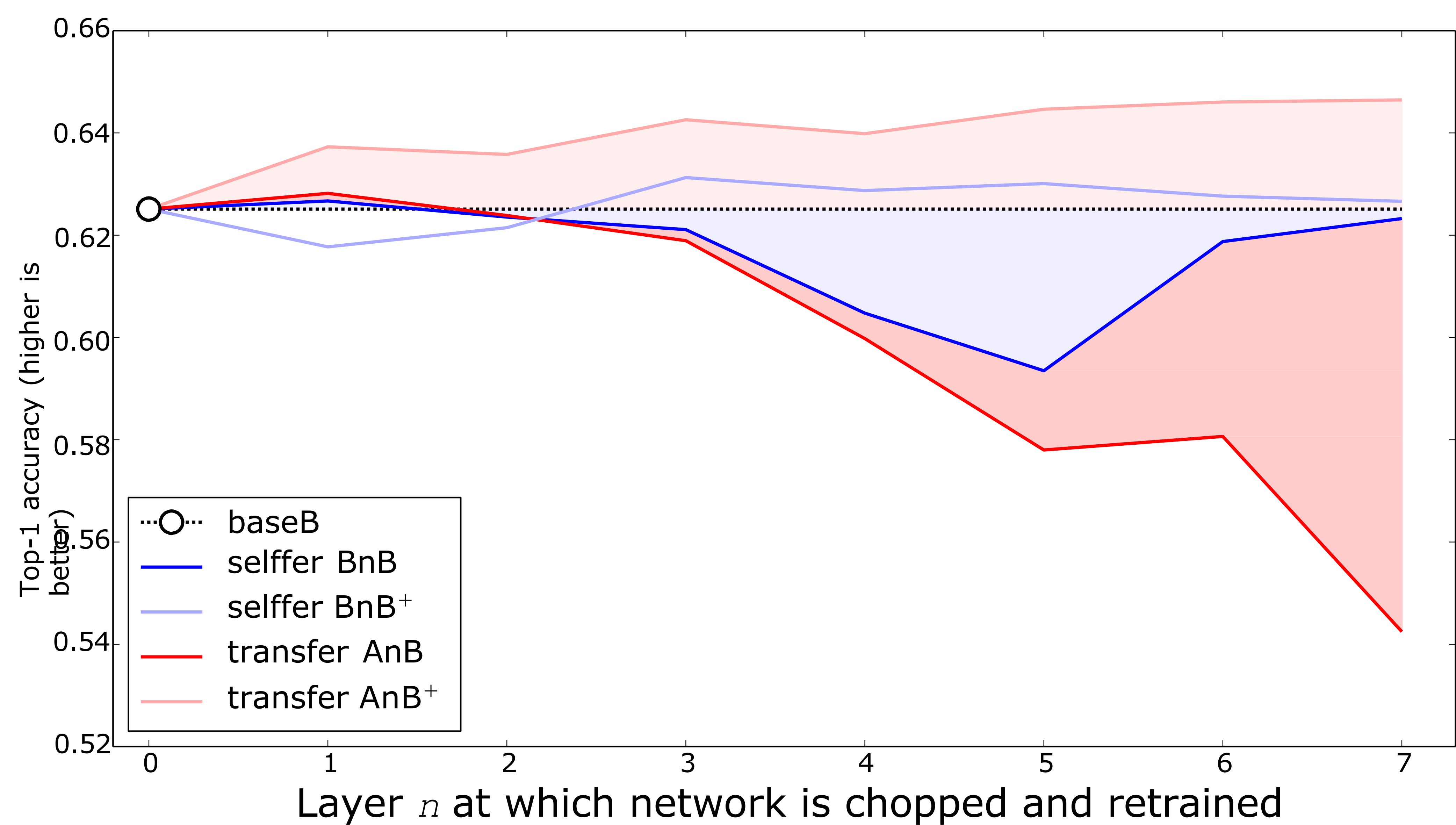


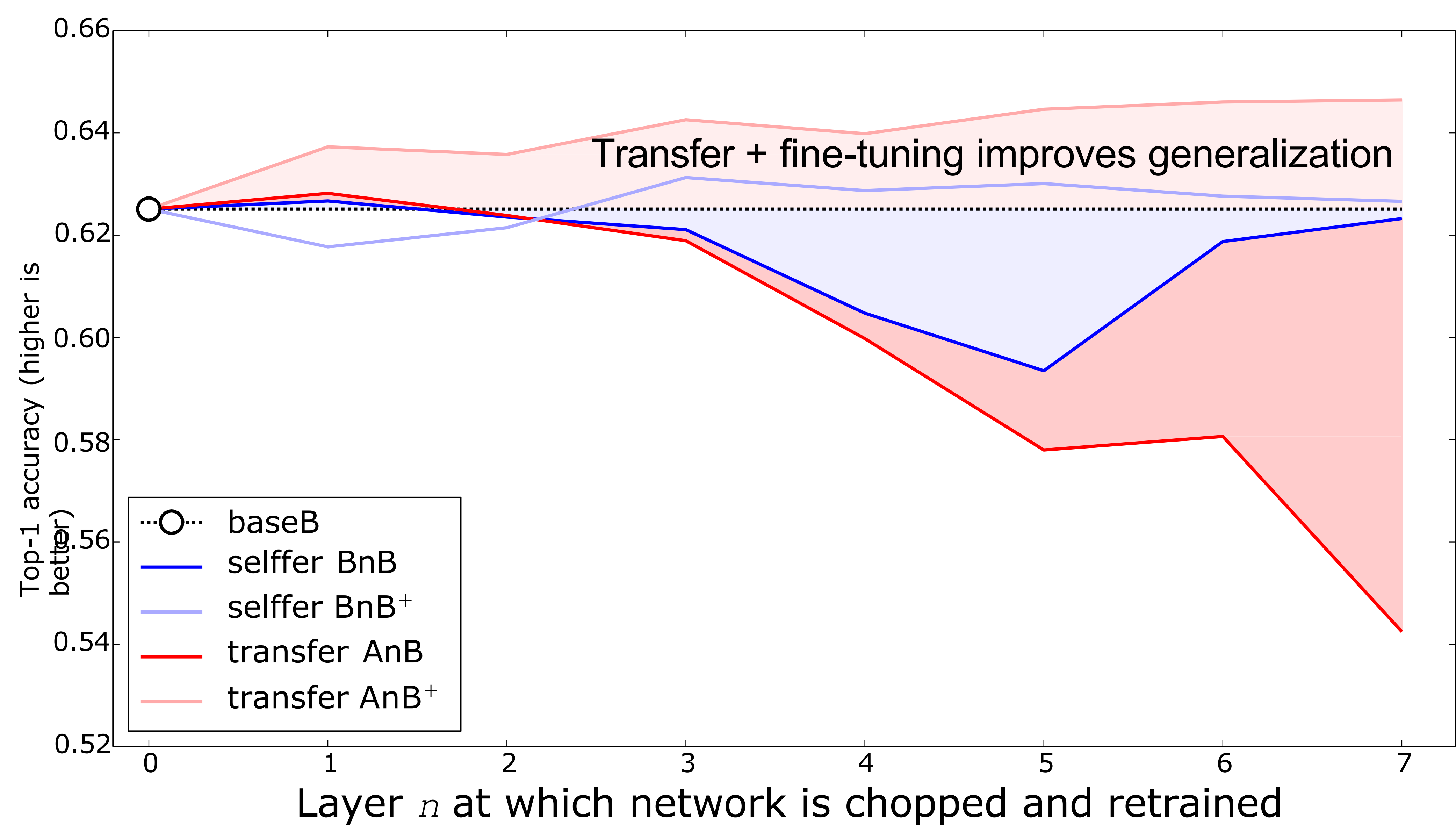












ImageNet has many related categories...

Dataset A: random

gecko

fire truck

baseball

panther

gorilla

rabbit

Dataset B: random

garbage truck

toucan

radiator

binoculars

lion

bookshop

ImageNet has many related categories...

