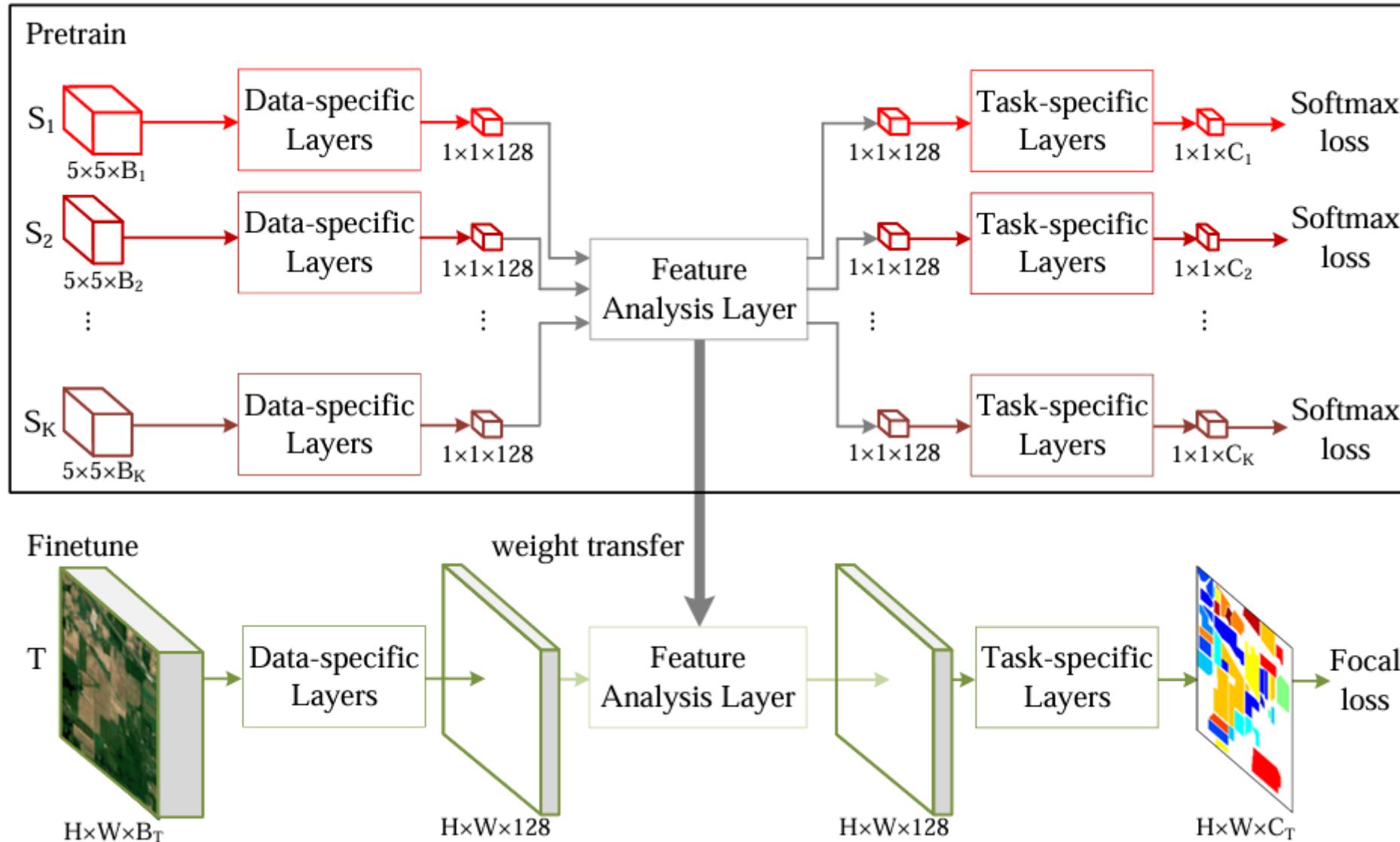


Pre-trained Deep Learning Networks for Analyzing Hyperspectral Image Data

Content

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- ✖ PCA
- ✖ Model result
- ✖ References

