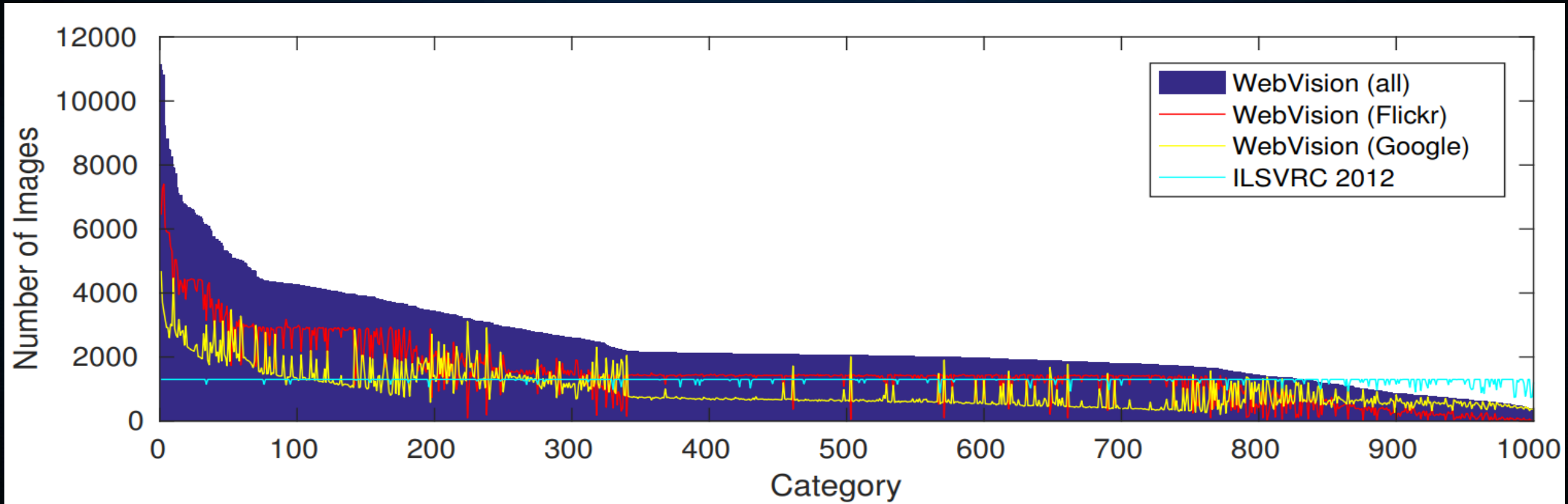


Learn CNNs from Large-scale Web Images without Human Annotations

Weilin Huang

Malong AI Research

Challenge: Data Imbalance



Challenge: Label Noise

Tench



Terrapin



Caretta



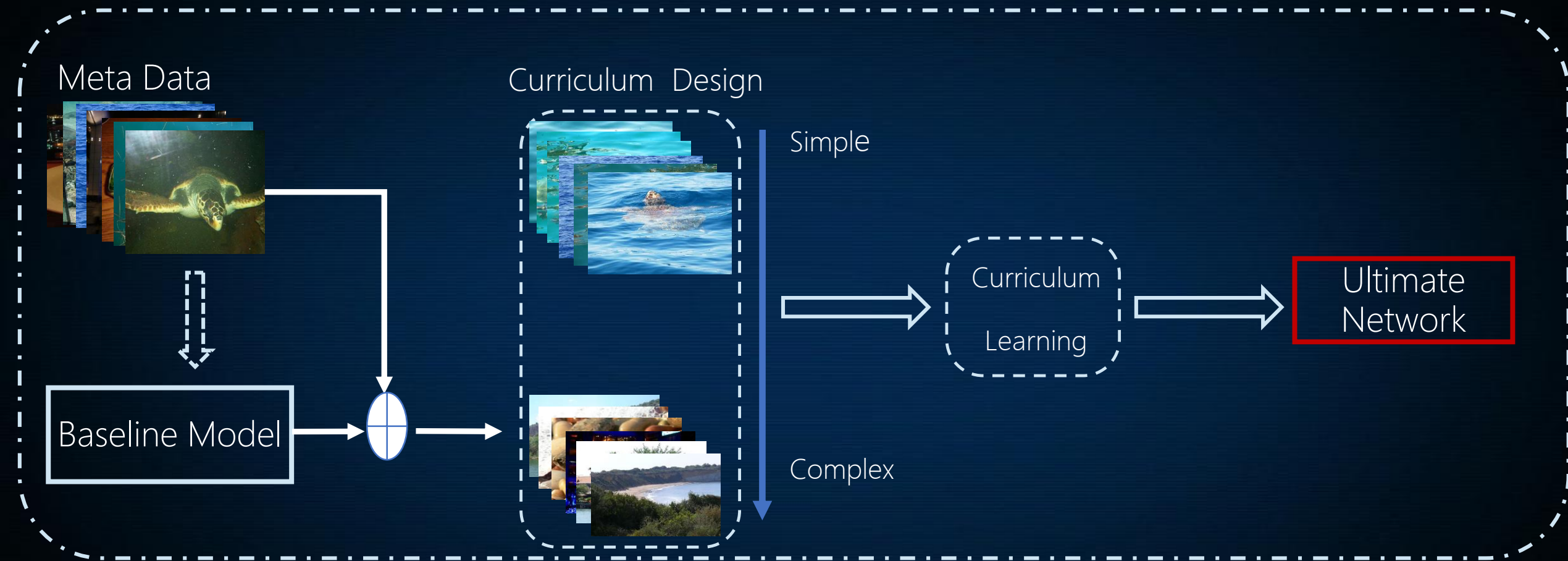
Curriculum learning

