

Model *Co-teaching* for Semi-supervised Image Classification

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CSE244A Final Project

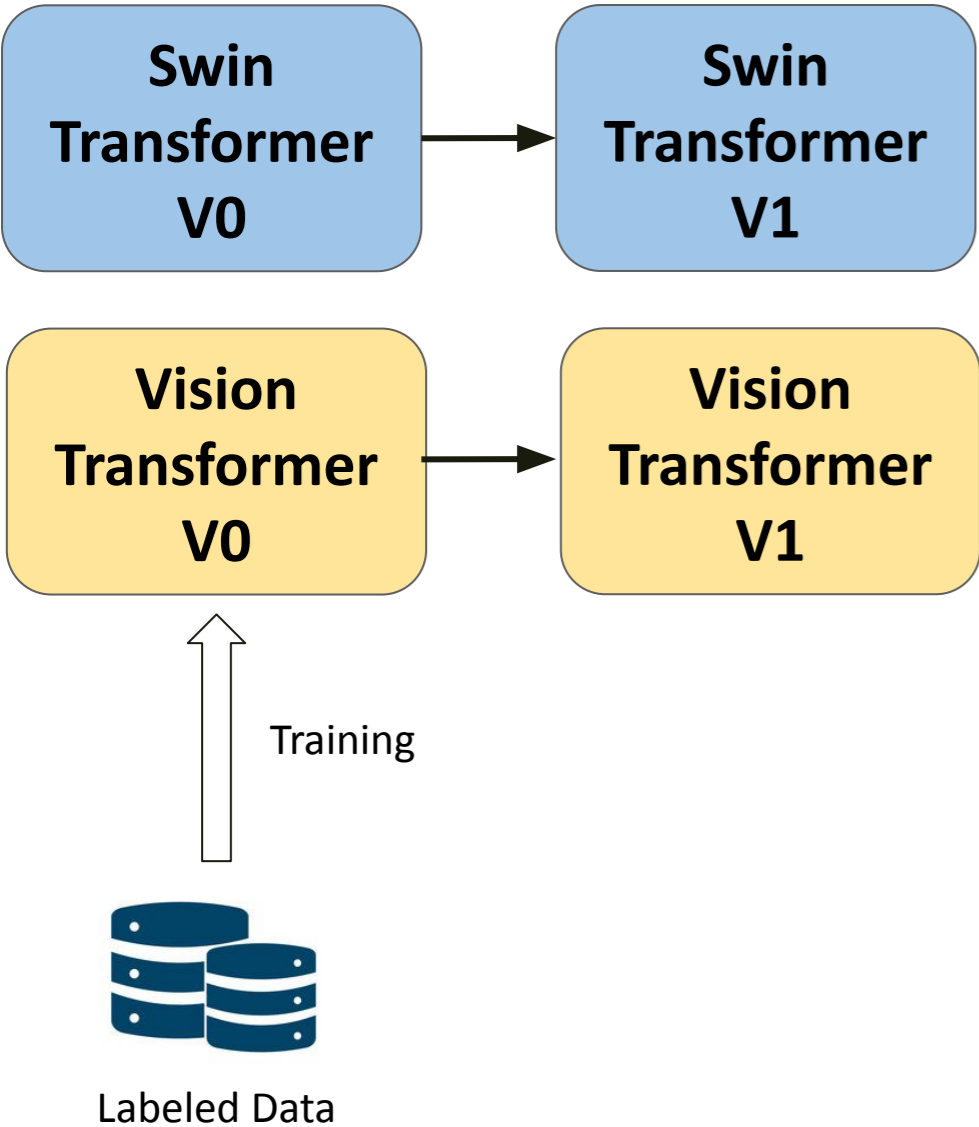
12/03/2024

Challenge Overview

- Challenge Task:
 - Apply semi-supervised learning techniques to classify a custom dataset of 135 fine-grained categories (15 plants, 120 dogs).
- Dataset
 - Training Set:
 - 9854 labeled images.
 - 22,995 unlabeled images.
 - Test Set:
 - 8213 images.
- Result: Achieve >50% accuracy using both labeled and unlabeled data.

