



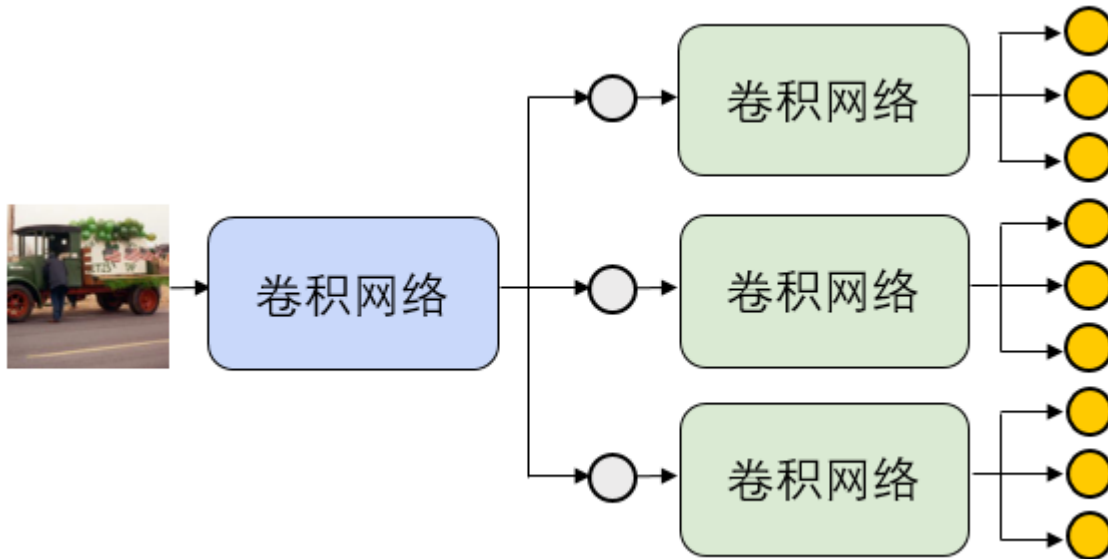
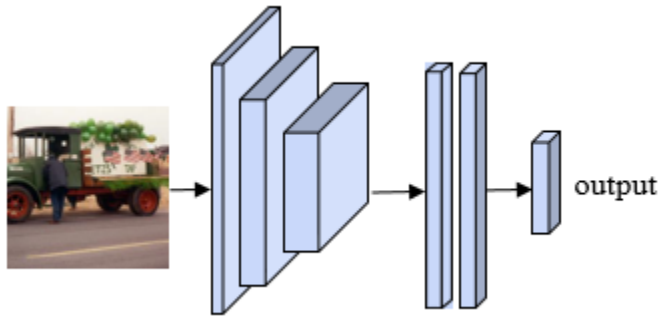
Paper Reading

陈铮

2018.12.15

Introduction

□ 树形网络





Outline

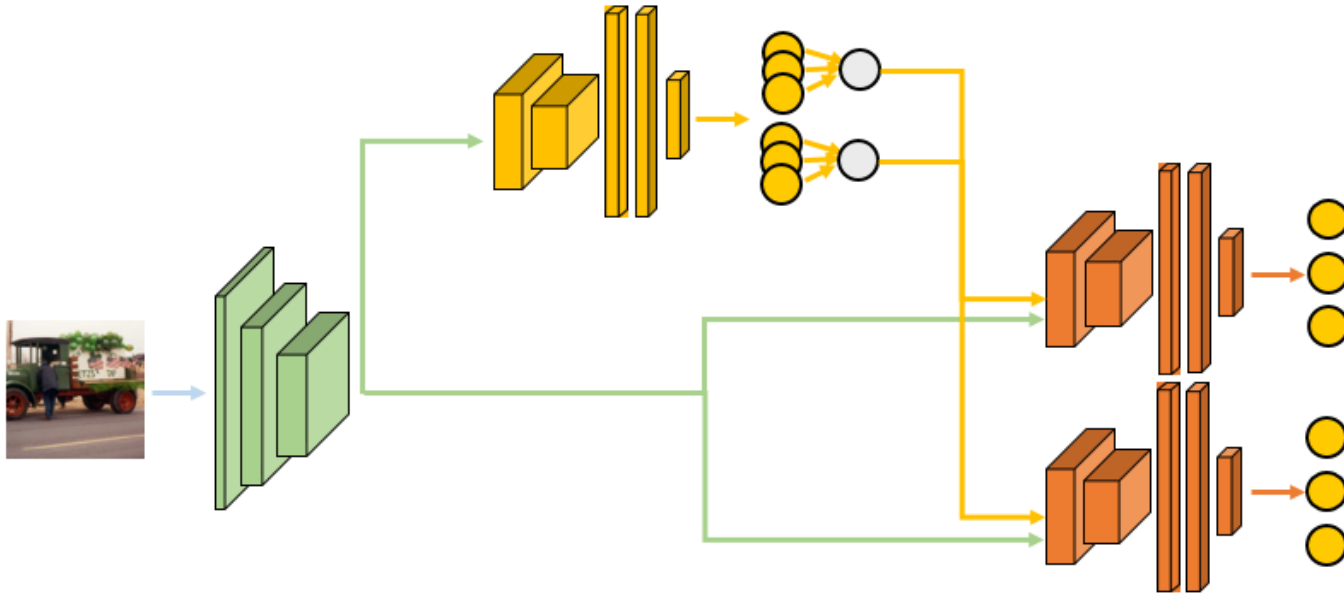
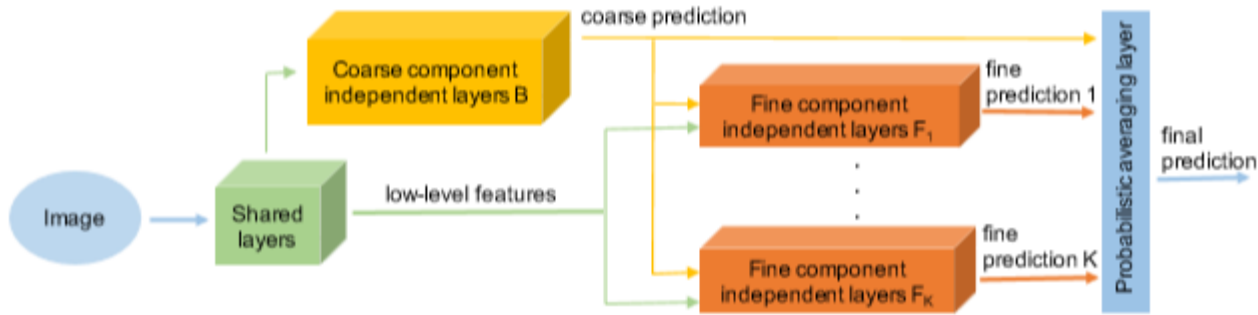
- ICCV 2015
 - HD-CNN: Hierarchical Deep Convolutional Neural Networks for Large Scale Visual Recognition
- CVPR 2018
 - HydraNets: Specialized Dynamic Architectures for Efficient Inference
- arXiv 2018
 - Tree-CNN: A Hierarchical Deep Convolutional Neural Network for Incremental Learning



