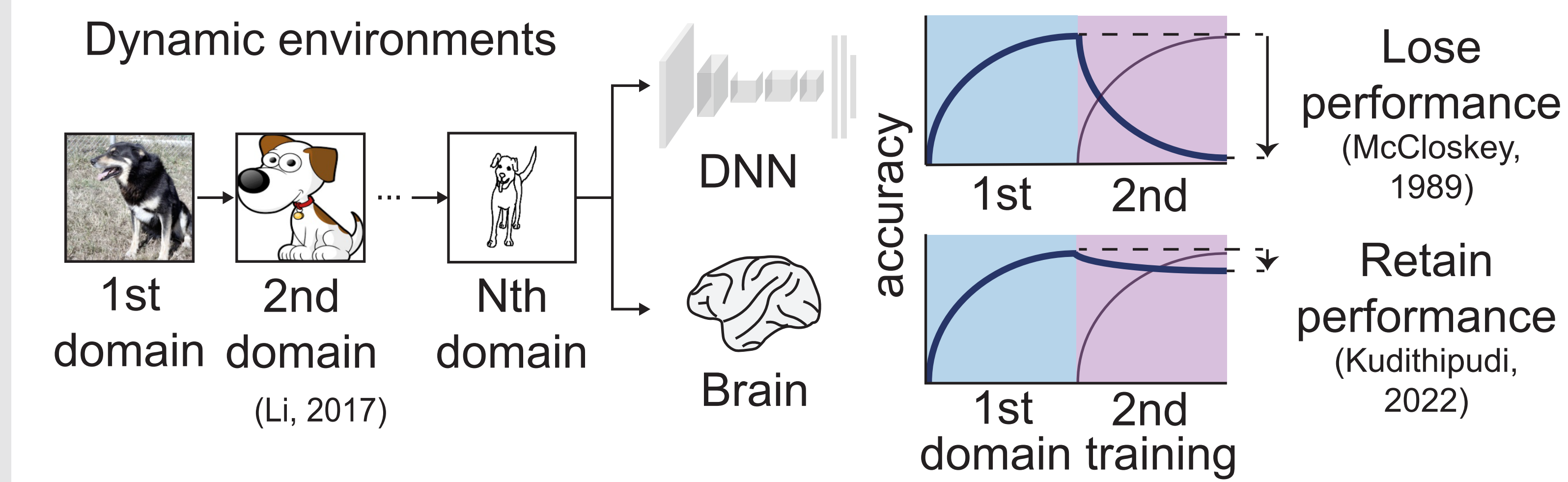


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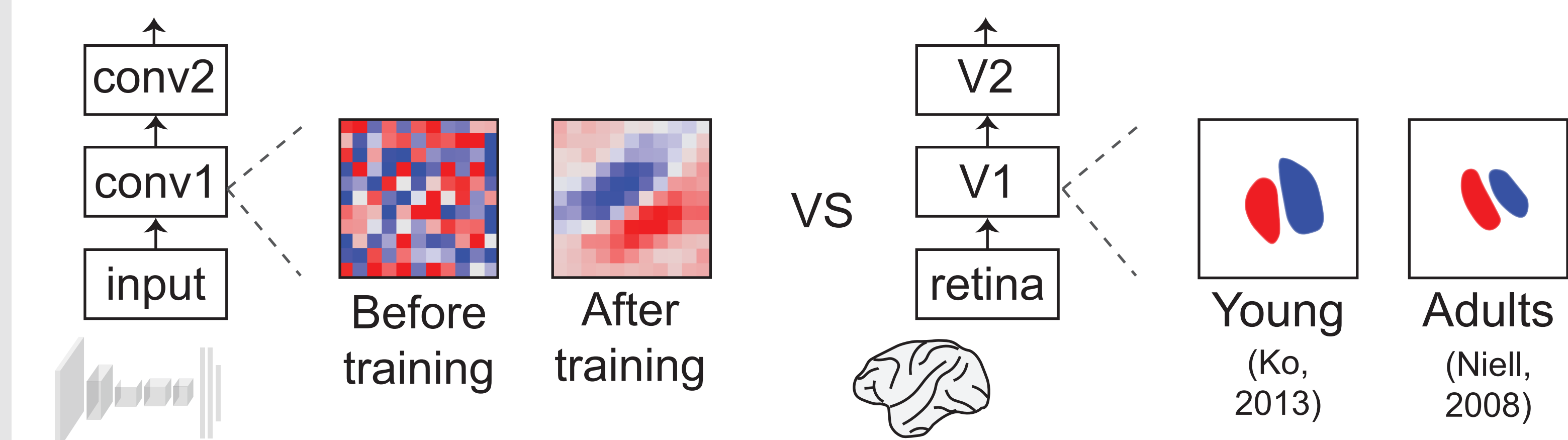
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Introduction