Exploring Cross-Domain Pretrained Model for Hyperspectral Image Classification

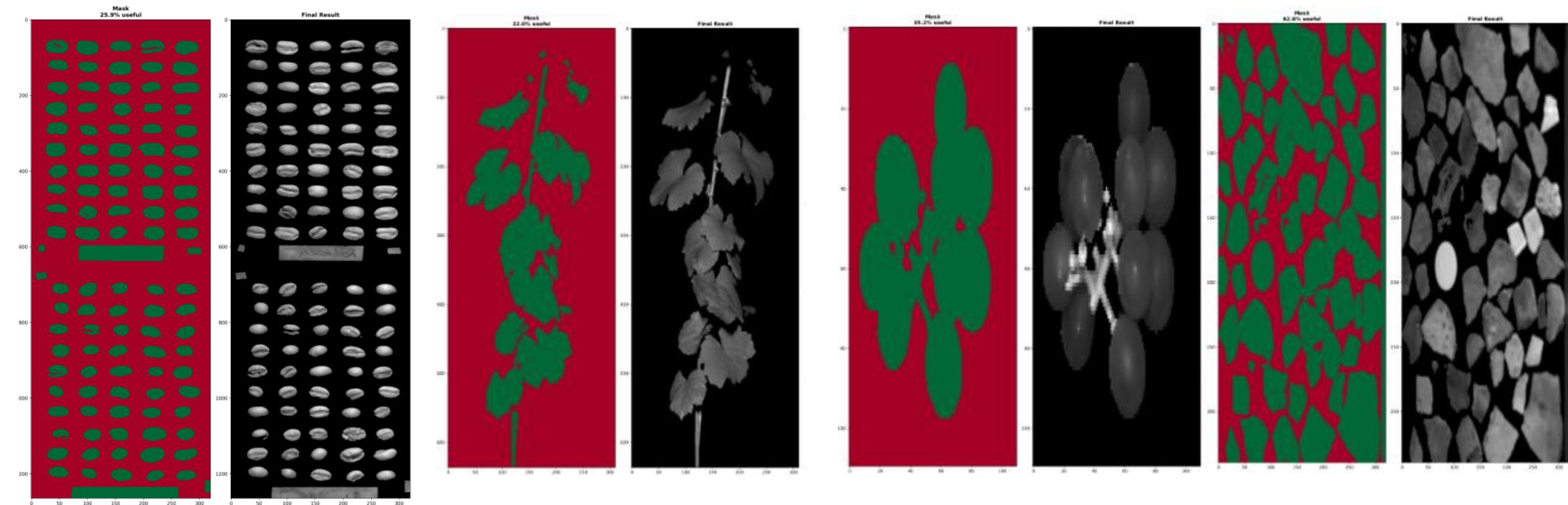


Data and Processing

Sourced from multiple folders (coffee, grapes, pottery, sugar, paper, archeology, branches), totaling ~29,000 spectrally-rich samples.

Processing Steps:

- * Cropping and background masking
- * Patch extraction: 32x32 patches, with domain stratification



PCA for Band reduction

Different hyperspectral cameras and acquisition settings produce different numbers of spectral bands:

