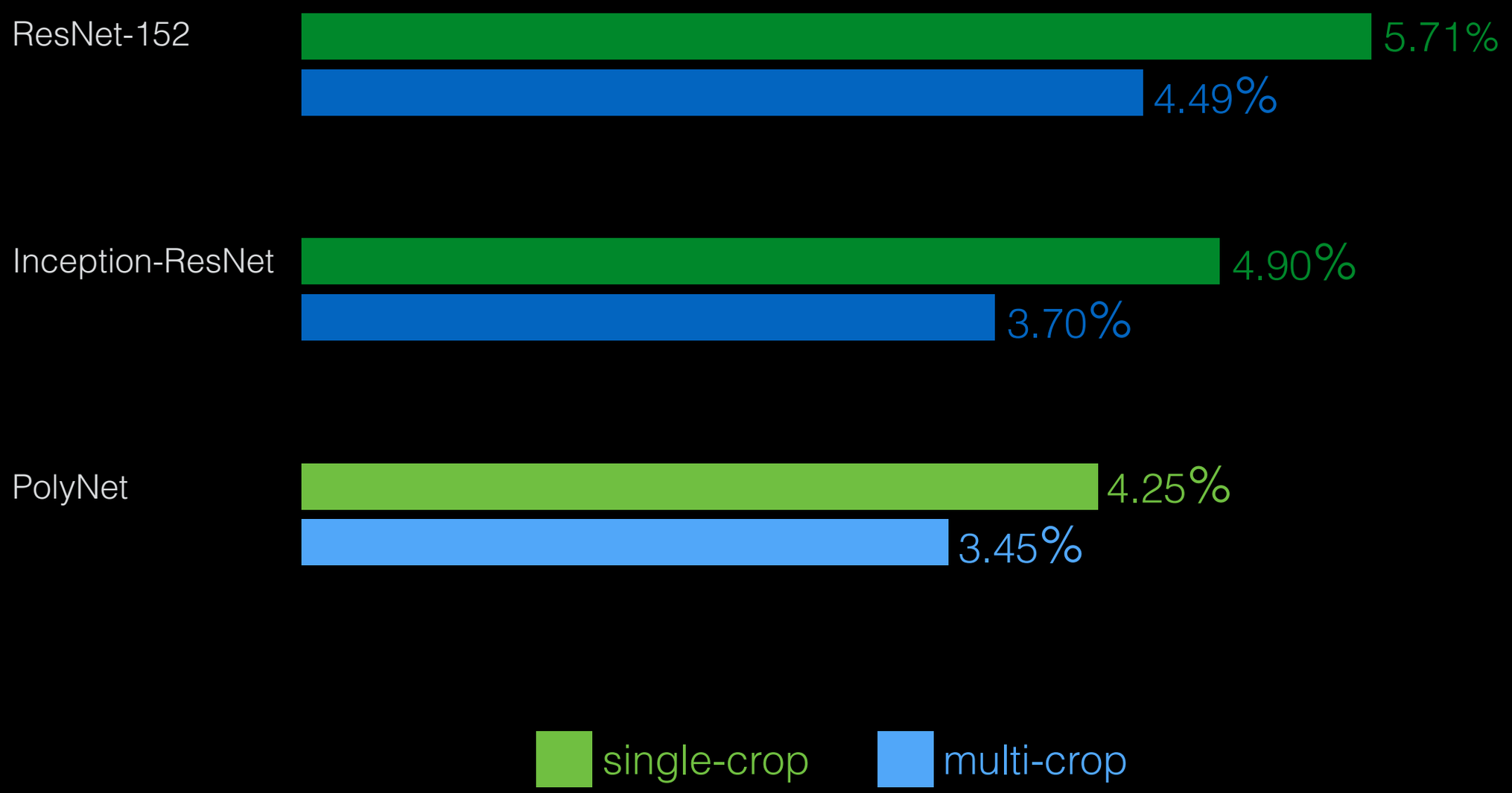
POLYNET

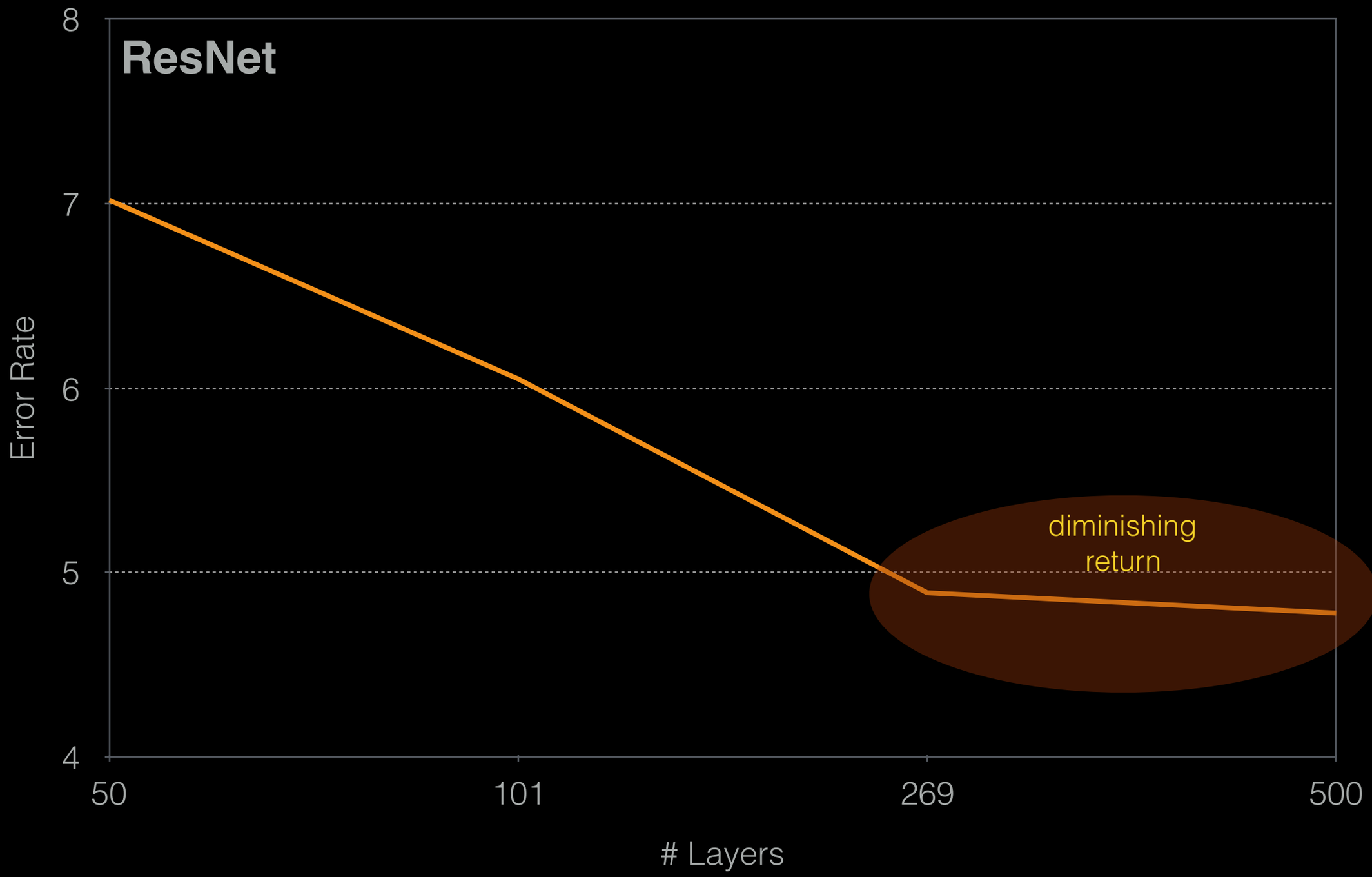