• Unlike brain, DNNs are vulnerable to environmental changes

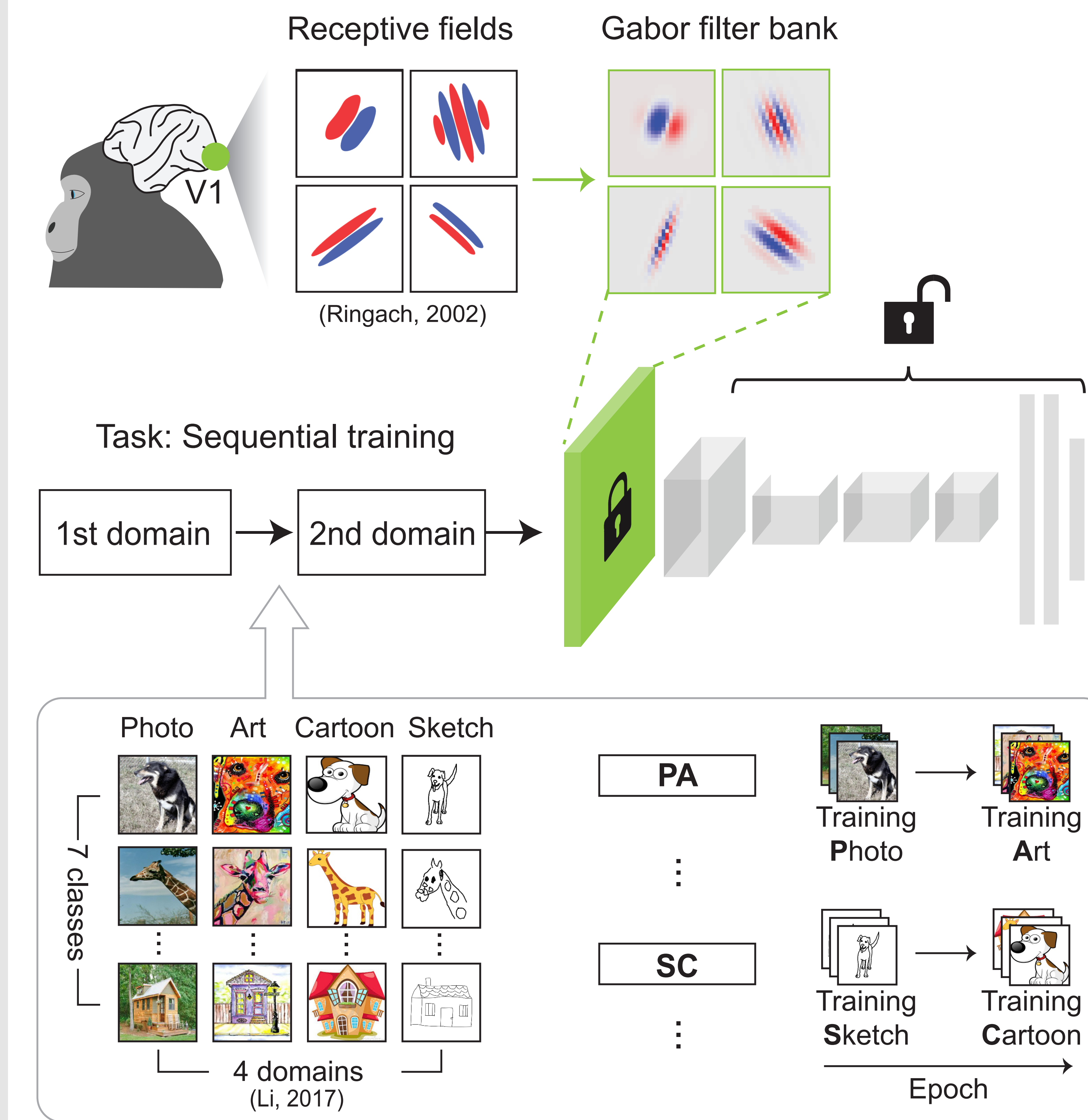


• Brain's early visual pathway has innate Gabor-like receptive fields that remain stable throughout visual experience