Paper domain: 288 bands

Coffee, pottery, sugar domains: 256 bands

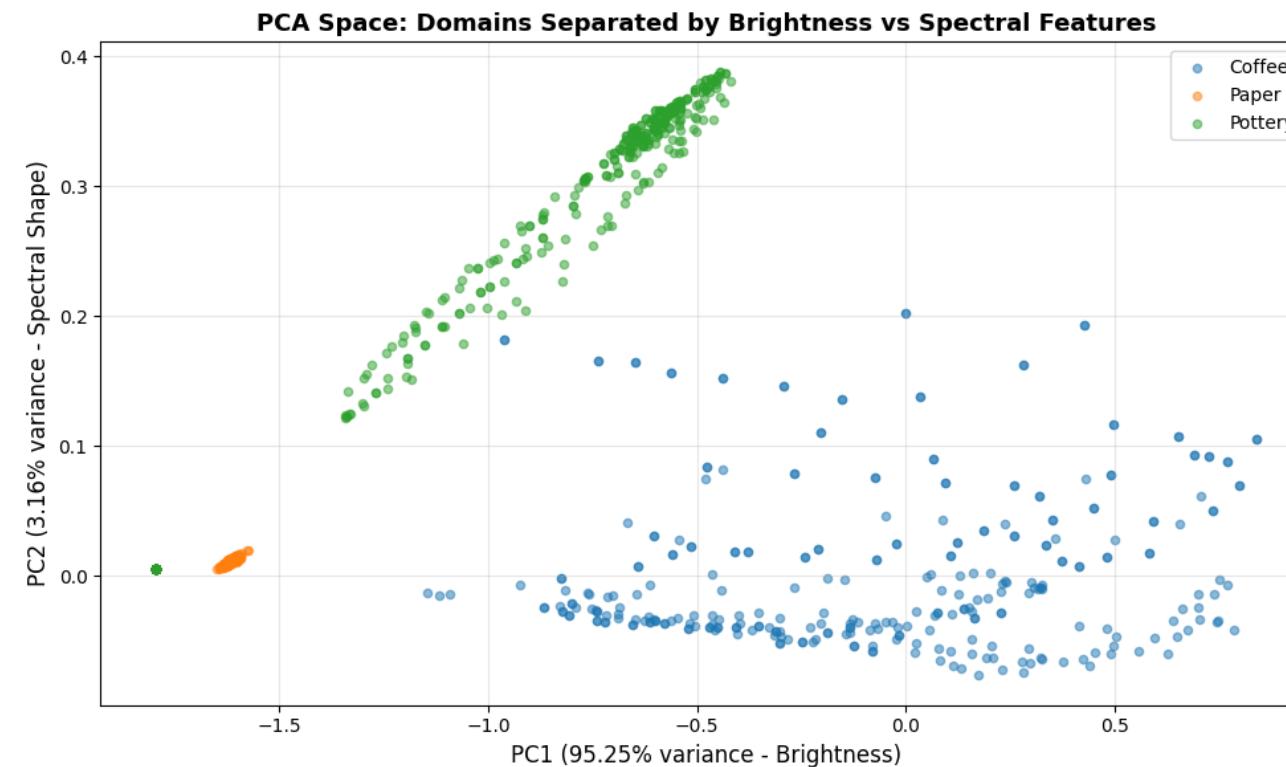
Grapes, branches: 160 bands

Interpolate to have consistent 256 bands across all the domains

