Autonomic nervous system data: distributions and transformations

2020-04/Area: psychological methods/statistics/bioengineering

Background

Cognitive and emotional states in human research are often inferred from autonomic nervous system signals recorded at the body surface [1]. Statistics from these signals are often transformed in one way or another, to make them more 'normal'. However, there is little research into distribution of ANS measures, or the appropriateness of various transformation strategies.

In this project, you will build on a large existing data set, and explore three different strategies for determining data transformation. (1) Distributions. If the data distribution can be reliably estimated and conforms to a standard family of distributions, then a canonical transformation can be established. (2) Biophysical mapping. If the individual transformation from ANS activity to recorded signal can be reverse-engineered, then one may find a suitable transformation to infer actual ANS activity from the data. (3) Retrodictive validity. Assuming ANS activity is (approximately) known, then the best transformation strategy is the one that best approximates our assumptions [2].

What you can learn

- Applied statistics skills
- Bioengineering concepts
- Background on generalised linear modelling with canonical links
- Model-based analysis of biophysical signals with the Matlab-based software PsPM (bachlab.org/pspm)

Your profile

(1) You have a background in statistics, engineering, or physics, and a strong interest in biosystems.

(2) Your background is in neuroscience, psychology, or related fields, and you have experience with applied statistics and bioengineering.

In either case, an ability to conduct data analyses (e.g. in Python, R, or MATLAB) is required.

Supervision

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Literature

1. Bach, D.R.*, et al.* Psychophysiological modeling: Current state and future directions. *Psychophysiology*, e13214 (2018).
2. Bach, D.R., Melinscak, F., Fleming, S.M. & Voelkle, M.C. Calibrating the experimental measurement of psychological attributes. *Pre-Print* **https://psyarxiv.com/bhdez** (2020).