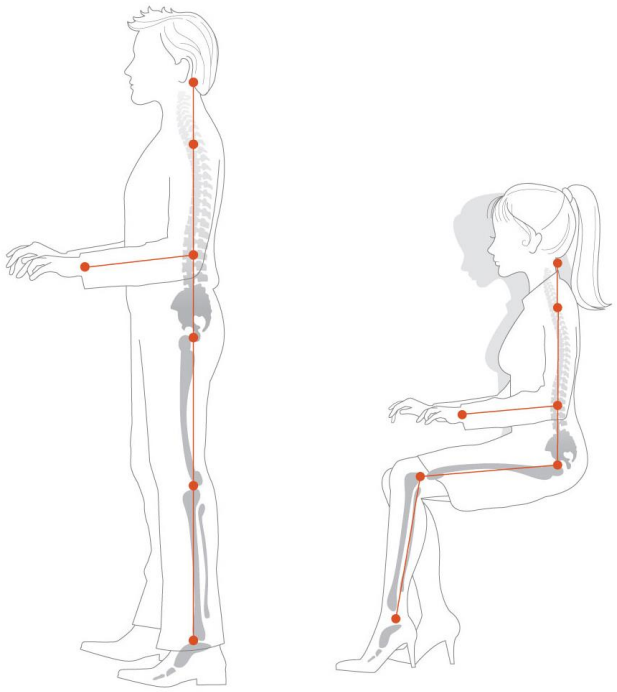
Sed-up and Burstiness



Mid point presentation

By

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SEDUP

- Repair R code that labels a time series of accelerometer data according to two postures – upright or sitting/lying.
- Package the code to prevent future issue.
- The issue could stem from the fractionality of the frequency.
- What's the most effective way to fix the issue.

BURSTINESS

- Create R code to calculate the burstiness of a time-series of active and inactive events extracted from a body worn accelerometer.
- Is there correlation between burstiness and health.
- What's the most appropriate measure for burstiness.

The Literature

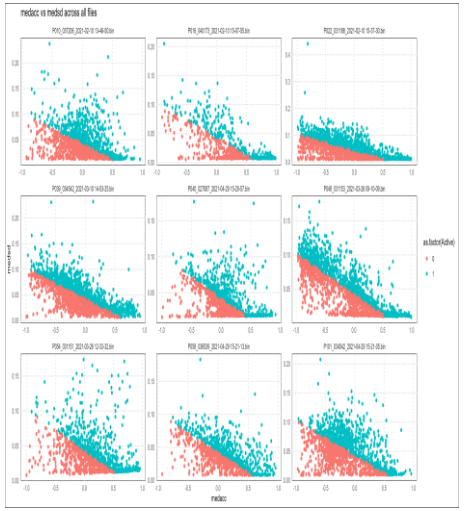
paper	method	participants	accuracy
Fast and Robust Algorithm for Detecting Body Posture Using Wrist-Worn Accelerometers (1)	logistic regression	45 community-dwelling older adults	Left wrist - TP = 83%, TN = 91% Right wrist - TP = 86%, TN = 93%
Using Functional Principal Component Analysis to Quantify Sitting Patterns(2)	Functional Principal Component Analysis	314 overweight postmenopausal women	90% of the overall variation of activity counts was explained by two subject-level principal compo- nents (PC)
Deep Learning for Classifying Physical Activities from Accelerometer Data(3)	deep feed-forward neural network (DNN) and a deep recurrent neural network (RNN)	24. participants	Accuracy: 84.89%, F1-score: 82.56%

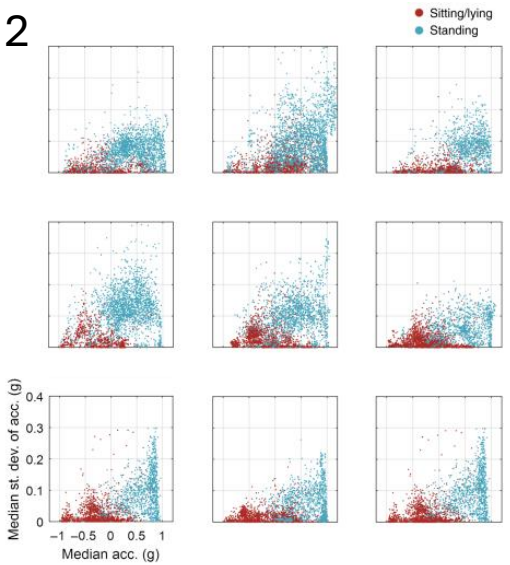
method	Equation	Features or limitations
Coefficient of variation	CV = Sigma/mu (SD/mean)	Simple. Doesn't consider temporal order and if mean is close to zero is can exaggerate variability
Burstiness Index	B = sigma – mu/sigma+mu (SD-mean/SD+mean)	Specifically designed for burstiness. Assumes data can be descried by mean and sd.
Inter-arrival Time Analysis	Var(X) = E[(X-mu)^2] Sigma = root of Var(X)	Directly analyses temporal data. Computationally intensive

