Seeking an Optimal Approach for Computer-aided Pulmonary Embolism Detection

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GitHub: https://github.com/JLiangLab/CAD_PE

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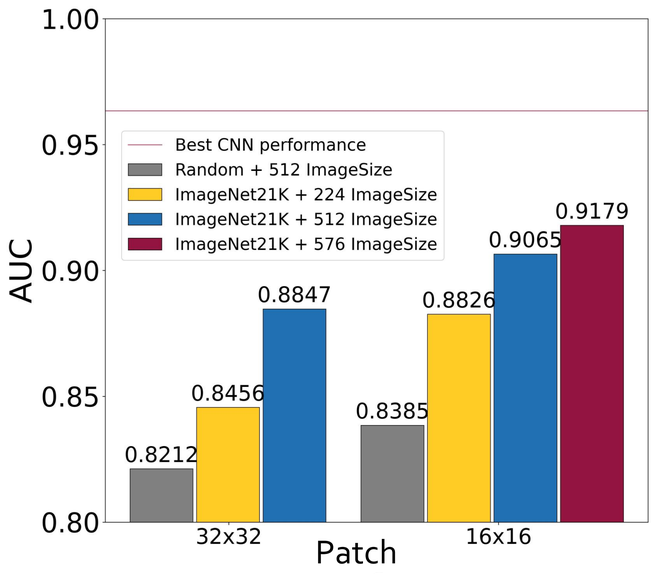
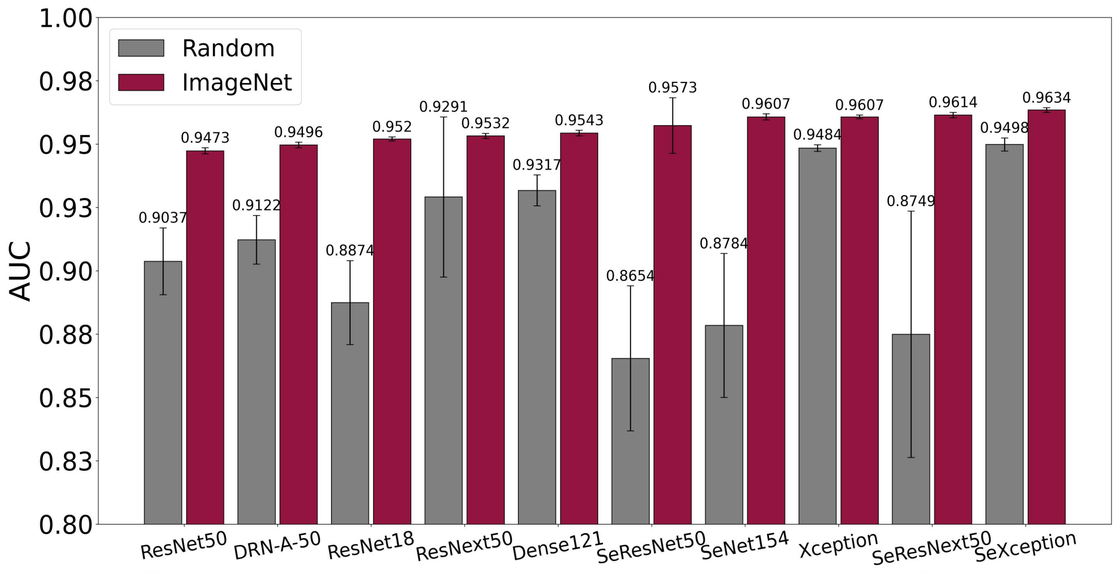
Pulmonary embolism (PE) represents a thrombus ("blood clot"), usually originating from a lower extremity vein, that travels to the blood vessels in the lung, causing vascular obstruction, and in some patients, death. We present a comprehensive analysis of competing deep learning methods applicable to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