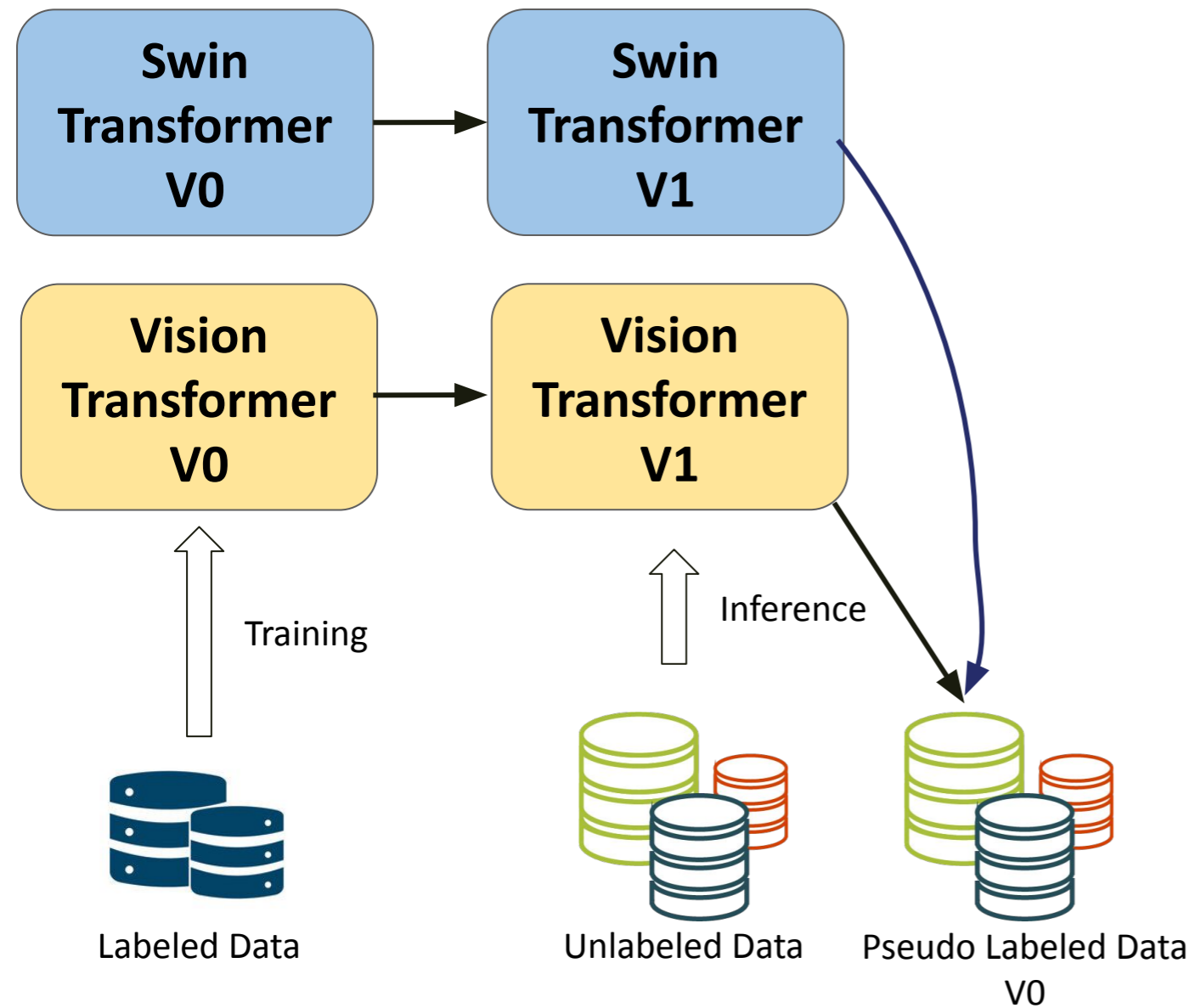
Model Training Pipeline

Initialization



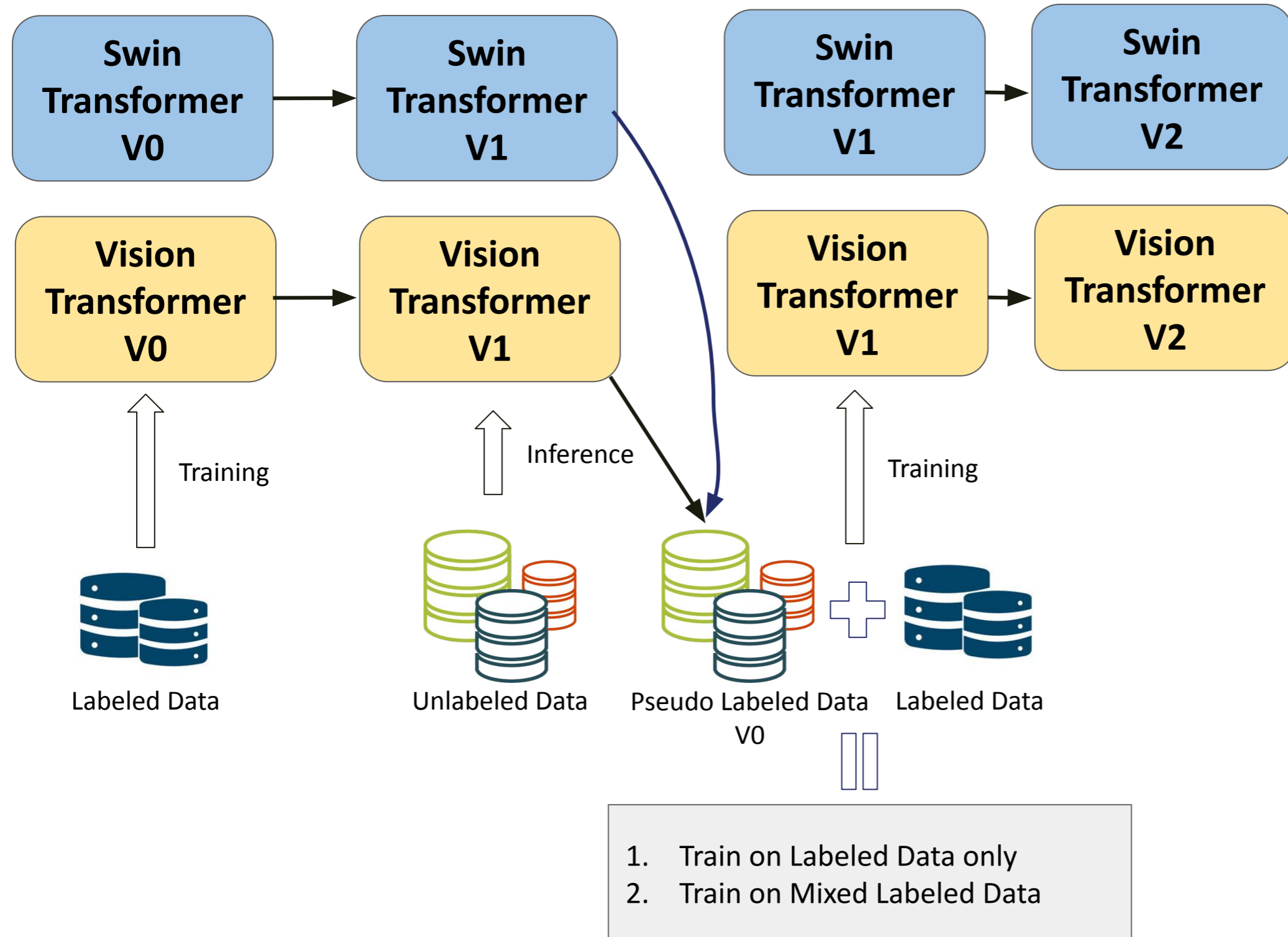
Model Training Pipeline

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Model Training Pipeline

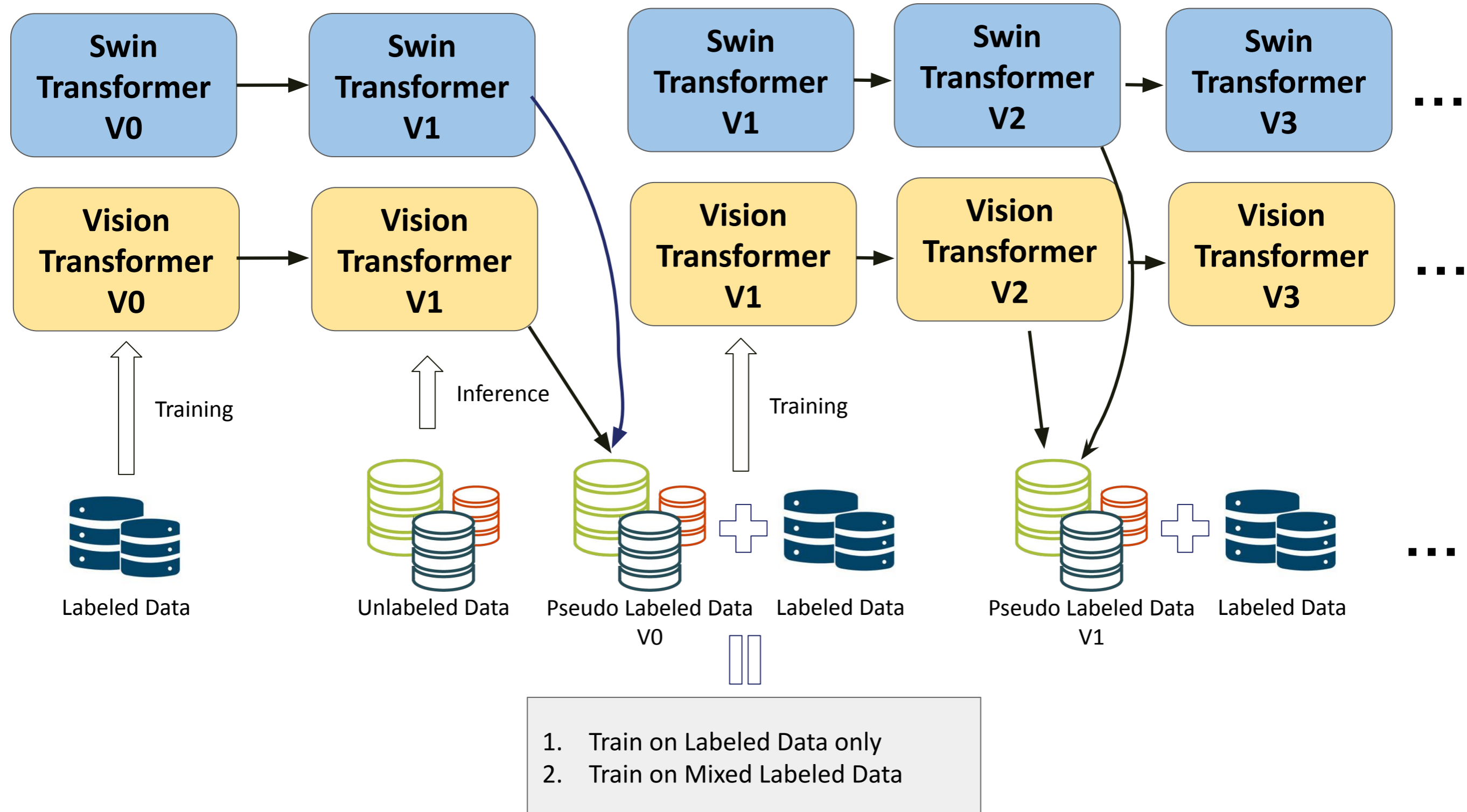
Initialization



Model Training Pipeline

Initialization

Model Co-teaching



Experimental Setup

- **Model Selection**

- ❖ **Model 1:** *Swin Transformer (**Base**)* pretrained on ImageNet, with a modified classification head.
- ❖ **Model 2:** *Vision Transformer (**ViT-B/16**)* pretrained on ImageNet, with a modified classification head.