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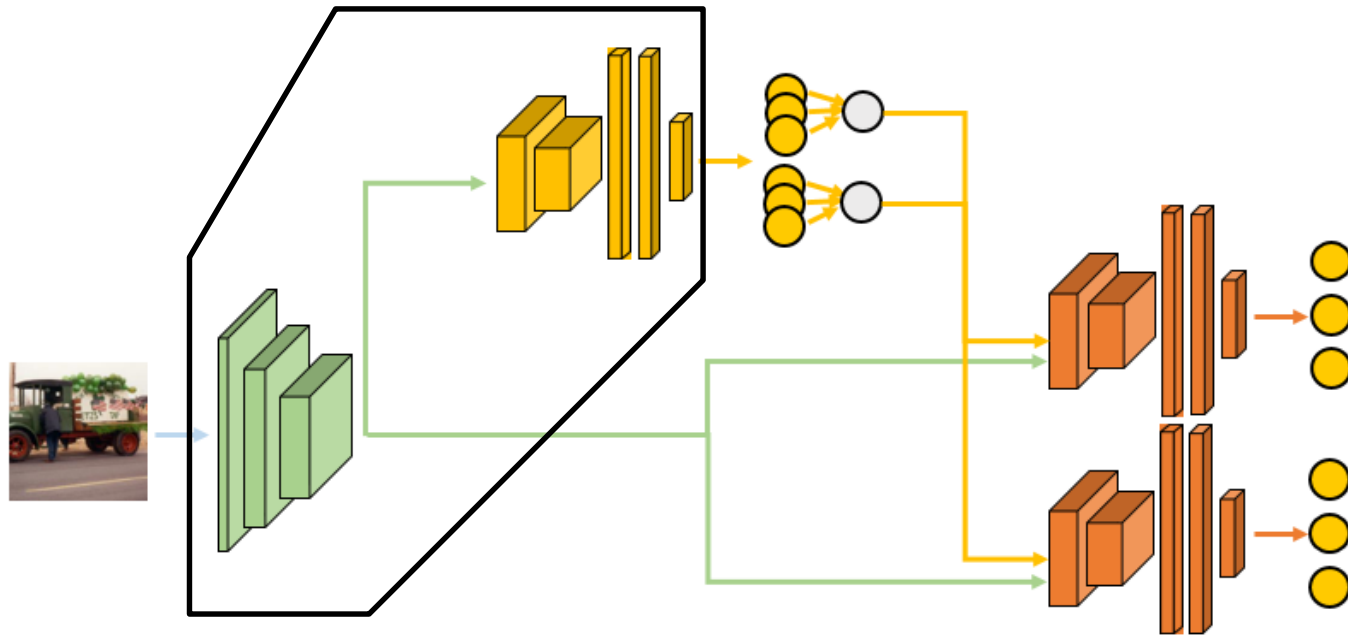
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Overview