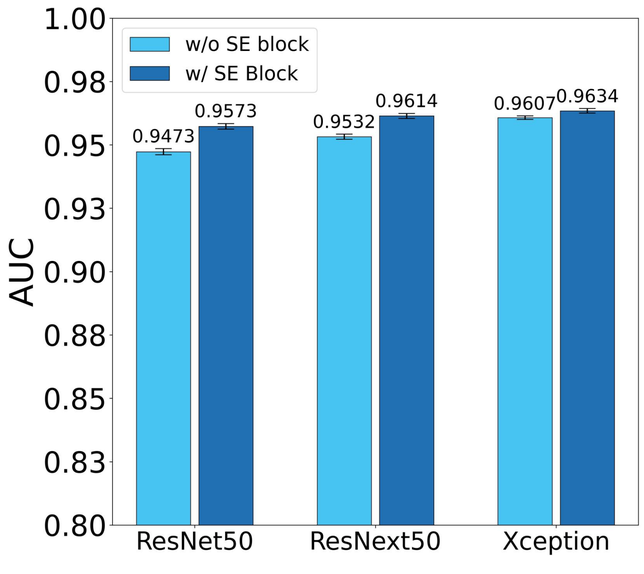
Contributions: Extensive experiments that compare architectures, model initializations, and learning paradigms; an optimal approach for PE detection, achieving an AUC gain of 0.2% and 1.05% at the slice and exam levels, respectively, compared with the state-of-the-art method.



Vision transformers underperform CNNs

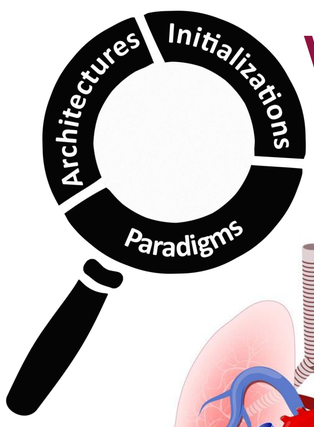


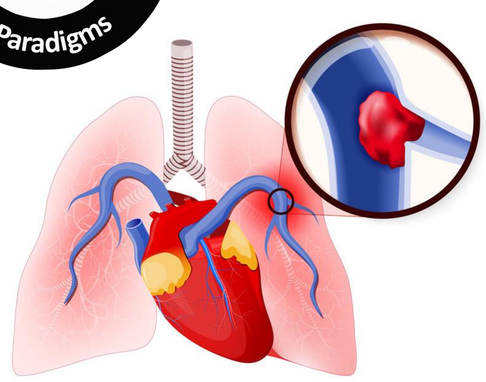
Transfer learning consistently improves performance across the 10 different CNN architectures

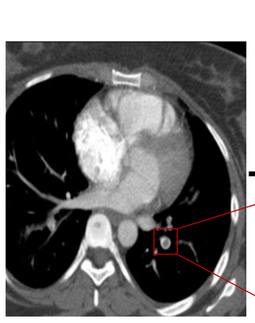


Squeeze & excitation blocks enhance CNN performance

What deep learning architectures, model initializations, and learning paradigms should be used for computer-aided pulmonary embolism detection?