paper	Key features	limitations
Measuring burstiness for finite event sequences (5)	Looking at inhomogeneous temporal patterns in natural and social phenomena. aims to improve the understanding, prediction, and control of complex systems.	its generalizability across different datasets and domains requires further validation. The models used assume periodic boundary conditions and specific interevent time distributions, which may not apply to all real-world data. Additionally, the study's localized model assumes a single burst, whereas many real-world datasets exhibit multiple bursts. While the new measure is demonstrated using a large-scale Twitter dataset, more diverse empirical validations are needed. The study also does not deeply explore other measures of temporal correlations or contextual bursts, and the sensitivity of the new measure to introduced parameters requires further investigation. Practical guidelines for implementing the new measure are not fully developed, and a comparative analysis with other existing measures would help clarify its advantages and limitations. These aspects highlight areas for future research to enhance the measure's robustness and applicability.
Burstiness and Memory in Complex Systems ∗(6)	Has a memory parameter (shows correlation between lengths of the busts being next to each other)	Δ and μ offer only a first order approximation for the origin of the burstiness, and for a detailed comparison between models and real systems we need to inspect other measures as well, such as the functional form of P(τ). It also indicates the lack of proper modeling tools to capture the detailed mechanisms responsible for the bursty interevent time distributions seen in real systems, opening up possibilities for future work.