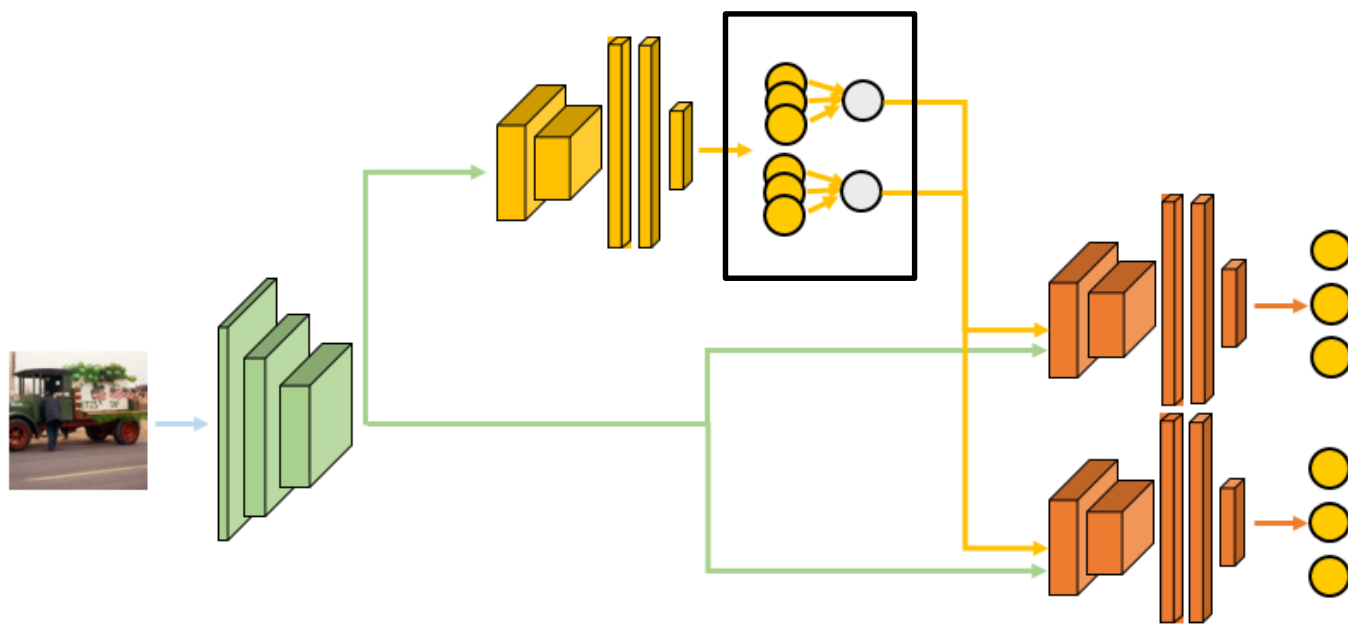
Training

□ 训练共享层和粗分类网络



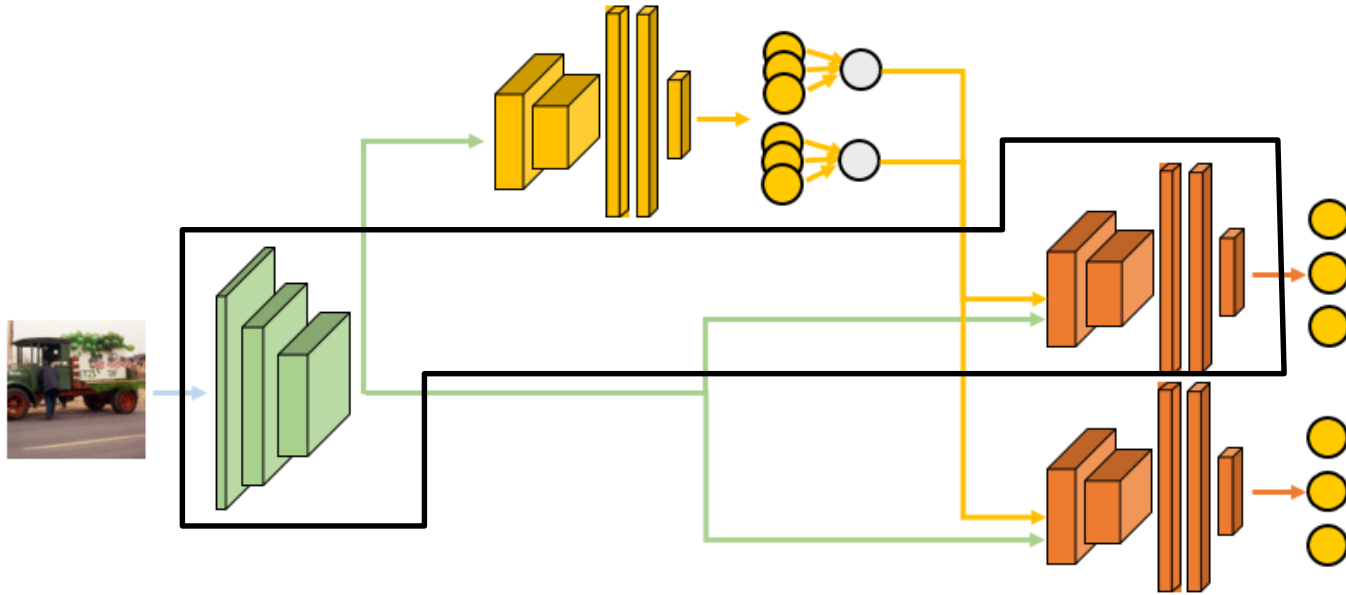
Training

- 计算混淆矩阵，通过谱聚类获得粗类别
- Overlapping



Training

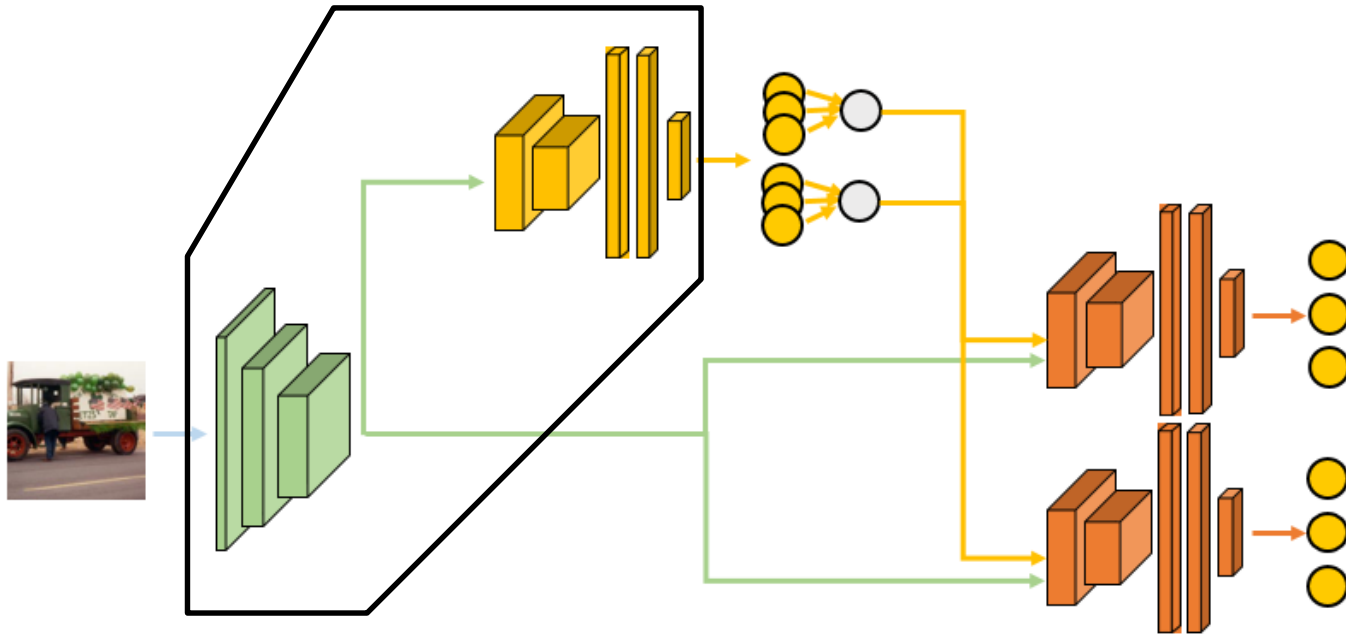
- 用各个大类的数据训练细分类网络（共享层固定）



Training

□ 分类器 fine-tune

$$E = -\frac{1}{n} \sum_{i=1}^n \log(p_{y_i}) + \frac{\lambda}{2} \sum_{k=1}^K (t_k - \frac{1}{n} \sum_{i=1}^n B_{ik})^2$$