Dataset A: man-made

garbage truck

fire truck

radiator

baseball

binoculars

bookshop

Dataset B: natural

gorilla

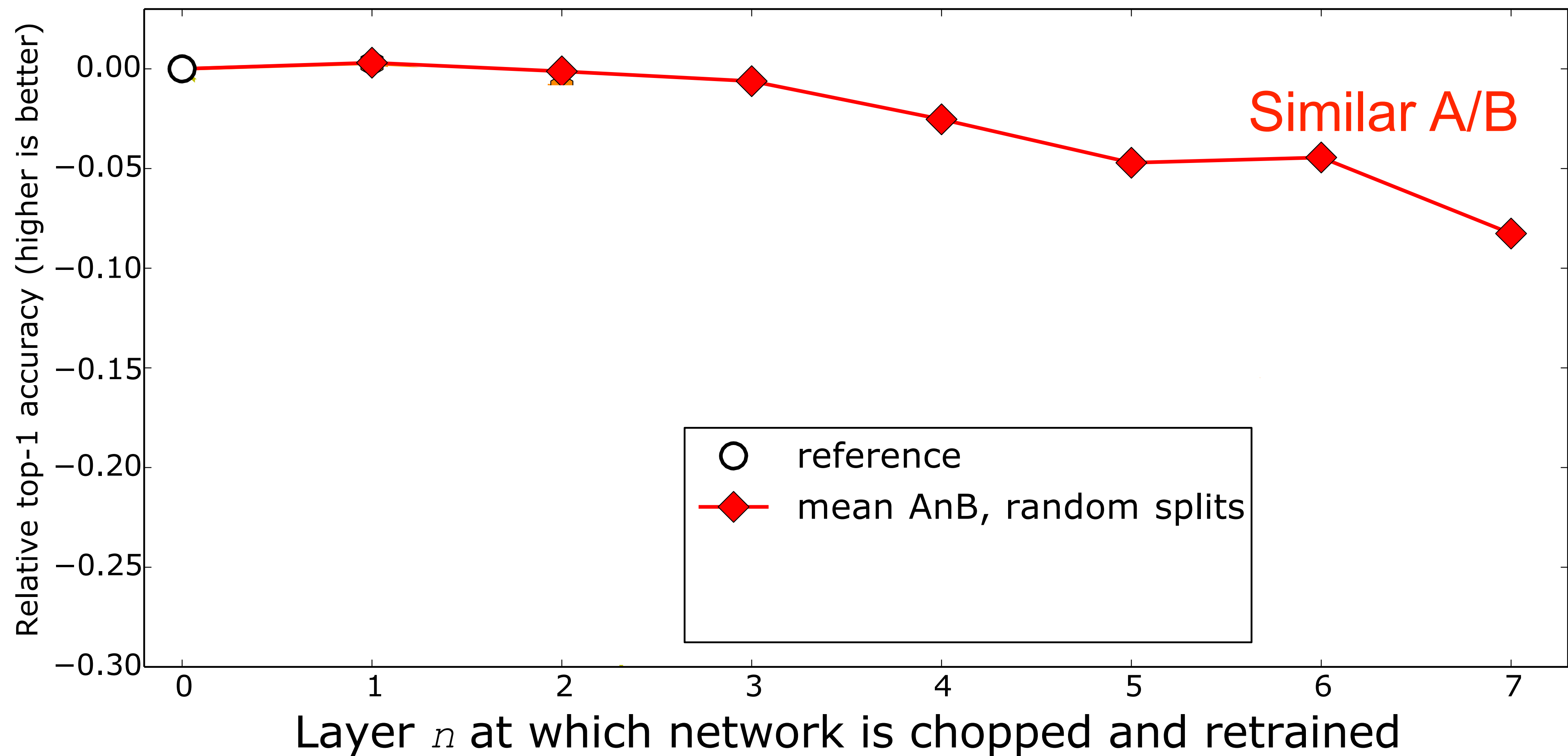
gecko

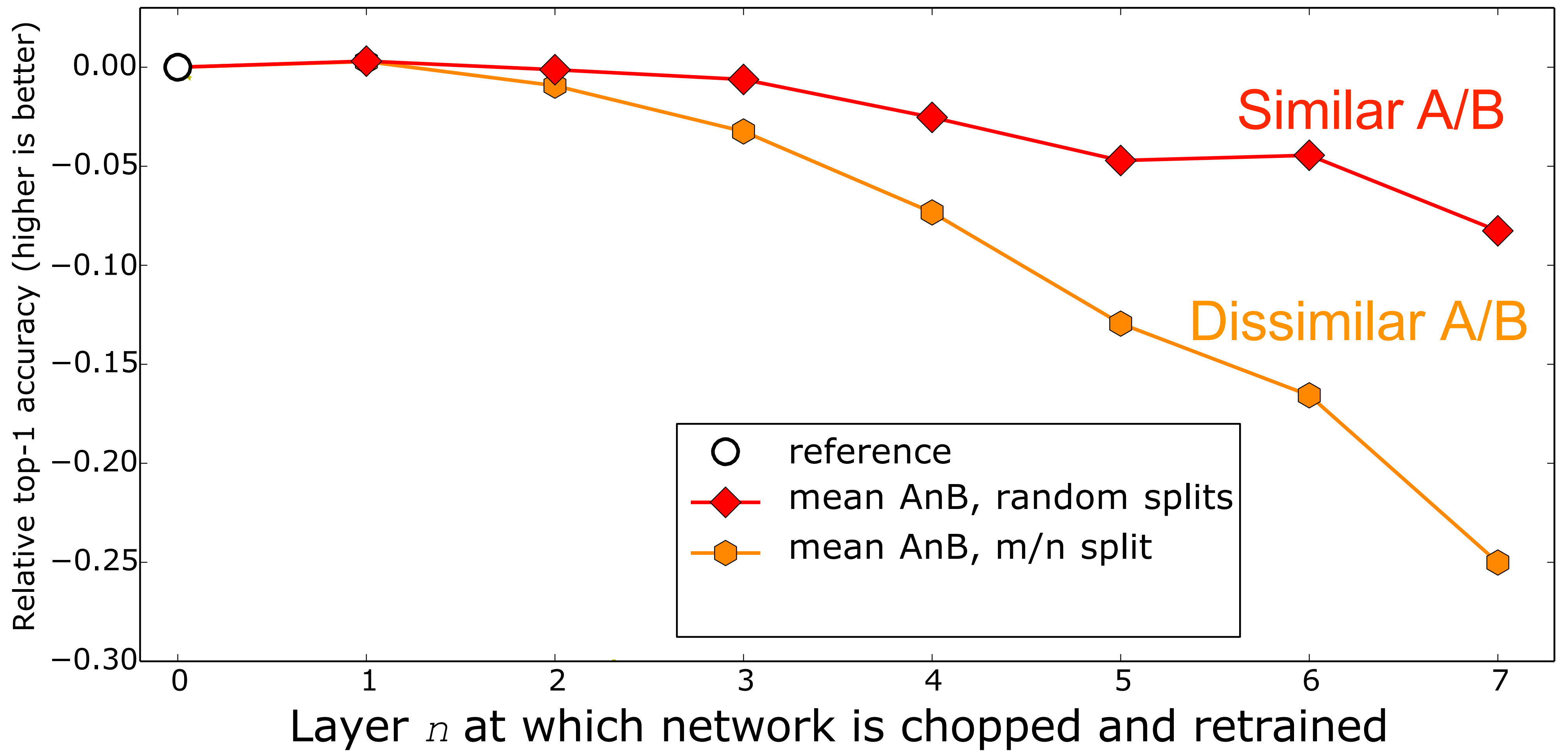
toucan

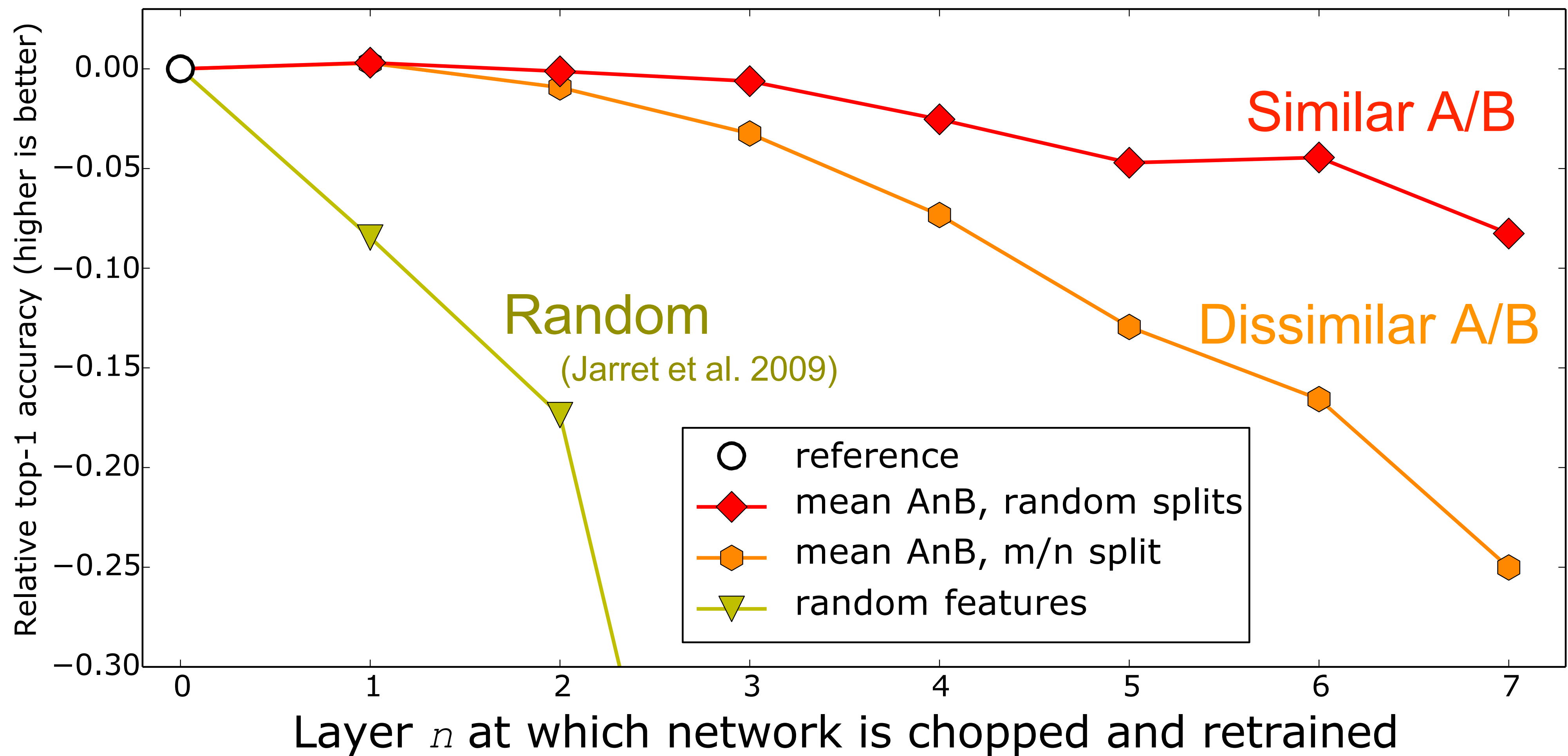
rabbit

panther

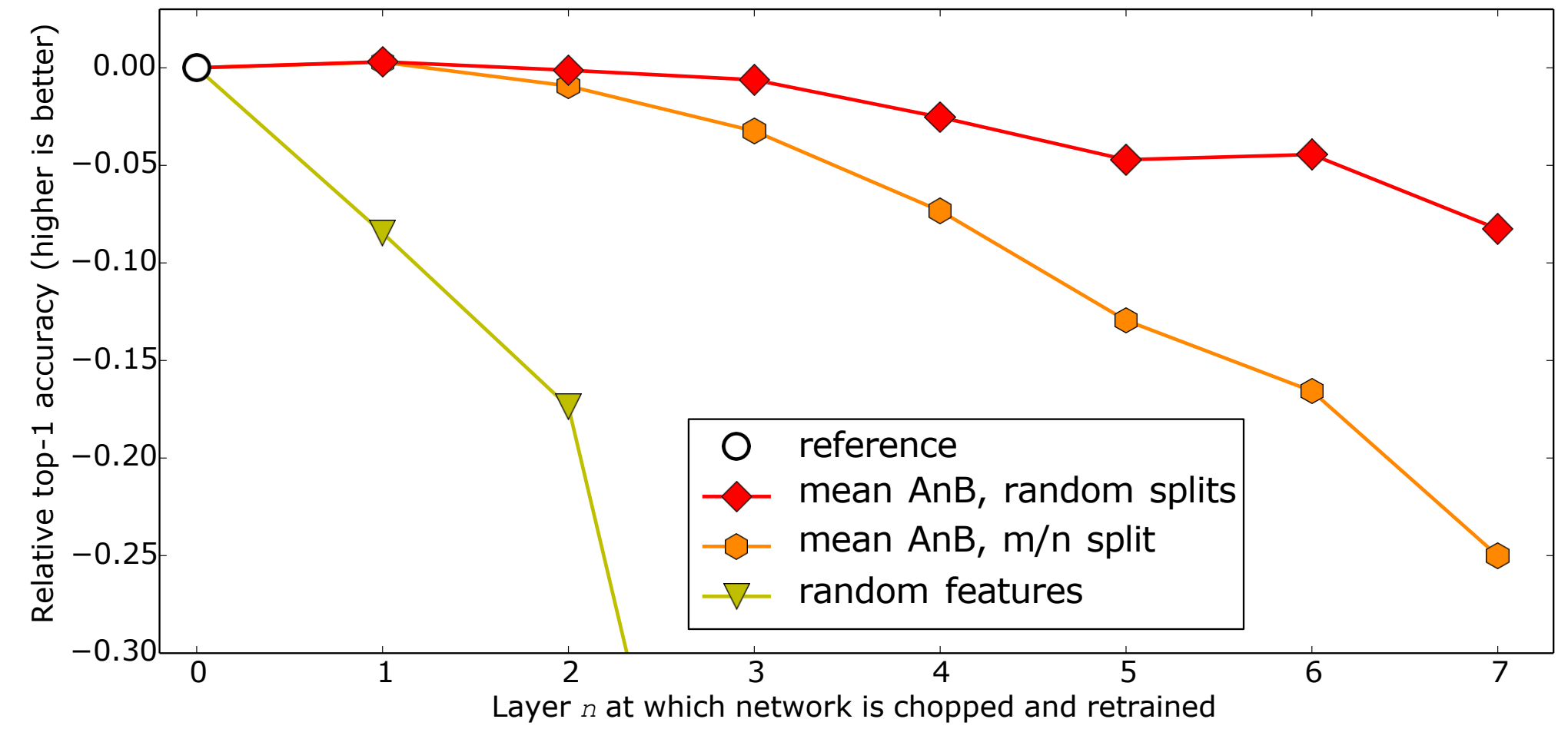
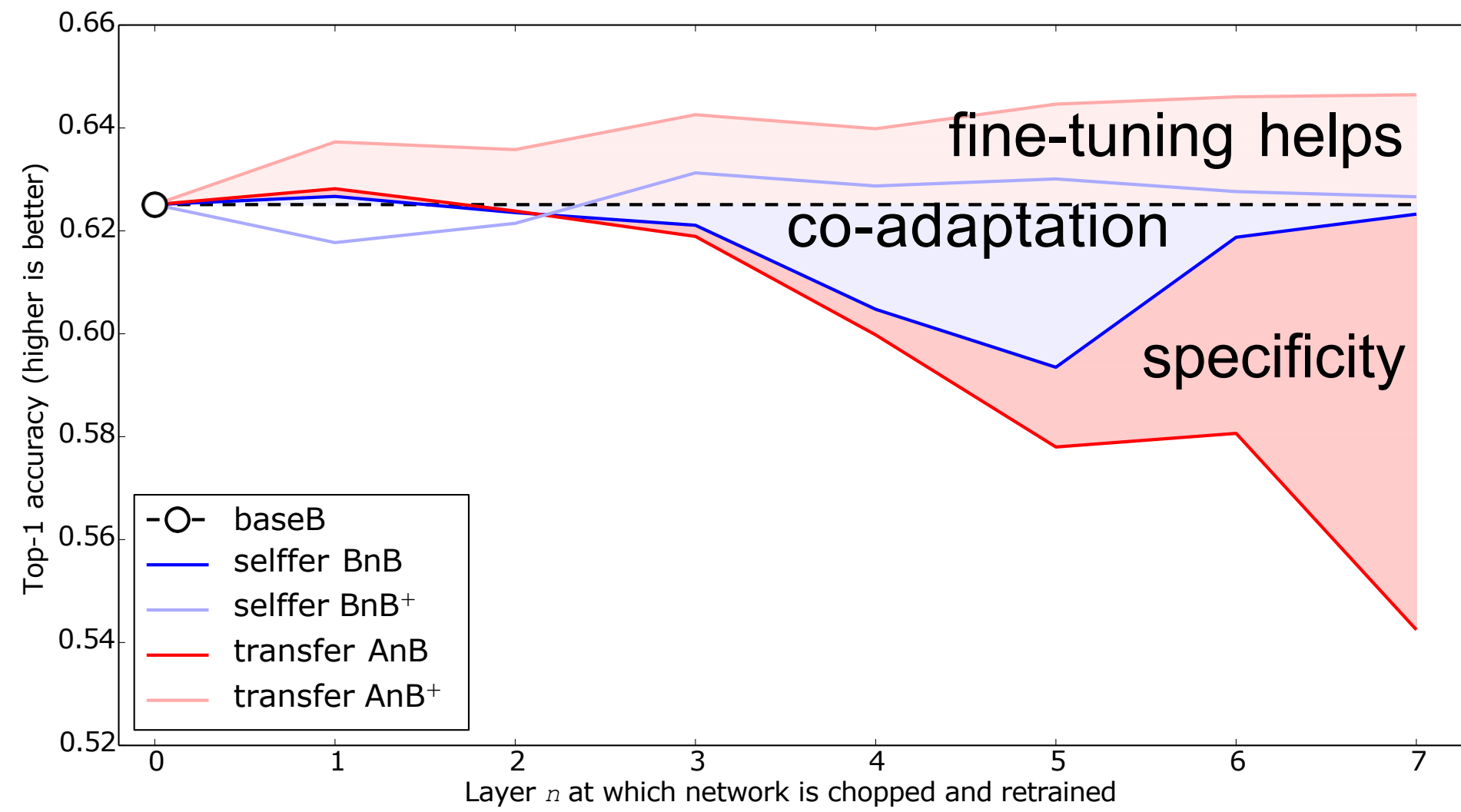
lion



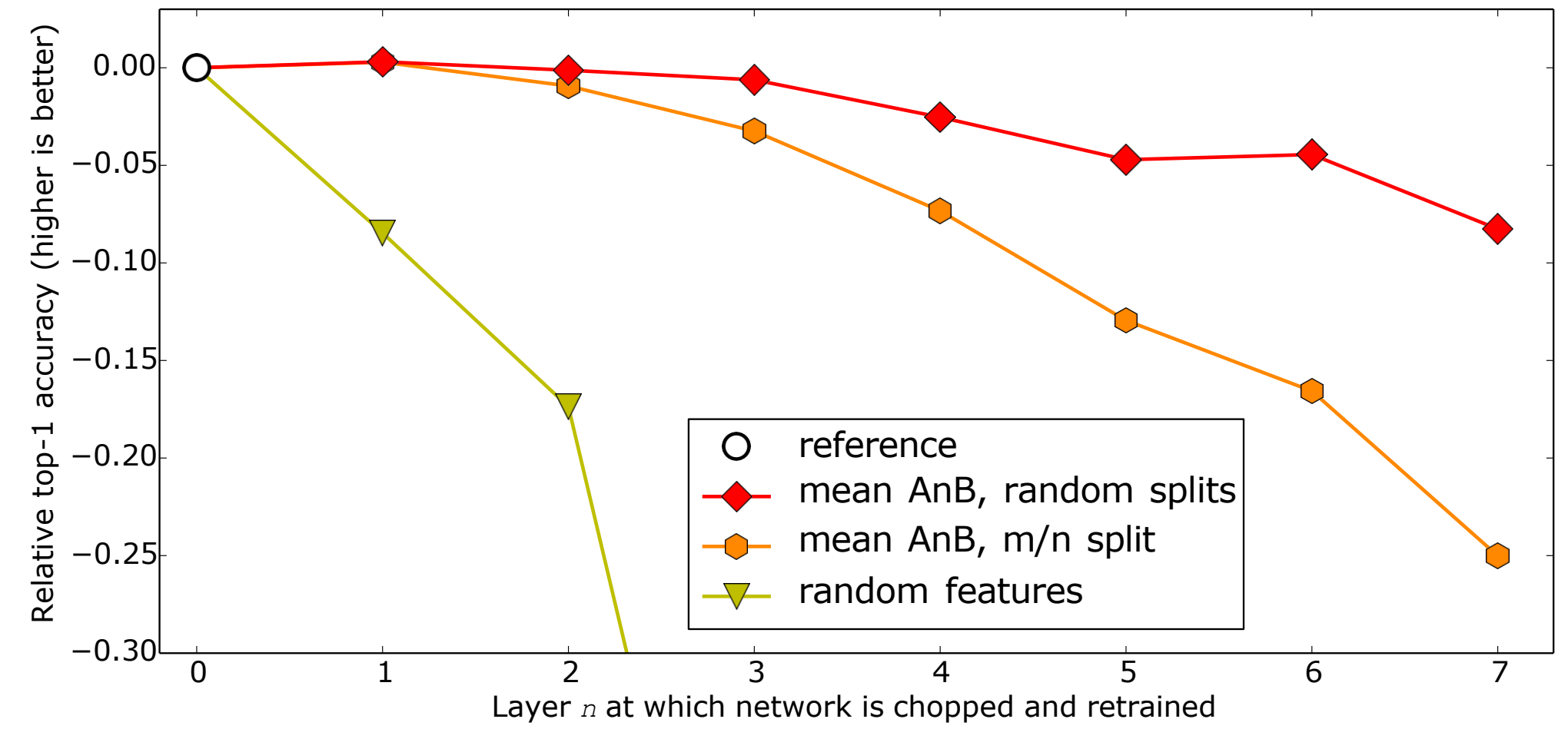
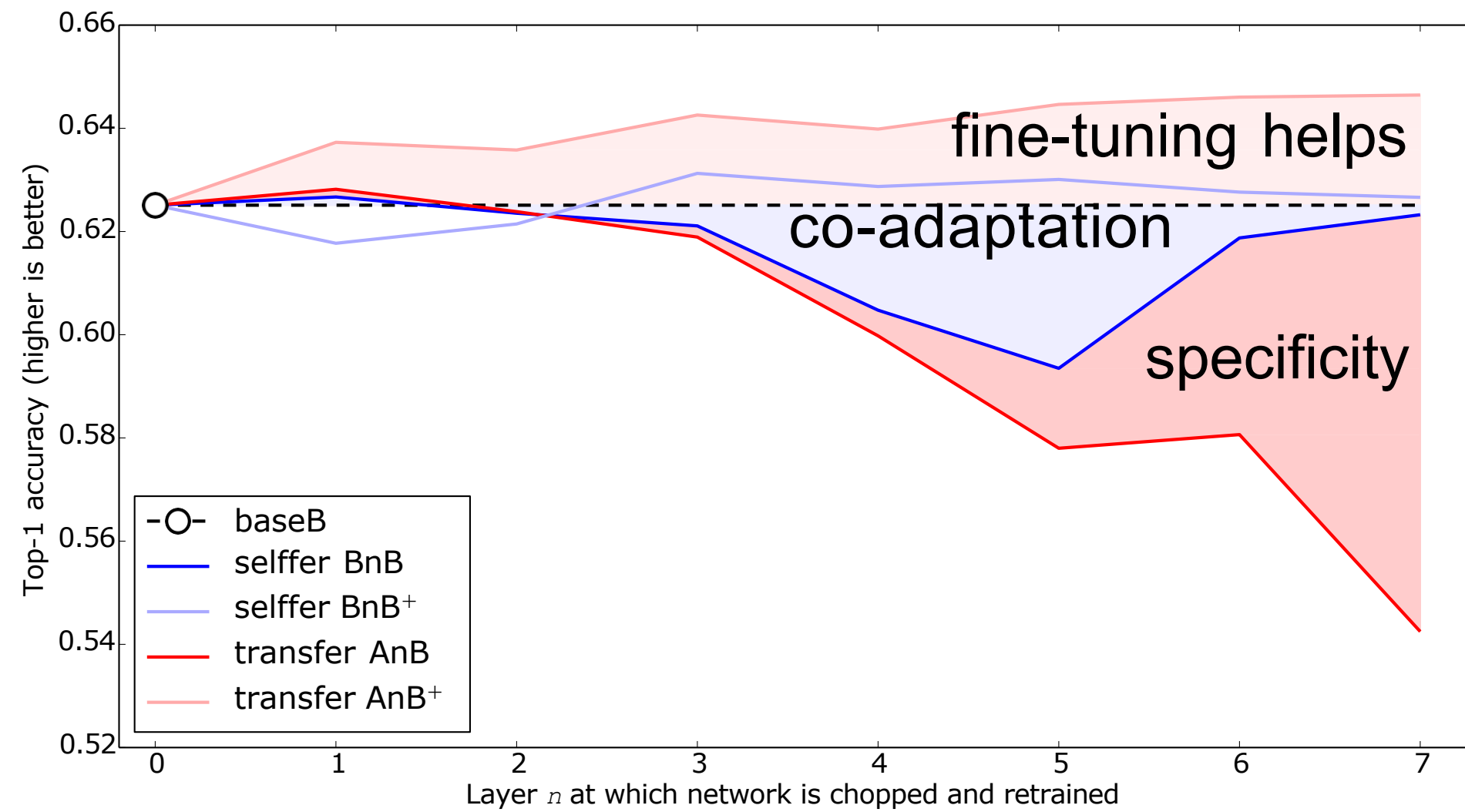




