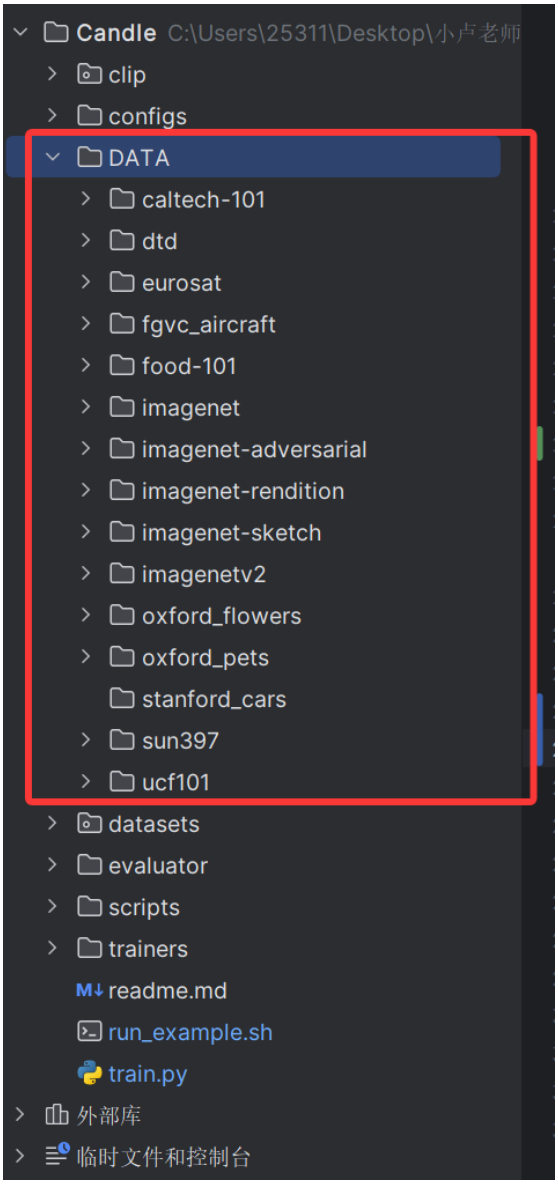
Candle

1 环境准备

确保项目的主目录：Candle
数据集路径：修改 DATA 环境变量，指向数据集存放的绝对路径（需根据实际路径调整）



数据集结构图

Base-to-New 泛化训练

数据集划分方法

1. **Base-to-New 泛化任务**：
   - 将每个数据集划分为 **互斥的基类（base classes）和新类（new classes）**。
   - 基类训练集通过下采样模拟长尾分布，**不平衡比率**定义为最大样本数与最小样本数之比（如 10、20、50）。
   - **测试集**包含基类和新类的平衡/非平衡样本（依数据集而定，如表 3）。
2. **跨数据集迁移**：
   - 在 **ImageNet 的不平衡子集（IR=100）** 上训练，在其他 10 个数据集（如 Caltech101、OxfordPets 等）上测试。
3. **域泛化**：
   - **源域**：ImageNet（不平衡子集）。
   - **目标域**：ImageNet-A（对抗样本）、ImageNetV2（分布偏移）、ImageNet-Sketch（草图）、ImageNet-R（艺术风格）。
4. **数据生成细节**：
   - 使用指数衰减分布生成不平衡数据（参考 Cao et al.）。
   - 确保每个类至少有 1 个样本，最大样本数为 100 或原数据集上限（如 FGVCAircraft 每类最多 100 样本）。

