

Detection of biological sex using image-based analysis of arterial tonometry waveforms

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Background and Objectives

Background

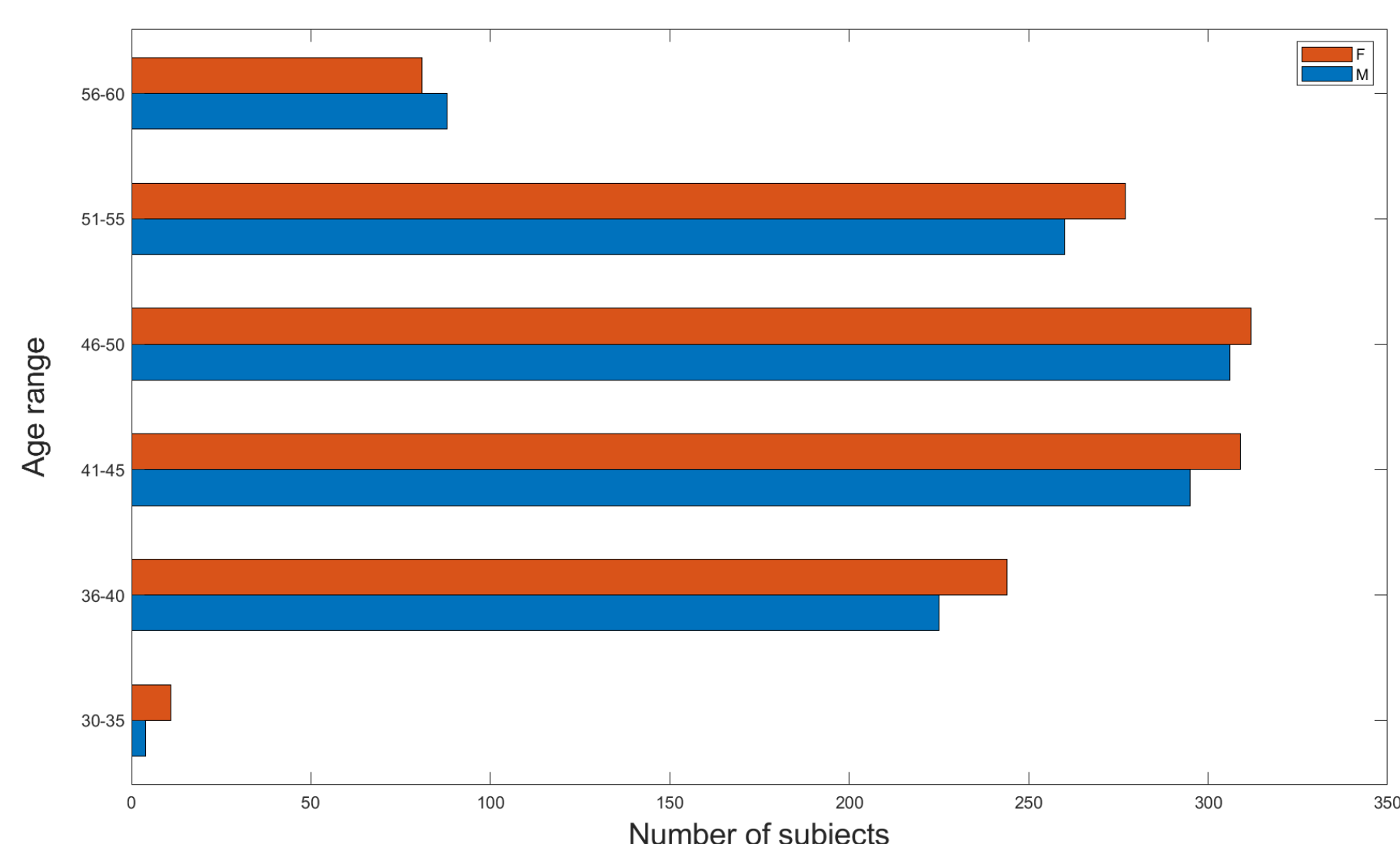
Sex-related differences could bias data-driven models
Differences related to biological sex in arterial tonometry signals are not explored

Objective

To examine whether a simple Convolutional Neural Network (CNN) captures sex-related features in Symmetric Projection Attractor Reconstruction (SPAR) images derived from high-quality arterial tonometry signals