Conclusions

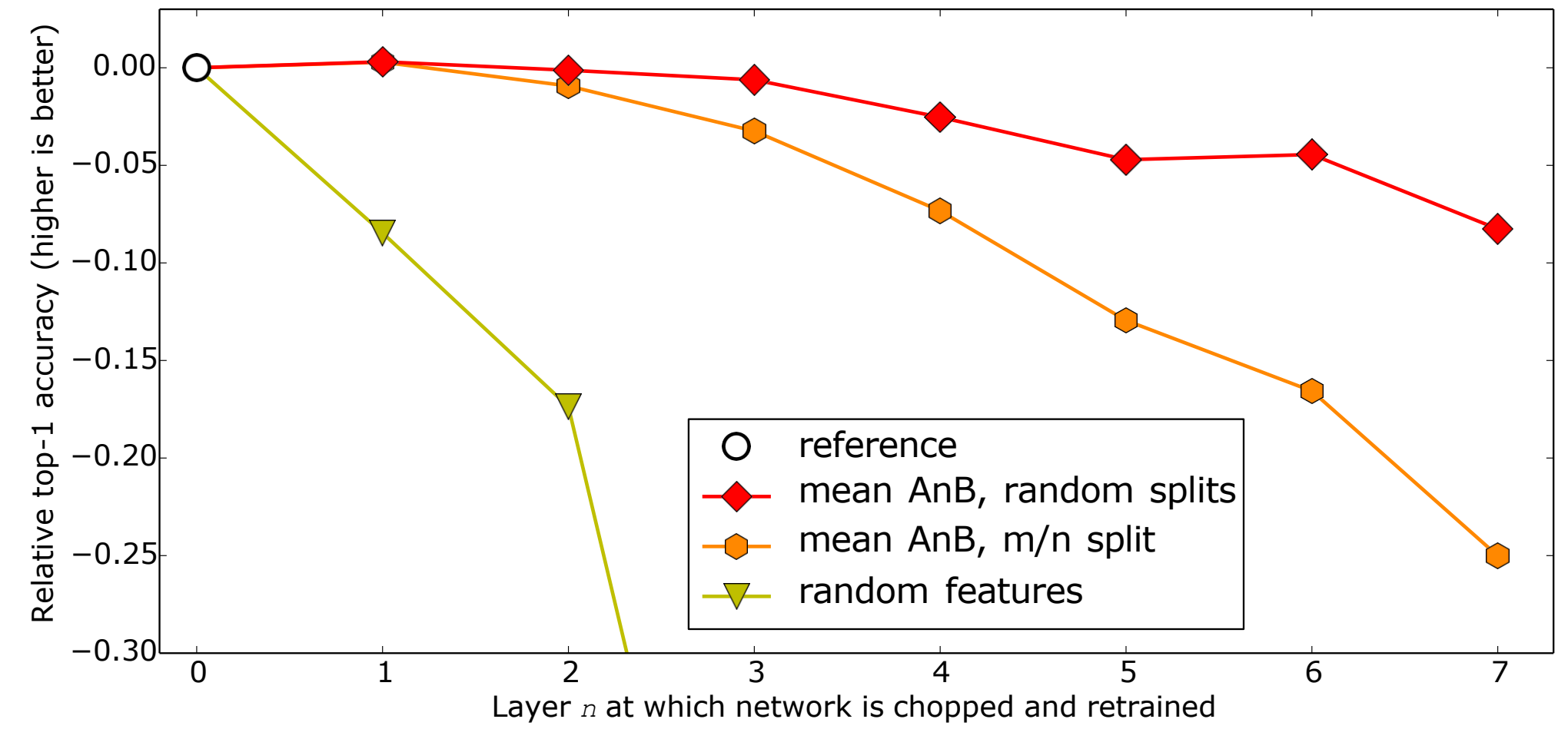
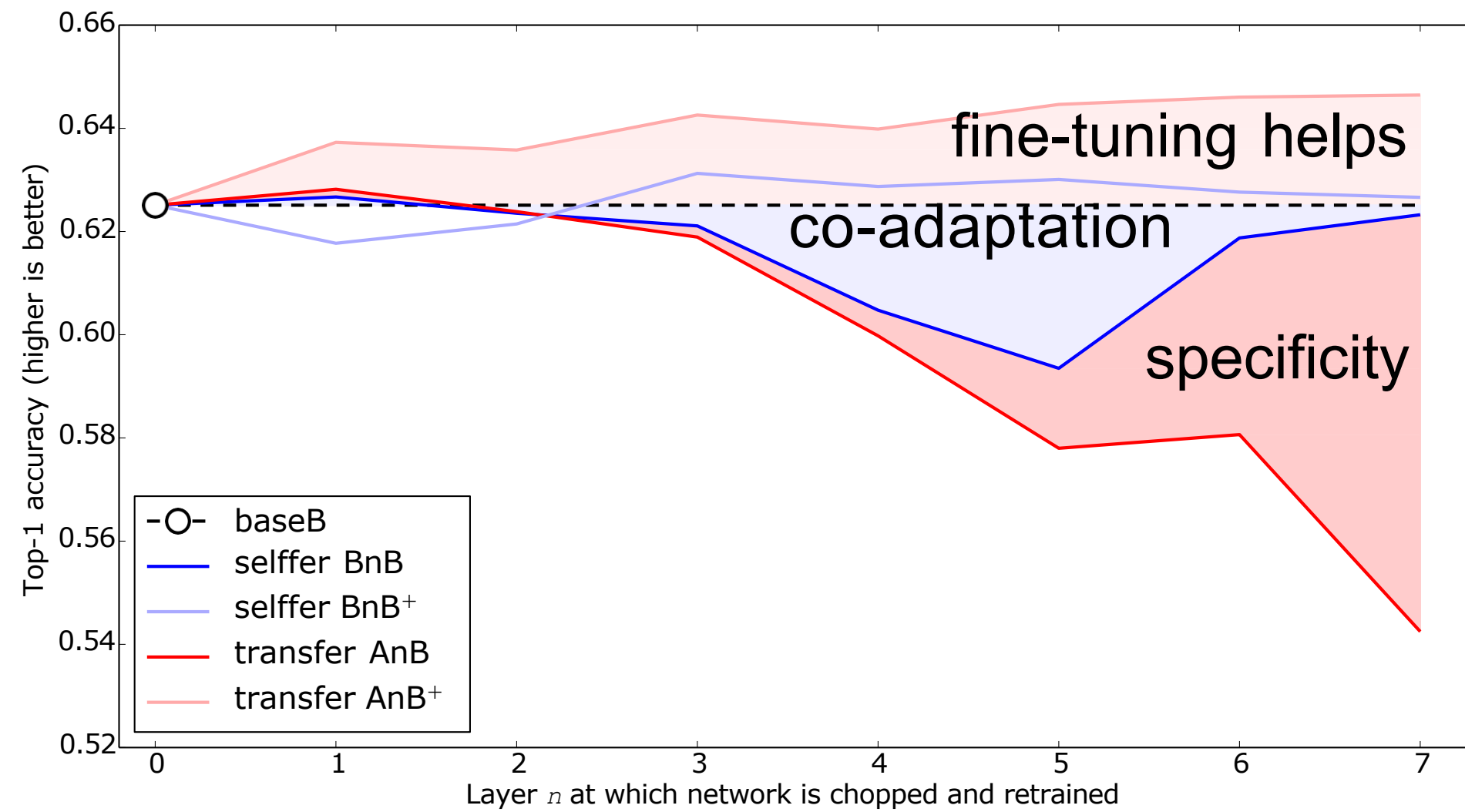


Conclusions



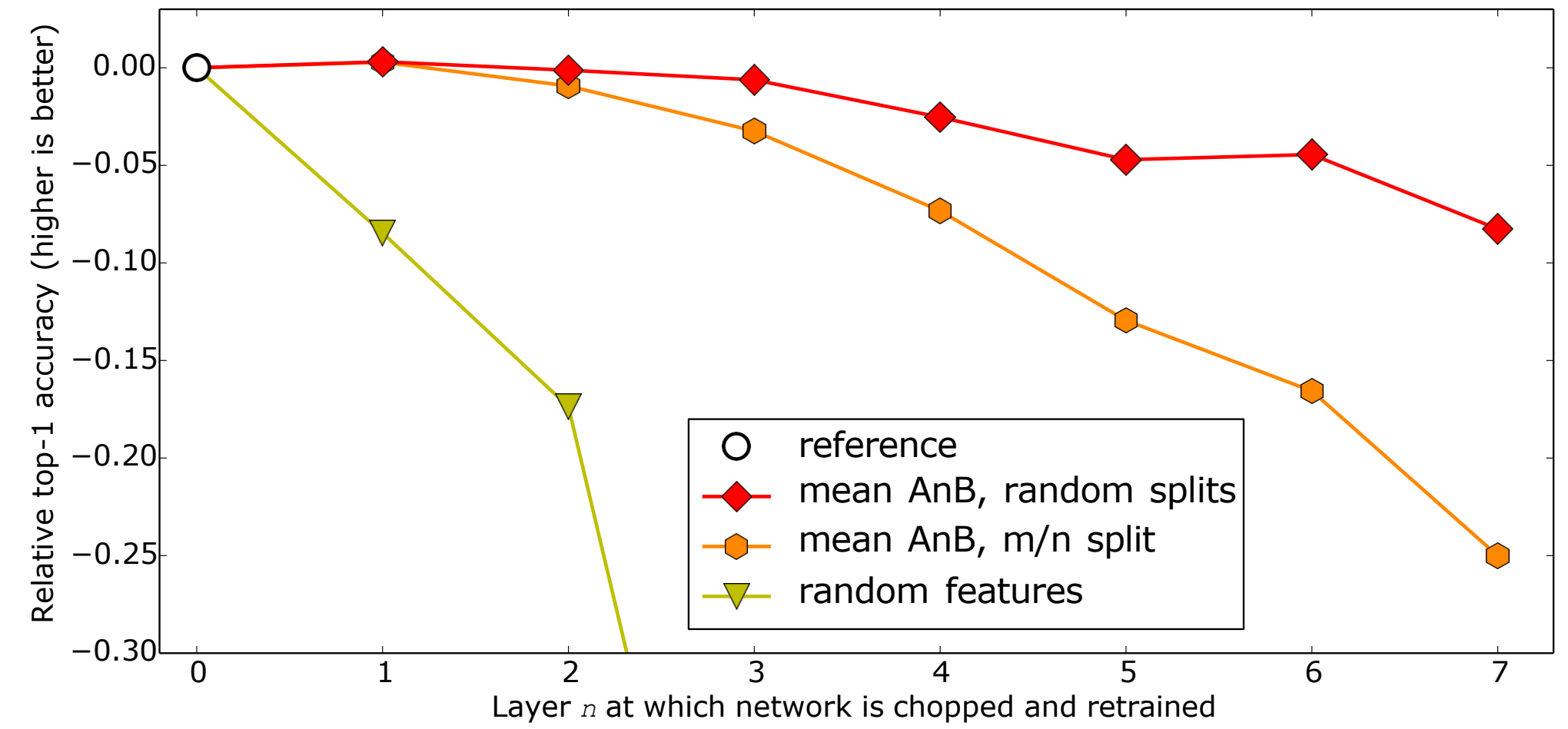
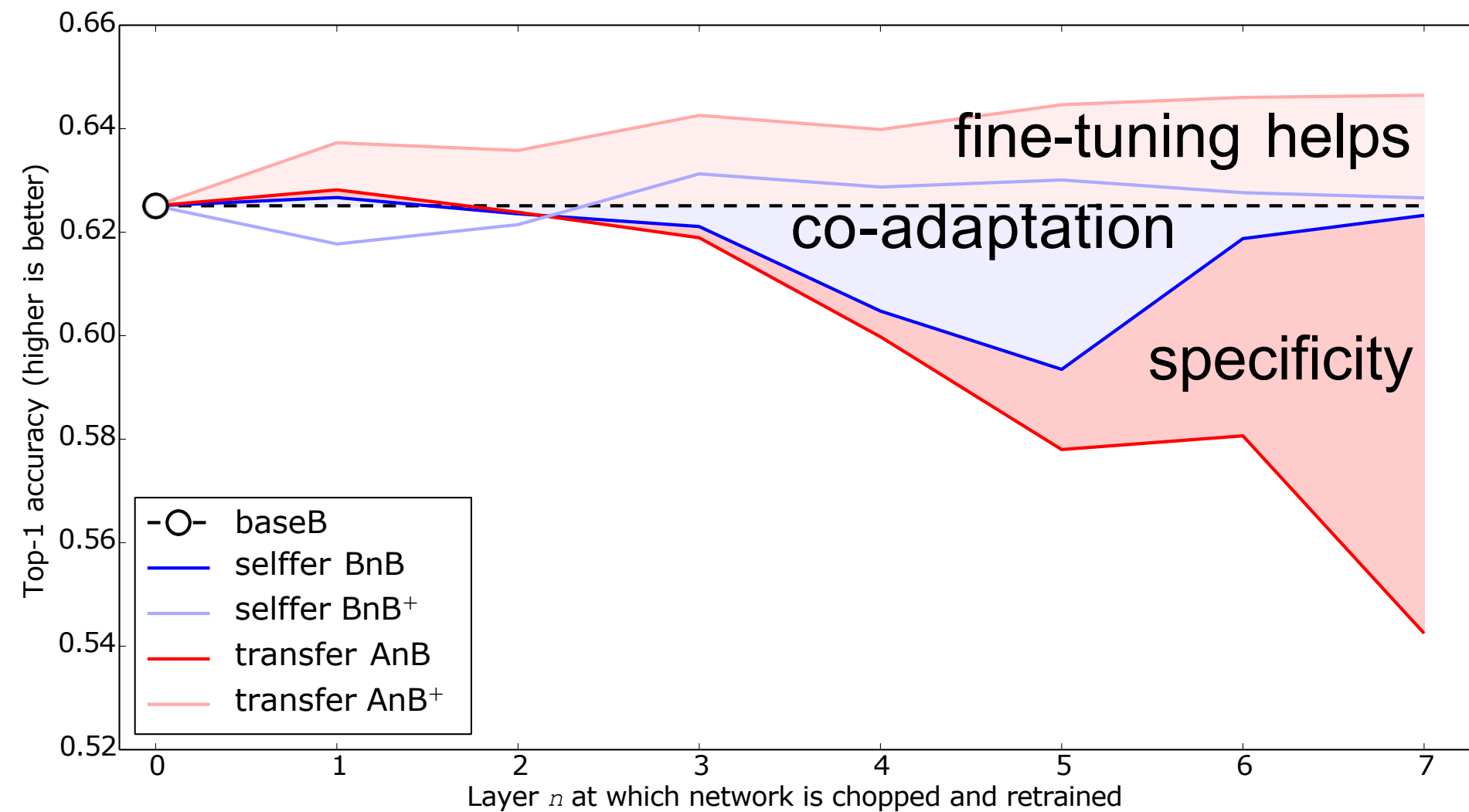
- Measure *general* to *specific* transition layer by layer