泛化性与测试验证方法

1. **评估指标**：
   - **调和平均（Harmonic Mean）**：平衡基类和新类的性能（公式：$\mathrm{H} = \frac{2 \times \mathrm{Base} \times \mathrm{New}}{\mathrm{Base} + \mathrm{New}}$）。
   - **平均类准确率（Mean-Class Accuracy）**：针对不平衡测试集，避免总体准确率的偏差。
2. **实验设置**：
   - **基线对比**：Zero-shot CLIP、CoOp、CoCoOp、LFA 等。
   - **训练配置**：ViT-B/16 视觉编码器，SGD 优化器（学习率 3e-4），单块 RTX 3090 GPU。
3. **泛化性验证**：
   - **Base-to-New 泛化**：
     - 训练集：基类（不平衡），测试集：基类 + 新类。
     - 16-shot 少样本学习验证模型鲁棒性（表 6）。
   - **跨数据集迁移**：在 ImageNet 训练后直接迁移至其他数据集（表 7）。
   - **域泛化**：在域偏移数据集（如 ImageNet-A）上测试模型鲁棒性（表 8）。
4. **消融实验**：
   - **损失函数**：对比 CLA Loss 与 CE Loss，验证其对不平衡的适应性（表 9）。
   - **模块有效性**：移除跨模态注意力或虚拟原型，观察性能下降（图 5）。
   - **注意力策略**：分析不同注意力掩码对性能的影响（表 11）。
5. **效率验证**：
   - 对比训练时间（表 1），Candle 仅需 11 分钟，显著快于 CoOp（5 小时）和 CoCoOp（30 小时）。

关键概念解释

1. **不平衡比率（Imbalance Ratio, IR）**：
   - 定义为训练集中多数类样本数 / 少数类样本数（如IR=100表示多数类样本是少数类的100倍）。
   - 用于模拟现实场景中长尾分布的数据特性。
2. **调和平均（Harmonic Mean）**：
   - 综合评估模型在基类和新类上的平衡性能，避免单一类别主导结果。
   - 公式：$H = \frac{2 \times \text{Base} \times \text{New}}{\text{Base} + \text{New}}$。
3. **虚拟原型（Virtual Prototypes）**：
   - 为无训练样本的新类生成可学习的特征表示，避免模型完全忽略新类。

表5：基类与新类的调和平均准确率（Harmonic Mean）

列名	数值含义	示例值
Base	模型在基类（训练集中存在的类别）上的平均准确率（%）	95.89, 95.84
New	模型在新类（训练中未见的类别）上的平均准确率（%）	95.99, 73.49
H	基类与新类的调和平均准确率（公式：$H = \frac{2 \times \text{Base} \times \text{New}}{\text{Base} + \text{New}}$）	79.34, 79.08

示例说明：

- 当不平衡比率（IR）为10时，Candle在Caltech101上的调和平均为95.89（基类）和95.99（新类），综合性能H=79.34%；
- **调和平均的意义**：避免基类或新类中某一方准确率过高掩盖另一方性能，综合反映整体泛化能力。

运行训练脚本

使用 main.sh 脚本，参数说明:

DATASET: 数据集名（如 caltech101）。

CFG: 配置文件（如 rn50_ep50 表示 ResNet50 训练 50 个 epoch）。

CTP: 上下文位置（end 或 middle）。

NCTX: 上下文 token 数量（默认为 16）。

SHOTS: 样本数量（如 1、2、4、8、16）。

CSC: 是否使用 CSC 模式（True 或 False）

训练命令:

训练 coding:

(1)caltech101 （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_train.sh caltech101 vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100
- bash scripts/candle/base2new_imb_train.sh caltech101 vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100
- bash scripts/candle/base2new_imb_train.sh caltech101 vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100

(2)Dtd （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_train.sh dtd vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100
- bash scripts/candle/base2new_imb_train.sh dtd vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100
- bash scripts/candle/base2new_imb_train.sh dtd vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100

(3)Eurosat （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_train.sh eurosat vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100
- bash scripts/candle/base2new_imb_train.sh eurosat vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100
- bash scripts/candle/base2new_imb_train.sh eurosat vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100

(4)Fgvc-aircraft （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_train.sh fgvc_aircraft vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100
- bash scripts/candle/base2new_imb_train.sh fgvc_aircraft vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100

- bash scripts/candle/base2new_imb_train.sh fgvc_aircraft vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100

(5)Food101 （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_train.sh food101 vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100
- bash scripts/candle/base2new_imb_train.sh food101 vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100
- bash scripts/candle/base2new_imb_train.sh food101 vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100

