Advancing Textual Prompt Learning with Anchored Attributes
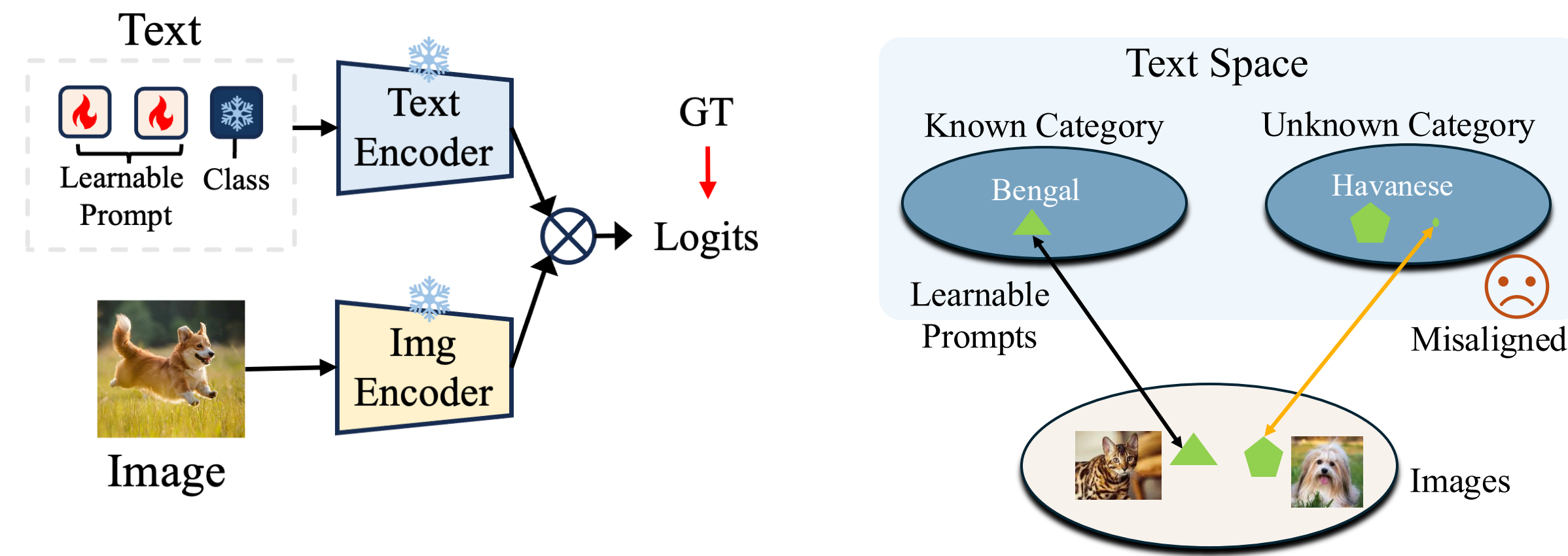
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Email: zhengli97@qq.com, **Code:** https://github.com/zhengli97/ATPrompt

