Seeking an Optimal Approach for Computer-Aided Pulmonary Embolism Detection

Nahid Ul Islam[1], Shiv Gehlot[1], Zongwei Zhou[1],
Michael B. Gotway[2], and Jianming Liang[1]

[1]Arizona State University   [2]Mayo Clinic
GitHub: https://github.com/Nahid1992/CAD_PE

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Motivation: Pulmonary embolism (PE) represents a thrombus ("blood clot"), usually originating from a lower extremity vein, that travels to the blood vessels in the lung, causing vascular obstruction, and in some patients, death. we present a comprehensive analysis of competing deep learning methods applicable to PE diagnosis using CTPA at both the image and exam levels.

Contribution: Extensive experiments that compare architectures, model initialization, and learning paradigms; Optimal approach for detecting PE, achieving an AUC gain of 0.2% and 1.05% at the image and exam levels, respectively, compared with the state-of-the-art performance.
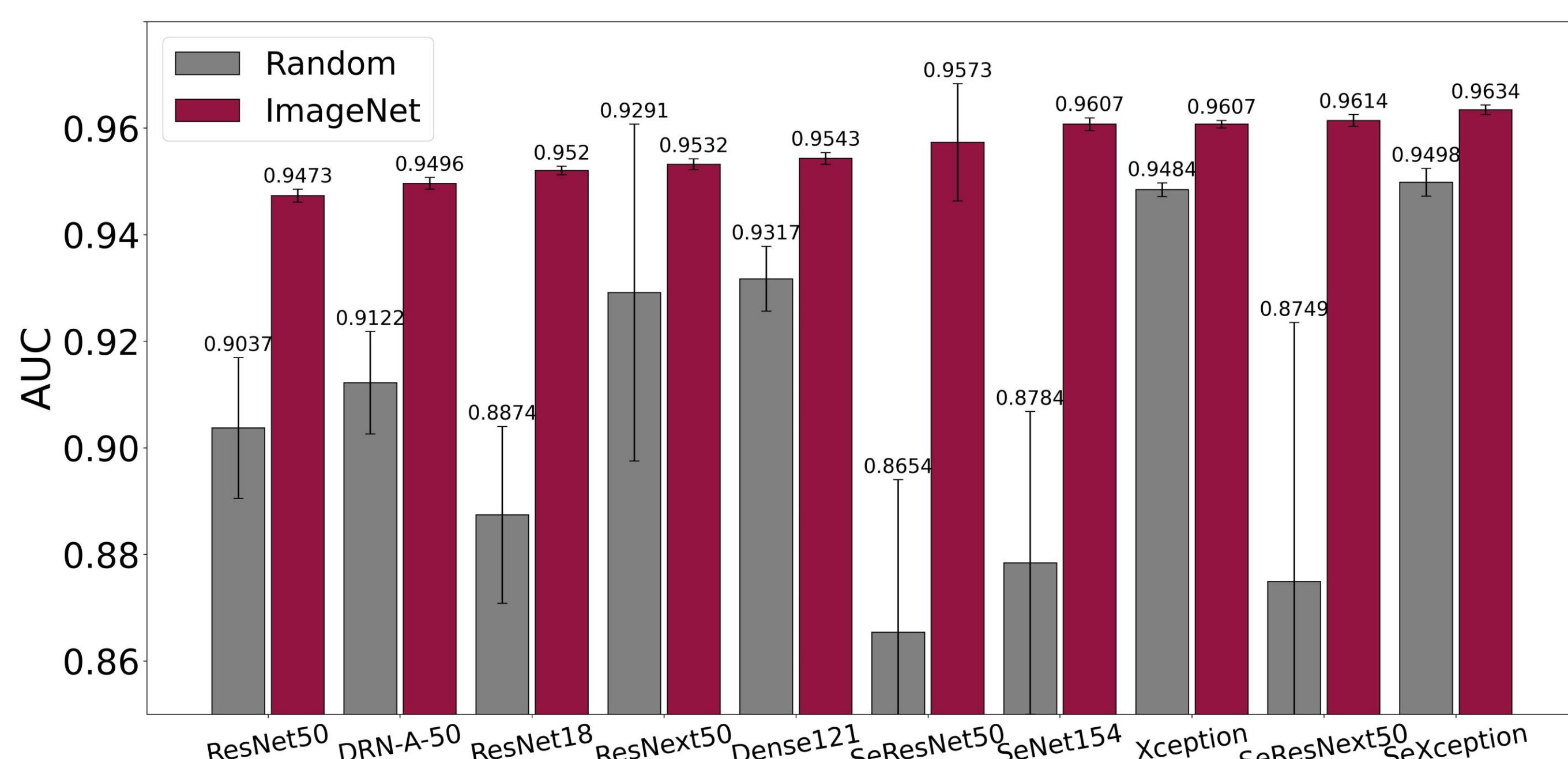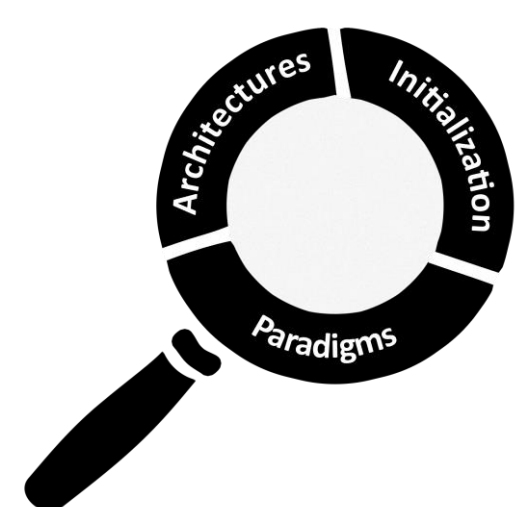

