

# EP15.41 Enhancing ultrasound content-based image retrieval through self-supervised domain adaptation of DINOv3

Vanda Czipczer, Richárd Zsámboki  
GE HealthCare Hungary, Budapest, Hungary

## OBJECTIVE

Ultrasound image appearance varies with gestational age, acquisition plane, and device settings, limiting the performance of off-the-shelf vision models for content-based image retrieval (CBIR).  
Therefore, we evaluated whether self-supervised domain adaptation of a large-scale vision foundation model (DINOv3) on unlabeled ultrasound data improves retrieval of clinically relevant reference images, using diagnosis agreement as a measurable proxy.

## METHODS

**Backbone.** A pretrained DINOv3 ViT-S/16 was adapted to the ultrasound domain using self-supervised teacher-student distillation on ~135k unlabeled fetal and early pregnancy images.

**Retrieval.** Feature embeddings from the adapted model were extracted for labeled SUOG (Smart Ultrasound in Obstetrics and Gynecology) reference images and for patient-disjoint query images (no patient overlap between reference and query sets); cosine similarity was used to retrieve the top-10 nearest neighbors.

**Metrics.** Retrieval quality was assessed against ground-truth diagnosis labels using two metrics: (1) average diagnosis match success (mean number of top-10 retrieved images sharing the query diagnosis; range 0–10) and (2) diagnosis coverage (number of diagnosis categories, of 65, whose mean diagnosis match success across queries was  $\geq 1$ ).

## RESULTS

0.61 → 0.71

Average diagnosis match success

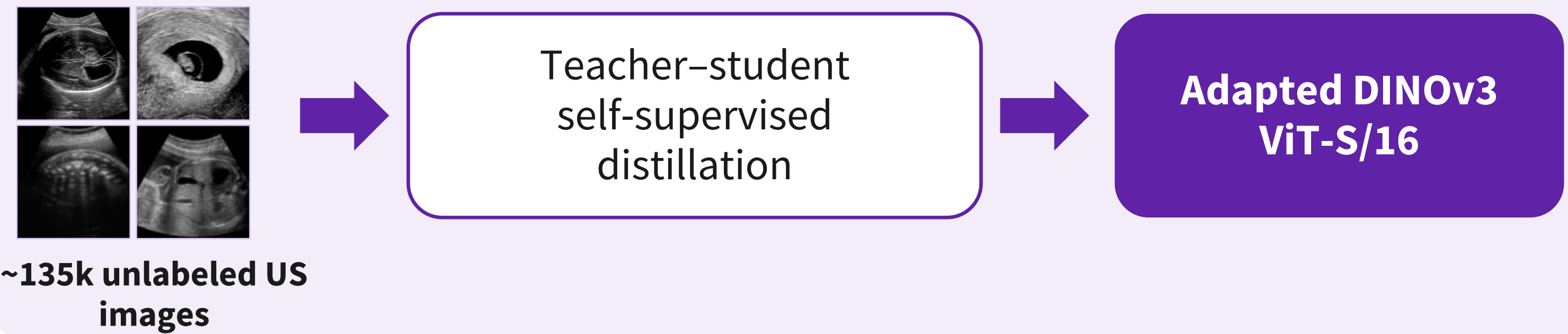
10/65 → 14/65

Diagnosis coverage

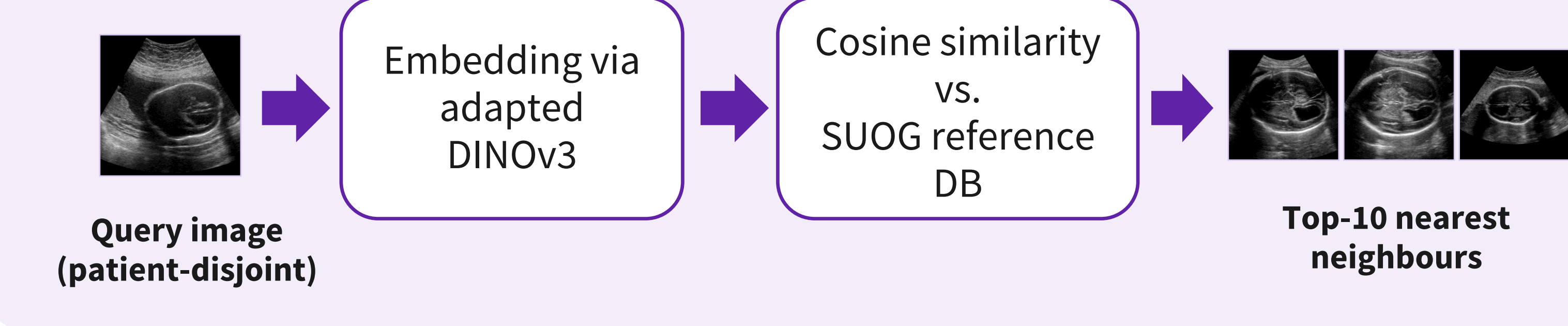
Compared with the original DINOv3 backbone, the adapted DINOv3 showed improved diagnosis-aligned CBIR.  
Average diagnosis match success increased from 0.61 to 0.71 and the diagnosis coverage increased from 10/65 to 14/65 after adaptation.

## STUDY OVERVIEW

### 1 Self-supervised domain adaptation



### 2 Diagnosis-aligned CBIR



## CONCLUSION

Self-supervised domain adaptation of DINOv3 on ultrasound data substantially improves diagnosis-aligned image retrieval from a curated reference database.  
These results suggest that adapting foundation models to ultrasound can enhance content-based access to exemplar images, with potential to support:

- Education and training
- Clinical decision support
- Quality assurance in routine ultrasound practice