(6)Imagenet-A （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_train.sh imagenet_a vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100
- bash scripts/candle/base2new_imb_train.sh imagenet_a vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100
- bash scripts/candle/base2new_imb_train.sh imagenet_a vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100

(7)Imagenet-R （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_train.sh imagenet_r vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100
- bash scripts/candle/base2new_imb_train.sh imagenet_r vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100
- bash scripts/candle/base2new_imb_train.sh imagenet_r vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100

(8)Imagenet-Sketch （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_train.sh imagenet_sketch vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100

- bash scripts/candle/base2new_imb_train.sh imagenet_sketch vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100

- bash scripts/candle/base2new_imb_train.sh imagenet_sketch vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100

(9)Imagenet-V2 （Imbalance Ratio = 10.| 20 | 50）

bash scripts/candle/base2new_imb_train.sh imagenetv2 vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100

bash scripts/candle/base2new_imb_train.sh imagenetv2 vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100

bash scripts/candle/base2new_imb_train.sh imagenetv2 vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100

(10) Oxford_flowers （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_train.sh oxford_flowers vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100

- bash scripts/candle/base2new_imb_train.sh oxford_flowers vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100

- bash scripts/candle/base2new_imb_train.sh oxford_flowers vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100

(11) Oxford_pets （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_train.sh oxford_pets vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100

- bash scripts/candle/base2new_imb_train.sh oxford_pets vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100

- bash scripts/candle/base2new_imb_train.sh oxford_pets vit_b16_bs128_lr0.0003 1.0 none

text 0.5 50 100

(12) Ucf101（Imbalance Ratio = 10.| 20 | 50）

bash scripts/candle/base2new_imb_train.sh ucf101 vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100

bash scripts/candle/base2new_imb_train.sh ucf101 vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100

bash scripts/candle/base2new_imb_train.sh ucf101 vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100

验证命令（基础类）:

(1)caltech101（Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh caltech101 vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 base
- bash scripts/candle/base2new_imb_test.sh caltech101 vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 base
- bash scripts/candle/base2new_imb_test.sh caltech101 vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 base

(2)Dtd（Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh dtd vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 base
- bash scripts/candle/base2new_imb_test.sh dtd vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 base
- bash scripts/candle/base2new_imb_test.sh dtd vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 base

(3)Eurosat（Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh eurosat vit_b16_bs128_lr0.0003 1.0 none text 0.1

50 100 base

- bash scripts/candle/base2new_imb_test.sh eurosat vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 base
- bash scripts/candle/base2new_imb_test.sh eurosat vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 base

(4)Fgvc-aircraft（Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh fgvc_aircraft vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 base
- bash scripts/candle/base2new_imb_test.sh fgvc_aircraft vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 base
- bash scripts/candle/base2new_imb_test.sh fgvc_aircraft vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 base

(5)Food101（Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh food101 vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 base
- bash scripts/candle/base2new_imb_test.sh food101 vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 base
- bash scripts/candle/base2new_imb_test.sh food101 vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 base

(6)Imagenet-A（Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh imagenet_a vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 base
- bash scripts/candle/base2new_imb_test.sh imagenet_a vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 base
- bash scripts/candle/base2new_imb_test.sh imagenet_a vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 base

(7)Imagenet-R （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh imagenet_r vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 base
- bash scripts/candle/base2new_imb_test.sh imagenet_r vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 base
- bash scripts/candle/base2new_imb_test.sh imagenet_r vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 base

(8)Imagenet-Sketch （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh imagenet_sketch vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 base
- bash scripts/candle/base2new_imb_test.sh imagenet_sketch vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 base
- bash scripts/candle/base2new_imb_test.sh imagenet_sketch vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 base

(9)Imagenet-V2 （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh imagenetv2 vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 base
- bash scripts/candle/base2new_imb_test.sh imagenetv2 vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 base
- bash scripts/candle/base2new_imb_test.sh imagenetv2 vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 base