—Train CNNs using samples with increasing complexity

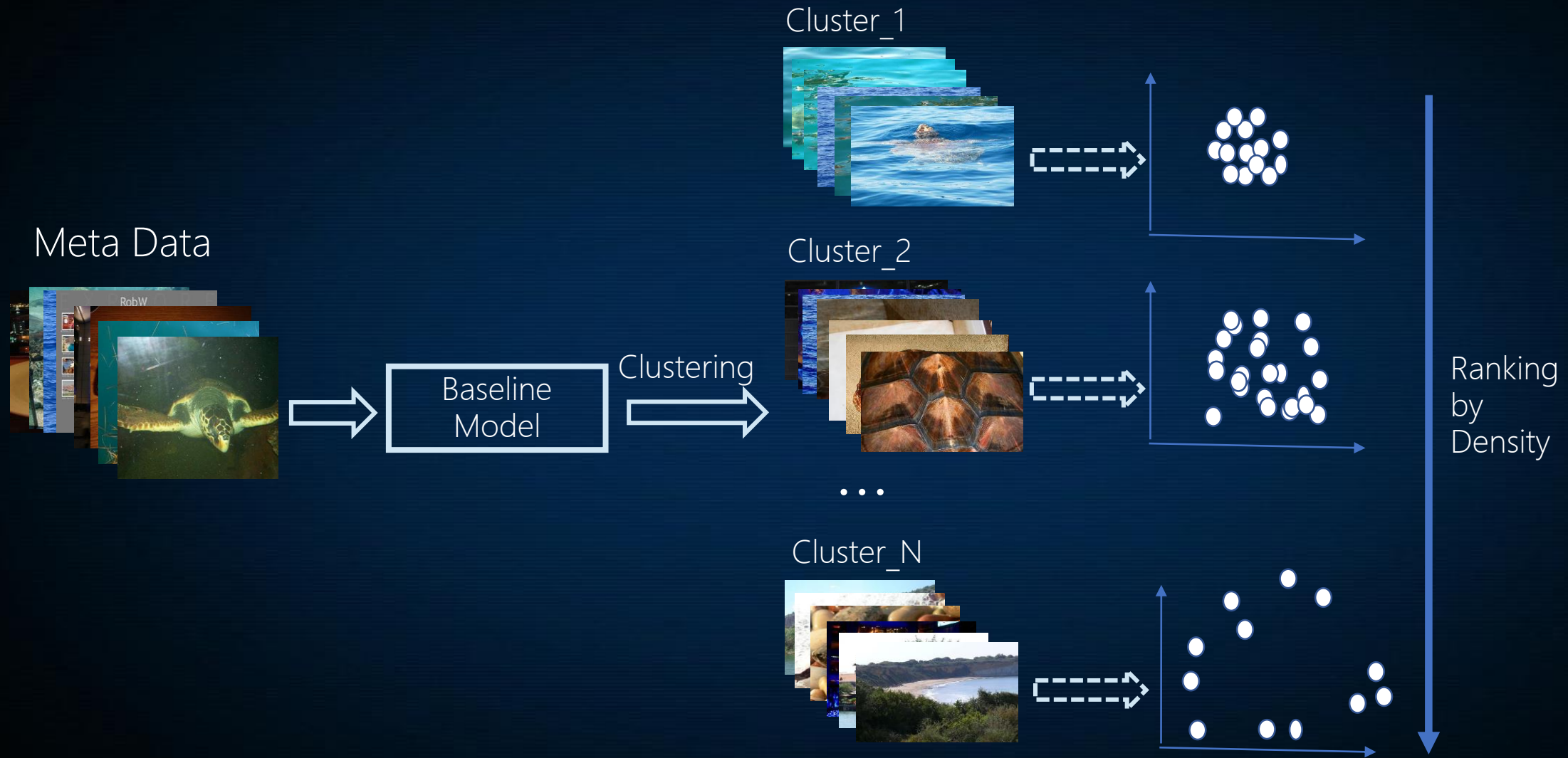
“Humans and animals learn much better when the examples are not randomly presented but organized in a meaningful order which illustrates gradually more concepts, and gradually more complex ones.”