A PURSUIT OF STRUCTURAL DIVERSITY WITHIN A NETWORK

Dahua Lin, on behalf of the **CU-DeepLink** team

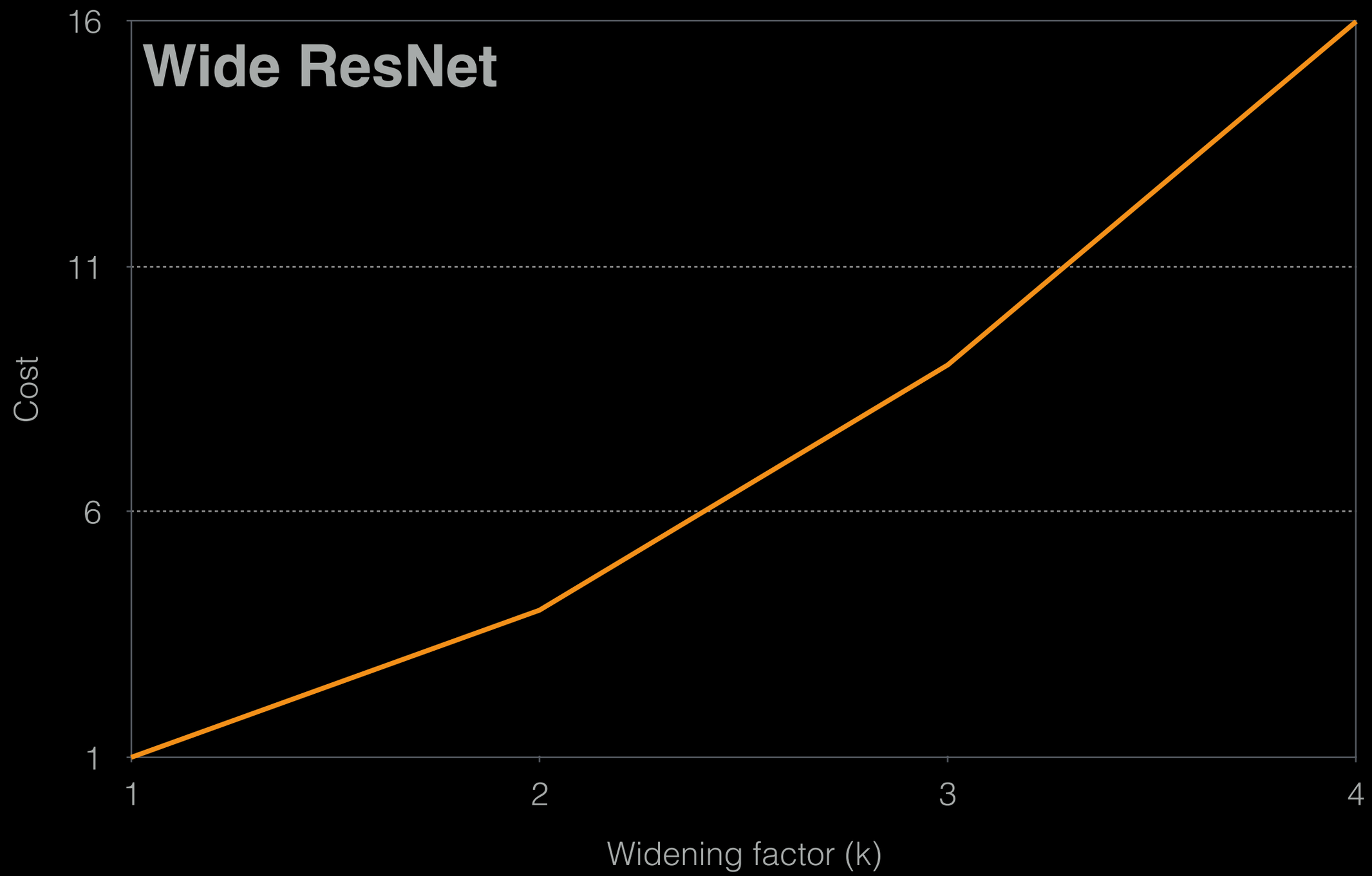
Single Network Accuracy



Going Deeper ?