(10) Oxford_flowers （Imbalance Ratio = 10.| 20 | 50）

bash scripts/candle/base2new_imb_test.sh oxford_flowers vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 base

bash scripts/candle/base2new_imb_test.sh oxford_flowers vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 base

bash scripts/candle/base2new_imb_test.sh oxford_flowers vit_b16_bs128_lr0.0003 1.0 none text

0.5 50 100 base

(11) Oxford_pets（Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh oxford_pets vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 base
- bash scripts/candle/base2new_imb_test.sh oxford_pets vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 base
- bash scripts/candle/base2new_imb_test.sh oxford_pets vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 base

(12) Ucf101（Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh ucf101 vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 base
- bash scripts/candle/base2new_imb_test.sh ucf101 vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 base
- bash scripts/candle/base2new_imb_test.sh ucf101 vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 base

验证命令（新类）:

(1)caltech101（Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh caltech101 vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 new
- bash scripts/candle/base2new_imb_test.sh caltech101 vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 new
- bash scripts/candle/base2new_imb_test.sh caltech101 vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 new

(2)Dtd（Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh dtd vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 new

- bash scripts/candle/base2new_imb_test.sh dtd vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 new
- bash scripts/candle/base2new_imb_test.sh dtd vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 new

(3)Eurosat （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh eurosat vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 new
- bash scripts/candle/base2new_imb_test.sh eurosat vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 new
- bash scripts/candle/base2new_imb_test.sh eurosat vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 new

(4)Fgvc-aircraft （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh fgvc_aircraft vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 new
- bash scripts/candle/base2new_imb_test.sh fgvc_aircraft vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 new
- bash scripts/candle/base2new_imb_test.sh fgvc_aircraft vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 new

(5)Food101 （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh food101 vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 new
- bash scripts/candle/base2new_imb_test.sh food101 vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 new
- bash scripts/candle/base2new_imb_test.sh food101 vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 new

(6)Imagenet-A （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh imagenet_a vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 new
- bash scripts/candle/base2new_imb_test.sh imagenet_a vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 new
- bash scripts/candle/base2new_imb_test.sh imagenet_a vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 new

(7)Imagenet-R （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh imagenet_r vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 new
- bash scripts/candle/base2new_imb_test.sh imagenet_r vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 new
- bash scripts/candle/base2new_imb_test.sh imagenet_r vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 new

(8)Imagenet-Sketch （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh imagenet_sketch vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 new
- bash scripts/candle/base2new_imb_test.sh imagenet_sketch vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 new
- bash scripts/candle/base2new_imb_test.sh imagenet_sketch vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 new

(9)Imagenet-V2 （Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh imagenetv2 vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 new
- bash scripts/candle/base2new_imb_test.sh imagenetv2 vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 new
- bash scripts/candle/base2new_imb_test.sh imagenetv2 vit_b16_bs128_lr0.0003 1.0 none text

0.5 50 100 new

(10) Oxford_flowers（Imbalance Ratio = 10.| 20 | 50）

bash scripts/candle/base2new_imb_test.sh oxford_flowers vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 new

bash scripts/candle/base2new_imb_test.sh oxford_flowers vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 new

bash scripts/candle/base2new_imb_test.sh oxford_flowers vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 new

(11) Oxford_pets（Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh oxford_pets vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 new
- bash scripts/candle/base2new_imb_test.sh oxford_pets vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 new
- bash scripts/candle/base2new_imb_test.sh oxford_pets vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 new

(12) Ucf101（Imbalance Ratio = 10.| 20 | 50）

- bash scripts/candle/base2new_imb_test.sh ucf101 vit_b16_bs128_lr0.0003 1.0 none text 0.1 50 100 new
- bash scripts/candle/base2new_imb_test.sh ucf101 vit_b16_bs128_lr0.0003 1.0 none text 0.2 50 100 new
- bash scripts/candle/base2new_imb_test.sh ucf101 vit_b16_bs128_lr0.0003 1.0 none text 0.5 50 100 new

Base2New_Im_Train_Base(Test_Base)

