Remote Blood Pressure Estimation

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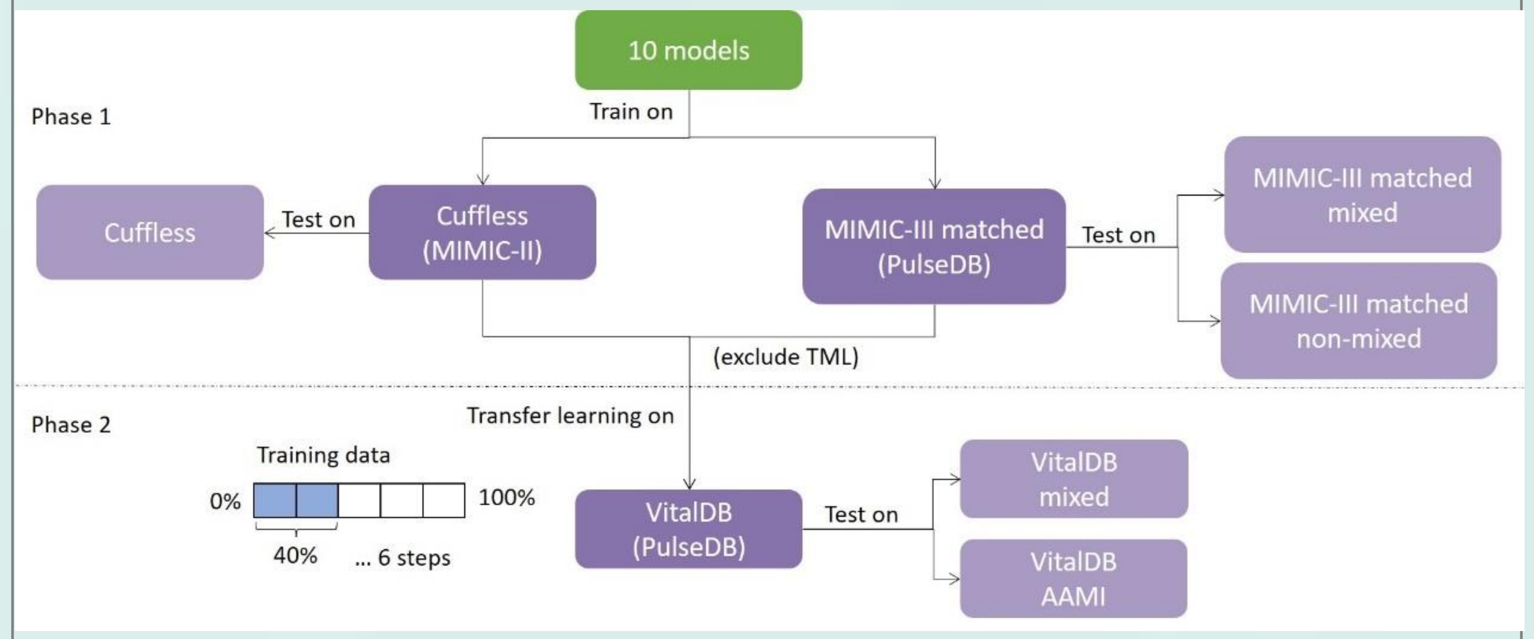
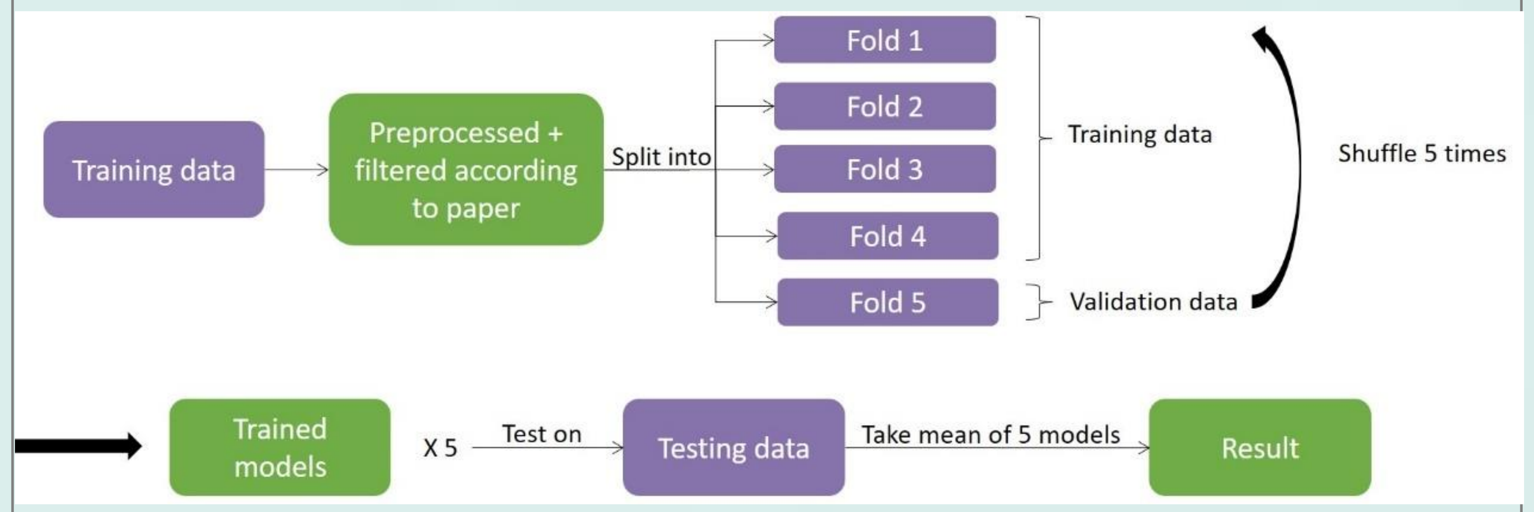
I. Introduction