Going Wider ?

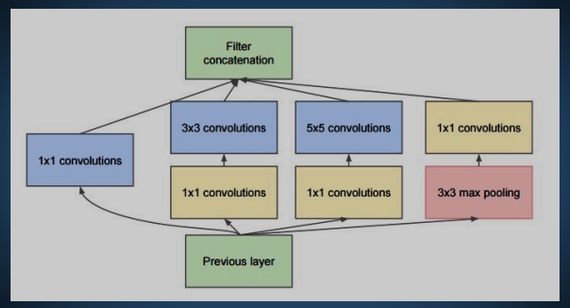


Dimensions to explore

I	**—**	**?**
Depth	Width	
Diminishing return & Increased training difficulty	Quadratic growth in both computational cost & memory demand.	Any other dimensions to explore?

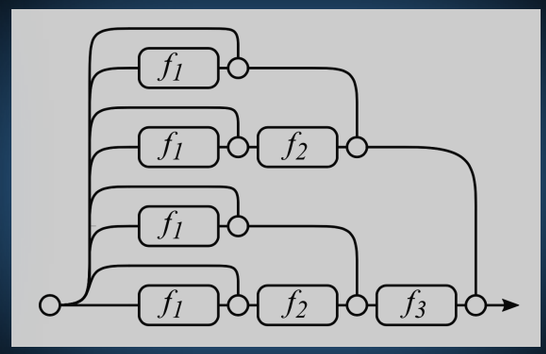
Clues from the History

What do they have in common?



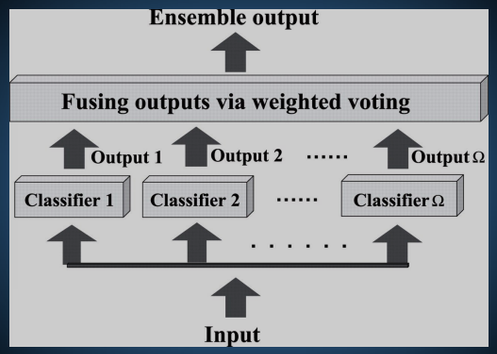
Inception

A combination of complementary paths — the most successful design of CNN modules.



ResNet

Veit et al showed that a ResNet is an exponential ensemble of relatively shallow paths.