Flatten all patches: (39,482 patches) \times (256 pixels) \times (256 bands)

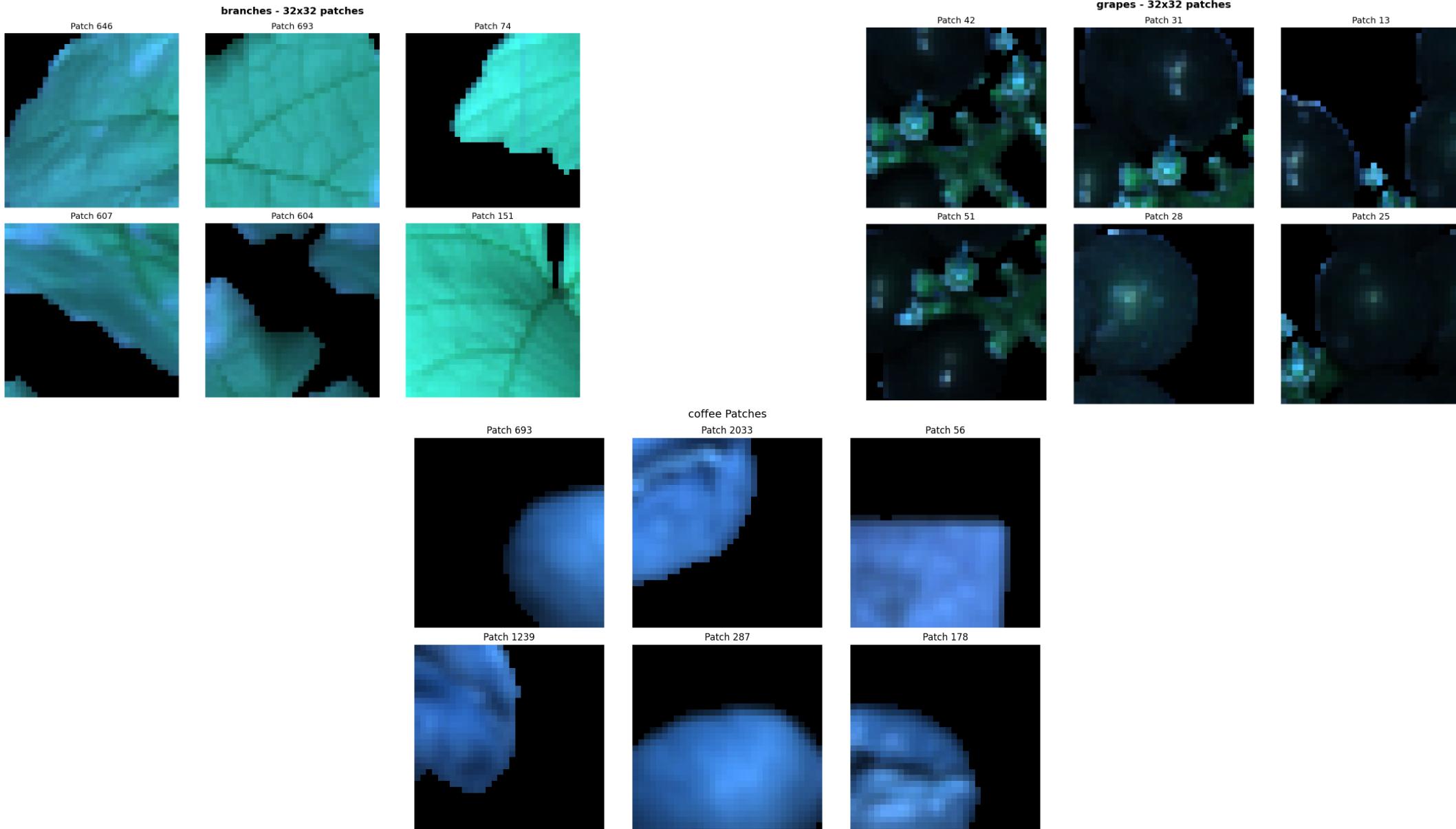
Fit PCA: Extract top 30 principal components