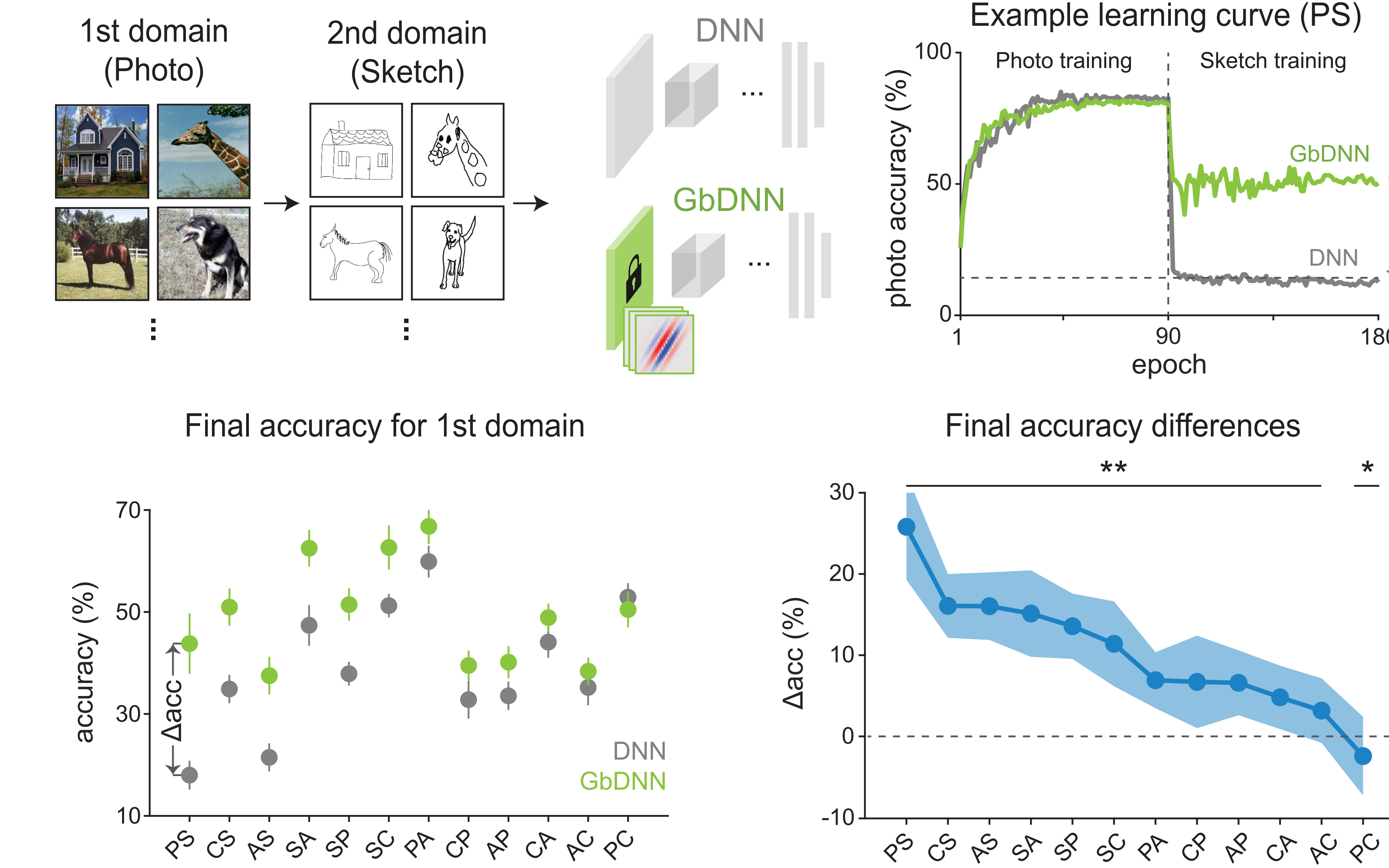
Q. Can Gabor-like receptive fields in the early layer enable environment-agnostic object recognition?