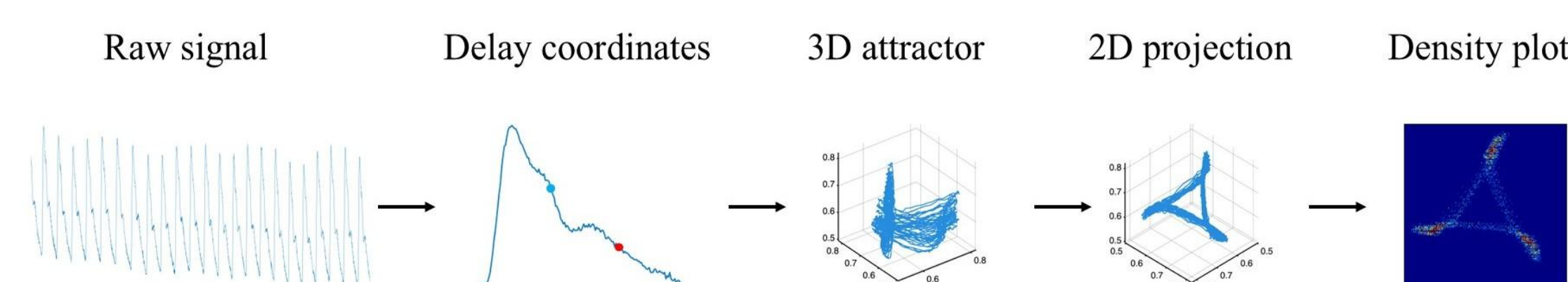
Methods

- Carotid arterial tonometry** data from the **Asklepios Round 1**[1] study. Selected population: subjects aged **30-60: 2 412** (1,178 M, 1,234 F)
 - Images generated from each segment using the **SPAR** method [2]
 - Images given as input to a **CNN** for a binary classification task. Train-validation-test split: 70%-10%-20%