Visualize PC1 vs PC2

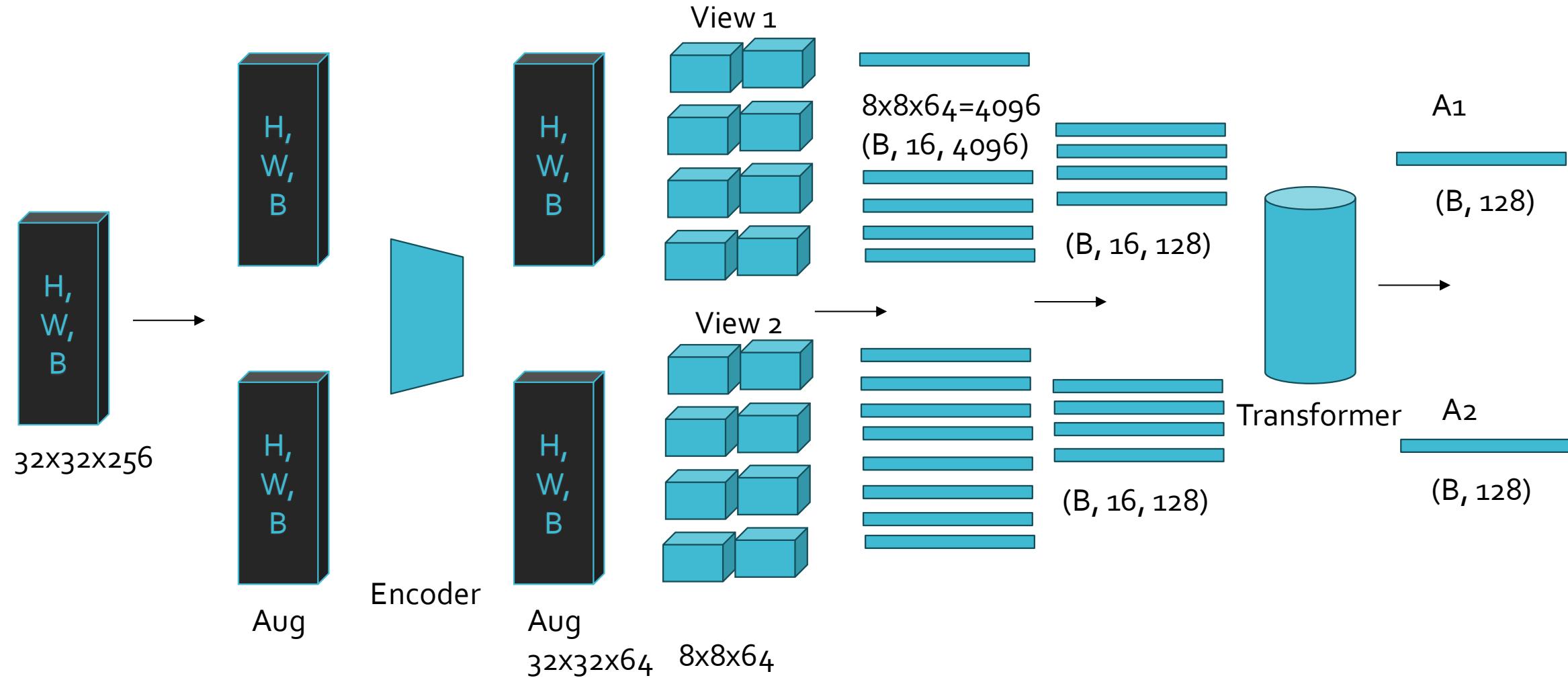


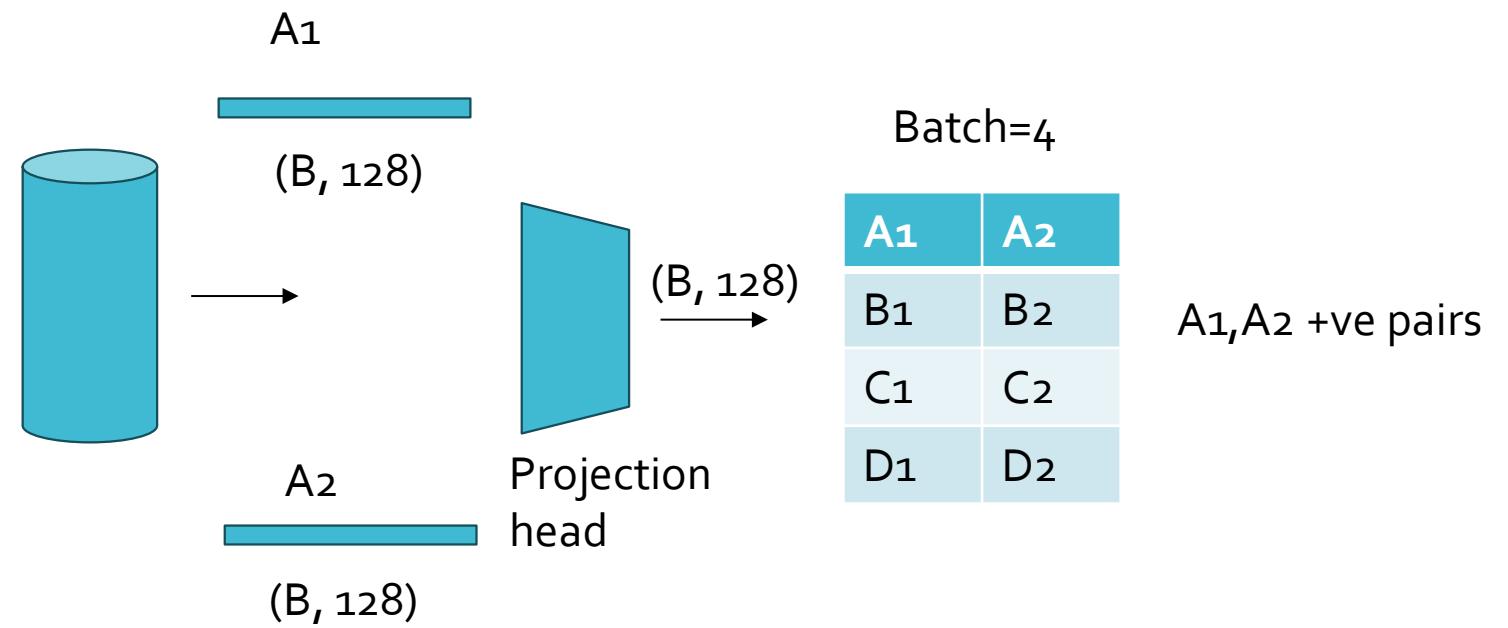
Make it into Patches for better processing

Making Patches of 32x32 from the image mask



Architecture of the model





- concatenates z_1 and z_2
- computes the similarity matrix
- applies NT-Xent
- returns the final loss

Training infra

Hardware Setup

Training is performed on the university cluster with 8× Tesla V100 GPUs (32GB each)

Multi-GPU Training:

Using DataParallel, we distribute the batch across all 8 GPUs. Each GPU processes 8 samples independently, then gradients are synchronized.