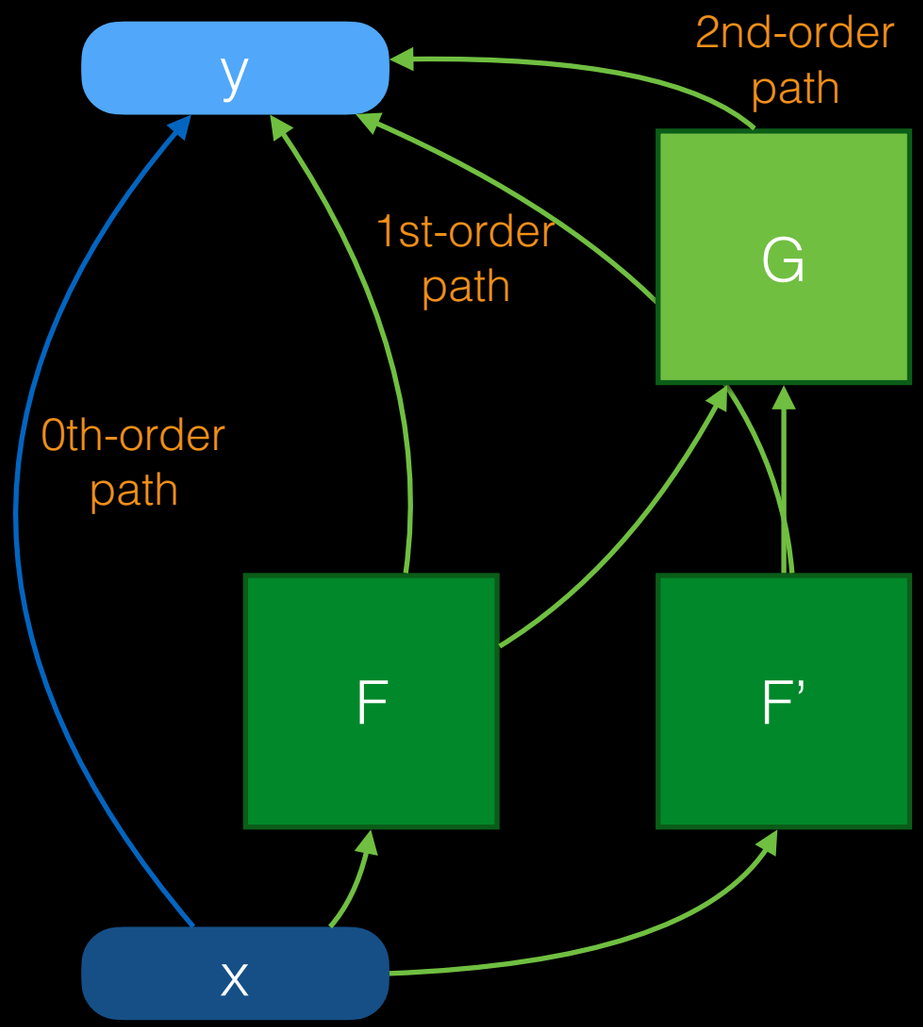


Ensemble

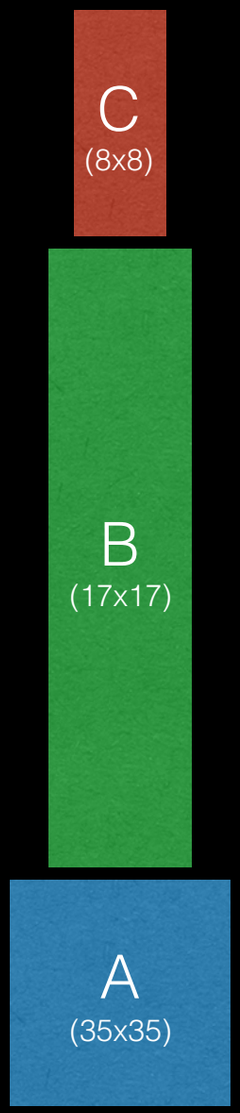
Ensemble usually gives you a considerable gain no matter how powerful individual models are.