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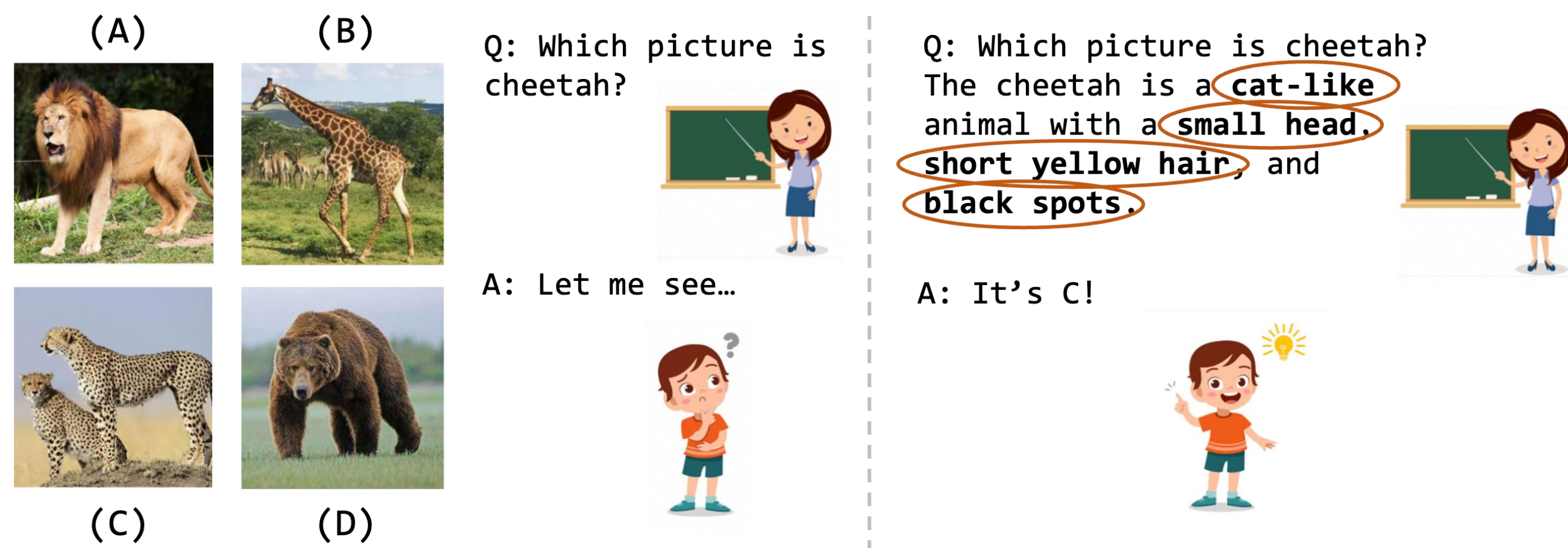ICCV HONOLULU HAWAII · OCT 19-23, 2025

Existing Methods

(a) Classic Prompt Learning

➤ Current forms of prompt learning limit the model to only access training data of known categories during training.

➤ After training, the model has difficulty accurately aligning images with unknown categories.

Inspiration

(A) (B) (C) (D)

Q: Which picture is cheetah?

A: Let me see…

Q: Which picture is cheetah? The cheetah is a **cat-like** animal with a **small head**, **short yellow hair**, and **black spots**.

A: It's C!

When people are faced with something of an unknown category, we often recognize it by combining relevant detailed attributes (e.g., **color, shape**) to increase clarity and comprehensibility.

Attributes can serve as **bridges** that connect unknown categories to our known knowledge.

Our Method

We present ATPrompt, an **attribute-anchored** prompt learning method for VLMs.
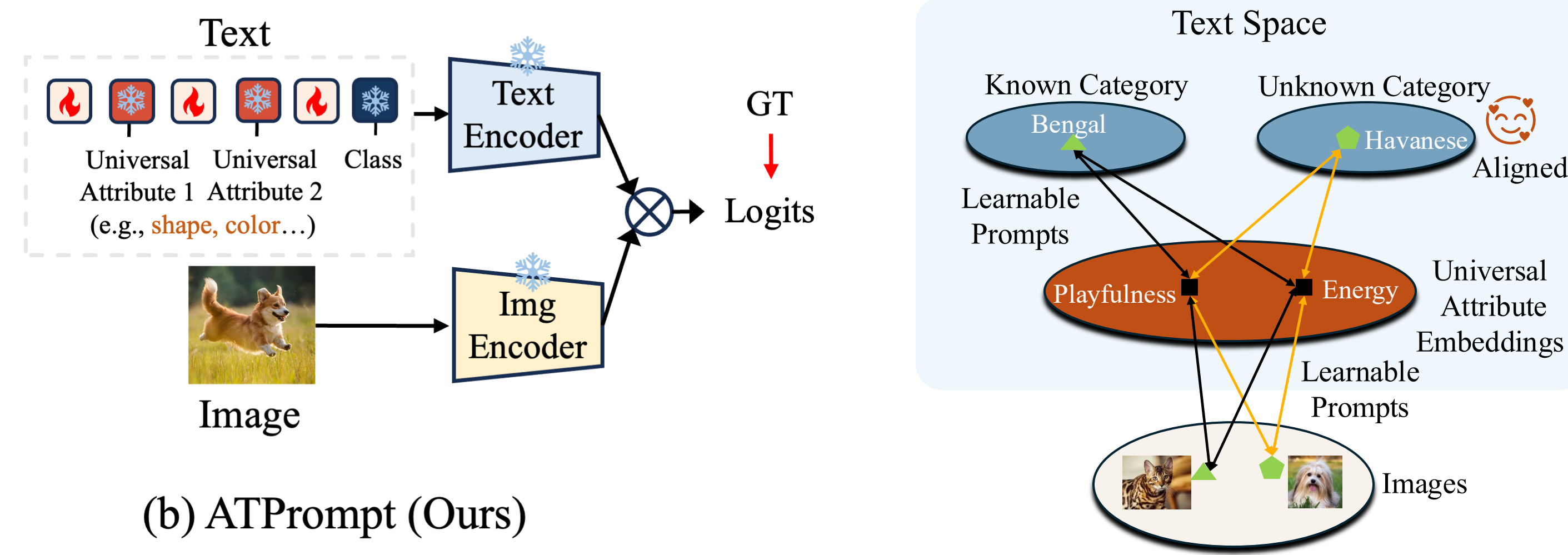
(b) ATPrompt (Ours)