Y. Bengio, J. Louradour, R. Collobert, and J. Weston, Curriculum Learning, ICML, 2009.

Methodology: Curriculum Learning



Methodology: Curriculum Design



Methodology: Curriculum Design

Cluster-1



Tench

Cluster-N



Tench

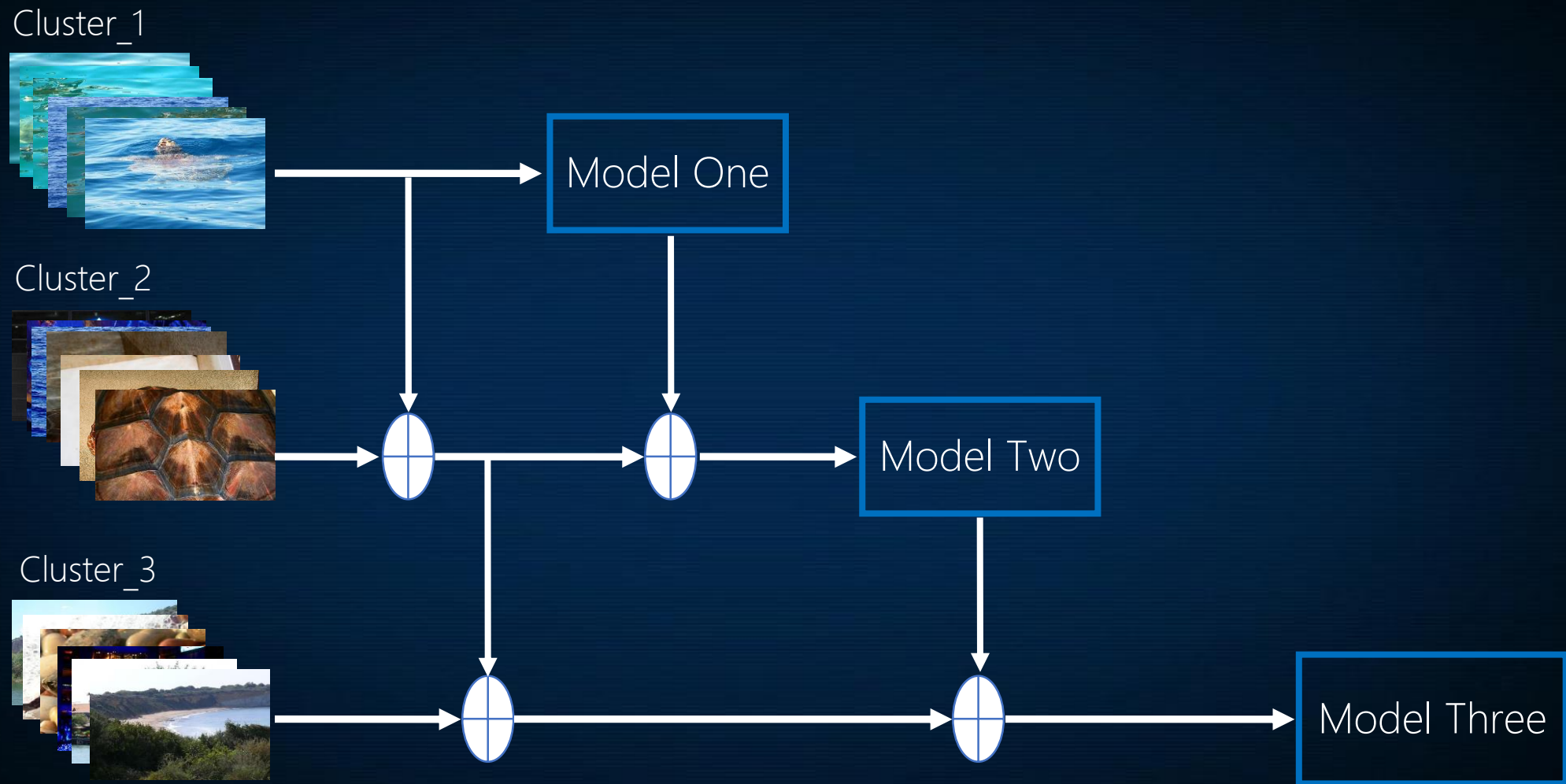


Terrapin

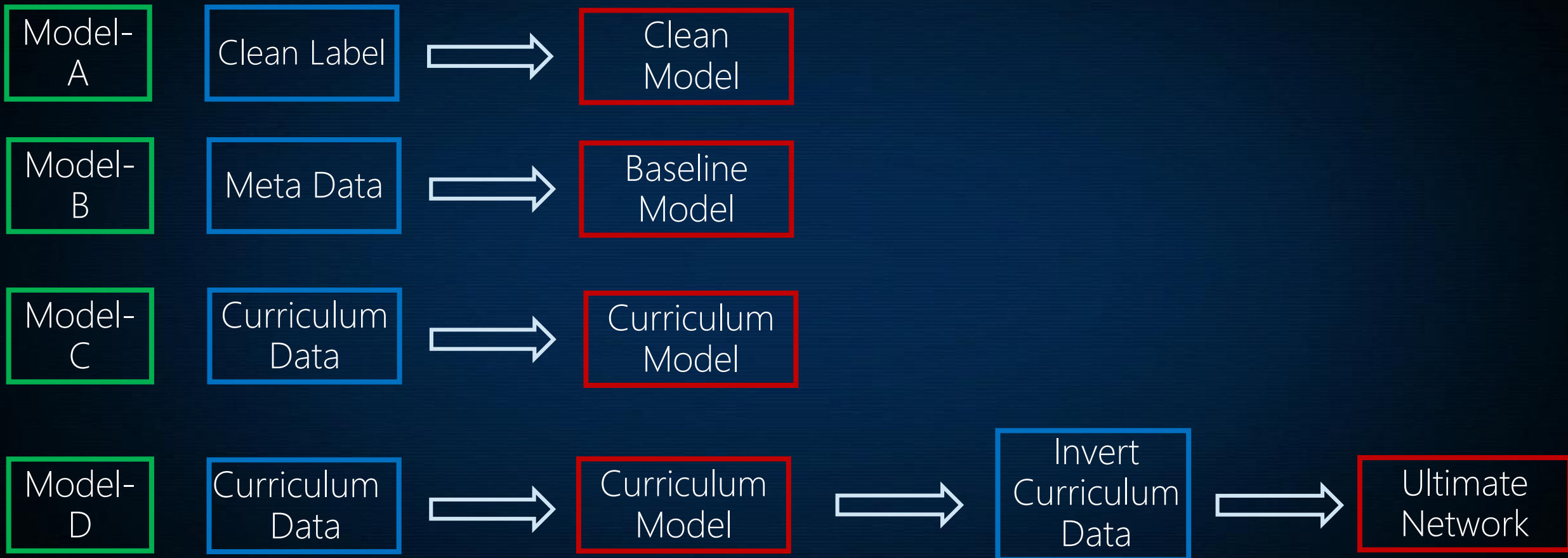


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Methodology: Training with Curriculum Learning