The data

Fig 1 and 2





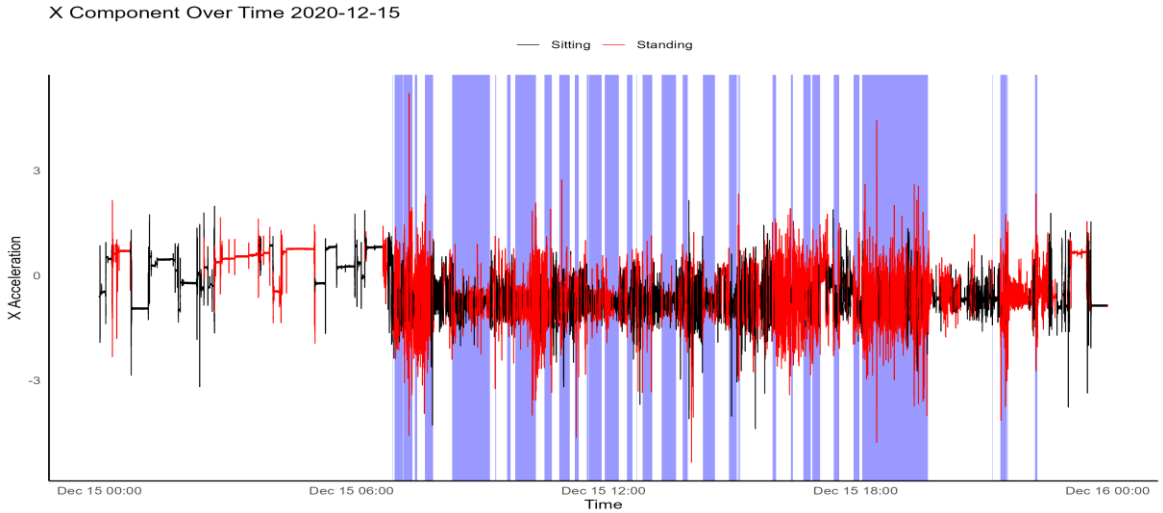


Fig 3

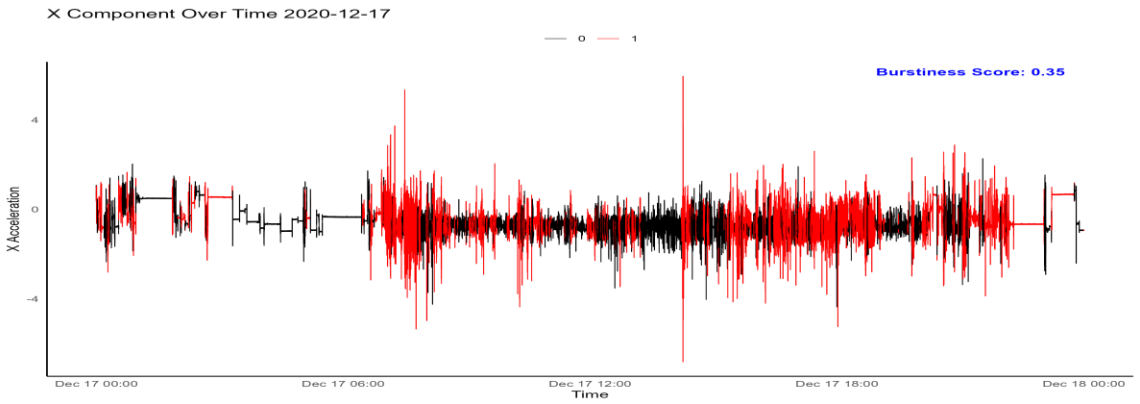
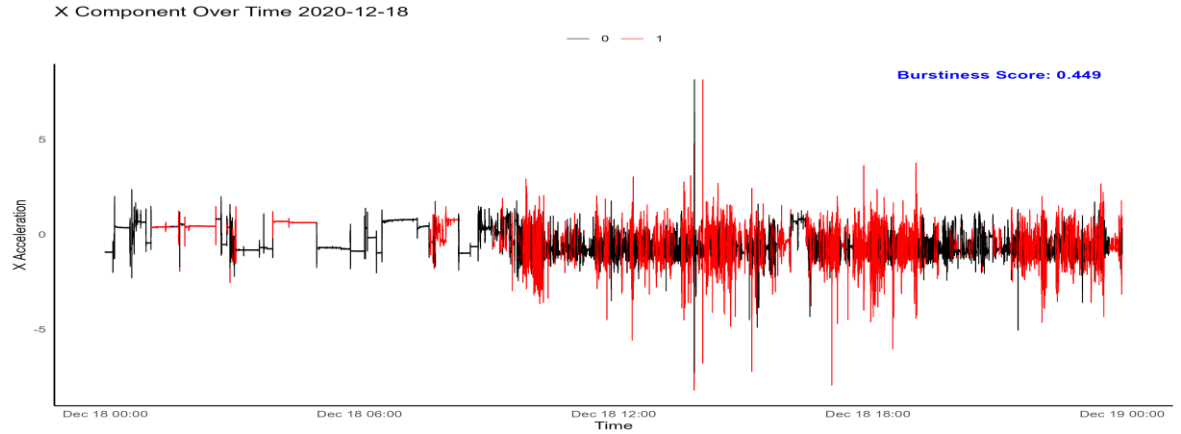
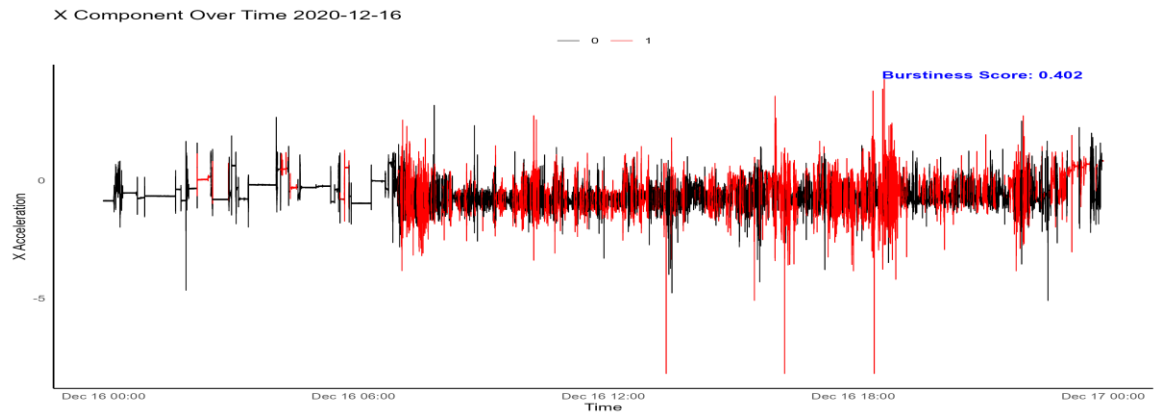


Fig 4





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