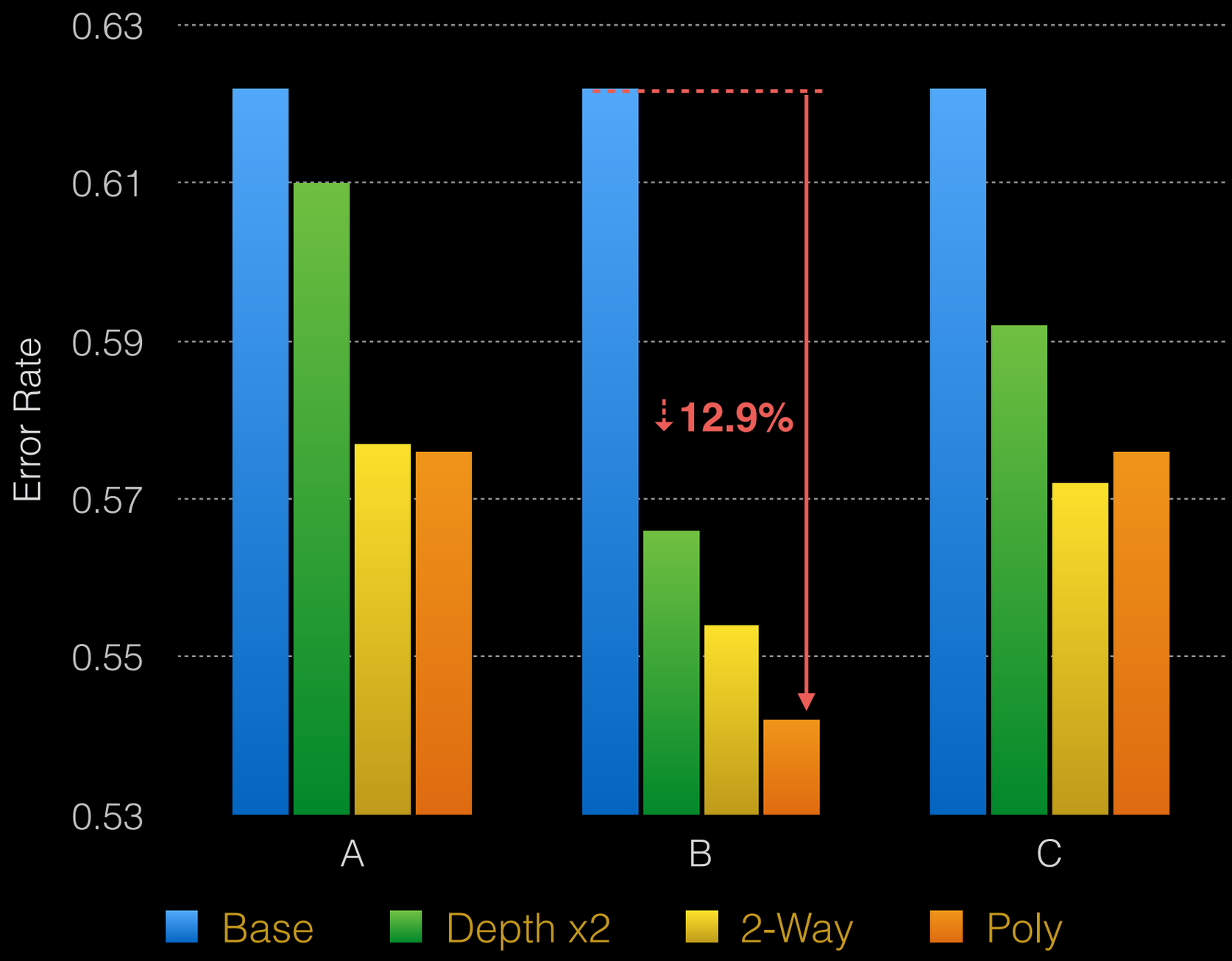
PolyInception

$$y = (I + F + G \circ F)(x)$$



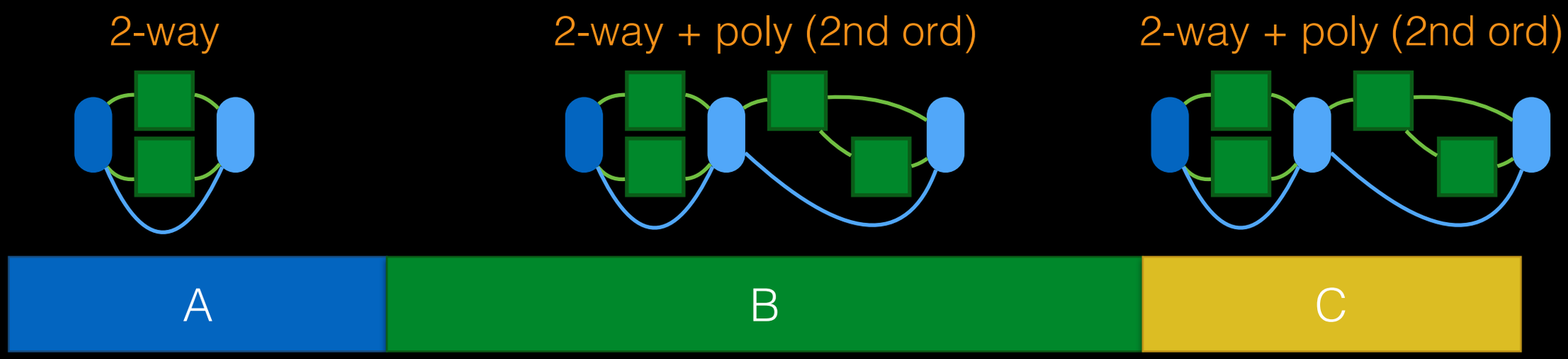
Ablation Study



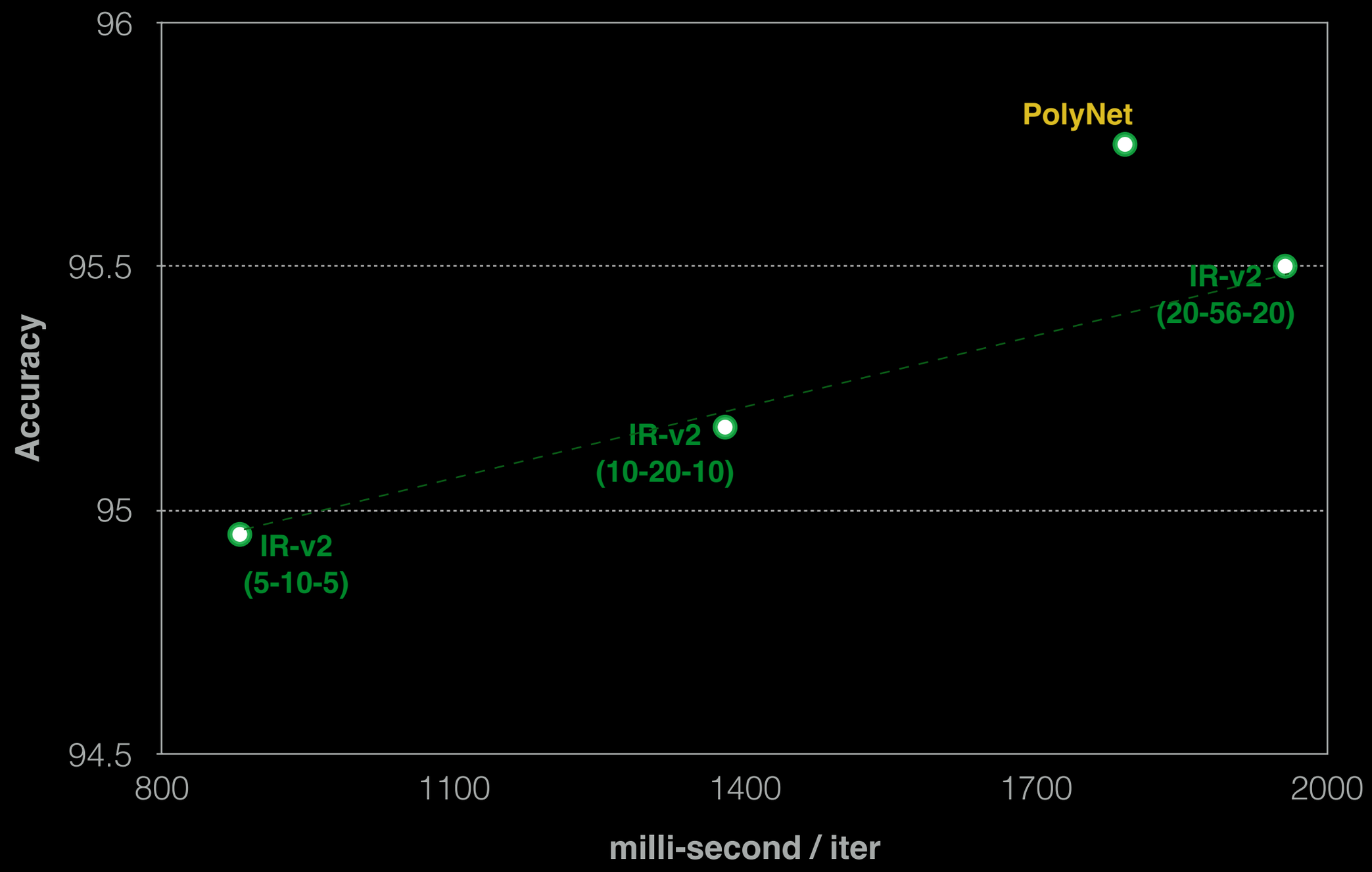


PolyNet

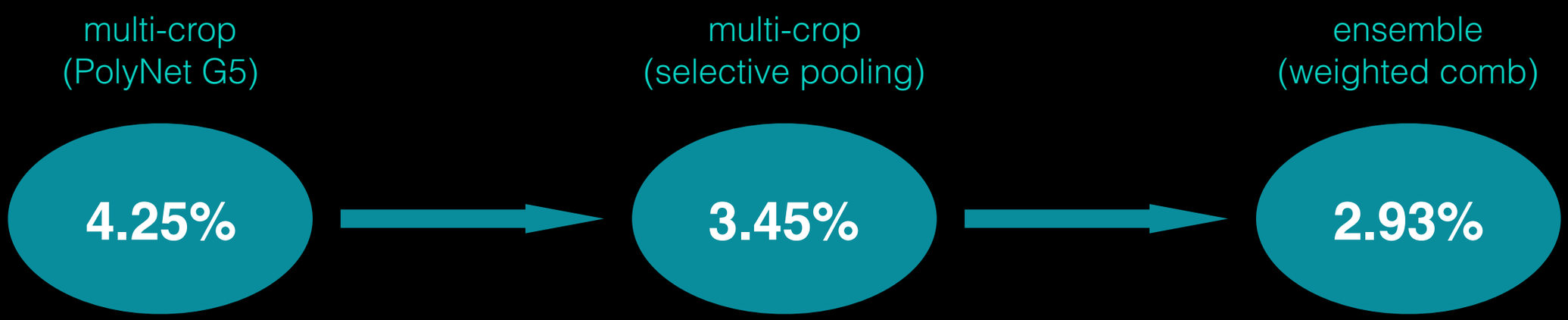
	#layers	param (MB)	ms/iter	single-crop error
IR-v2 (5-10-5)	132	135	880	5.05
IR-v2 (10-20-10)	242	237	1380	4.83
IR-v2 (20-56-20)	655	531	1957	4.50