Result

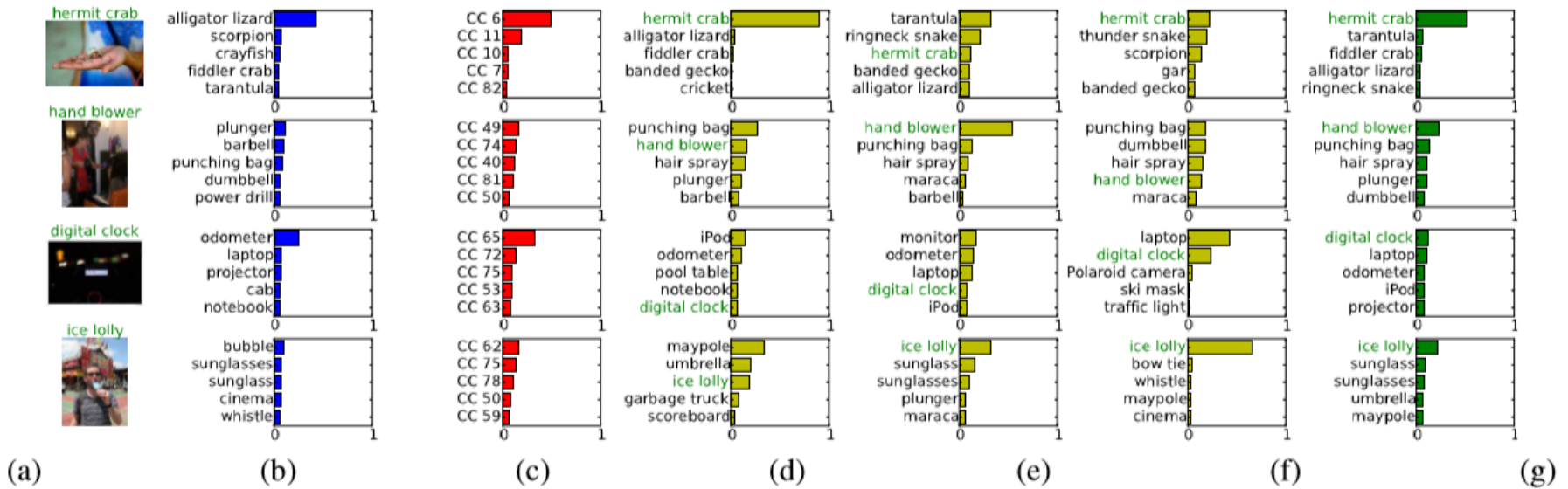


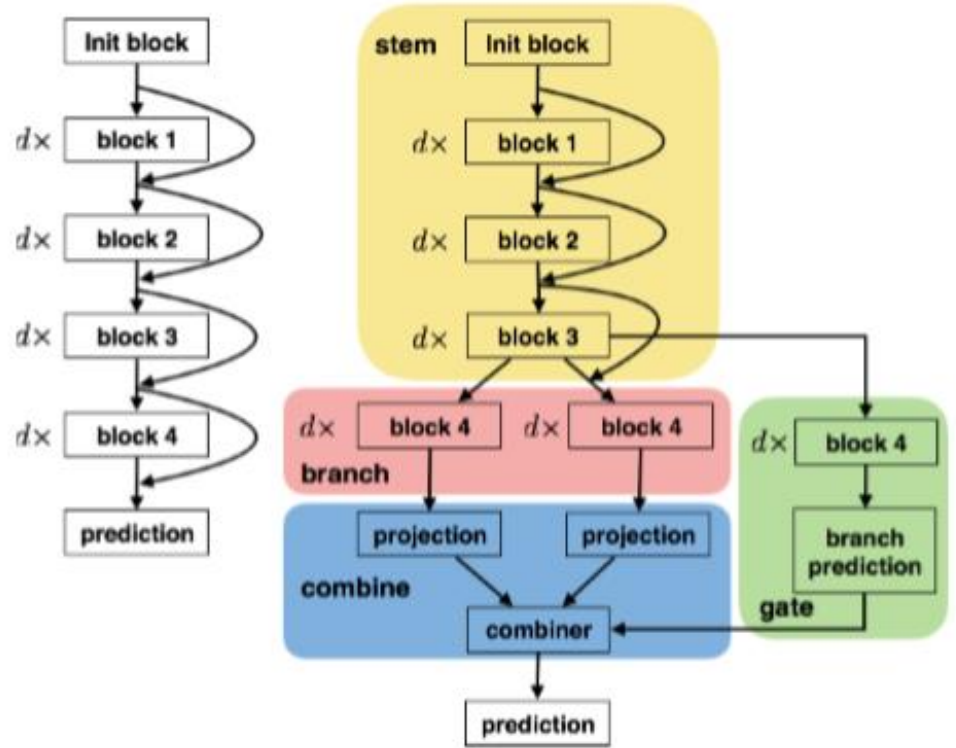
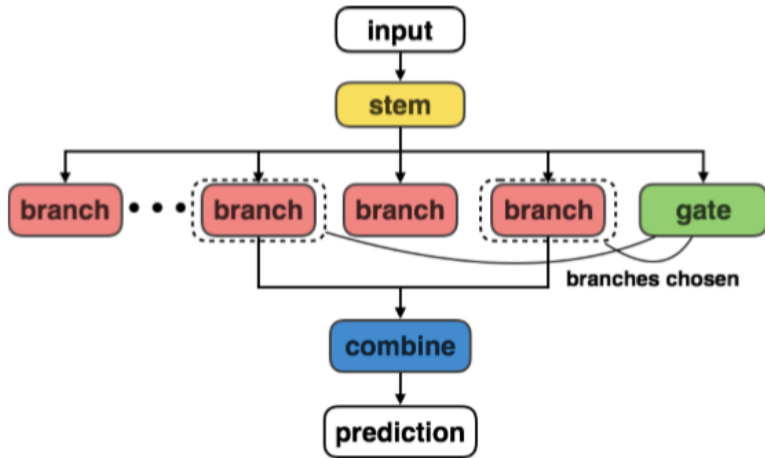
Figure 3: Case studies on ImageNet dataset. Each row represents a testing case. **Column (a)**: test image with ground truth label. **Column (b)**: top 5 guesses from the building block net ImageNet-NIN. **Column (c)**: top 5 Coarse Category (CC) probabilities. **Column (d)-(f)**: top 5 guesses made by the top 3 fine category CNN components. **Column (g)**: final top 5 guesses made by the HD-CNN. See text for details.