Guided by these anchored attributes, soft tokens acquire not only category-specific but also attribute-related general representations during training, leading to better alignment between images and unknown categories.

How to determine attribute?   We introduce differentiable attribute search 🔍 !

(a) Form an attribute pool.

(b) Differentiable attribute search.
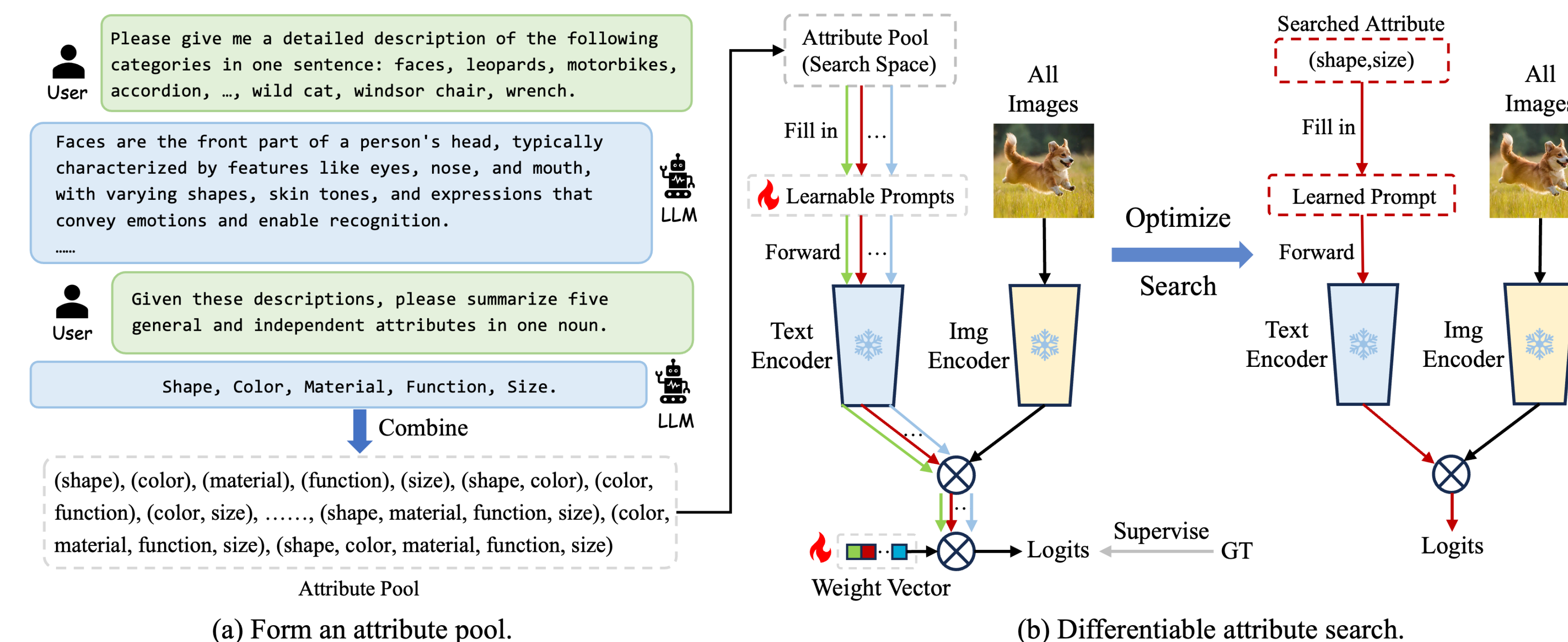
Step 1: Form a candidate pool of attributes by querying LLMs.