PolyNet	537	365	1792	**4.25**



Comparison


96
95.5
95
94.5
Accuracy
800
1100
1400
1700
2000
milli-second / iter
PolyNet
IR-v2
(20-56-20)
IR-v2
(10-20-10)
IR-v2
(5-10-5)

Overview of CLS Results



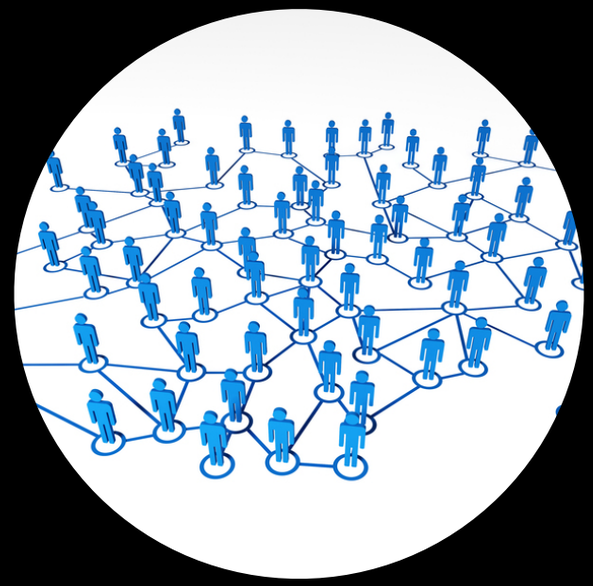
This is only the first step …

Parrots

A new deep learning framework developed by us (from scratch)

Efficient

Highly efficient scheduling & optimal memory reuse



Scalable

Multi-node & multi-GPU support.

Scalable to 64 GPUs and more …

Extensible

Highly extensible modular design based on a novel notion of VM

Will be open sourced …

Thank You

CU-DeepLink

Xingcheng Zhang
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Shengen Yan
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