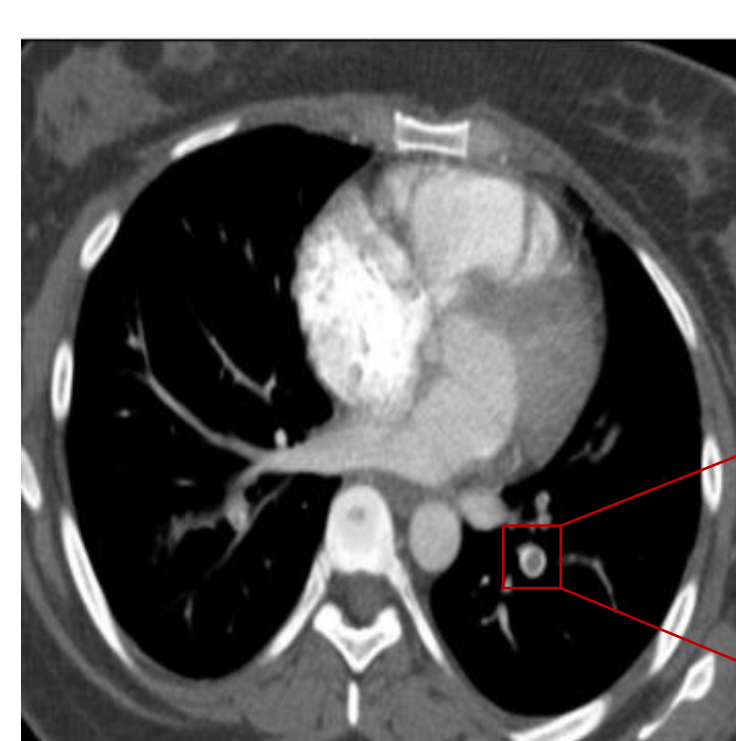Transfer learning improves the performance despite modality difference between datasets
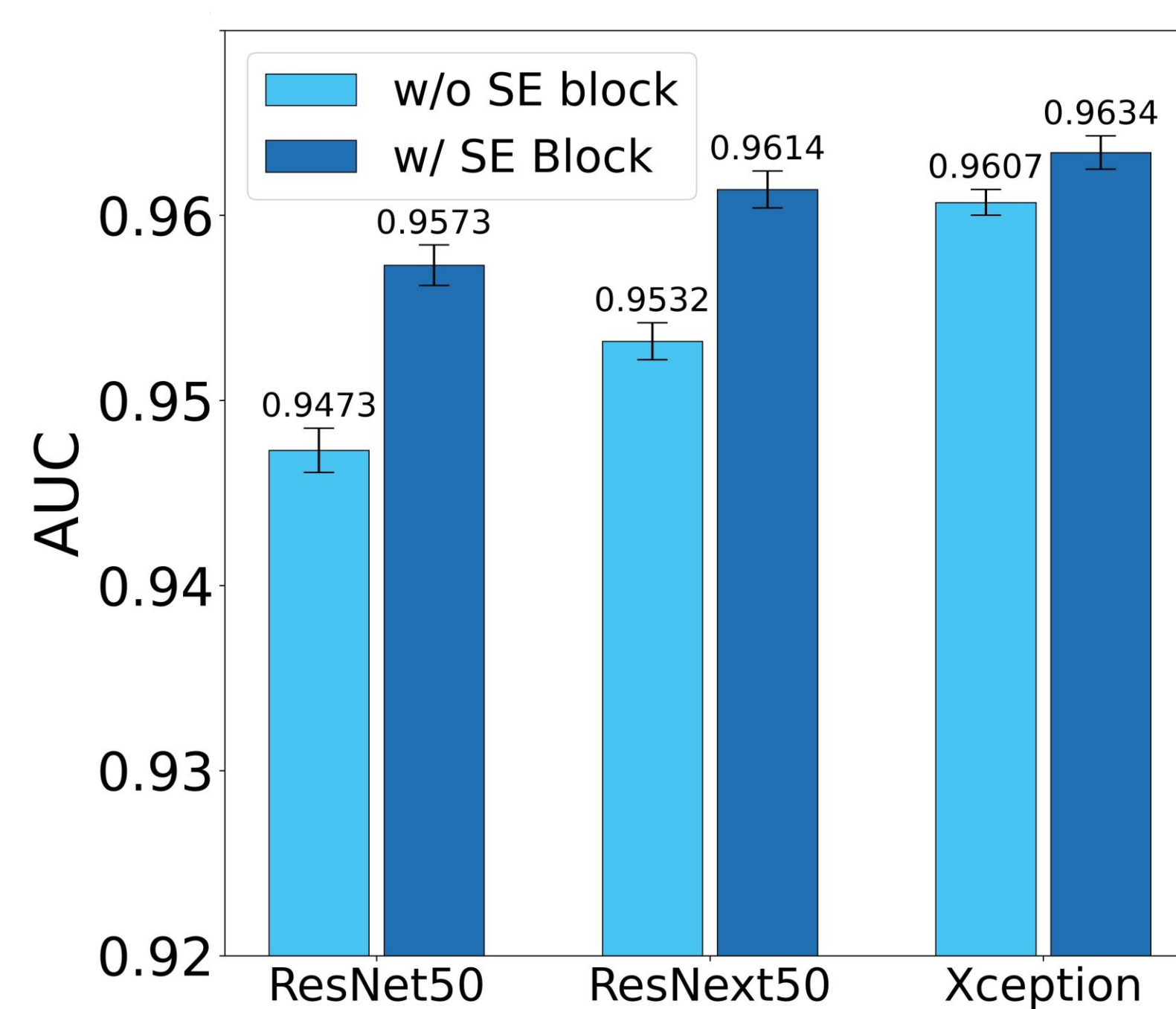