Methodology: Models with Different Training Schemes

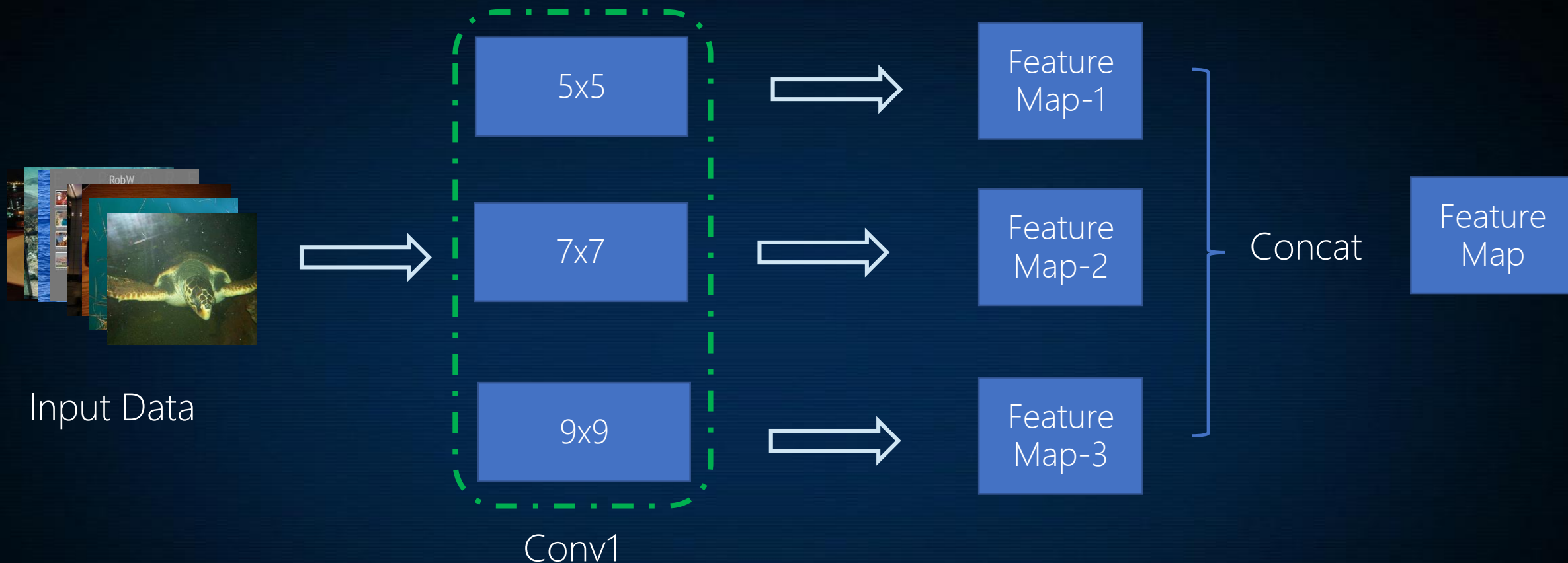


Curriculum Design = 3 Clusters

Mini-batch = 256

- Samples balance among clusters (three clusters applied)
[Cluster_1 = 128, Cluster_2 = 64, Cluster_3 = 64]
- Classes balance only on Cluster_1
 - > Randomly select 128 classes
 - > Each class only has one sample

Methodology: Multi-Scale Convolutional Kernel



Enhance low-level features which improve the performance (about 0.5%).