Imb10

	Cal.	DTD.	FvgcA.	FD.	Flw.	Euro.	UCF.	Pets.	Avg
Seed1	96.7	78.0	40.1	90.4	97.7	90.6	87.2	93.2	84.24
Seed2	97.1	77.9	40.5	90.5	97.7	91.1	84.6	93.8	84.15
Seed3	97.0	76.9	39.7	90.4	97.6	90.9	86.1	94.1	84.09
Candle	**97.1**	**78.0**	**40.5**	**90.5**	**97.7**	**91.1**	**87.2**	**94.1**	**84.53**

Imb20

	Cal.	DTD.	FvgcA.	FD.	Flw.	Euro.	UCF.	Pets.	Avg
Seed1	97.1	77.8	42.4	90.7	98.1	93.1	86.8	93.8	84.98
Seed2	97.2	78.7	42.9	90.8	98.0	93.4	85.6	94.2	85.1
Seed3	97.1	78.2	42.9	90.8	97.9	92.7	86.7	94.3	85.08
Candle	**97.2**	**78.7**	**42.9**	**90.8**	**98.1**	**93.4**	**86.8**	**94.3**	**85.28**

Imb50

	Cal.	DTD.	FvgcA.	FD.	Flw.	Euro.	UCF.	Pets.	Avg
Seed1	97.1	81.0	45.2	91.0	98.0	93.2	86.6	94.5	85.83
Seed2	97.4	80.9	44.8	91.0	98.0	92.6	87.2	94.4	85.79
Seed3	97.2	81.3	45.2	91.0	97.9	93.6	87.0	94.7	85.99
Candle	**97.4**	**81.3**	**45.2**	**91.0**	**98.0**	**93.6**	**87.2**	**94.7**	**86.05**

Base2New_Im_Test_New

Imb10

	Cal.	DTD.	FvgcA.	FD.	Flw.	Euro.	UCF.	Pets.	Avg
Seed1	94.5	61.6	36.9	91.2	75.6	62.7	79.5	96.7	74.84
Seed2	94.6	61.0	36.8	91.2	75.6	62.5	78.7	96.7	74.64
Seed3	94.6	60.4	36.3	91.1	76.3	63.3	78.5	96.7	74.65
Candle	**94.6**	**61.6**	**36.9**	**91.2**	**76.3**	**63.3**	**78.7**	**96.7**	**74.91**

Imb20

	Cal.	DTD.	FvgcA.	FD.	Flw.	Euro.	UCF.	Pets.	Avg
Seed1	94.5	60.7	36.9	91.2	75.5	62.7	79.6	96.5	74.7
Seed2	94.5	61.1	37.2	91.1	75.5	62.2	78.8	96.5	74.61
Seed3	94.4	61.0	36.5	91.1	75.6	62.9	79.1	96.3	74.61
Candle	**94.5**	**61.1**	**37.2**	**91.2**	**75.6**	**62.9**	**79.6**	**96.5**	**74.83**

Imb50

	Cal.	DTD.	FvgcA.	FD.	Flw.	Euro.	UCF.	Pets.	Avg
Seed1	94.5	60.5	36.7	91.3	75.5	62.3	79.8	96.6	74.65
Seed2	94.5	60.1	36.6	91.1	75.7	62.2	78.8	96.5	74.44
Seed3	94.6	60.1	36.5	91.3	75.9	62.6	79.4	96.4	74.6
Candle	**94.6**	**60.5**	**36.7**	**91.3**	**75.9**	**62.6**	**79.4**	**96.6**	**74.7**

Harmonic mean values

Candle	Cal.	DTD.	FvgcA.	FD.	Flw.	Euro.	UCF.	Pets.	Avg
Imb10	**95.83**	**68.84**	**38.62**	**90.85**	**85.68**	**74.7**	**82.73**	**95.38**	**79.08**
Imb20	**95.83**	**68.79**	**39.85**	**91.0**	**85.39**	**75.17**	**83.04**	**95.39**	**79.31**
Imb50	**95.98**	**69.37**	**40.51**	**91.15**	**85.55**	**75.02**	**83.12**	**95.64**	**81.8**