Conclusions



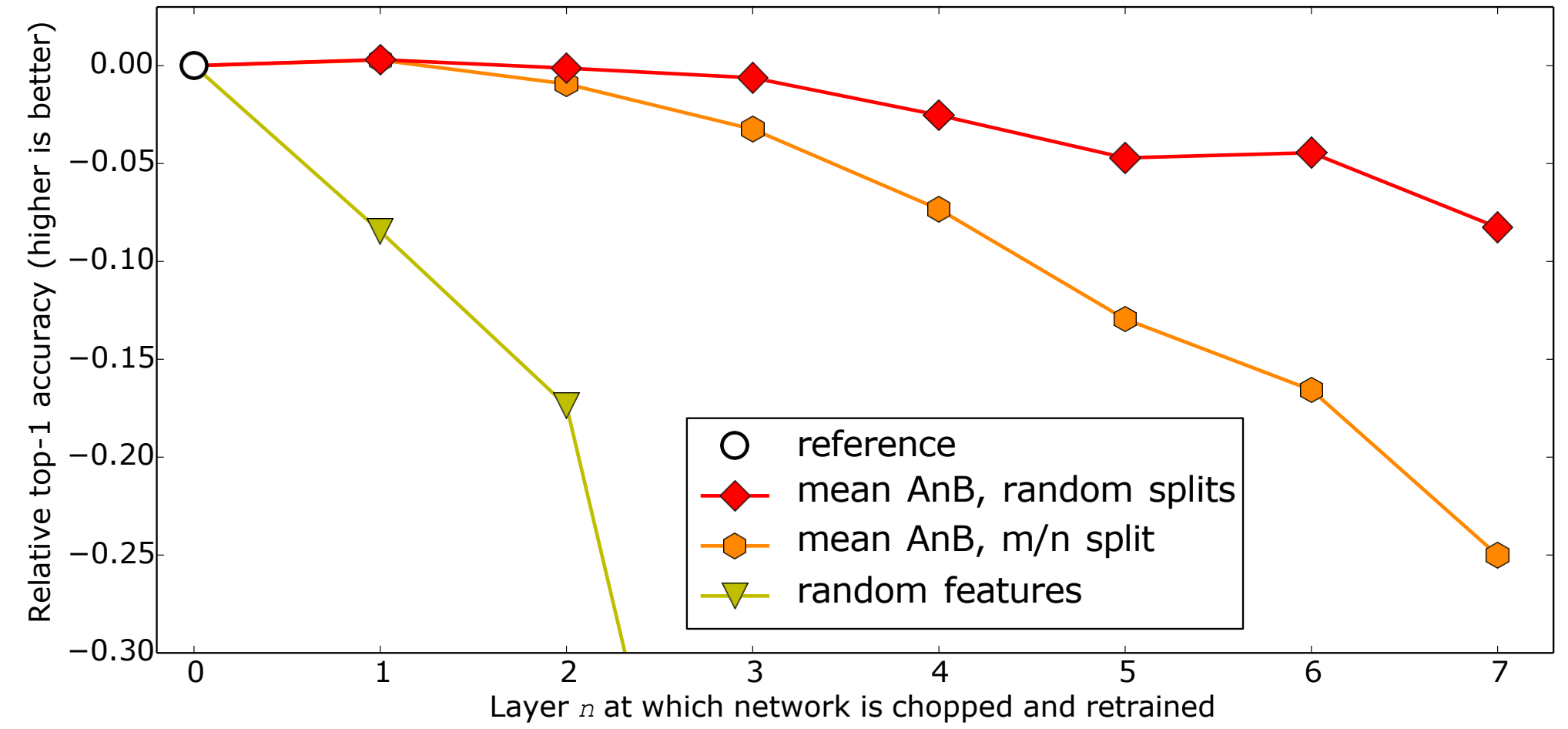
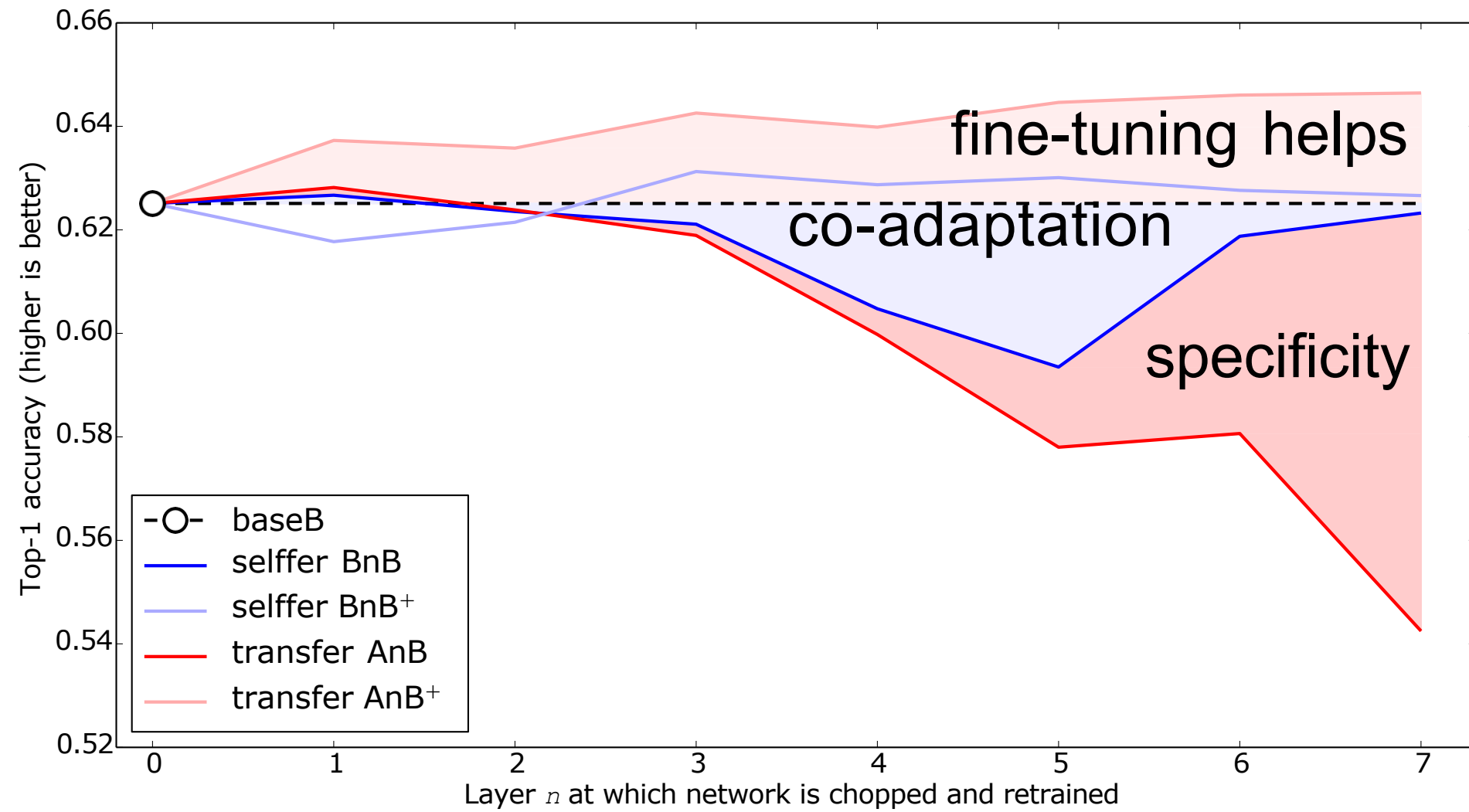
- Measure *general* to *specific* transition layer by layer
- Transferability governed by:

Conclusions



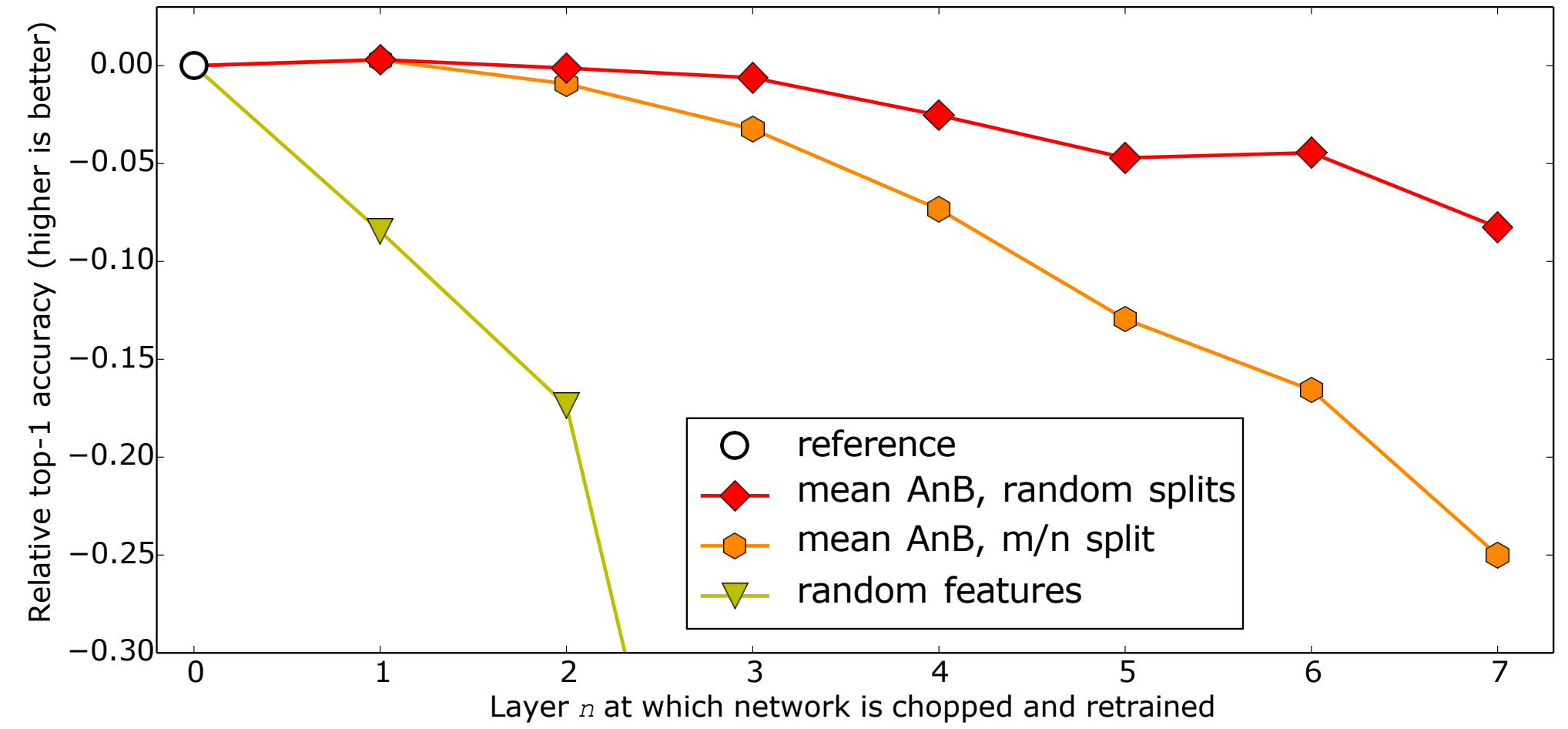
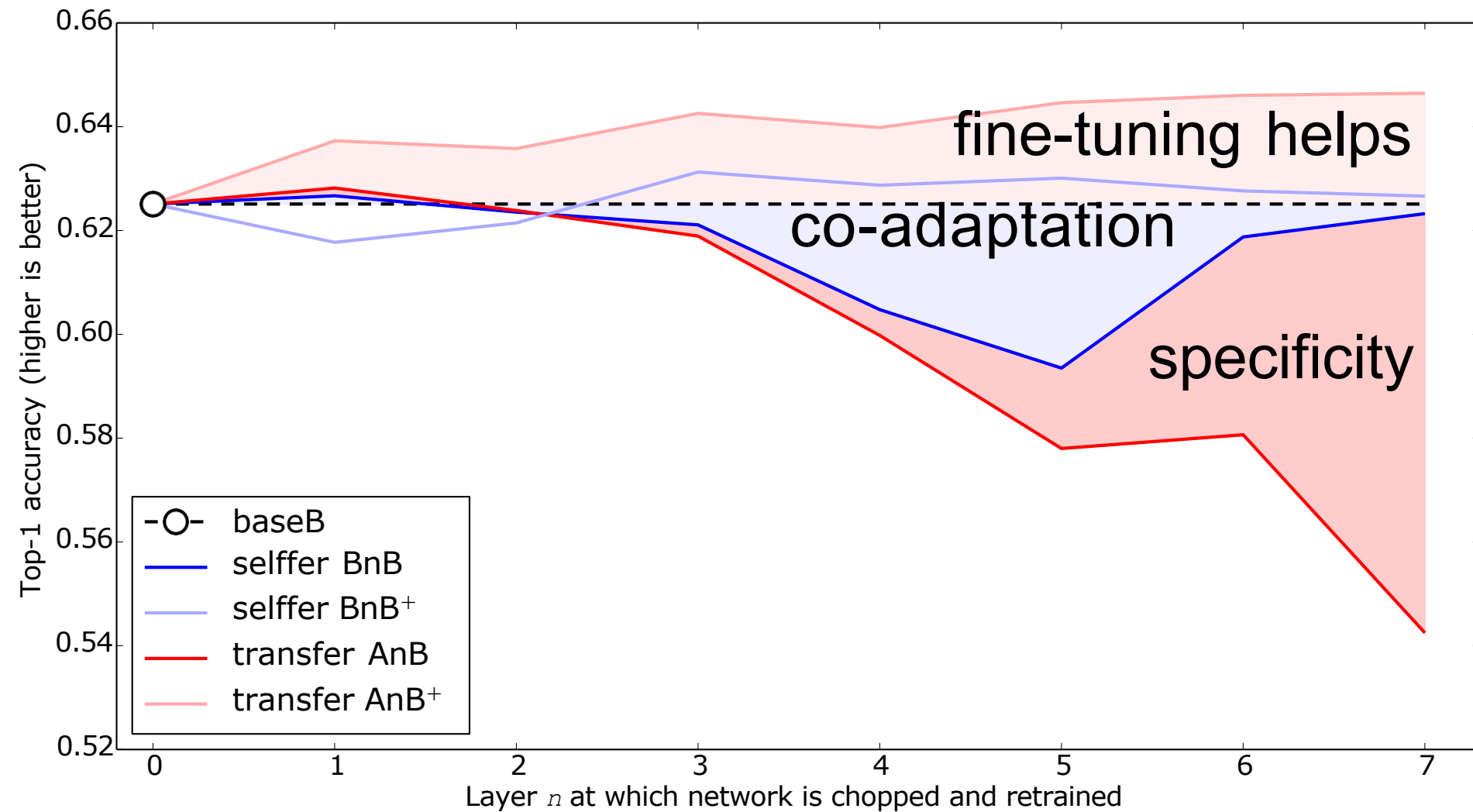
- Measure *general* to *specific* transition layer by layer
- Transferability governed by:
 - lost co-adaptations