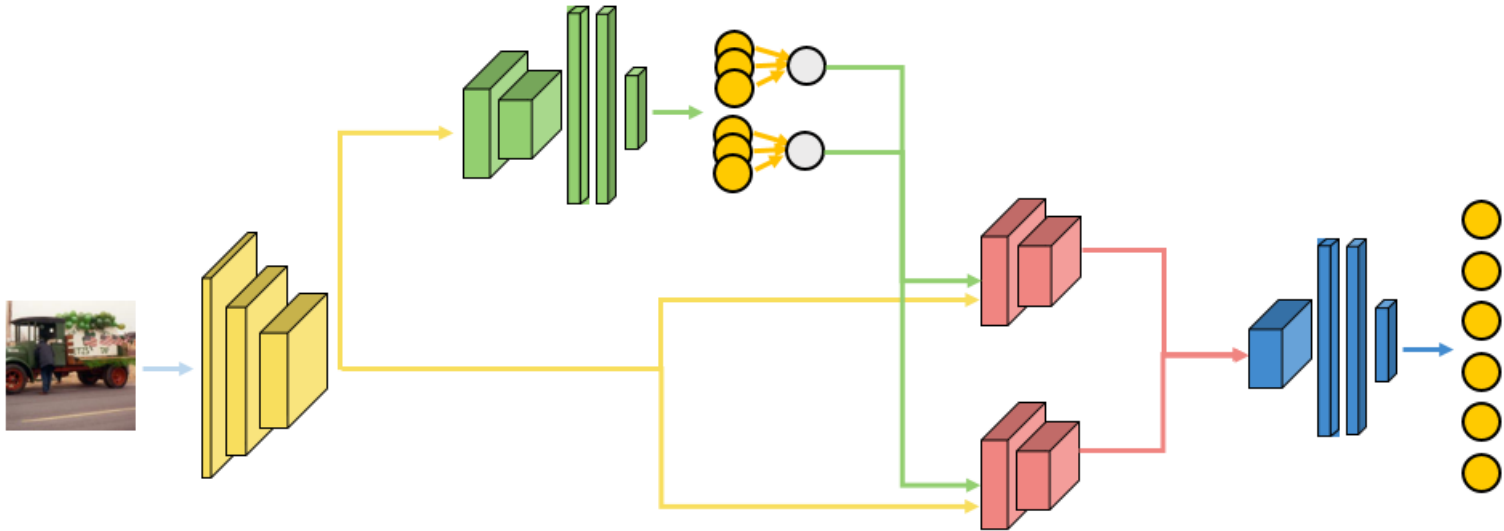
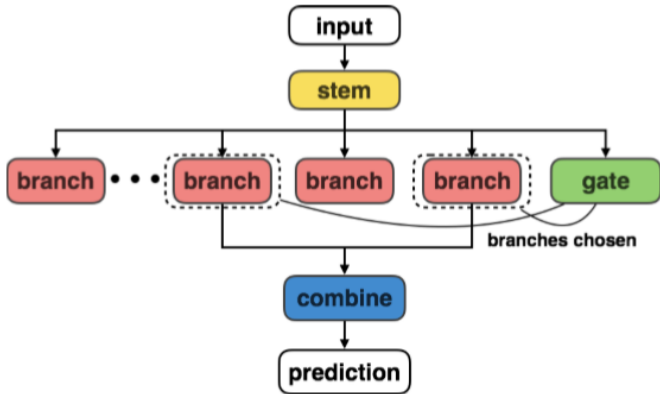
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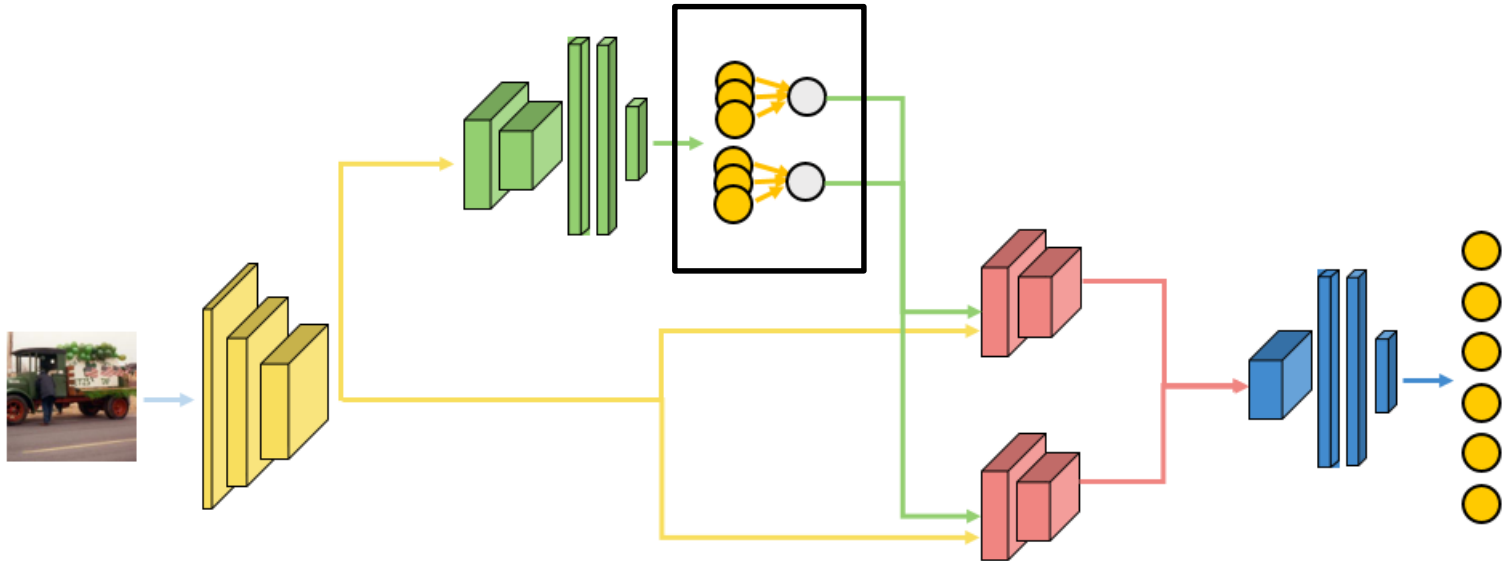