Training Speed:

Single GPU: ~8 - 9 hours for 100 epochs

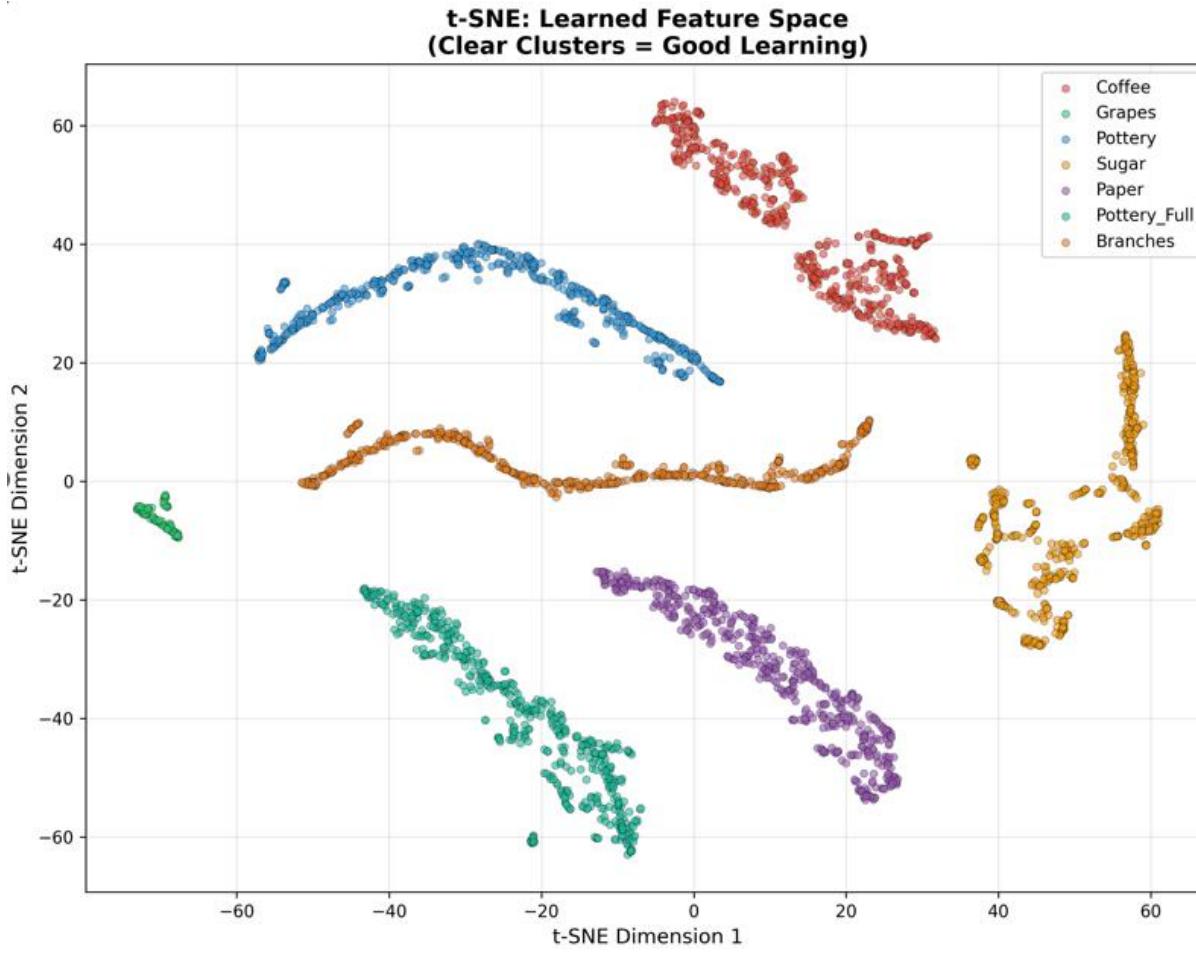
8 GPUs: ~90 -120 min for 100 epochs

Batch Size & Memory:

Total batch: 64 samples

Per GPU: 8 samples

Model result 30 epochs



Knn

k-NN Accuracy (k=20): 85.77%

Linear probe

Pretrained backbone accuracy : 47.31%
Random backbone accuracy : 15.44%
Representation gain : +31.87%

Thank you