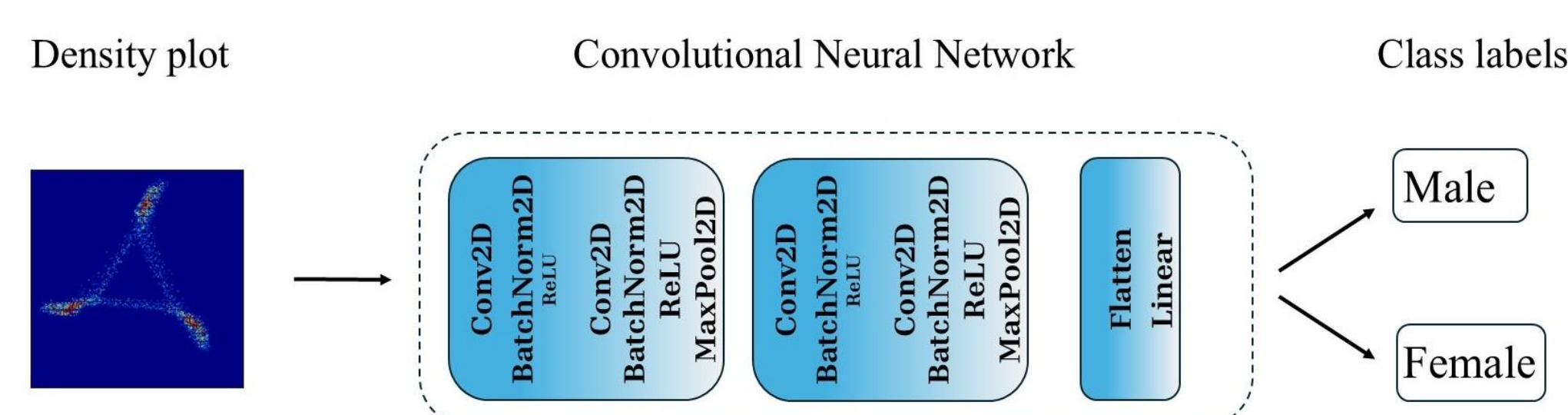


Age distribution of male and female subjects selected for analysis

a) SPAR pipeline



b) CNN pipeline



Results

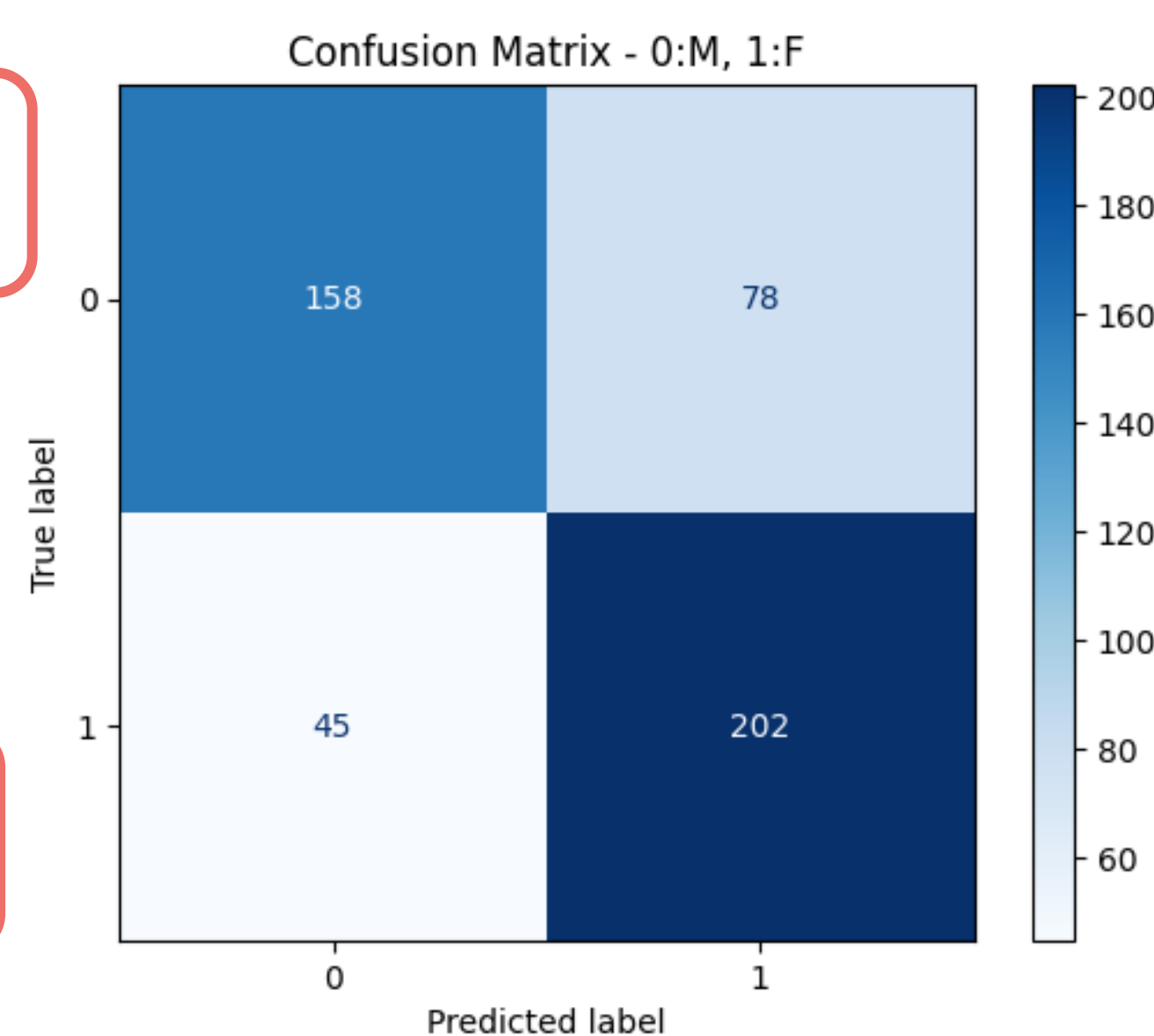
F1 score: 77 %

Accuracy : 74 %

Specificity: 67%

Sensitivity: 82%

AUC score : 74%



Conclusions

Sex-related differences can be appreciated in the model's ability to classify between the two groups

Therefore

Sex must be considered as a potential bias factor when training AI models

Acknowledgements

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References

- [1] Rietzschel, Ernst-R., et al. "Rationale, design, methods and baseline characteristics of the Asklepios Study." *European Journal of Preventive Cardiology* 14.2 (2007).
- [2] Aston, Philip J., et al. "Beyond HRV: attractor reconstruction using the entire cardiovascular waveform data for novel feature extraction." *Physiological measurement* 39.2 (2018).