Conclusions



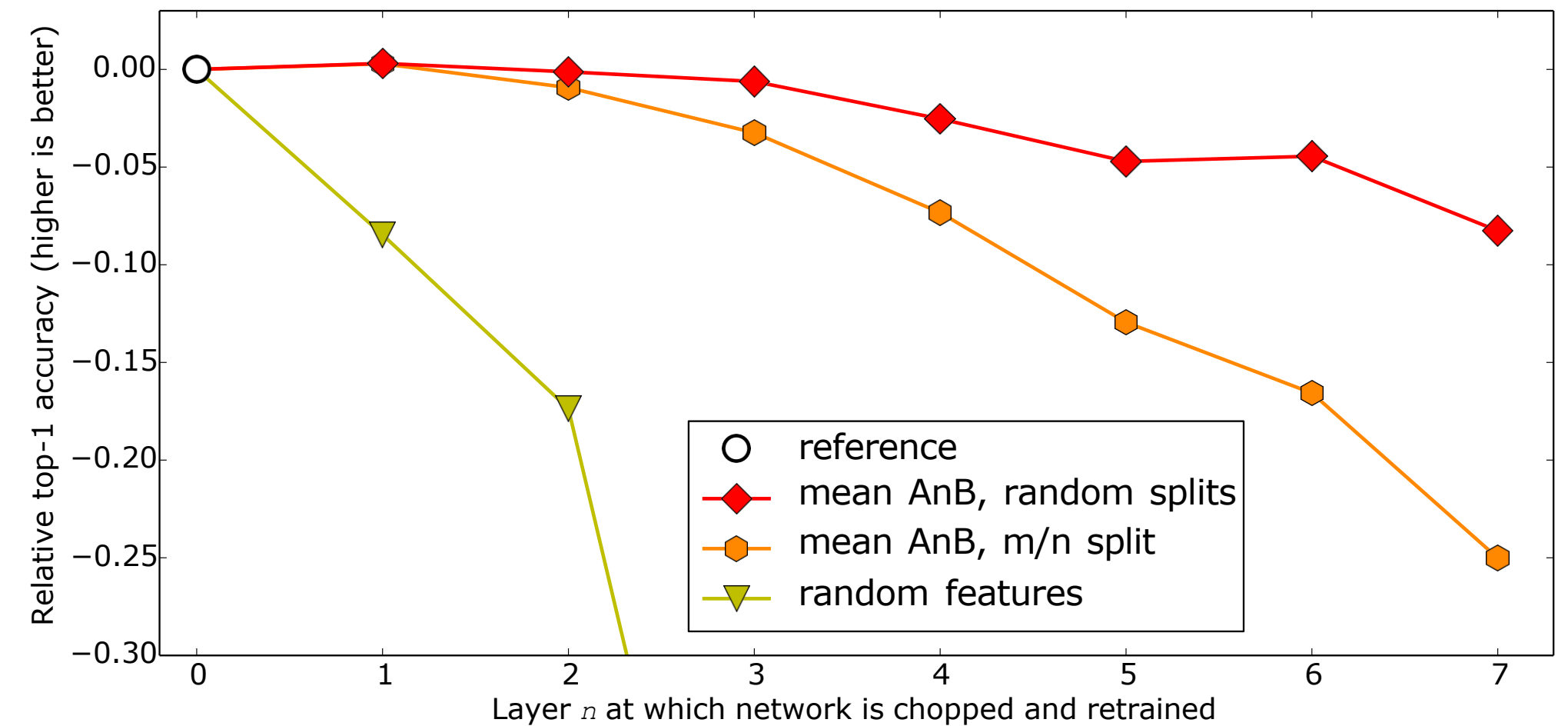
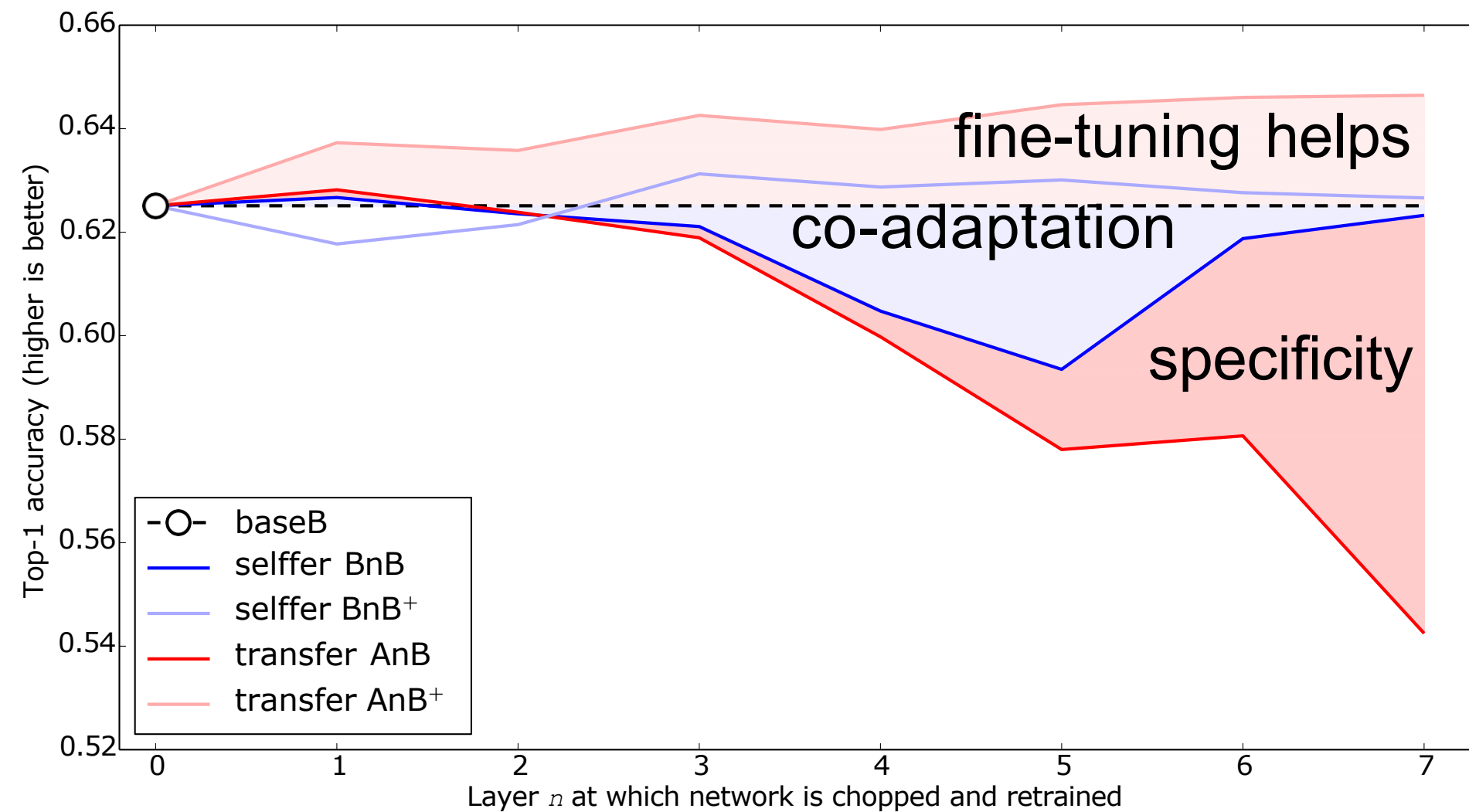
- Measure *general* to *specific* transition layer by layer
- Transferability governed by:
 - lost co-adaptations
 - specificity

Conclusions



- Measure *general* to *specific* transition layer by layer
- Transferability governed by:
 - lost co-adaptations
 - specificity
 - difference between base and target dataset

Main idea

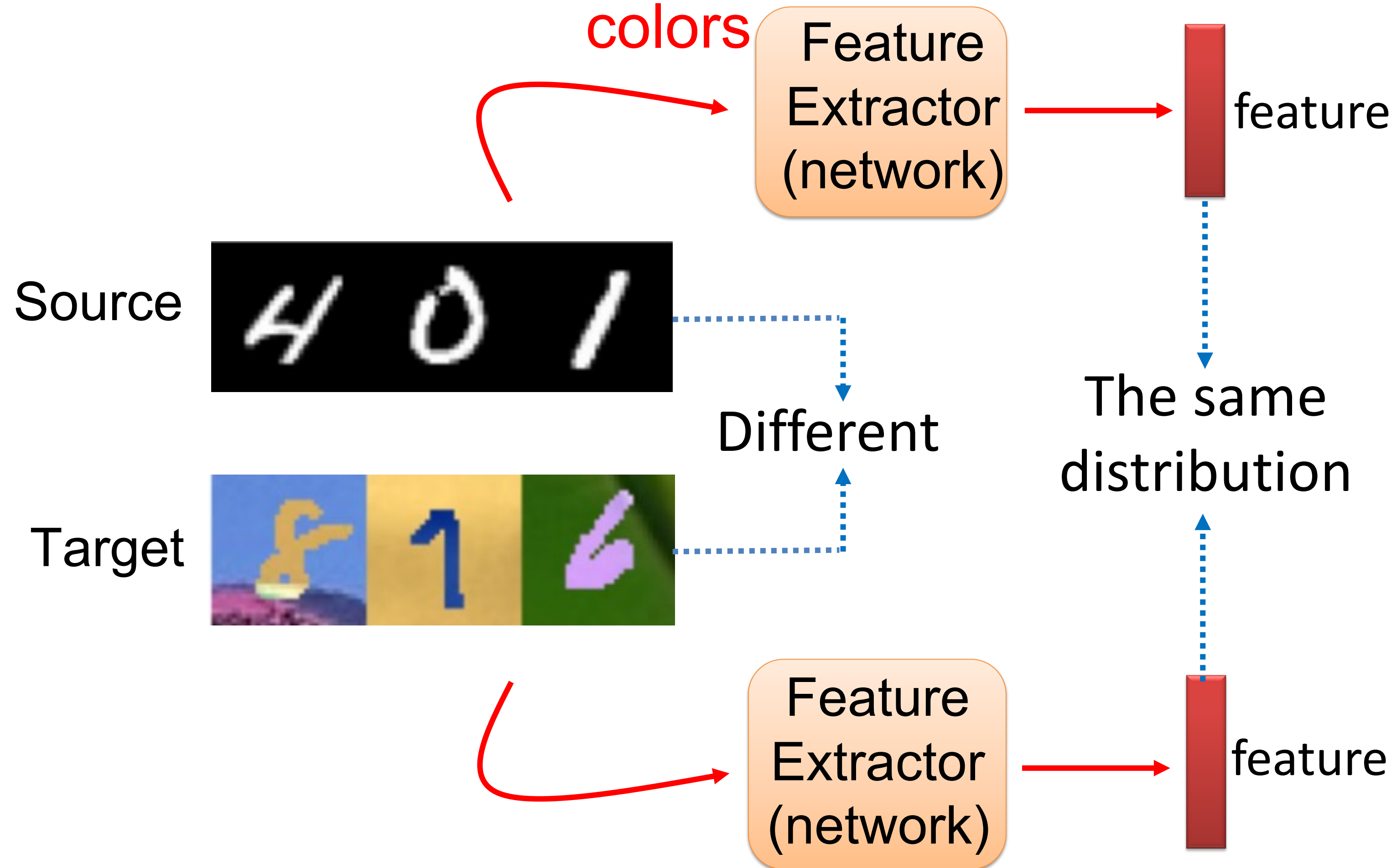


- Measure *general* to *specific* transition layer by layer
- Transferability governed by:
 - lost co-adaptations
 - specificity
 - difference between base and target dataset
- Fine-tuning helps even on large target dataset

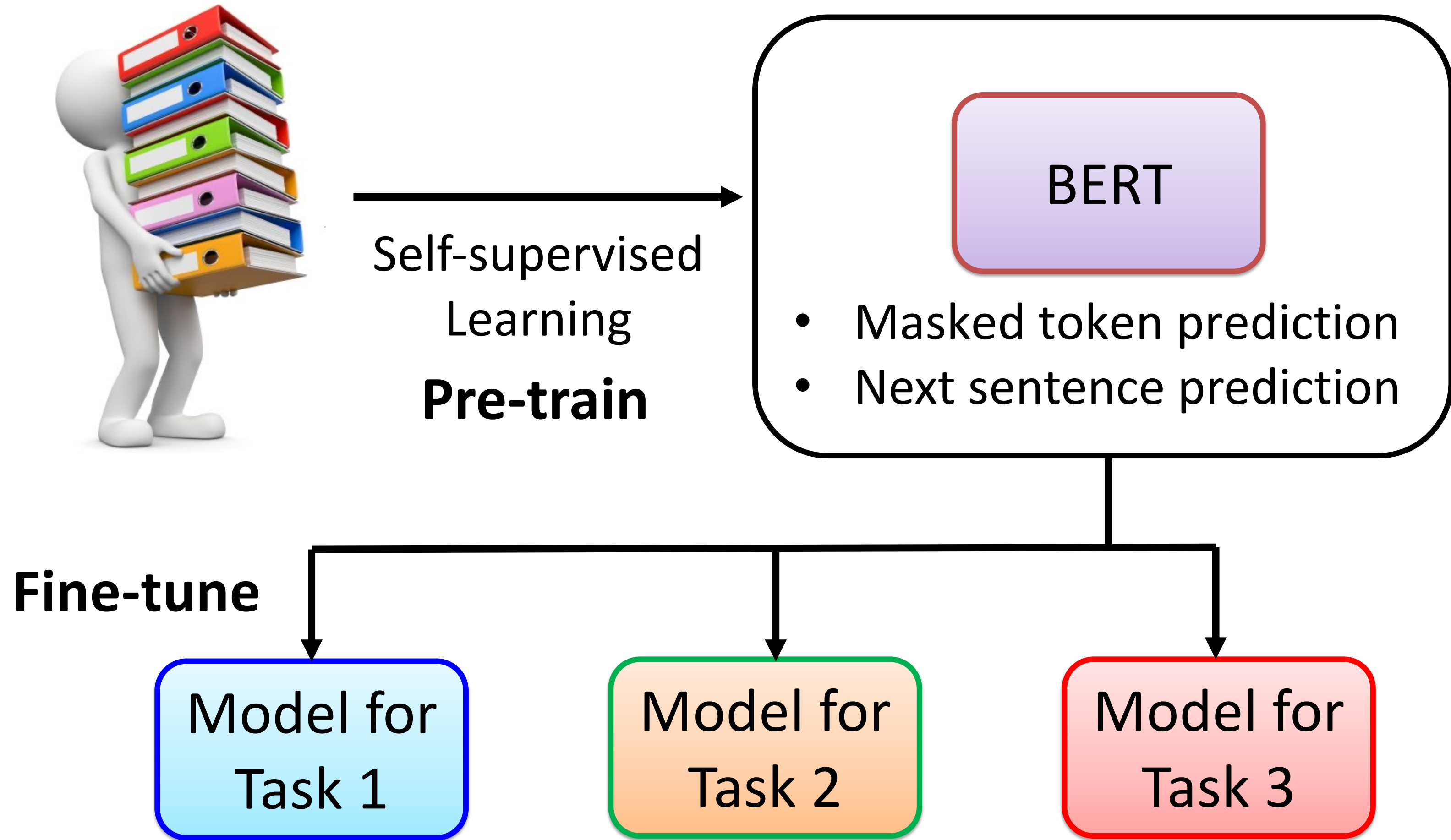
How can we utilize
fine-tune mechanism?