少样本训练 16shot（不存在不平衡的情况）

(1)caltech101（16shot）

- bash scripts/candle/base2new_train.sh caltech101 vit_b16_bs128_lr0.0003 1.0 none text 50

(2)Dtd（16shot）

- bash scripts/candle/base2new_train.sh dtd vit_b16_bs128_lr0.0003 1.0 none text 50

(3)Eurosat（16shot）

- bash scripts/candle/base2new_train.sh eurosat vit_b16_bs128_lr0.0003 1.0 none text 50

(4)Fgvc-aircraft（16shot）

- bash scripts/candle/base2new_train.sh fgvc_aircraft vit_b16_bs128_lr0.0003 1.0 none text 50

(5)Food101（16shot）

- bash scripts/candle/base2new_train.sh food101 vit_b16_bs128_lr0.0003 1.0 none text 50

(6)Oxford_flowers（16shot）

- bash scripts/candle/base2new_train.sh oxford_flowers vit_b16_bs128_lr0.0003 1.0 none text 50

(7)Oxford_pets（16shot）

- bash scripts/candle/base2new_train.sh oxford_pets vit_b16_bs128_lr0.0003 1.0 none text 50

(8)Ucf101（16shot）

bash scripts/candle/base2new_train.sh ucf101 vit_b16_bs128_lr0.0003 1.0 none text 50

验证命令少样本测试（基础类）16shot

(1) caltech101（16shot）

- bash scripts/candle/base2new_test.sh caltech101 vit_b16_bs128_lr0.0003 1.0 none text 50 base

(2) Dtd（16shot）

- bash scripts/candle/base2new_test.sh dtd vit_b16_bs128_lr0.0003 1.0 none text 50 base

(3) Eurosat（16shot）

- bash scripts/candle/base2new_test.sh eurosat vit_b16_bs128_lr0.0003 1.0 none text 50 base

(4) Fgvc-aircraft（16shot）

- bash scripts/candle/base2new_test.sh fgvc_aircraft vit_b16_bs128_lr0.0003 1.0 none text 50 base

(5) Food101（16shot）

- bash scripts/candle/base2new_test.sh food101 vit_b16_bs128_lr0.0003 1.0 none text 50 base

(6) Oxford_flowers（16shot）

- bash scripts/candle/base2new_test.sh oxford_flowers vit_b16_bs128_lr0.0003 1.0 none text 50 base

(7) Oxford_pets（16shot）

- bash scripts/candle/base2new_test.sh oxford_pets vit_b16_bs128_lr0.0003 1.0 none text 50 base

(8) Ucf101（16shot）

- bash scripts/candle/base2new_test.sh ucf101 vit_b16_bs128_lr0.0003 1.0 none text 50 base

验证命令少样本测试（新类）16shot

(1)caltech101（16shot）

- bash scripts/candle/base2new_test.sh caltech101 vit_b16_bs128_lr0.0003 1.0 none text 50 new

(2) Dtd（16shot）

- bash scripts/candle/base2new_test.sh dtd vit_b16_bs128_lr0.0003 1.0 none text 50 new

(3) Eurosat（16shot）

- bash scripts/candle/base2new_test.sh eurosat vit_b16_bs128_lr0.0003 1.0 none text 50 new

(4) Fgvc-aircraft（16shot）

- bash scripts/candle/base2new_test.sh fgvc_aircraft vit_b16_bs128_lr0.0003 1.0 none text 50 new

(5) Food101（16shot）

- bash scripts/candle/base2new_test.sh food101 vit_b16_bs128_lr0.0003 1.0 none text 50 new

(6) Oxford_flowers（16shot）

- bash scripts/candle/base2new_test.sh oxford_flowers vit_b16_bs128_lr0.0003 1.0 none text 50 new