Step 2: Identify the target attribute in the pool through differentiable attribute search.

Experiments

Method	Average			ImageNet			Caltech101			OxfordPets		
	Base	Novel	HM	Base	Novel	HM	Base	Novel	HM	Base	Novel	HM
CoOp (IJCV 22)	82.69	63.22	71.66	76.47	67.88	71.92	98.00	89.81	93.73	93.67	95.29	94.47
CoCoOp (CVPR 22)	80.47	71.69	75.83	75.98	70.43	73.10	97.96	93.81	95.84	95.20	97.69	96.43
MaPLe (CVPR 23)	82.28	75.14	78.55	76.66	70.54	73.47	97.74	94.36	96.02	95.43	97.76	96.58
PromptSRC (ICCV 23)	84.26	76.10	79.97	77.60	70.73	74.01	98.10	94.03	96.02	95.33	97.30	96.30
ArGue (CVPR 24)	83.69	78.07	80.78	76.92	72.06	74.41	98.43	95.20	96.79	95.36	97.95	96.64
DePT (CVPR 24)	83.66	71.82	77.29	77.13	70.10	73.45	98.33	94.33	96.29	94.70	97.63	96.14
CoPrompt (ICLR 24)	84.00	77.23	80.48	77.67	71.27	74.33	98.27	94.90	96.55	96.87	
PromptKD (CVPR 24)	86.96	80.73	83.73	80.83	74.66	77.62	98.91	96.65	97.77	96.30	98.01	97.15
CoOp + ATPrompt	82.68	68.04	**74.65** (+2.99)	76.27	70.60	**73.33**	97.95	93.63	**95.74**	94.77	96.59	**95.67**
CoCoOp + ATPrompt	81.69	74.54	**77.95** (+2.12)	76.43	70.50	**73.35**	97.96	95.27	**96.60**	95.46	97.89	**96.66**
MaPLe + ATPrompt	82.98	75.76	**79.21** (+0.66)	76.94	70.72	**73.70**	98.32	95.09	**96.68**	95.62	97.63	**96.61**
DePT + ATPrompt	83.80	73.75	**78.45** (+1.16)	77.32	70.65	**73.83**	98.48	94.60	**96.50**	94.65	97.99	**96.29**
PromptKD + ATPrompt	87.05	81.82	**84.35** (+0.62)	80.90	74.83	**77.75**	98.90	96.52	97.70	96.92	98.27	97.59

As a fundamental technique, ATPrompt can be seamlessly integrated into existing textual prompt learning methods and brings consistent improvement.

What are the final attributes?

Dataset	Attribute Bases	Searched Attributes
ImageNet-1K	color, size, shape, habitat, behavior	(color, shape)
Caltech-101	shape, color, material, function, size	(shape, size)
Oxford Pets	loyalty, affection, playfulness, energy, intelligence	(playfulness, energy)
Stanford Cars	design, engine, performance, luxury, color	(luxury)
Flowers-102	color, flower, habitat, growth, season	(color, habitat, growth)
Food-101	flavor, texture, origin, ingredients, preparation	(flavor, preparation)
FGVC Aircraft	design, capacity, range, engines, liveries	(design, range)
SUN-397	architecture, environment, structure, design, function	(function)
DTD	pattern, texture, color, design, structure	(pattern, color, design)
EuroSAT	habitat, foliage, infrastructure, terrain, watercourse	(habitat)
UCF-101	precision, coordination, technique, strength, control	(precision)

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