Basic Idea

Learn to ignore
colors



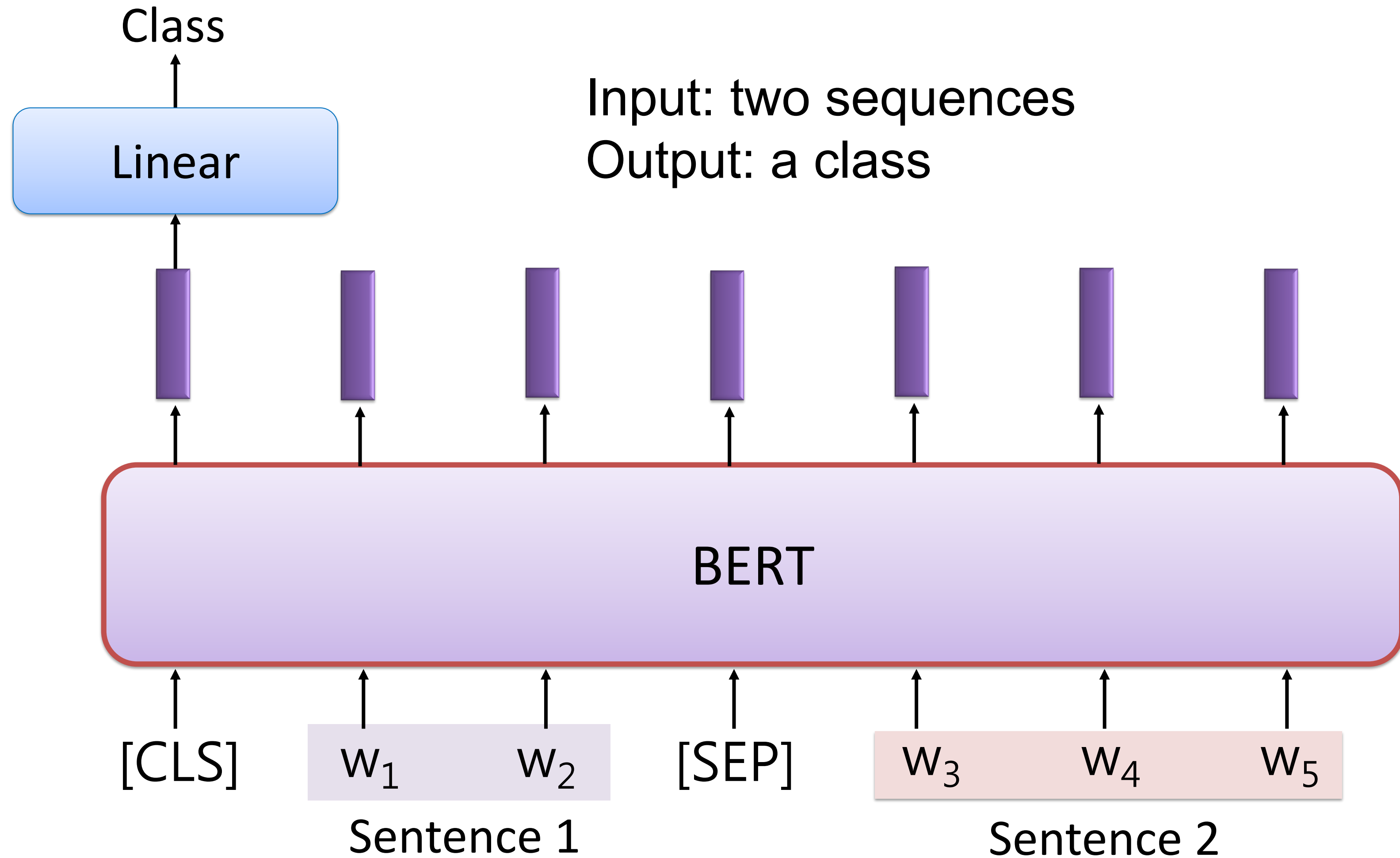
BERT



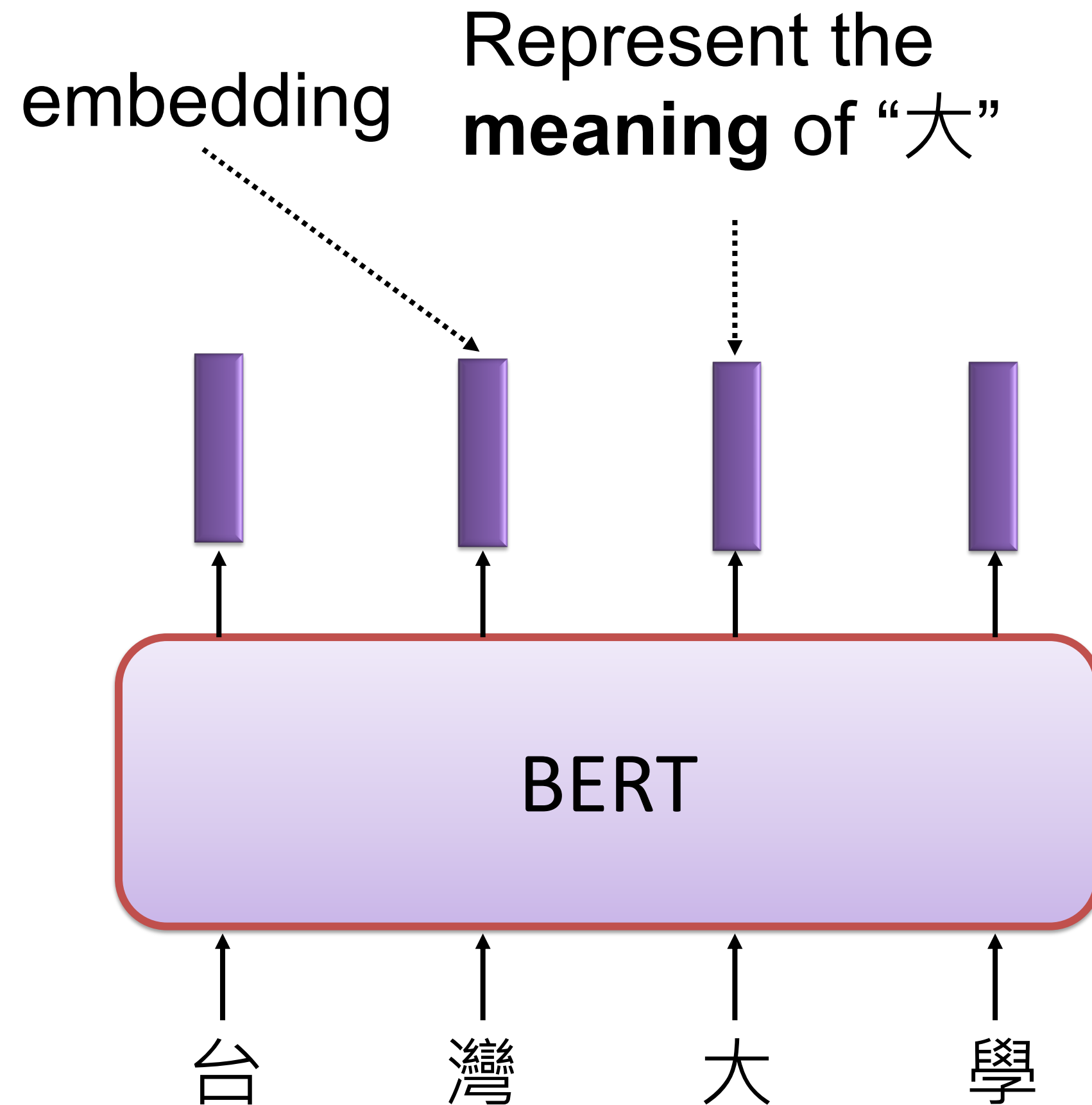
Downstream Tasks

- The tasks we care
- We have a little bit labeled data.

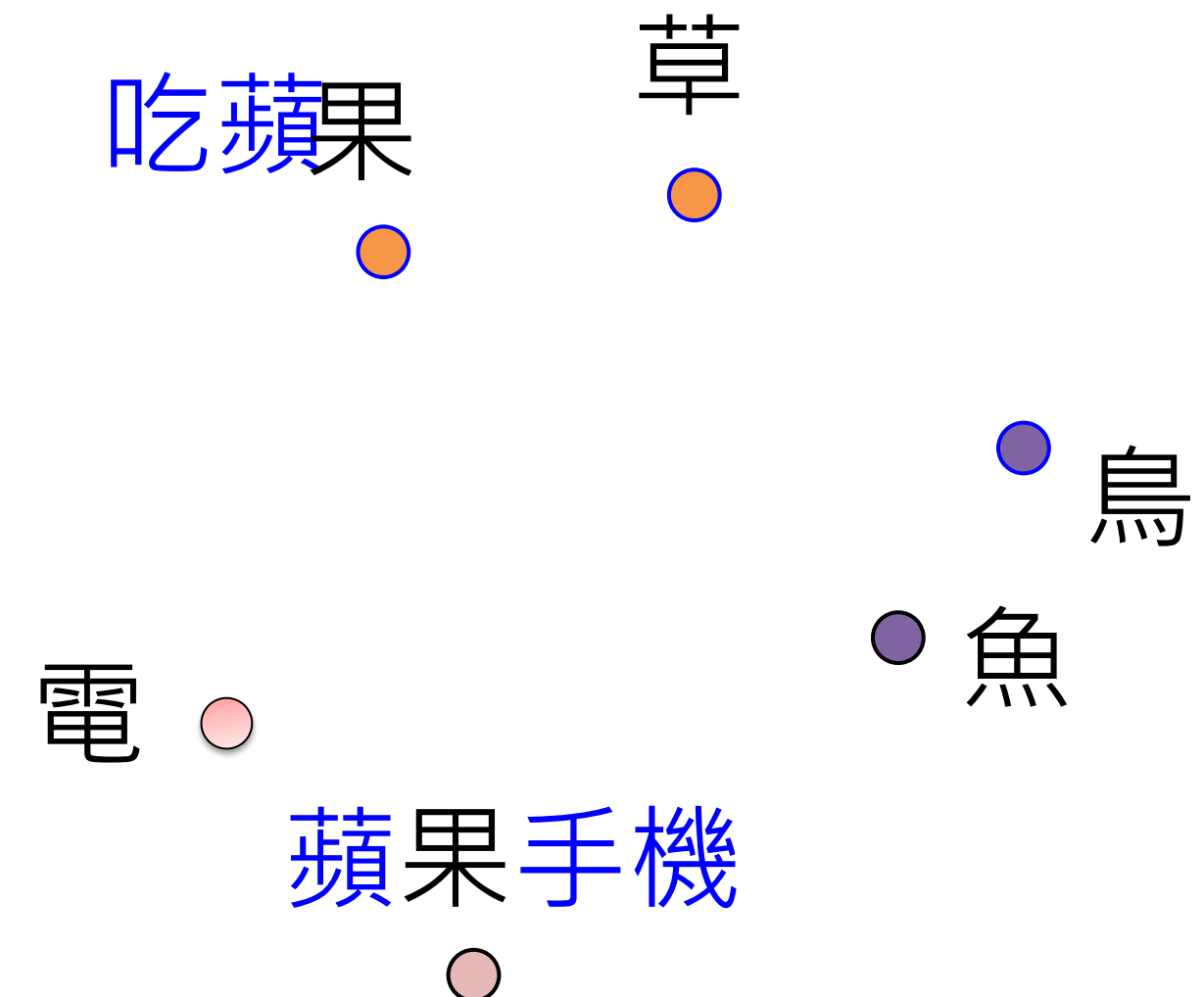
How to use BERT



Why does BERT work?



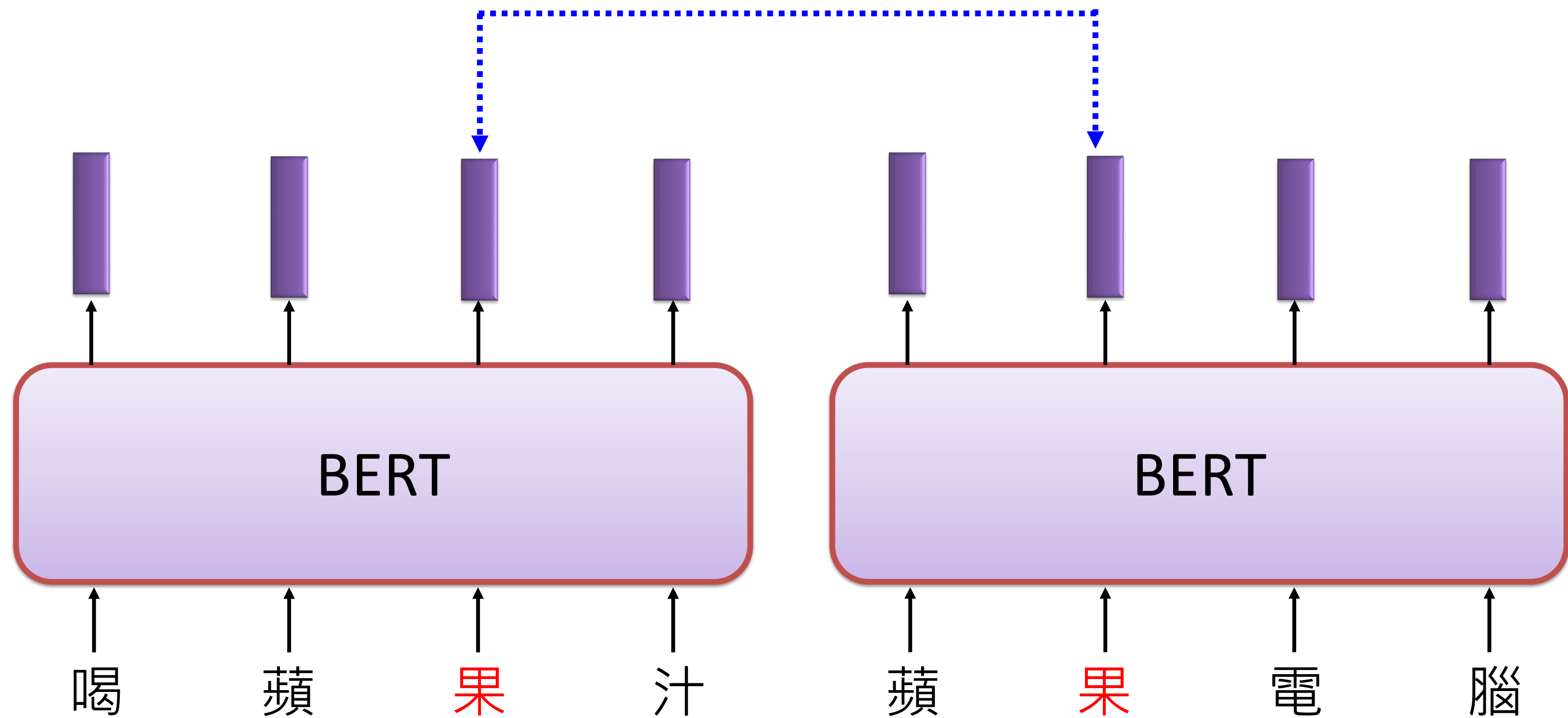
The tokens with similar meaning have similar embedding.