Overview



Training

- 用修改版的 K-means 对小类进行聚类
- 每个大类包含的小类数相等





Result

- 为减小计算量，对滤波器的数目，以及 ResNet 种 block 的重复次数进行一定的减少

Name	Layers	Stride	Channels
Init block	conv 3×3	2	64
	max pool 3×3	2	64
Block 1	sep conv 3×3	[1, 2]	$128 \times w$
	sep conv 3×3	1	$128 \times w$
Block 2	sep conv 3×3	[1, 2]	$256 \times w$
	sep conv 3×3	1	$256 \times w$
Block 3	sep conv 3×3	[1, 2]	$512 \times w$
	sep conv 3×3	1	$512 \times w$
Block 4	sep conv 3×3	[1, 2]	$1024 \times w$
	sep conv 3×3	1	$1024 \times w$
Projection	conv 1×1	1	$1024 \times w$
Combiner	add		$1024 \times w$
	sep conv 3×3	1	$1024 \times w$
Prediction	avg pool 7×7	1	$1024 \times w$
	fully connected		1000

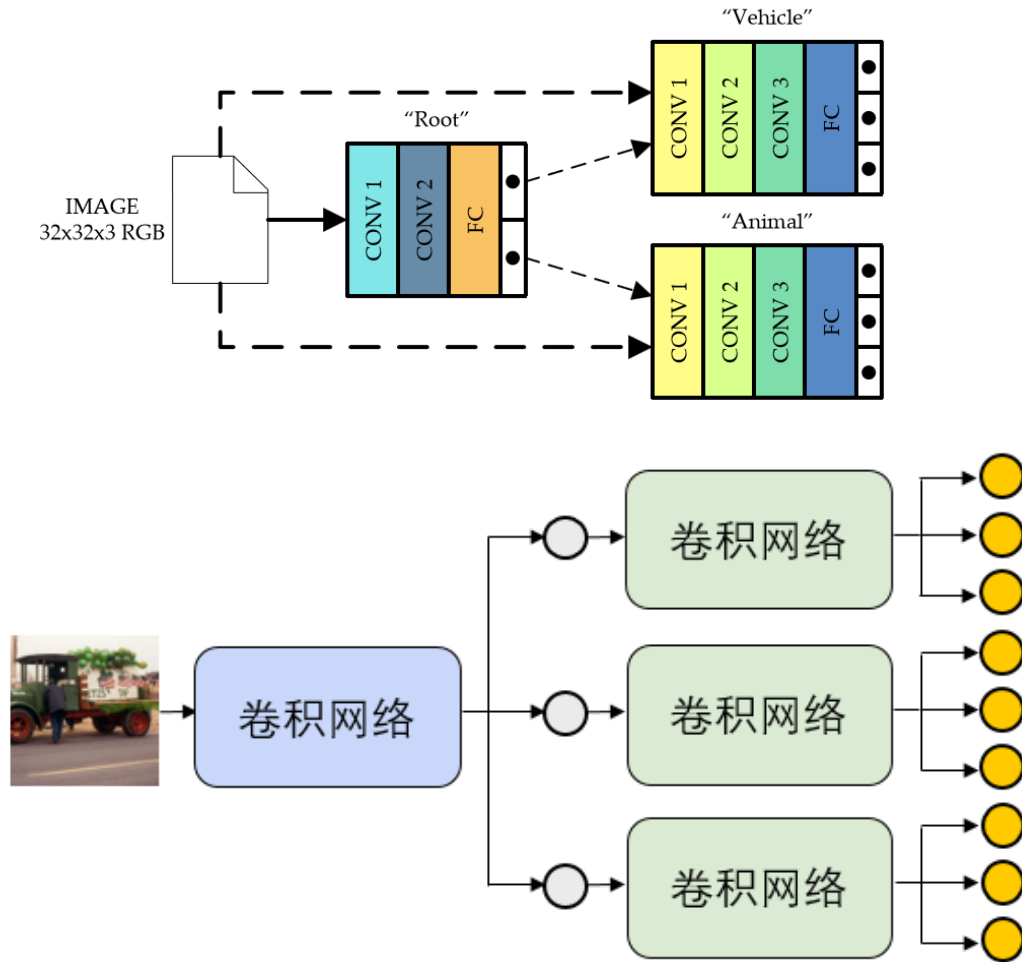
Model	Configuration d	w	Params ($\times 10^6$)	MADDs ($\times 10^6$)	Accuracy (Top-1)
ResSep-A	2	0.50	1.96	181	61.88
ResSep-B	3	0.50	2.68	290	65.27
ResSep-C	2	0.75	3.98	380	67.16
ResSep-D	3	0.75	5.58	620	69.90
ResSep-E	3	1.00	9.53	1060	72.02
ResNet-18	-	-	11.69	1800	69.30
MobileNet	-	-	4.2	569	70.60



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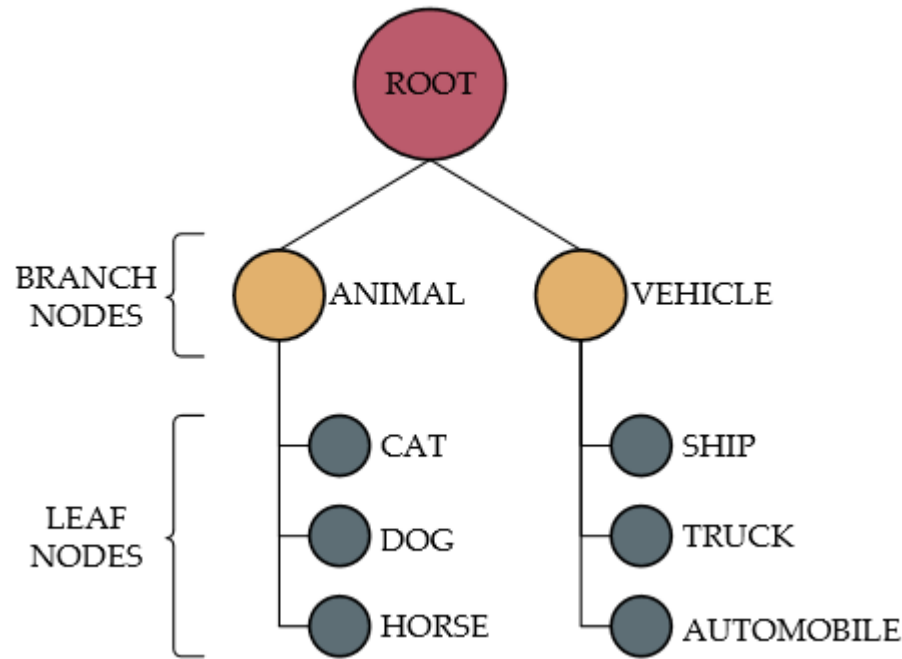
Overview