- **Training Parameters**

- ❖ **Epochs:** 10 dynamic iterations involving pseudo-labeling.
- ❖ **Optimizer:** AdamW with weight decay of $1e-4$.
- ❖ **Learning Rate:** Initial learning rate of $1e-4$ with cosine annealing warm restarts.
- ❖ **Loss Function:** Cross-entropy with label smoothing (0.1) and class weights to handle imbalanced data.
- ❖ **Batch Size:** 256

- **Dynamic Accuracy Threshold**

- ❖ **Pseudo-label Threshold:** Starts at 0.8 and decreases by 0.02 per epoch to include more predictions dynamically.

Final Result

9	CamelliaWang-1		0.9427
10	Yanqing Liu		0.9384
...	...		...

Potential Improvements

- ❖ **Larger Model:** employ visual transformers with larger model size
- ❖ **Optimized Training Framework:** probing other diverse training paradigm such as wake-sleep training
- ❖ **Data Augmentation:** use data augmentation strategies to labeled&unlabeled data such as crop, rotate to improve training accuracy
- ❖

Task Distribution

- ❖ **Yanqing Liu:** Methodology, Vision Transformer Training
- ❖ **Zhonghui Li:** Methodology, Slides, Report
- ❖ **Haoqin Tu:** Data preprocess, Data Labeling

Thanks!

Q&A