(7) Oxford_pets（16shot）

- bash scripts/candle/base2new_test.sh oxford_pets vit_b16_bs128_lr0.0003 1.0 none text 50

new

(8) Ucf101 （16shot）

bash scripts/candle/base2new_test.sh ucf101 vit_b16_bs128_lr0.0003 1.0 none text 50 new

Base2New_Train_Base(Test_Base 16shot)

	Cal.	DTD.	FvgcA.	FD.	Flw.	Euro.	UCF.	Pets.	Avg
Seed1	97.0	77.5	44.6	89.9	97.8	88.6	84.7	93.0	84.14
Seed2	97.1	77.1	43.6	89.8	97.1	92.5	85.2	92.4	84.35
Seed3	97.0	78.2	43.2	89.7	97.5	91.1	84.5	93.3	84.31
Candle	**97.1**	**78.0**	**44.6**	**89.9**	**97.7**	**92.5**	**85.2**	**93.3**	**84.79**

Base2New_Test_New(Test 16shot)

	Cal.	DTD.	FvgcA.	FD.	Flw.	Euro.	UCF.	Pets.	Avg
Seed1	94.3	62.0	36.4	91.0	76.2	61.4	79.9	96.8	74.75
Seed2	94.5	61.7	36.3	90.9	76.2	60.8	79.2	96.7	74.54
Seed3	94.6	61.6	36.5	91.2	76.4	61.4	79.7	96.7	74.76
Candle	**94.6**	**62.0**	**36.5**	**91.2**	**76.4**	**61.4**	**79.9**	**96.8**	**74.85**

Harmonic mean values(16shot)

	Cal.	DTD.	FvgcA.	FD.	Flw.	Euro.	UCF.	Pets.	Avg
Candle(HM)	**95.83**	**69.09**	**40.94**	**90.55**	**85.75**	**73.81**	**82.46**	**95.02**	**79.51**

命令行 Debug

```
ssh -p 11097 root@connect.nmb2.seetacloud.com

训练:
# base-to-new generalization

DATASET=caltech101
CFG=vit_b16_bs128_lr0.0003
SCALE=1.0 # controls the scale between visual and text temperatures
MASK=none # for ablation on attn
VIR=text # virtual prototype init
IMB=0.02 # imbalance ratio, set to 1.0 for balanced scenarios; fixed at 0.01 for imagenet
EPOCHS=50
SHOTS=100 # maximum number of samples per class



#输入八个参数
# training
bash scripts/candle/base2new_imb_train.sh ${DATASET} ${CFG} ${SCALE} ${MASK} ${VIR} ${IMB} ${EPOCHS} ${SHOTS}


# testing
bash scripts/candle/base2new_imb_test.sh ${DATASET} ${CFG} ${SCALE} ${MASK} ${VIR} ${IMB} ${EPOCHS} ${SHOTS} base
bash scripts/candle/base2new_imb_test.sh ${DATASET} ${CFG} ${SCALE} ${MASK} ${VIR} ${IMB} ${EPOCHS} ${SHOTS} new


训练coding:
(1)caltech101
bash scripts/candle/base2new_imb_train.sh caltech101 vit_b16_bs128_lr0.0003 1.0 none text 0.02 50 100

(2)eurosat
bash scripts/candle/base2new_imb_train.sh eurosat vit_b16_bs128_lr0.0003 1.0 none text 0.02 50 100


测试coding:
(1)caltech101
bash scripts/candle/base2new_imb_test.sh caltech101 vit_b16_bs128_lr0.0003 1.0 none text 0.02 50 100
```

Linux 下的命令行问题

1. 首先，让我们安装dos2unix工具并转换文件格式：

```bash
sudo apt-get update
sudo apt-get install -y dos2unix
dos2unix scripts/candle/base2new_imb_train.sh
```

2. 如果上面的命令不可用，你可以使用sed命令来删除回车符：

```bash
sed -i 's/\r$//' scripts/candle/base2new_imb_train.sh
```

sudo apt-get install dos2unix # 如果尚未安装

dos2unix scripts/candle/base2new_test.sh

Debug:
删除错误路径命令:
sudo rm -rf output

sudo rm -rf caltech101