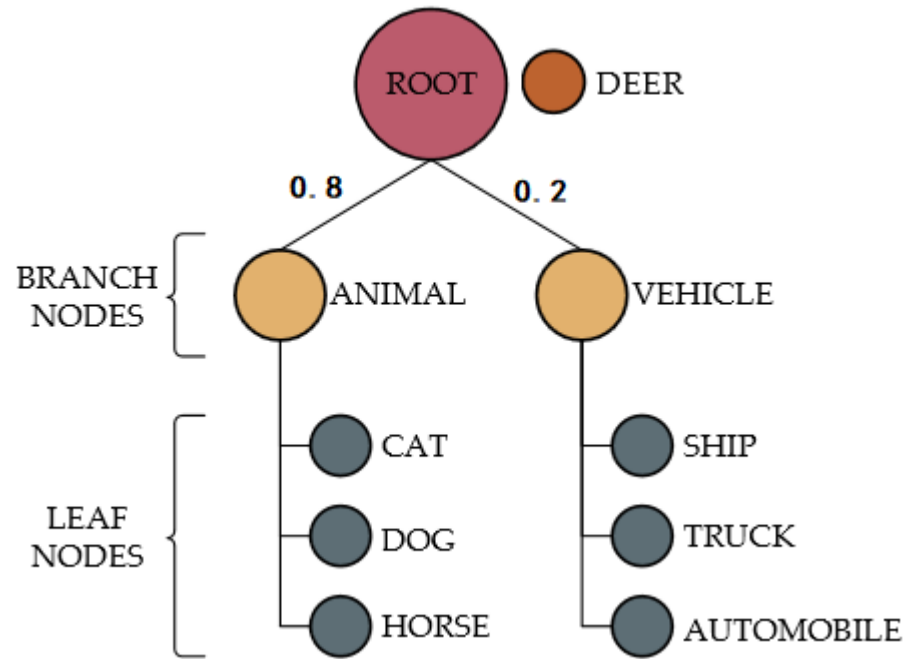
Roy, Deboleena, Priyadarshini Panda, and Kaushik Roy.

"Tree-CNN: A Hierarchical Deep Convolutional Neural Network for Incremental Learning."

