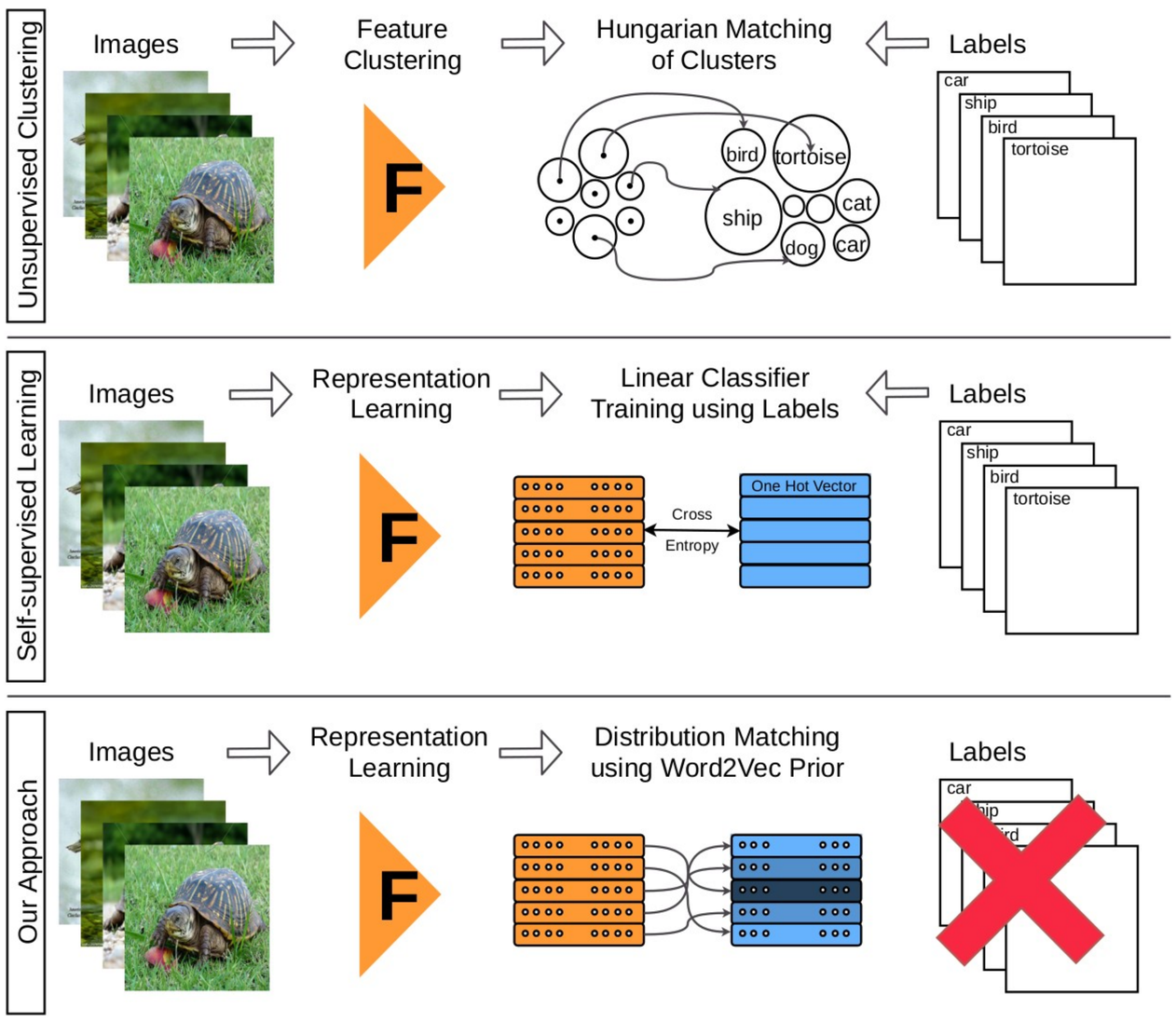
Beyond Learning Features: Training a Fully-functional Classifier with ZERO Instance-level Labels