This project aims to benchmark various blood pressure (BP) prediction machine learning model utilizing photoplethysmography (PPG) to serve as a comparative study, with consideration in accuracy and inference time. In phase one of this project, two traditional machine learning (TML) and eight deep learning (DL) models were trained and tested using two large datasets: Cuffless and MIMIC-III. AlexNet, BP net and PPG2ABP were found to be effective models for commercial use. In phase two of this project, all 20 trained models were performed transferred learning on a new separate dataset: VitalDB, which aims to find out how many percentages of training data were needed for a trained PPG-to-BP model to learn a new distribution. It was found out to be 20%. In a bid to construct a better rPPG-to-BP model for commercial use, the top three models were transferred their learning on rPPG using a small dataset.

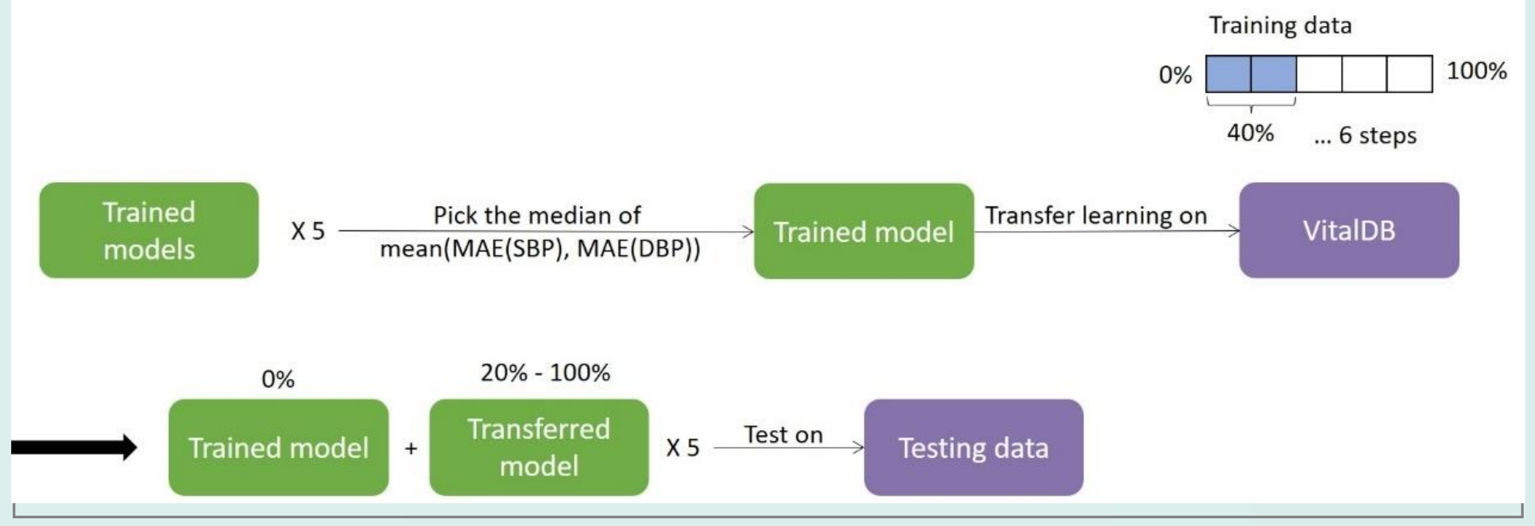
II. Benchmark Flowchart



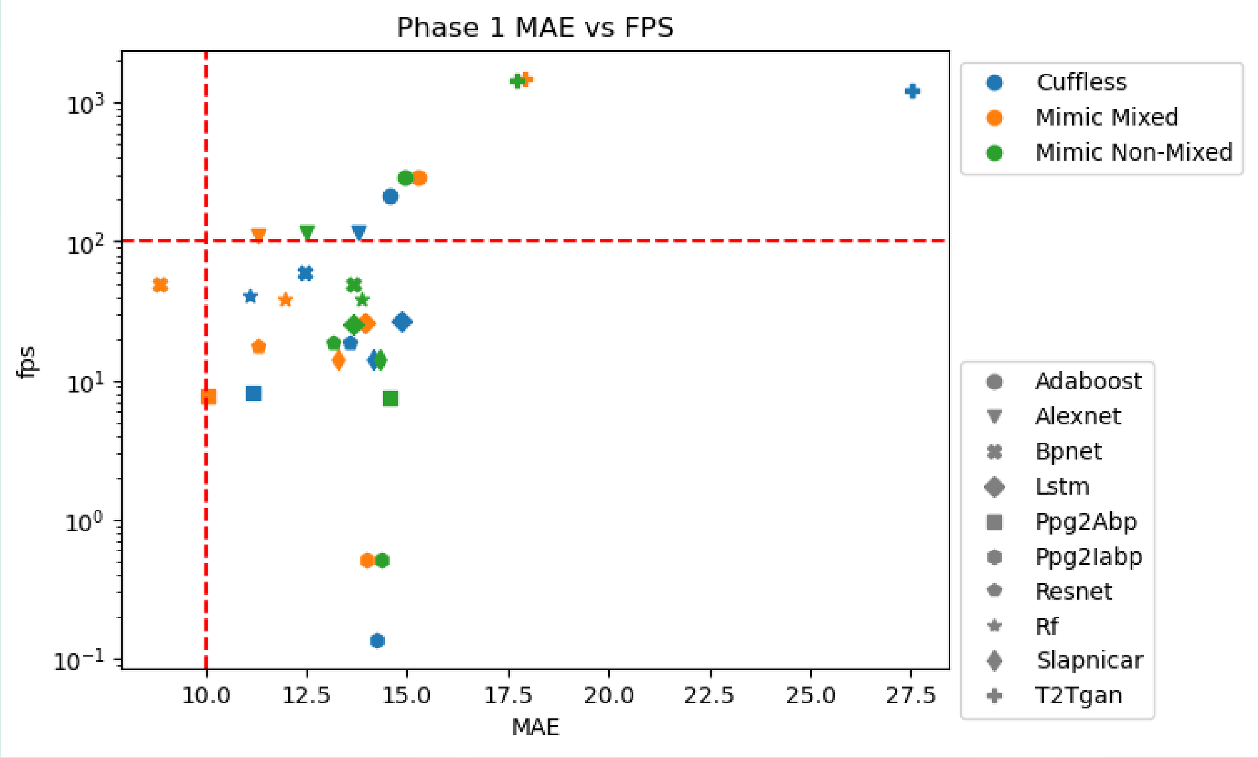
a. Benchmark Phase 1: 5-fold training



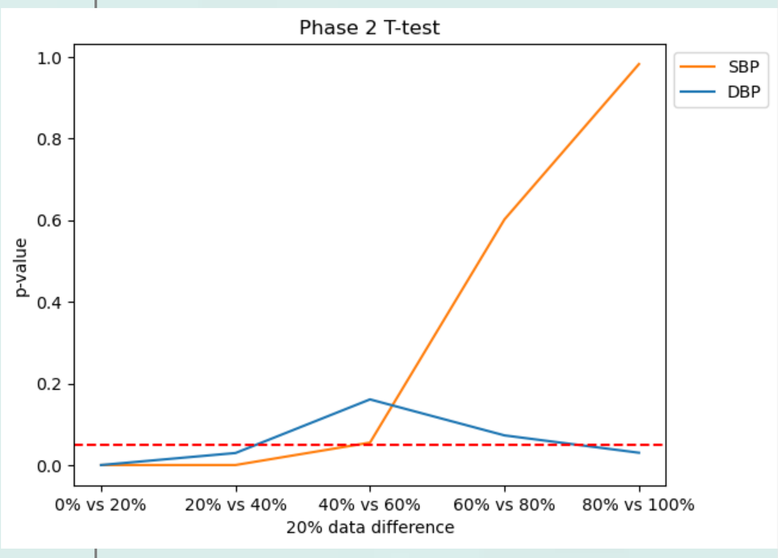
b. Benchmark Phase 2: transfer learning



III. Findings



As the result from phrase one, the top three models were Mimic-trained BP net, PPG2ABP, and AlexNet. In Figure 5, this graph visualized the best overall model when considering MAE and FPS, since the model with the highest FPS and lower MAE will be located on top left. The MAE in this graph was also computed to be the mean of MAE(SBP) and MAE(DBP), i.e. [MAE(SBP)+MAE(DBP)]/2..



Although using only 20% of the training data, there was a significant boost in performance. The T-test proved the MAE difference between 0% to 20% was reliable. It also showed that after 40% data, the MAE difference became insignificant, meaning there was not much performance gained from training extra data after 40%.