• Our model: Fixed Gabor filters in the early layer (GbDNN)



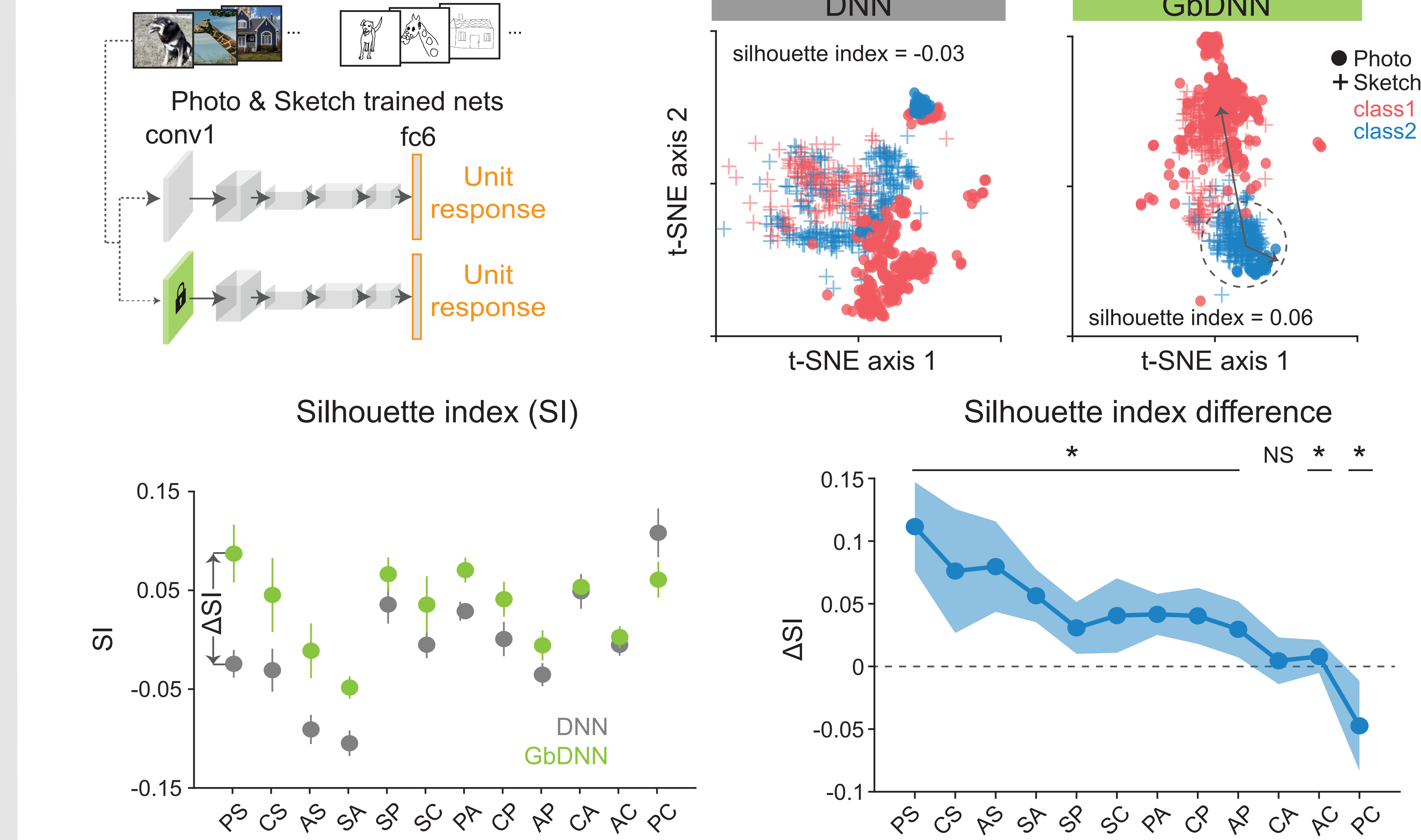
Key results

• GbDNN robustly maintained performance under various domain changes



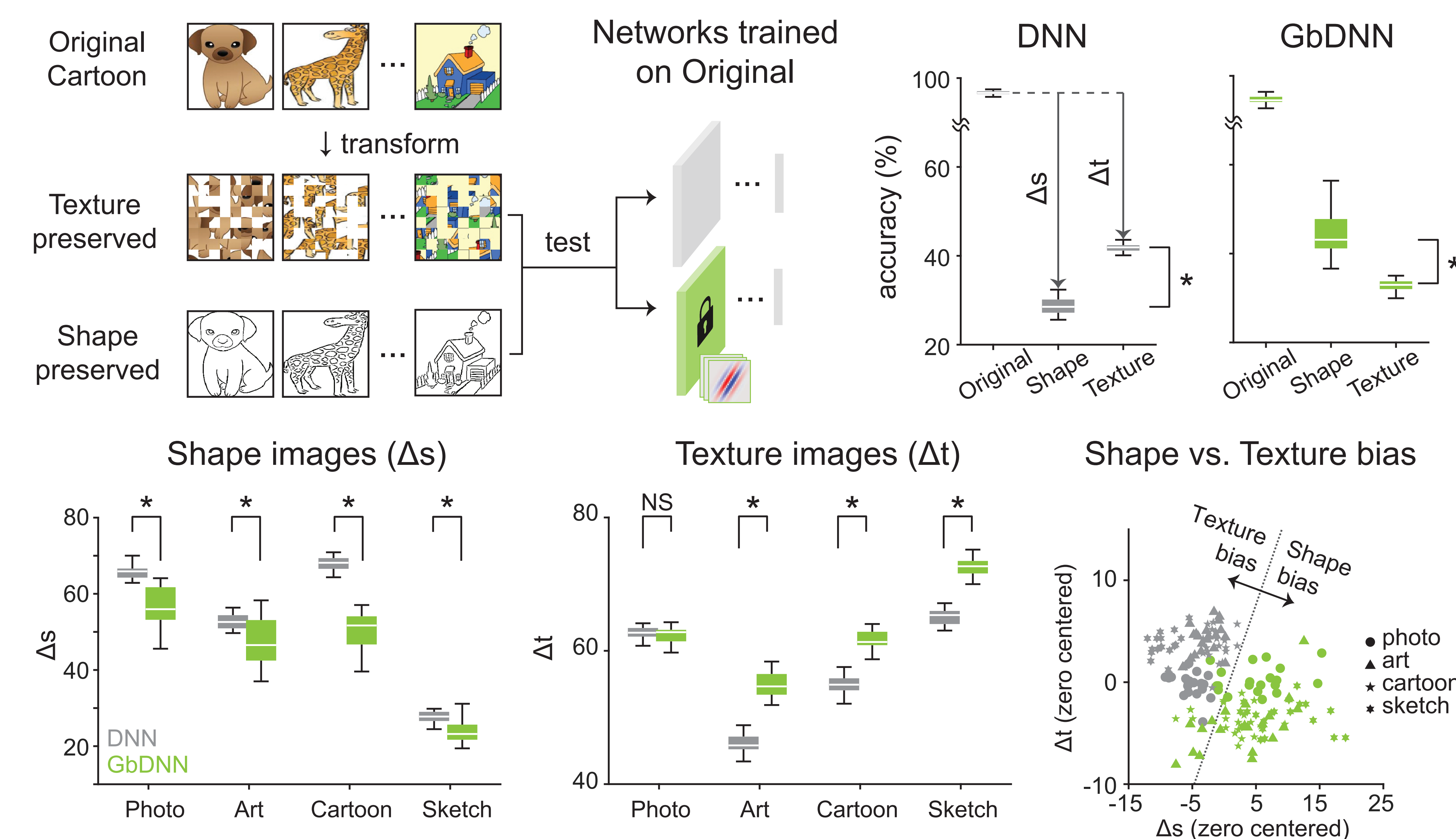
Results2

• GbDNN produces invariant object representations across domains