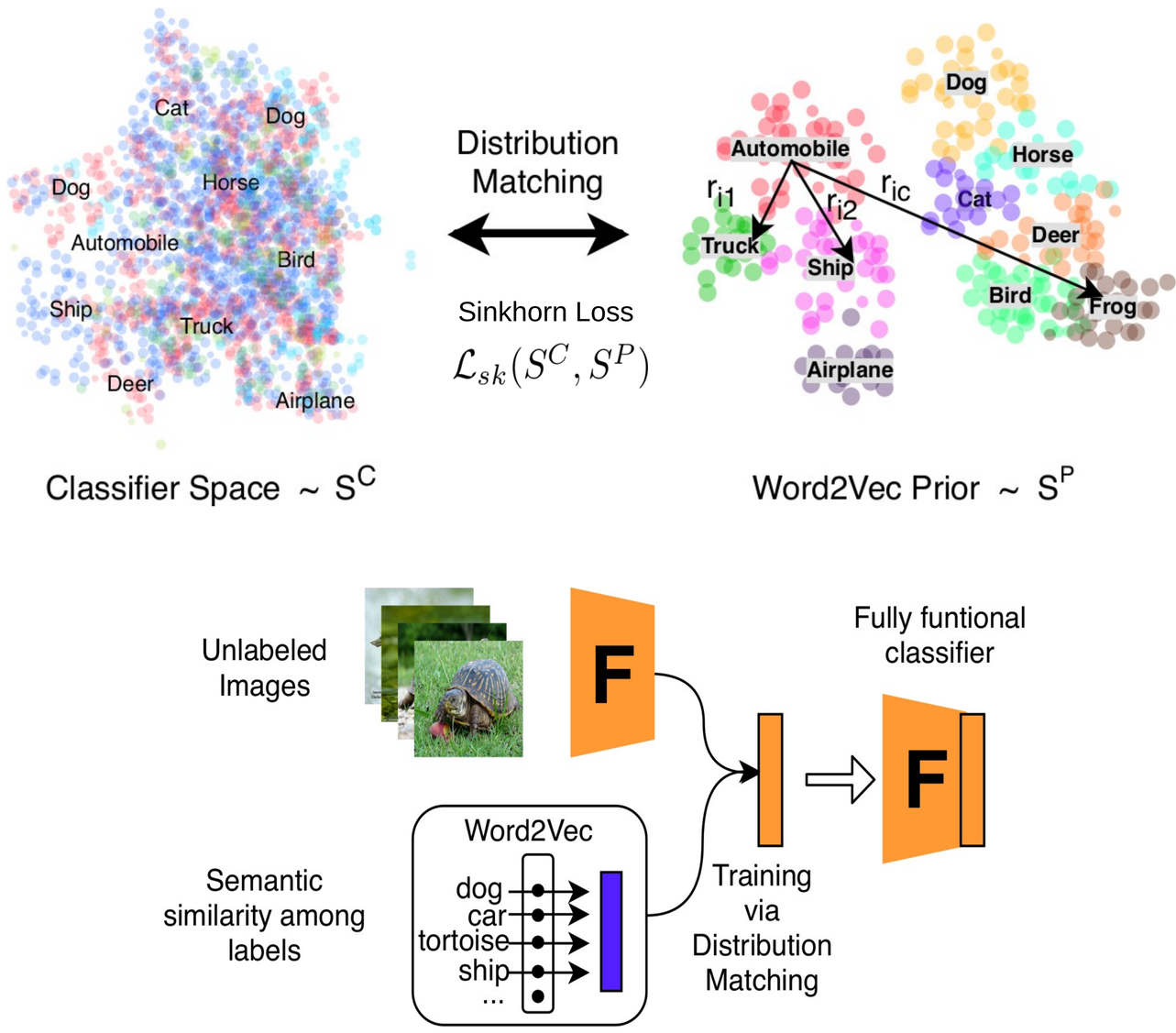
Deepak Babu Sam*, Abhinav Agarwalla* and R. Venkatesh Babu
Video Analytics Lab, Indian Institute of Science, Bangalore, India

TL;DR: Existing unsupervised methods require some annotated samples to facilitate the final task-specific predictions. Instead, we leverage the distribution of labels for supervisory signal such that no image-label pair is needed for training a classifier.