Squeeze & excitation blocks enhance CNN performance
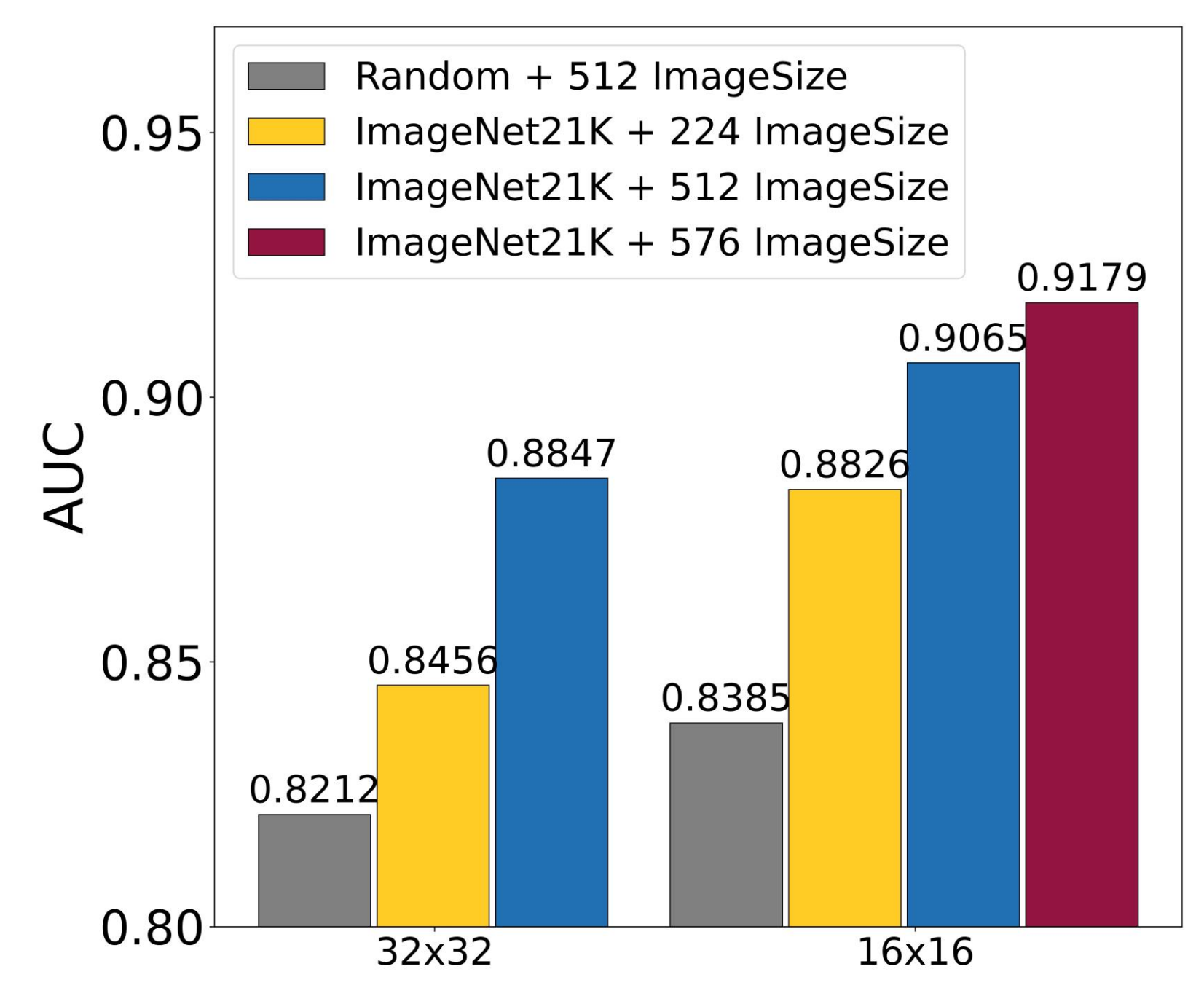
Vision transformer performs inferiorly compared with CNN