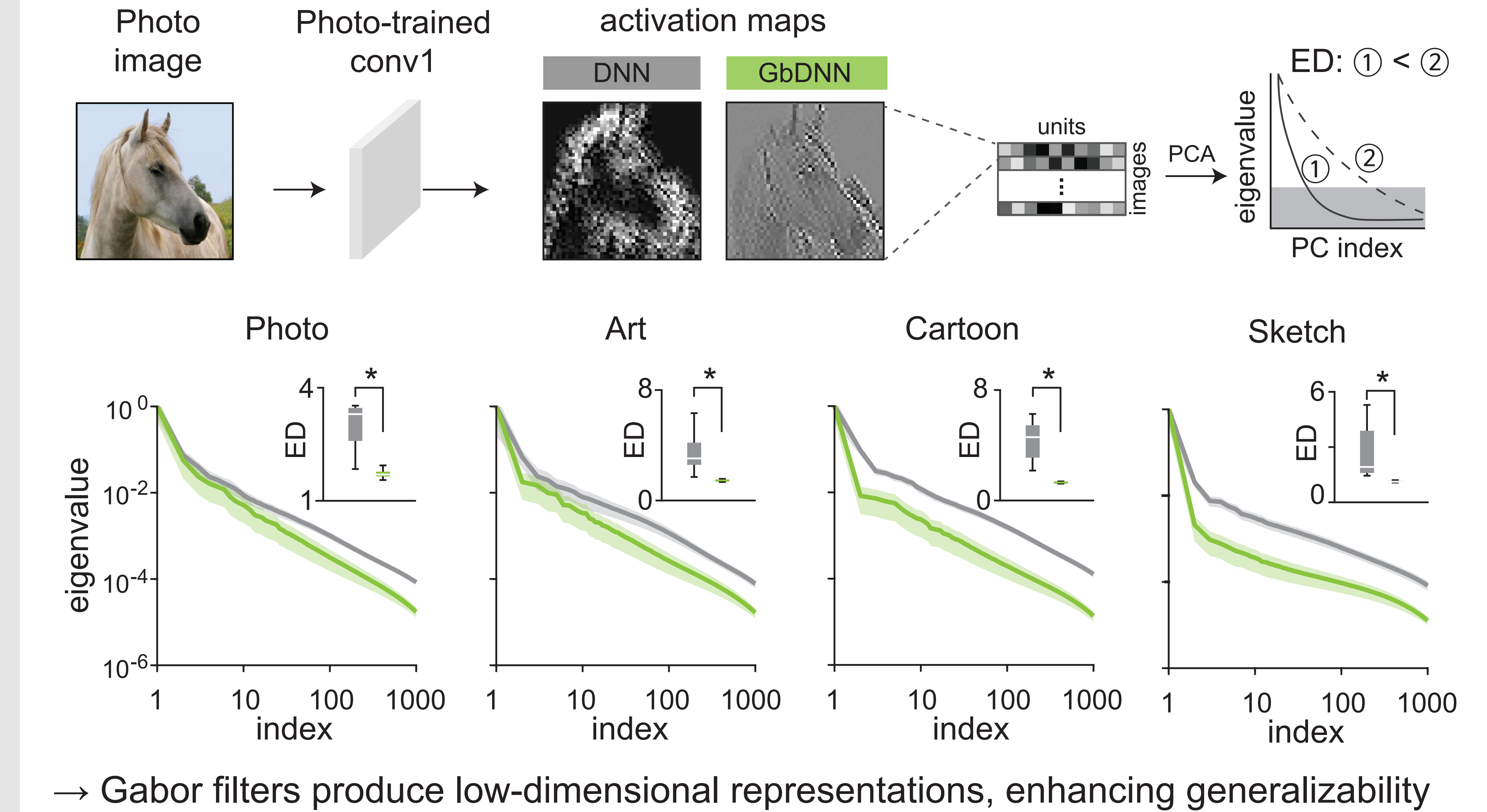
Results3

• GbDNNs show shape-biased object classification



Results4

• Gabor filters reduce dimensionality of learned representations



Conclusions

- Hard-wired Gabor filters, resembling the receptive fields of V1 neurons, enable environment-agnostic object recognition
- Unlike DNNs which cluster based on image domains, our model spontaneously clustered same objects across various domains in the latent space,
- Fixed Gabor filters allow shape-biased object classifications, suggesting that these filters highly prevented overfitting.