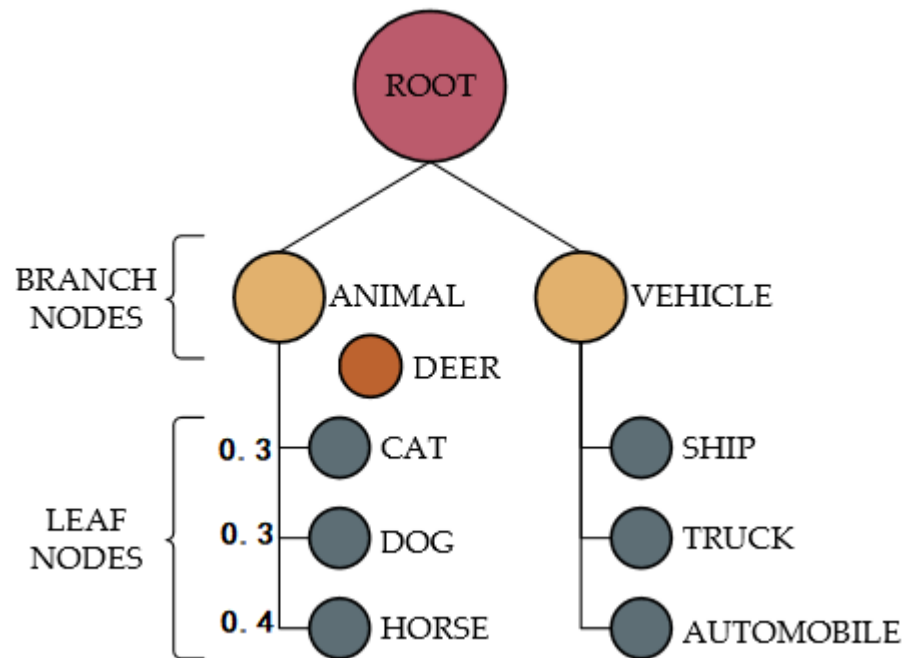
Incremental Learning Model



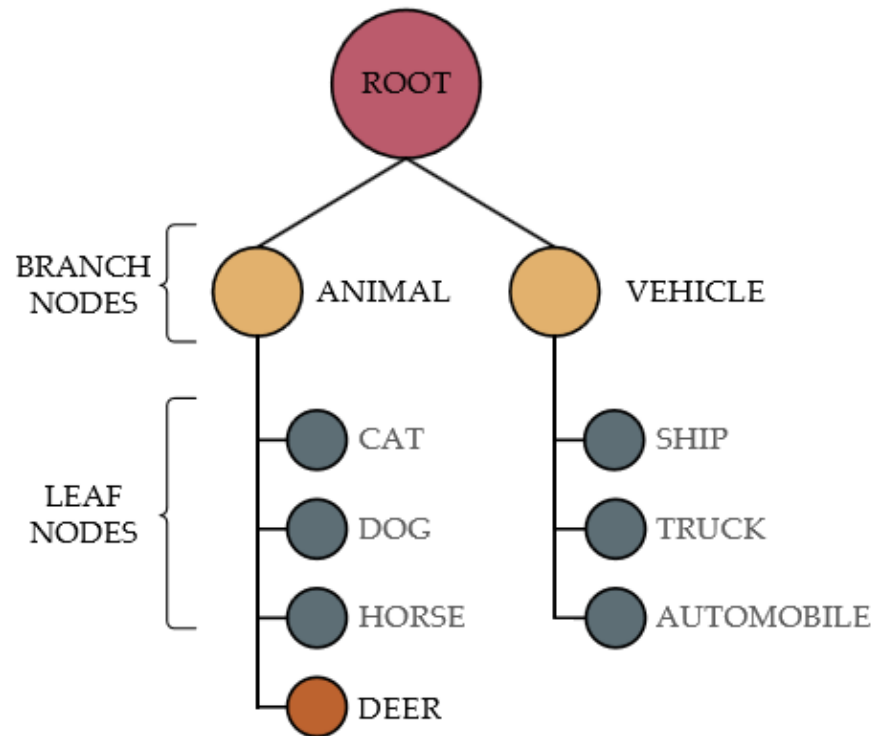
Incremental Learning Model



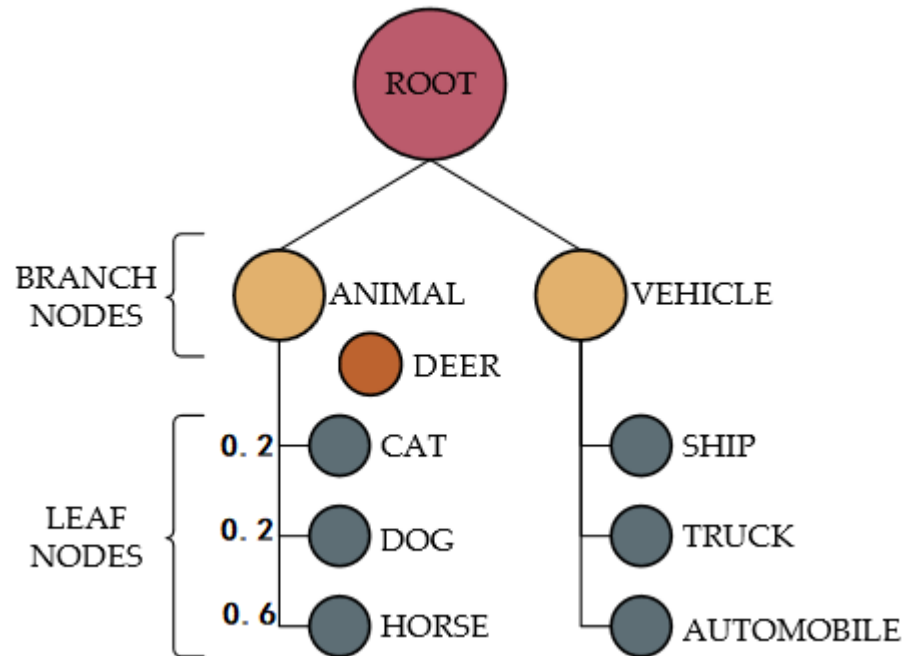
Incremental Learning Model



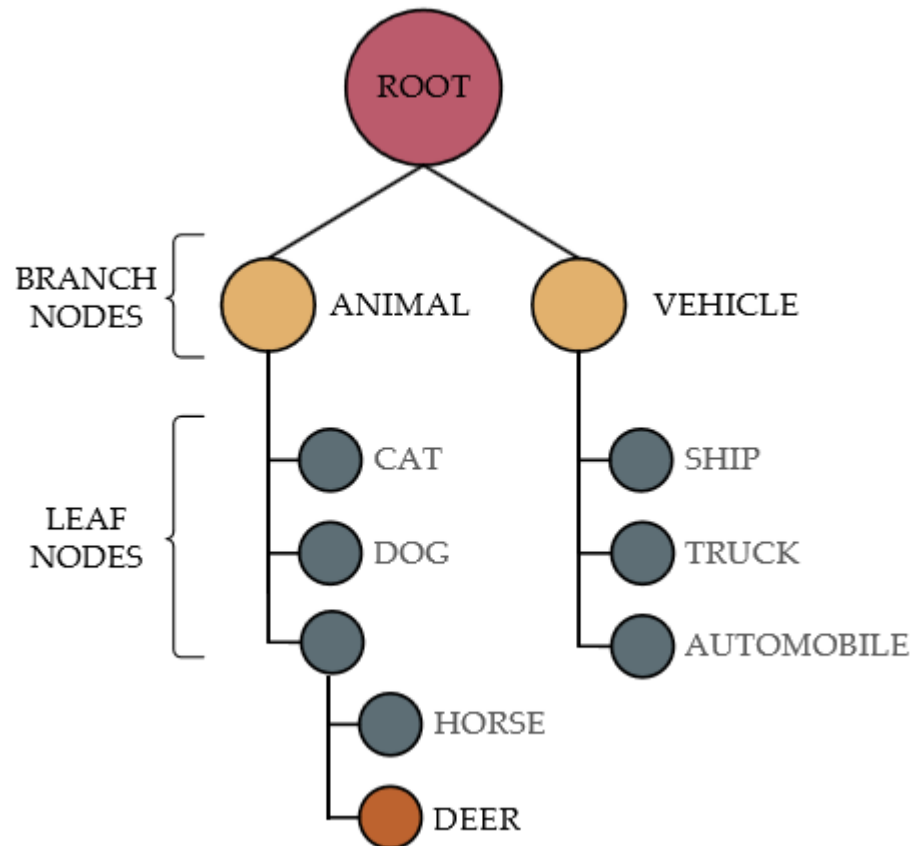
Incremental Learning Model



Incremental Learning Model



Incremental Learning Model

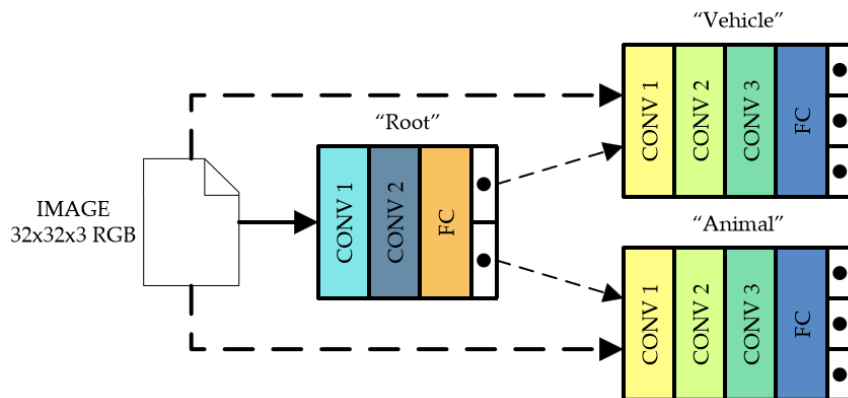


Roy, Deboleena, Priyadarshini Panda, and Kaushik Roy.

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Result

Tree-CNN A



Network B:III



Table 4: Training Effort and Test Accuracy comparison for Tree-CNN A against Network B for CIFAR-10 dataset

	B:I	B:II	B:III	B:IV	B:V	Tree-CNN A
Testing Accuracy	78.37	85.02	88.15	90.00	90.51	86.24
Normlaized Training Effort	0.40	0.85	0.96	0.99	1	0.60



End

Thank you for listening.