Result: Single Model, Single Crop

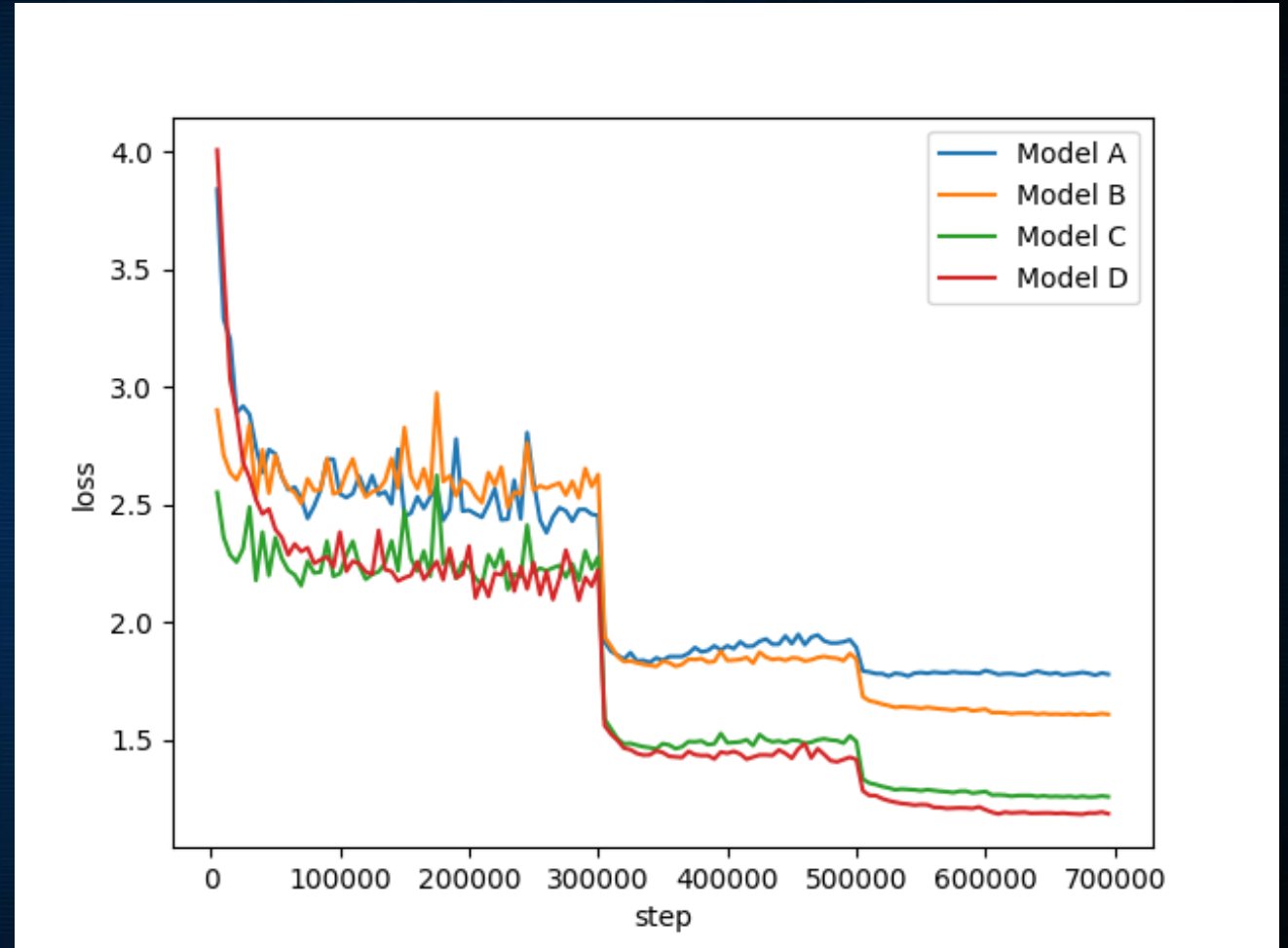
| Method | top1 | top5 |
|---------|-------|-------|
| Model-A | 33.4% | 16.8% |
| Model-B | 31.4% | 12.2% |
| Model-C | 28.7% | 11.3% |
| Model-D | 27.5% | 10.4% |

Table1.

Performance of four different models with Inception_v2 architecture on validation set.

