Università della Svizzera italiana

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Lidia Alecci
lidia.alecci@usi.ch

Mitigating Interpersonal Variability in Machine Learning Models for Human Behavior Monitoring

1 Motivation

- **Population models** trained on data from the entire population often fail to meet individual needs, relying on the assumption that common patterns generalize well across individuals.
- **Personalized models** exacerbate the **data scarcity** problem and do not consider **label variability**.

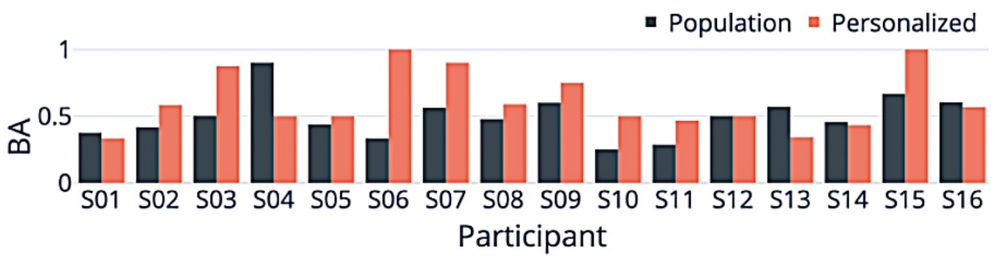
2 Definition of the problem

Interpersonal variability:

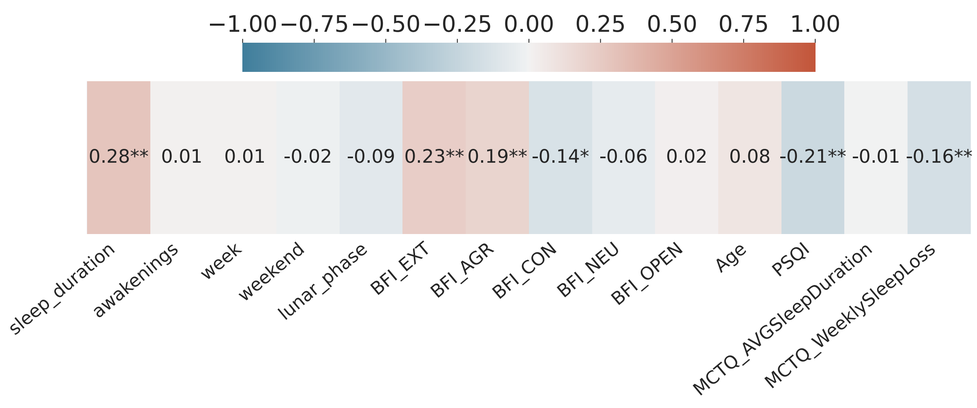
- **Signal variability -** reflected in the different behaviors observed.
- **Label variability -** derived from the subjective perception of behaviors.

3 Completed research

Personalized models outperform population models especially in subjective tasks such as rating perceived sleep quality [1].



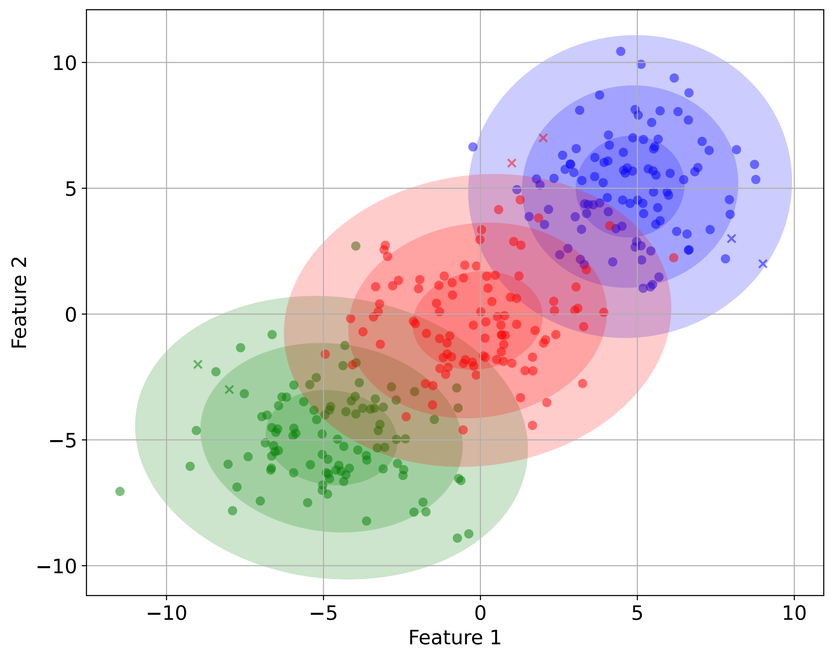
Mismatch between **objective** sleep quality measures and **subjective** self-reported sleep quality [2].



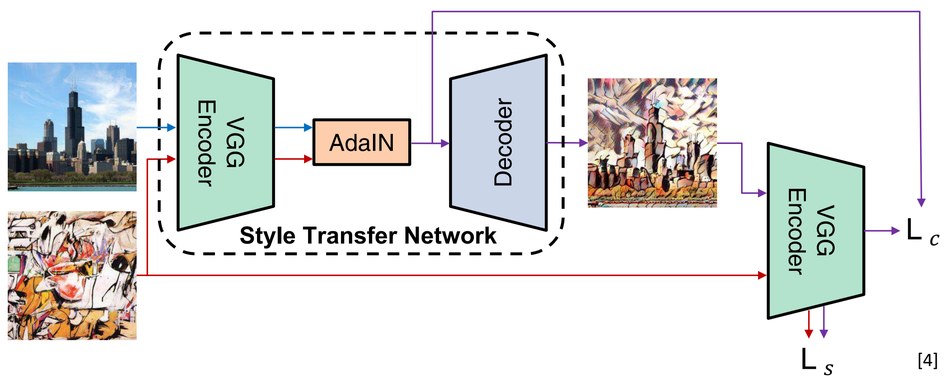
Even in seemingly objective tasks such as recognizing walking, running, and other transportation modes, **testing on unseen users decreases performance of a population model** [3].

4 Current and future works

Clustering-based personalization using **sensor-derived features** and **self-reported attributes**.



Generative models to create synthetic data to solve data scarcity.



References

[1] Shkurta Gashi, Lidia Alecci, Elena Di Lascio, Maike E. Debus, Francesca Gasparini, and Silvia Santini. The Role of Model Personalization for Sleep Stage and Sleep Quality Recognition Using Wearables. IEEE Pervasive Computing, 21(2):69–77, April 2022. ISSN 1536-1268, 1558-2590. doi: 10.1109/MPRV.2022.3164334.

[2] Lidia Alecci, Nouran Abdalazim, Leonardo Alchieri, Shkurta Gashi, and Silvia Santini. On the mismatch between measured and perceived sleep quality. In Proceedings of the 2022 ACM International Joint Conference on Pervasive and Ubiquitous Computing, pages 148–152, Cambridge United Kingdom, September 2022. ACM. ISBN 978-1-4503-9423-9. doi: 10.1145/3544793.3563412.

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