What deep learning architectures, model initialization, and learning paradigms should be used for CAD applications in medical imaging?

Input image

Slice-level Classification
- Training from scratch
- Fine-tuning
  - Supervised pretrained models
  - Self-supervised pretrained models
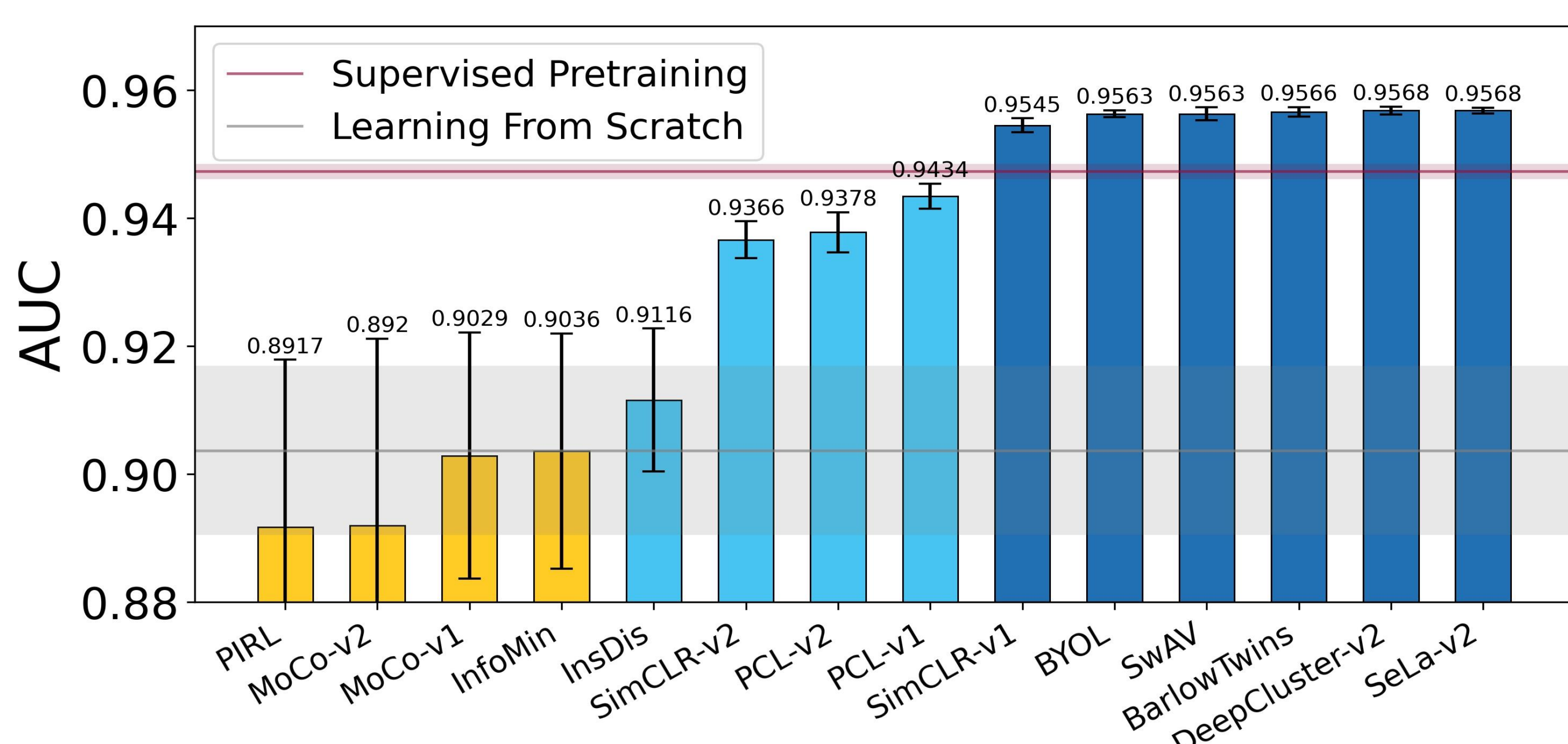
Organize for each exam