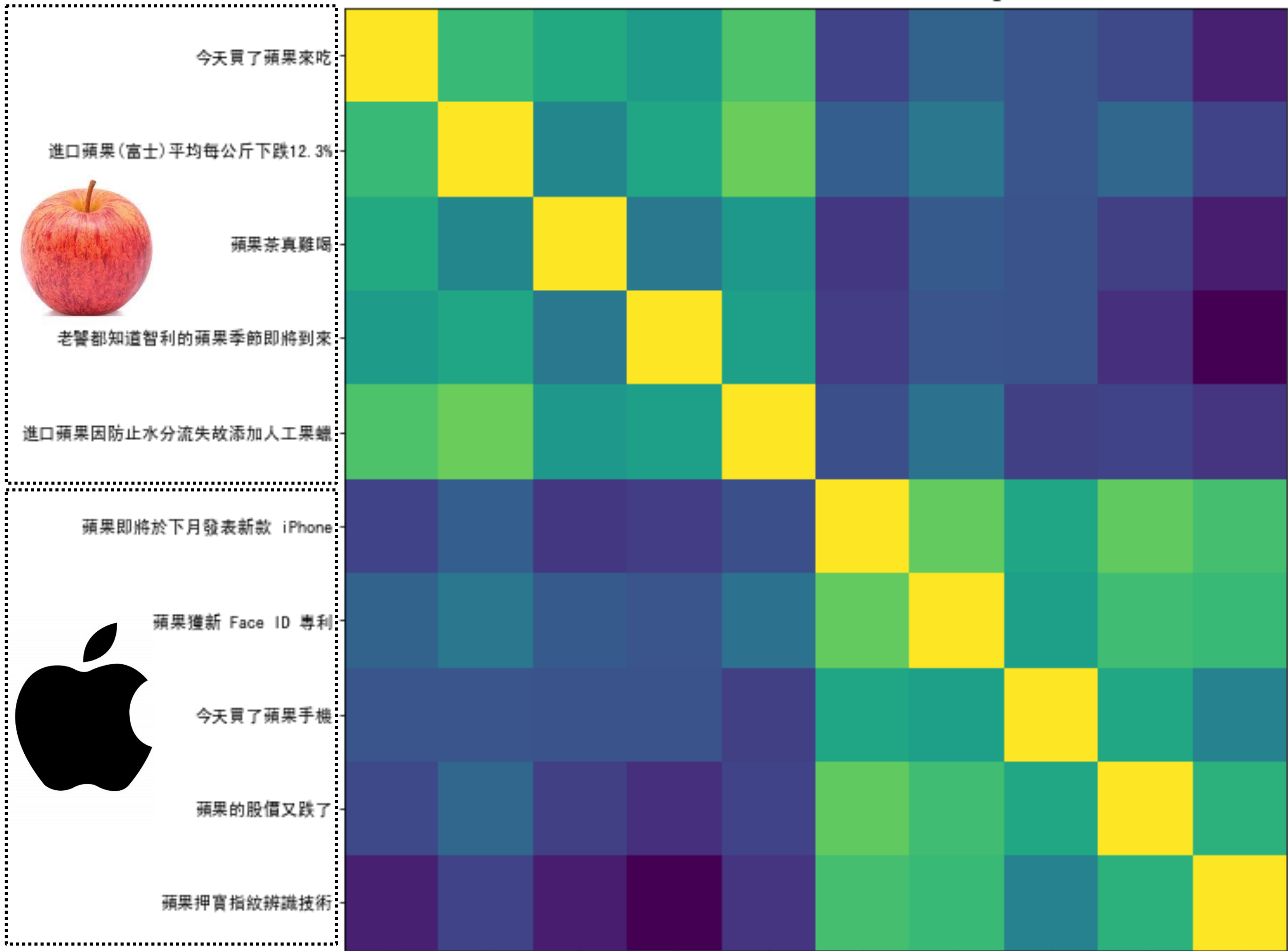
Context is considered.

Why does BERT work?

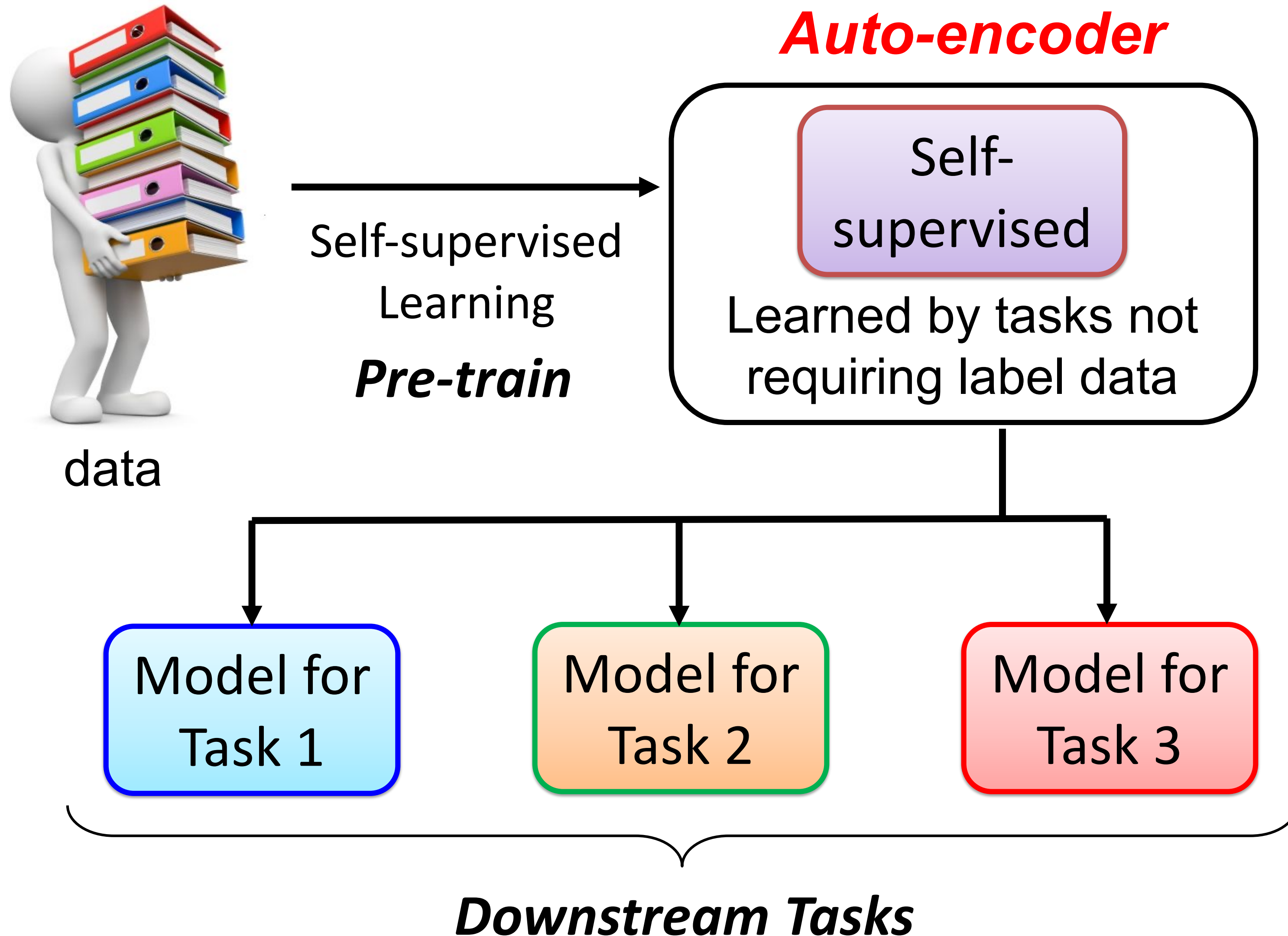
compute cosine similarity



Cosine Similarities of BERT Embeddings



Self-supervised Learning Framework



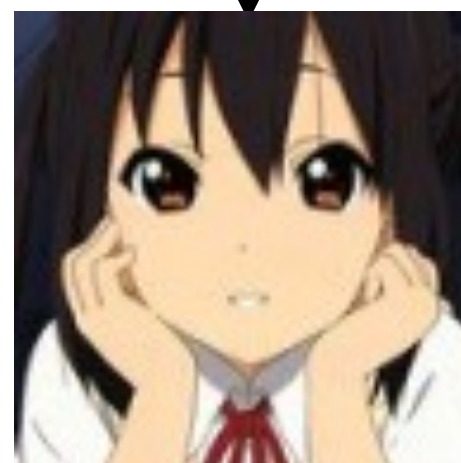
Auto-encoder

Unlabeled
Images

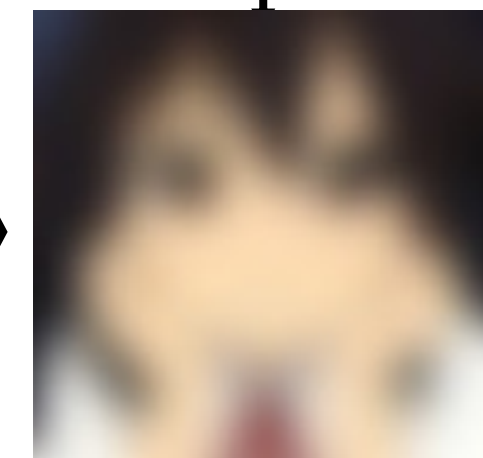
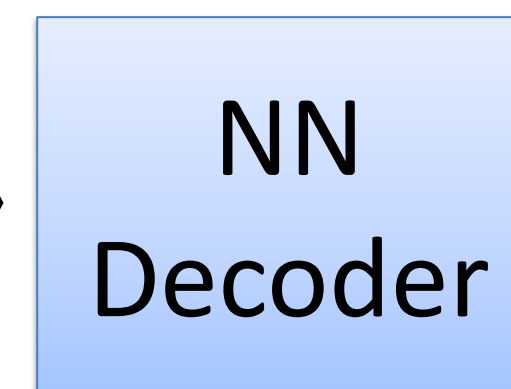
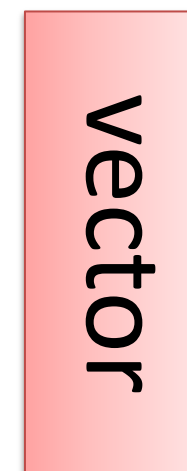
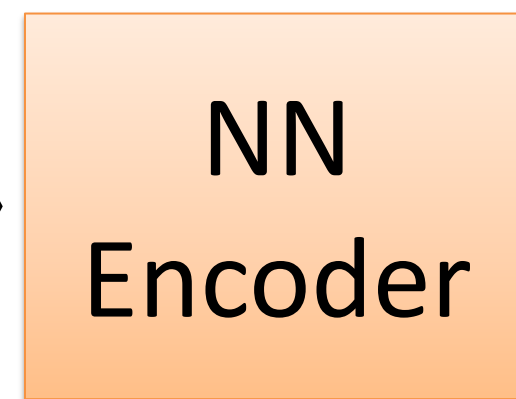


As close as possible (reconstruction)

high dim



old feature



low dim (bottleneck)

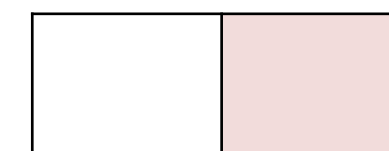
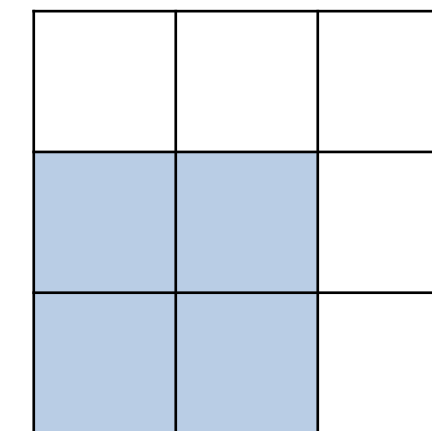
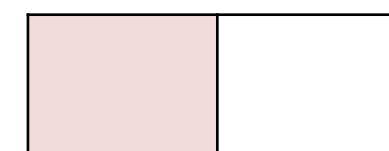
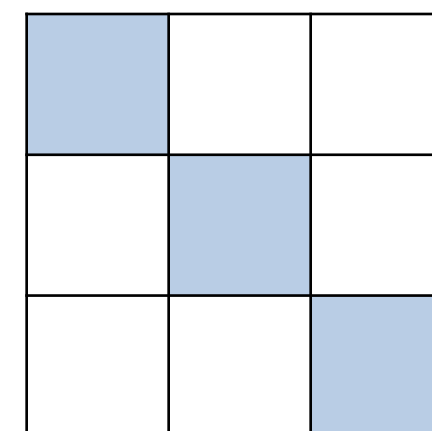
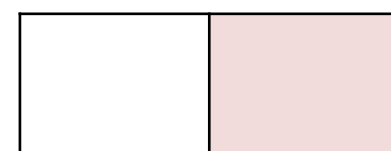
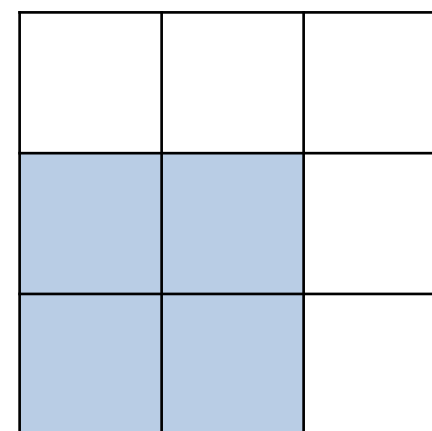
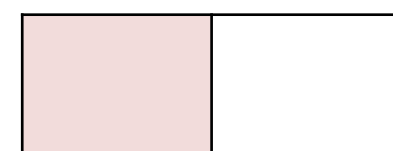
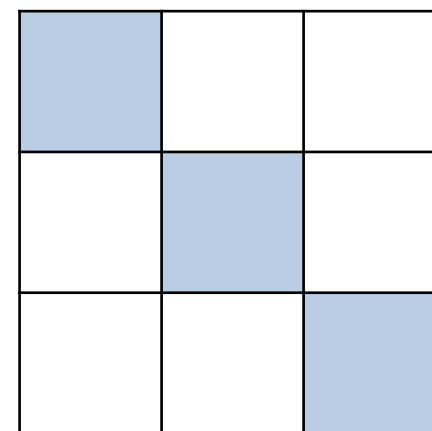
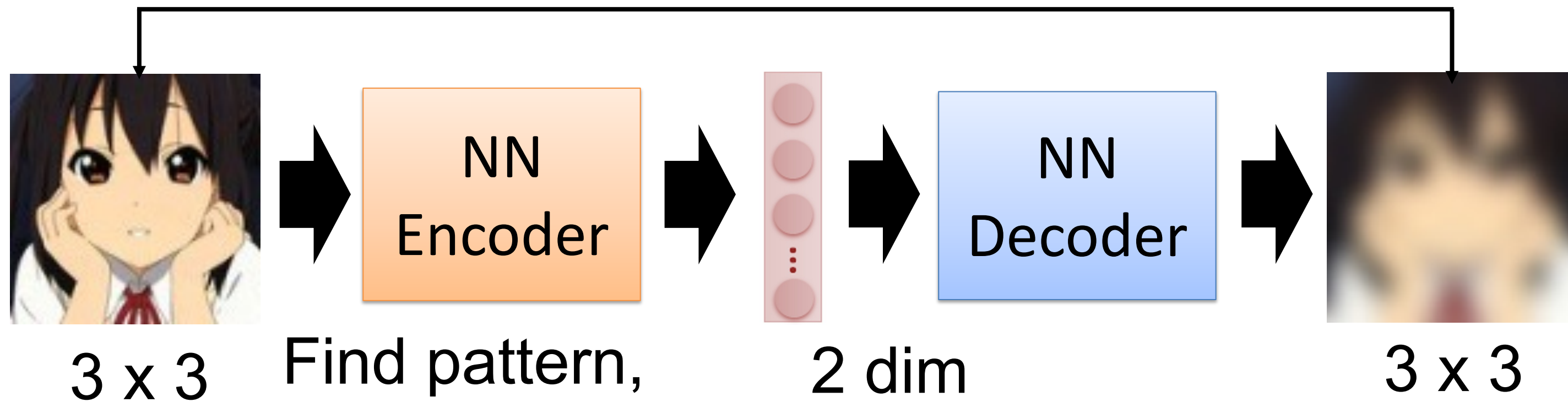
Dimension reduction