Comparison of Learning Paradigms

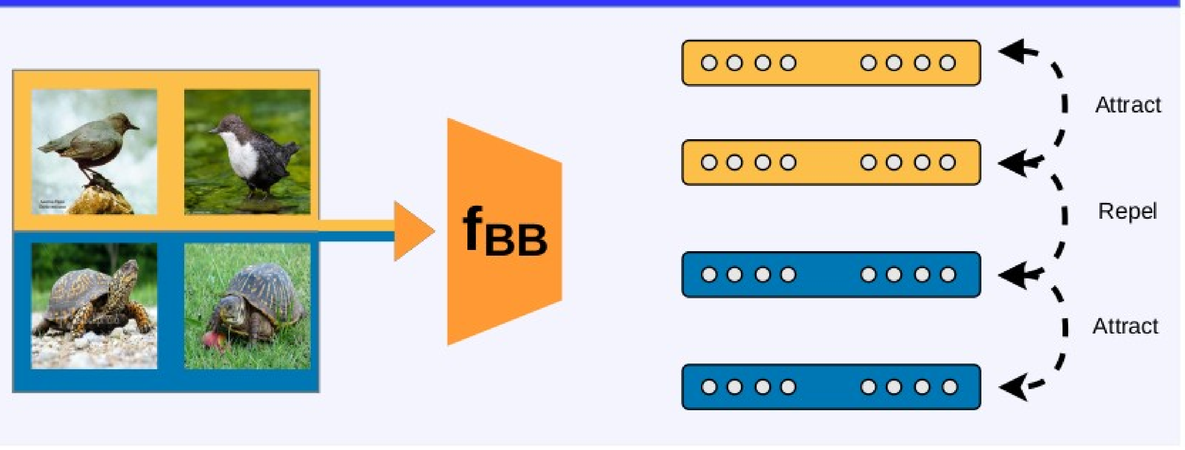


Supervision via Distribution Matching

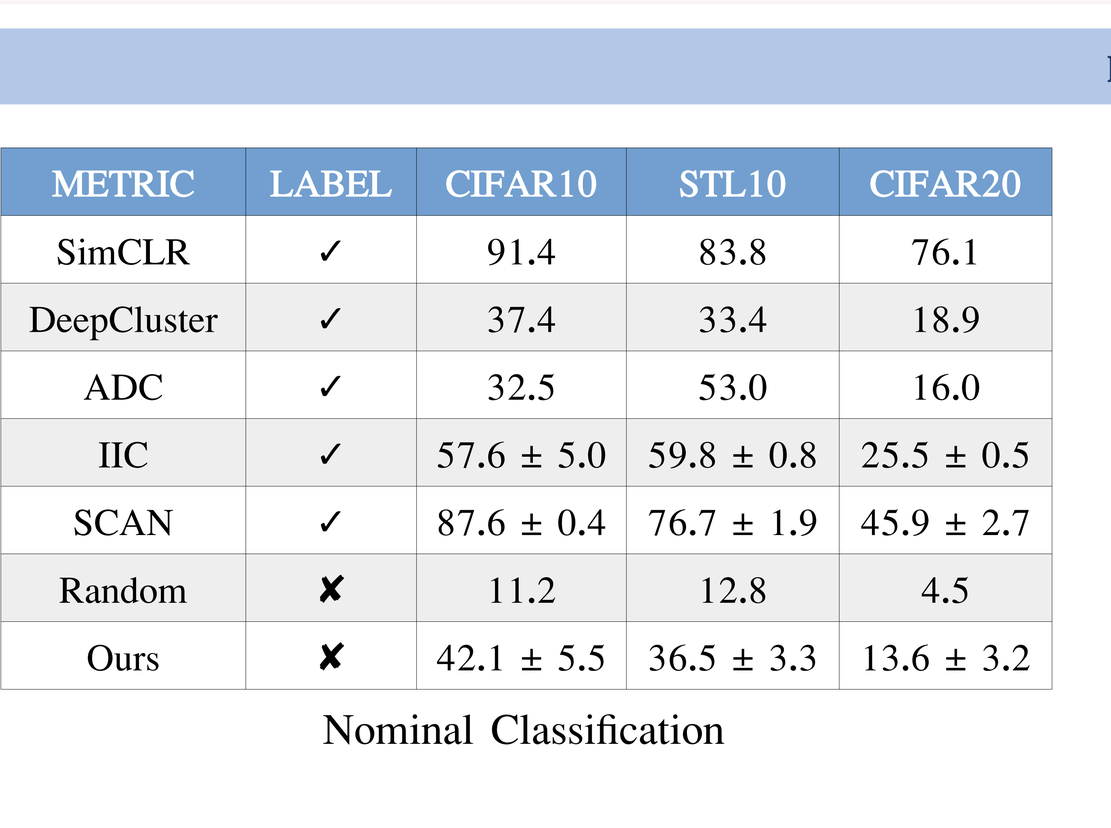


Training Pipeline

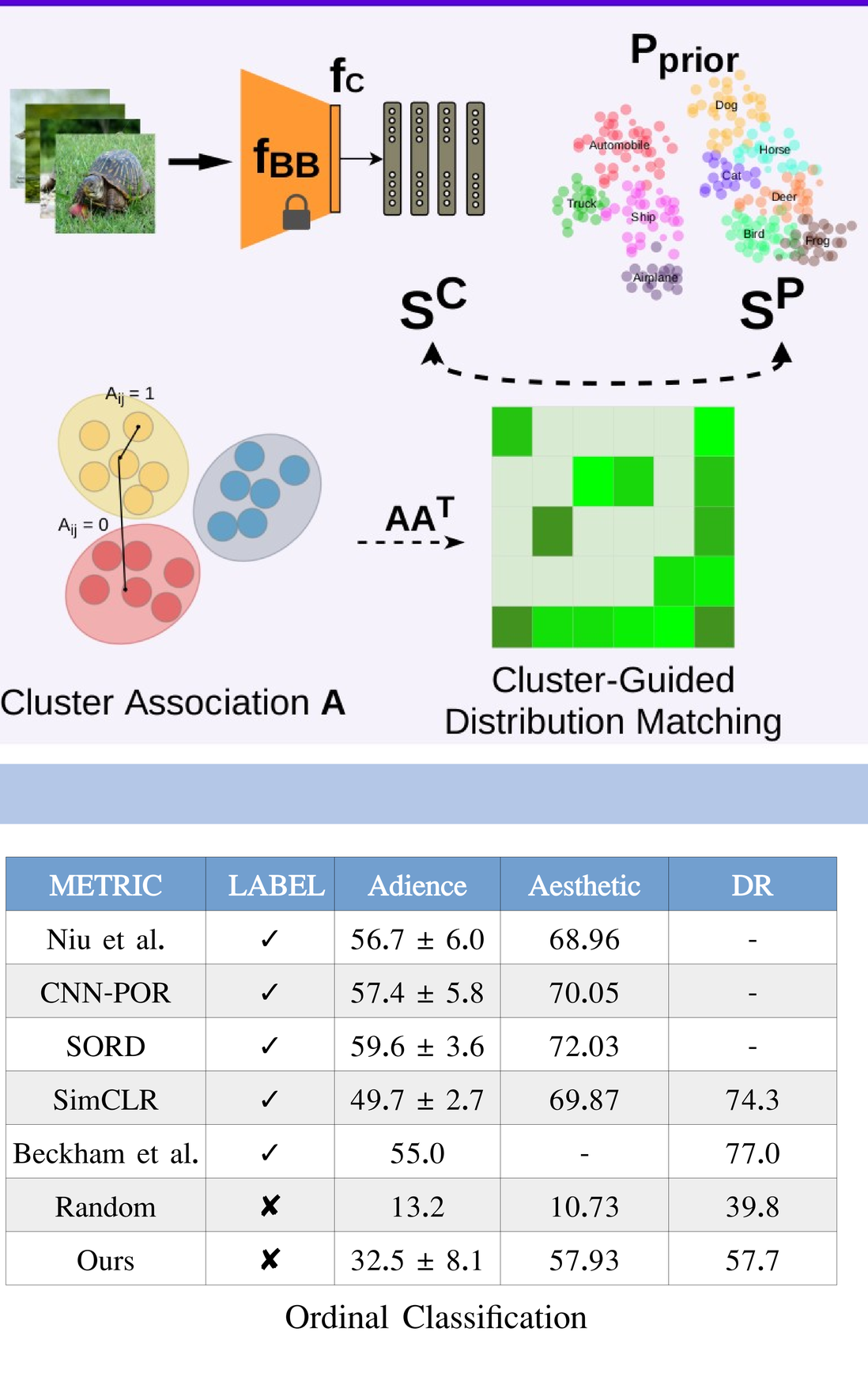
I. SFL: Contrastive self-supervised training of backbone f_{BB}



II. FC: Feature Clustering



III. Cluster-Guided Distribution Matching



Results

METRIC	LABEL	CIFAR10	STL10	CIFAR20
SimCLR	✓	91.4	83.8	76.1
DeepCluster	✓	37.4	33.4	18.9
ADC	✓	32.5	53.0	16.0
IIC	✓	57.6 ± 5.0	59.8 ± 0.8	25.5 ± 0.5
SCAN	✓	87.6 ± 0.4	76.7 ± 1.9	45.9 ± 2.7
Random	✘	11.2	12.8	4.5
Ours	✘	42.1 ± 5.5	36.5 ± 3.3	13.6 ± 3.2

Nominal Classification

METRIC	LABEL	Adience	Aesthetic	DR
Niu et al.	✓	56.7 ± 6.0	68.96	-
CNN-POR	✓	57.4 ± 5.8	70.05	-
SORD	✓	59.6 ± 3.6	72.03	-
SimCLR	✓	49.7 ± 2.7	69.87	74.3
Beckham et al.	✓	55.0	-	77.0
Random	✘	13.2	10.73	39.8
Ours	✘	32.5 ± 8.1	57.93	57.7

Ordinal Classification