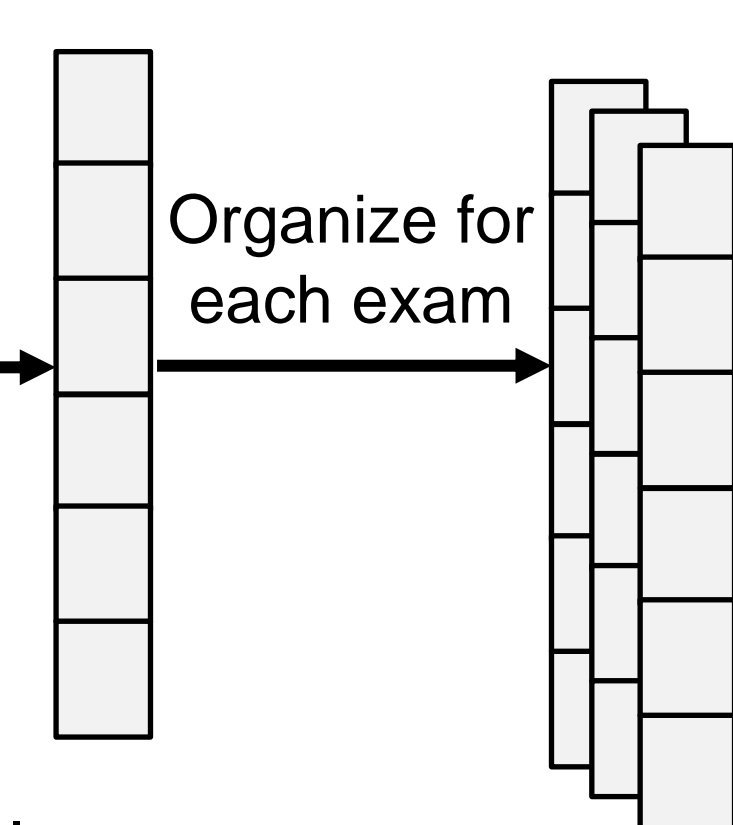
Feature vector

Exam-level Classification
- Bidirectional GRU
- Multiple instance learning

Transfer learning with self-supervised methods performs better than supervised model

Conventional classification (CC) marginally outperforms the Multiple instance learning (MIL) for exam-level data.