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Preliminary Investigation into the Feasibility of Probabilistic Blood Pressure Neural Networks (AutoBNN) Estimation from ECG using Compositional Bayesian

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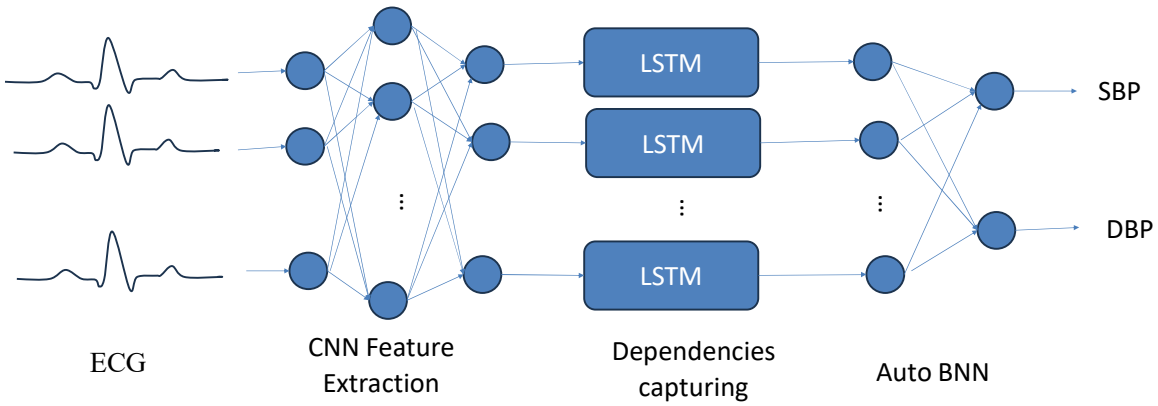
INTRODUCTION & AIM

The rising prevalence of cardiovascular disease, especially hypertension, requires continuous and non-invasive BP monitoring. While previous studies have explored BP estimation from ECG, this approach remains uncertain and requires further validation. In this study, we investigate the feasibility of using ECG pulse morphology to estimate BP using a deep Bayesian neural network architecture (AutoBNN).

METHOD

The proposed model combines several key techniques to extract meaningful BP-related features from ECG signals:
- **CNN Layers**: Extract ECG waveform features like P waves, QRS complex, and T waves.
- **LSTM Units**: Capture the temporal dependencies within the ECG sequences.
- **AutoBNN Layers**: Enable probabilistic modeling by estimating the uncertainty of the BP predictions.

Training and evaluation were conducted using a dataset of 130 individuals from the Physionet repository.



RESULTS & DISCUSSION

The model achieved a mean error of 3.38 mmHg (systolic) and 2.40 mmHg (diastolic), with standard deviations of 13.20 mmHg and 11.88 mmHg respectively. The model successfully captured ECG features associated with BP variations, including changes in R wave amplitude, ST-segment depression, and T-wave inversion. However, there is potential interference from HR-related features. Further work should focus on excluding HR information to validate BP estimations.

CONCLUSION

Our preliminary investigation demonstrates the feasibility of using ECG pulse morphology for BP estimation. However, further validation on larger and more diverse datasets is essential to assess the generalizability of our approach. Although the results are promising, the challenge of excluding HR information needs to be addressed in future research to achieve higher accuracy.

FUTURE WORK / REFERENCES

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