Embedding, Representation, Code

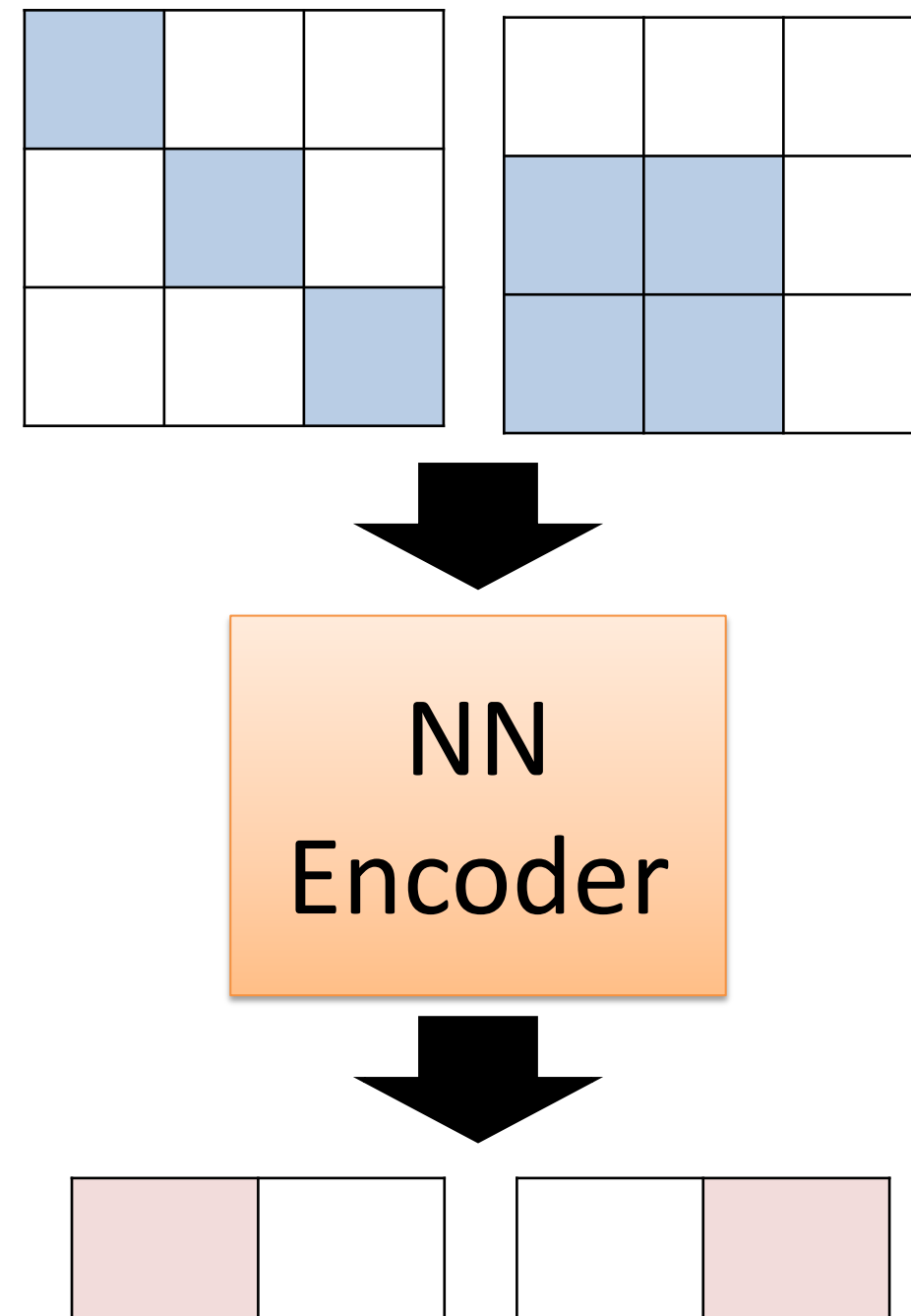
New feature for downstream tasks

Why Auto-encoder?

As close as possible (reconstruction)

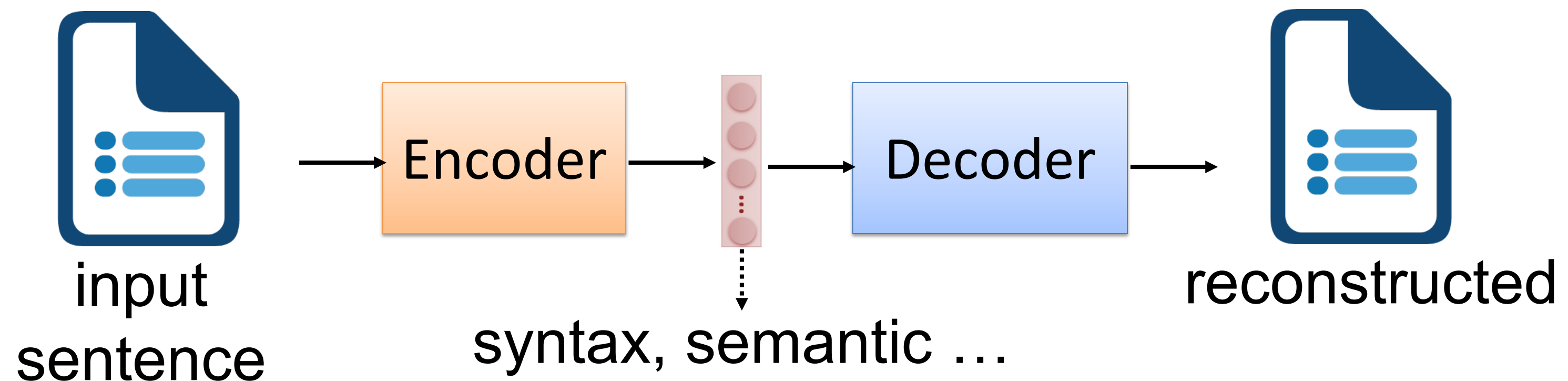
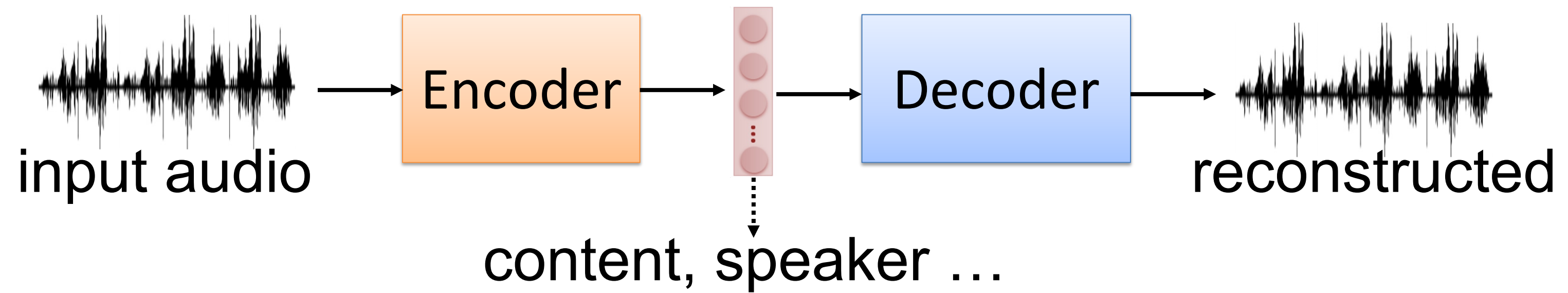
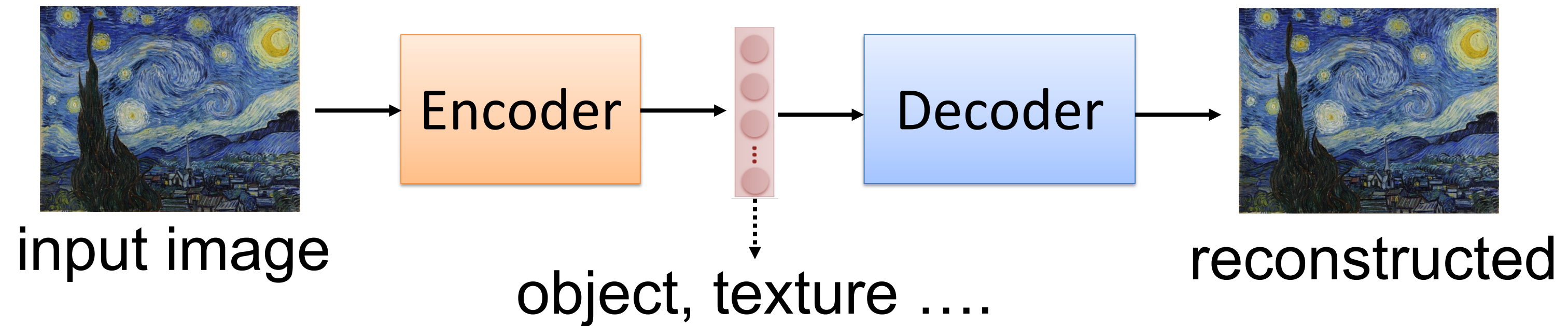


Why Auto-encoder?

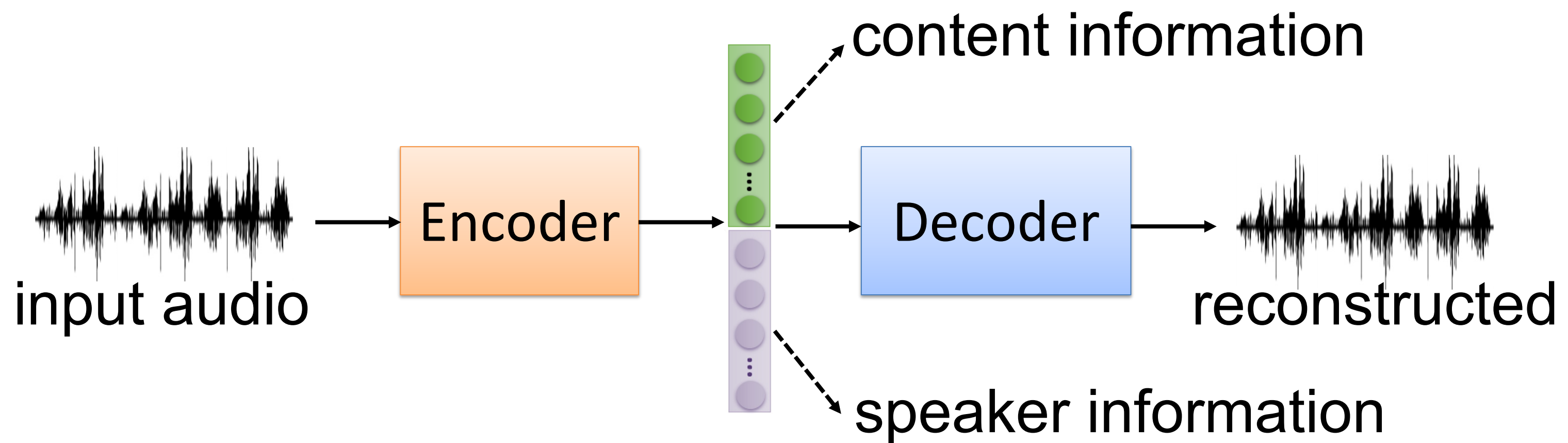
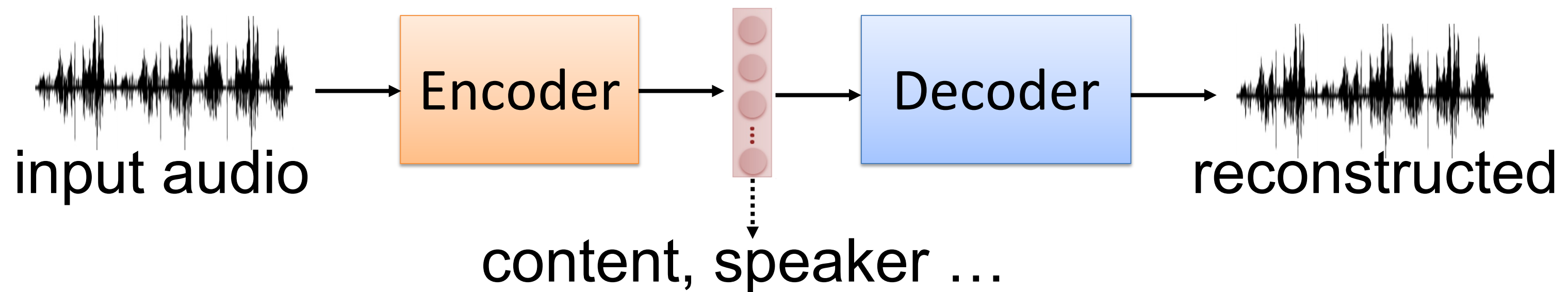


《神鵰俠侶》

Representation includes information of different aspects



Feature Disentangle



<https://arxiv.org/abs/1904.05742>
<https://arxiv.org/abs/1804.02812>
<https://arxiv.org/abs/1905.05879>