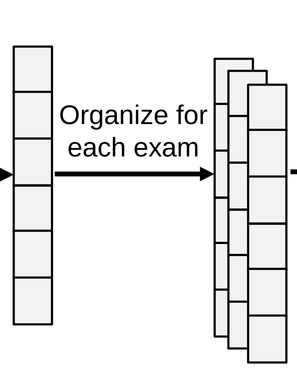






Slice-level Classification

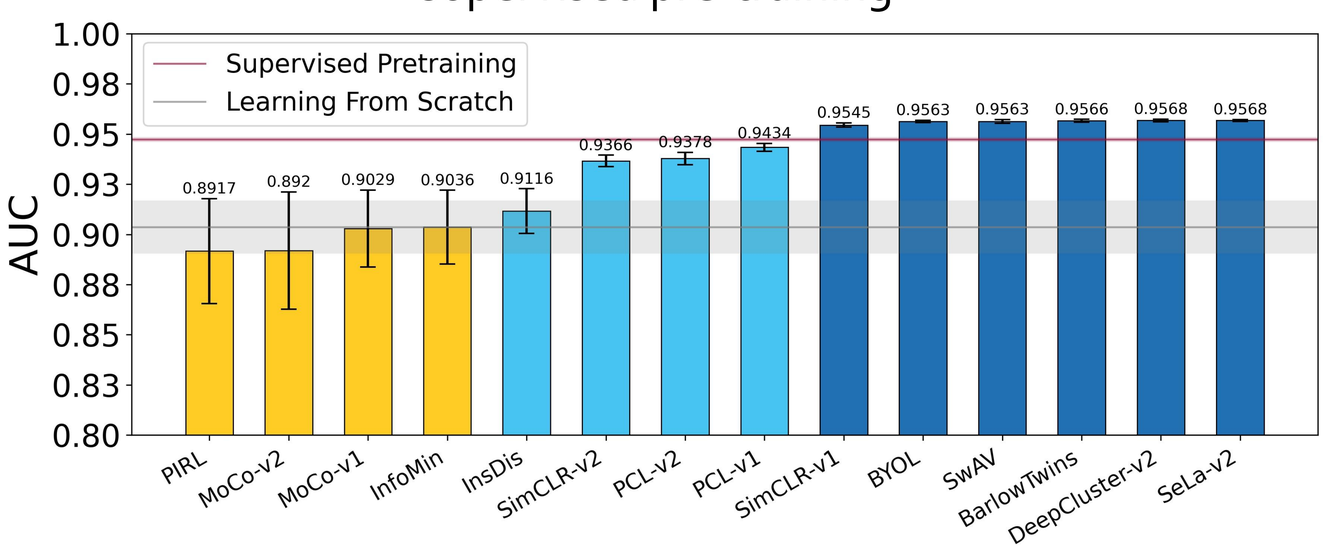
- Training from scratch
- Fine-tuning
  - Supervised pretrained models
  - Self-supervised pretrained models



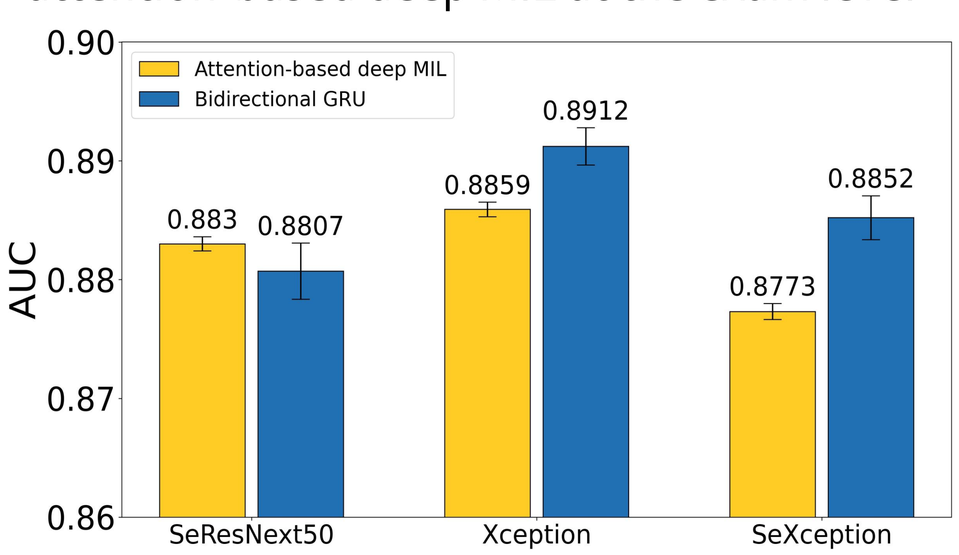
Exam-level Classification

- Bidirectional gated recurrent unit (GRU)
- Attention-based deep multiple instance learning (MIL)

Self-supervised pre-training overtakes (fully) supervised pre-training



Bidirectional GRU marginally outperforms attention-based deep MIL at the exam level



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