H-Tuning: Toward Low-Cost and Efficient ECG-based Cardiovascular Disease Detection with Pre-Trained Models

Github: https://github.com/KAZABANA/H-Tuning

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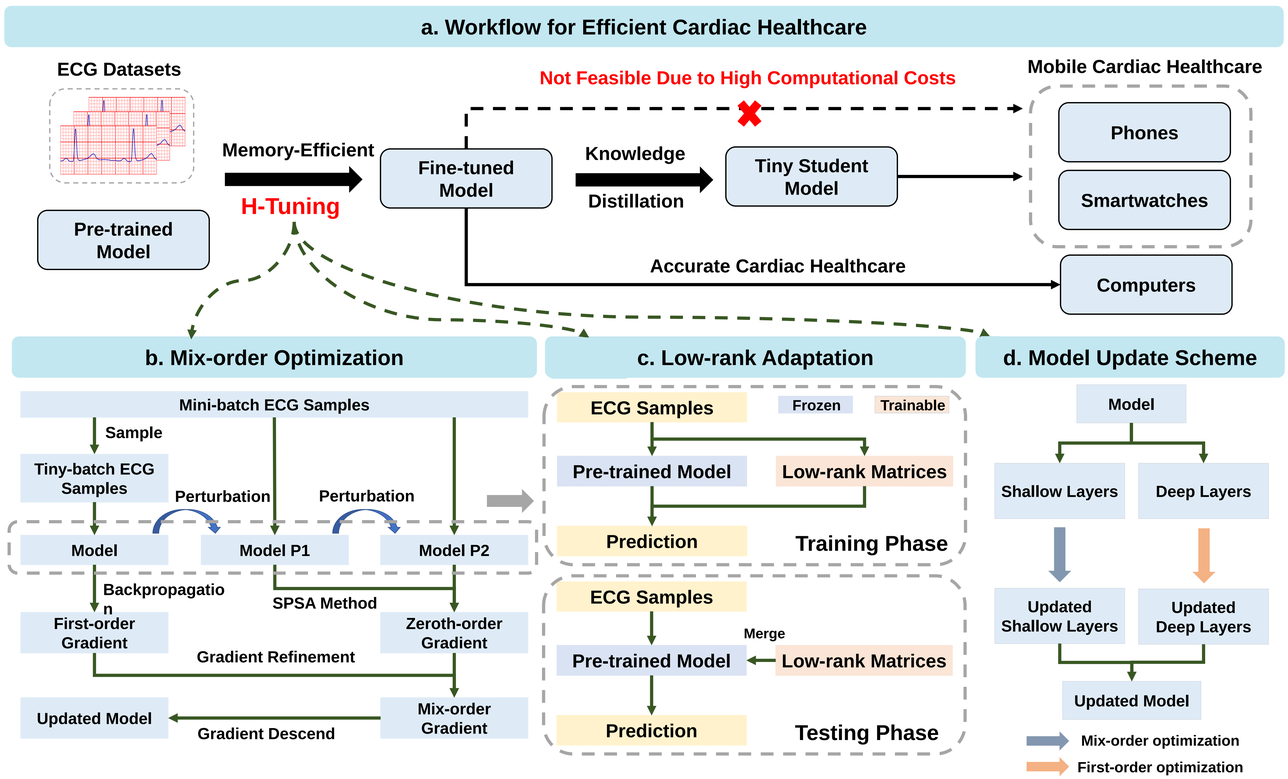
Motivation

How can we leverage the power of pre-trained models without exceeding the limited computational resources available in healthcare environments?



Experiments and Results

We finetune large pretrained models on four downstream datasets with our H-Tuning. Knowledge distillation is used to generate tiny student models from the fine-tuned models (aka, the teachers), enabling mobile cardiac healthcare.

TL; DR: we propose a low-cost fine-tuning method, **H-Tuning,** that achieves a great balance between first-order and zeroth-order optimization, making fine-tuning pre-trained models more efficient. Integrated with knowledge distillation, it paves the way for low-cost and efficient cardiovascular disease detection.

Fig 1: Average performance of H-Tuning and the compared models across four public datasets.

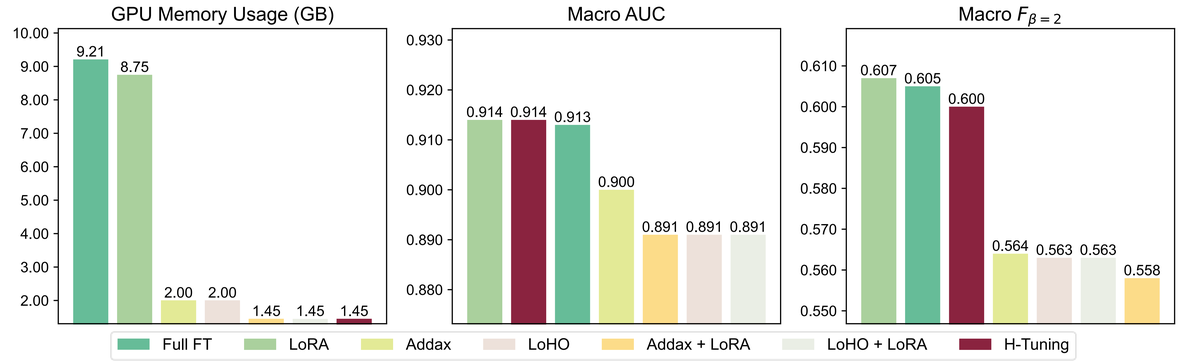


Fig 2: AUC of different student models on various CVDs. The green lines denote the student model trained with 12-lead ECG, the orange lines denote the student model trained with 3-lead ECG, and the blue lines denote the student model trained with 1-lead ECG.

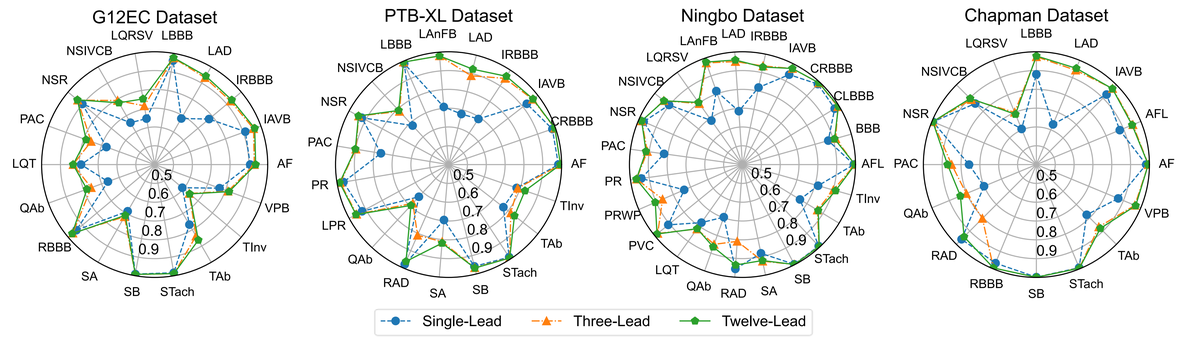


Fig 3: Inference efficiency of the teacher model and the student models for inference.