Result: Testing Loss

Figure 1. Testing loss of four different models with Inception_v2



Result : Top 1 and Top 5 Accuracies

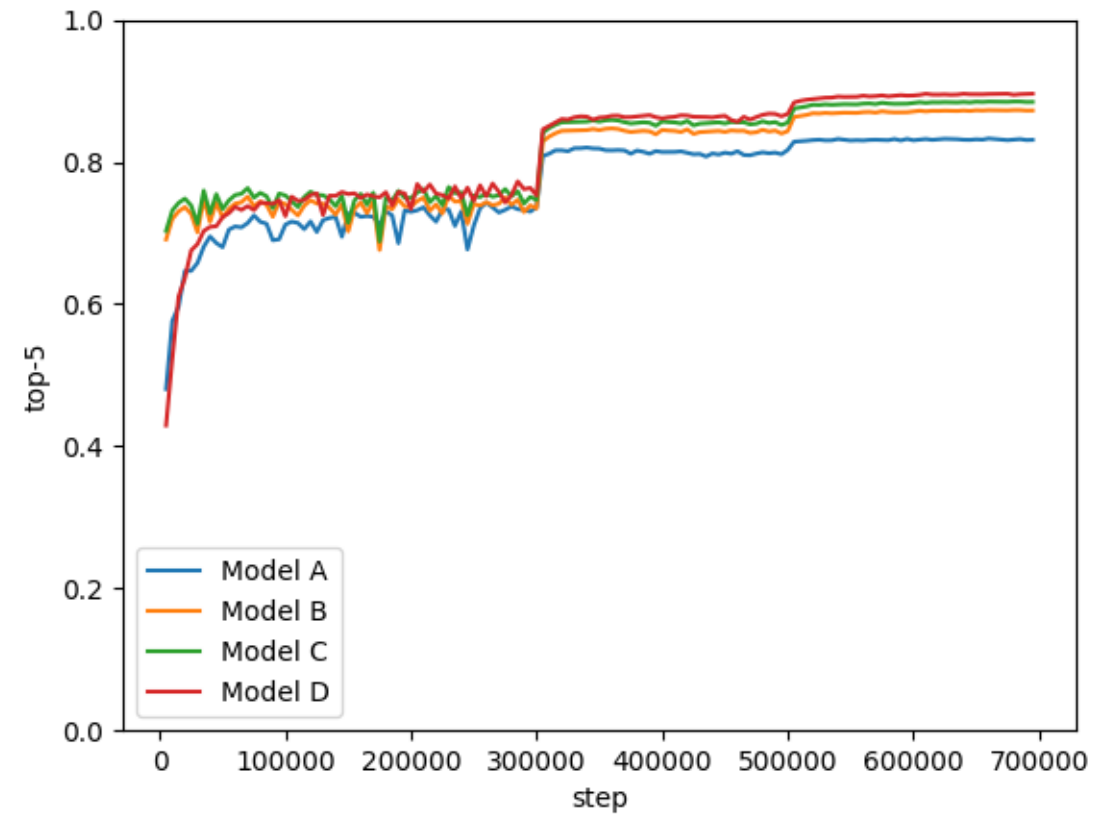
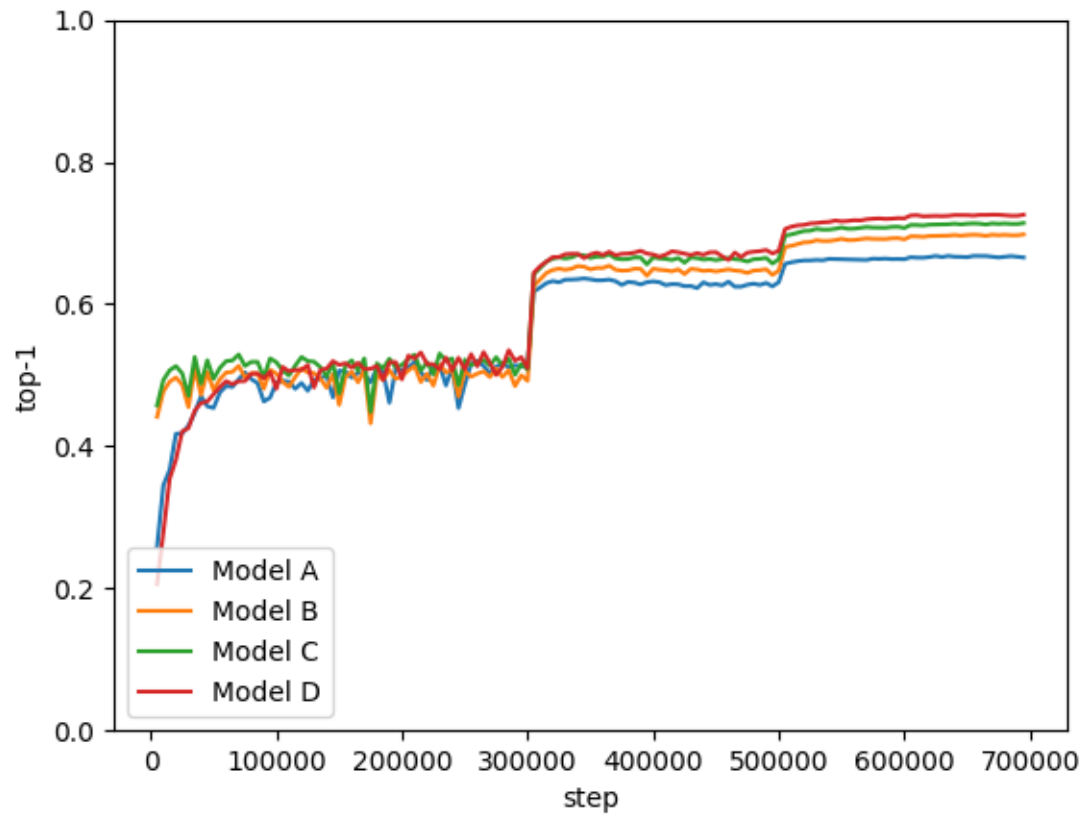


Figure 2. Top 1 and Top 5 accuracies with Inception_v2 on validation set.

Table2.

Performance of various networks with model-D on validation dataset (10 crops) .

| Method | top1 | top5 |
|---------------------|-------|------|
| Inception_v2 | 26.1% | 9.2% |
| Inception_v3 | 22.2% | 6.9% |
| Inception_v4 | 21.0% | 6.5% |
| Inception_Resnet_v2 | 20.3% | 6.2% |

Result: Final Results with Ranking

Challenge Results

WebVision Image Classification Task

| Rank | Team name | Run1 | Run2 | Run3 | Run4 | Run5 |
|------|--------------------------|---------------|---------------|---------------|---------------|---------------|
| 1 | Malong AI Research | 0.9358 | 0.9467 | 0.9478 | 0.9478 | 0.9470 |
| 2 | SHTU_SIST | 0.9223 | 0.9225 | 0.9218 | 0.9219 | 0.9216 |
| 3 | HG-AI | 0.9189 | 0.9152 | 0.9152 | 0.9189 | 0.9189 |
| 4 | VISTA | 0.8979 | 0.9005 | 0.8980 | 0.8992 | 0.8980 |
| 5 | LZ_NES | 0.8853 | 0.8758 | 0.8723 | 0.8504 | 0.8504 |
| 6 | CRCV | 0.8707 | 0.8717 | 0.8701 | 0.8712 | 0.8721 |
| 7 | Chahrazad | 0.8705 | 0.8705 | 0.8705 | 0.8705 | 0.8705 |
| 8 | Gombru (CVC and Eurecat) | 0.8475 | 0.8374 | 0.8586 | 0.8586 | 0.8586 |

Pascal VOC Transfer Learning Task

| Rank | Team name | mAP |
|------|--------------------|------|
| 1 | Malong AI Research | 0.90 |

Sheng Guo, Weilin Huang, Chenfan Zhuang,
Dengke Dong, Haozhi Zhang, Matthew R.
Scott, Dinglong Huang

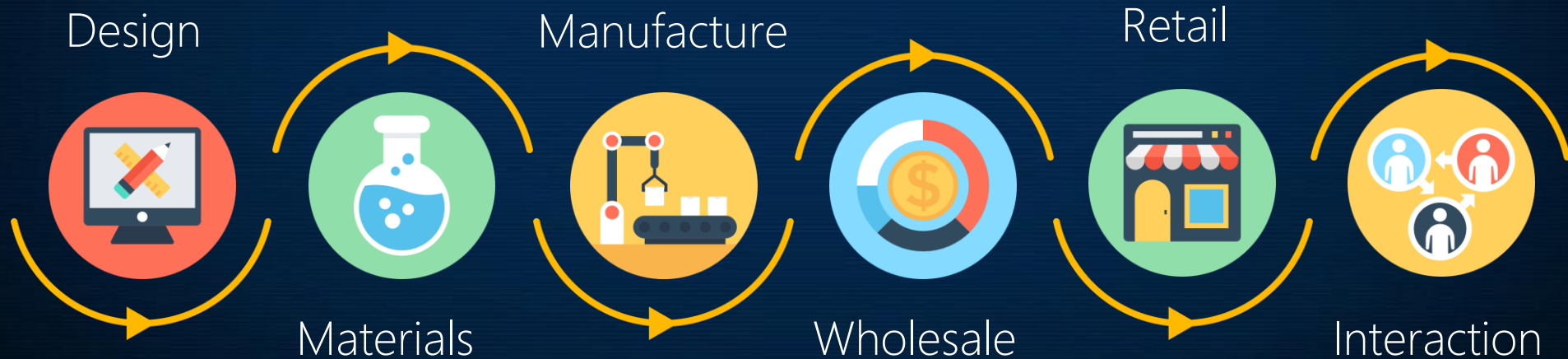
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