

## Data Analytics

### Literature Survey FitBit Fitness Analysis

Name : Abhinav Gunti

SRN: PES1UG20CS008

Name : Abhishek Singhi

SRN: PES1UG20CS011

Name : Aniket Acharya

SRN: PES1UG20CS052

# LITERATURE SURVEY

## Paper 1: Is FitBit fit for sleep-tracking?

Year of Publication: 2017

Author: Zilu Liang

Link:

[https://dl.acm.org/doi/abs/10.1145/3154862.3154897?casa\\_token=iOEKNoqB0x8AAAAA:5UsPnn5lOWjLseJJmA8KbBm\\_5M2XgnOJV3rC2zatsDbZkjBlNSixEv-z9KCJTl4\\_dIWl2rsv5xUC6Q](https://dl.acm.org/doi/abs/10.1145/3154862.3154897?casa_token=iOEKNoqB0x8AAAAA:5UsPnn5lOWjLseJJmA8KbBm_5M2XgnOJV3rC2zatsDbZkjBlNSixEv-z9KCJTl4_dIWl2rsv5xUC6Q)

This paper talks about how it is now easy to track one's sleep through consumer wearable devices like Fitbit from the comfort of one's home. However, compared to clinical measures, the data generated by such consumer devices is limited in its accuracy. The aim of this paper is to explore how users perceive accuracy issues, possible measurement errors and what can be done to address these issues. Through an interview study with Fitbit users, three main sources of errors are found which are: (1) lack of definition of sleep metrics, (2) limitations in underlying data collection and processing mechanisms, and (3) lack of rigor in tracking approach. This paper proposes countermeasures to address these issues, both from the aspect of technological advancement and through engaging end-users more closely with their data.

# LITERATURE SURVEY

## Paper 2: Heart Rate Variability

Year of Publication: 1993

Author: Conny M. A. van Ravenswaaij

Link:

<https://www.acpjournals.org/doi/abs/10.7326/0003-4819-118-6-199303150-00008>

**This paper talks about the amount of short- and long-term variability in heart rate that reflects the vagal and sympathetic function of the autonomic nervous system, respectively. Therefore heart rate variability can be used as a monitoring tool in clinical conditions with altered autonomic nervous system function. In postinfarction and diabetic patients, low heart rate variability is associated with an increased risk for sudden cardiac death.**

**Heart rate variability analysis is easily applicable in adult medicine, but physiologic influences such as age must be considered. The most important application is the surveillance of postinfarction and diabetic patients to prevent sudden cardiac death. With heart rate variability analysis, individual therapy adjustments to achieve the most favorable sympathetic-parasympathetic balance might be possible in the future.**

# LITERATURE SURVEY

## Paper 3: Daily Associations Between Sleep and Physical Activity

Year of Publication: 2019

Author: Michael P. Mead

Link:

<https://link.springer.com/article/10.1007/s12529-019-09810-6>

**This paper talks about Research that has demonstrated a correlational relationship between sleep and physical activity, though this work has been largely cross sectional and fails to demonstrate temporal relationships. The purpose of the study was to test the daily, bidirectional relationships between sleep and physical activity, and whether this varied between weekdays and weekend days.**

**Mixed linear models revealed that physical activity did not predict subsequent night's sleep. However, on nights when participants had longer than their own average total sleep time, and greater than their own average wake after sleep onset, this predicted less physical activity the following day.**

**Results further suggest that, in healthy young adults, physical activity may not promote healthier subsequent sleep, but sleep duration and continuity influence physical activity in their own way.**

# LITERATURE SURVEY

## Paper 4:Measuring the fitness of fitness trackers

Year of Publication: 2017

Author: Chelsea G. Bender

Link:

<https://ieeexplore.ieee.org/abstract/document/7894077>



Data collected by fitness trackers could play an important role in improving the health and well-being of the individuals who wear them. Many insurance companies even offer monetary rewards to participants who meet certain steps or calorie goals. However, in order for it to be useful, the collected data must be accurate and also reflect real-world performance. While previous studies have compared step counts data in controlled laboratory environments for limited periods of time, few studies have been done to measure performance over longer periods of time, while the subject does real-world activities. There are also few direct comparisons of a range of health indicators on different fitness tracking devices. In this paper, a comparison was deduced between step counts, calories burned, and miles travelled data collected by three pairs of fitness trackers over a 14-day time period in free-living conditions. It indicates that the number of steps reported by different devices worn simultaneously could vary as much as 26%. At the same time, the variations seen in distance travelled, based on the step count, followed the same trends. Little correlation was found between the number of calories burned and the variations seen in the step count across multiple devices. The results demonstrate that the reporting of health indicators, such as calories burned and miles travelled, are heavily dependent on the device itself, as well as the manufacturer's proprietary algorithm to calculate or infer such data. As a result, it is difficult to use such measurements as an accurate predictor of health outcomes, or to develop a consistent criteria to rate the performance of such devices in head-to-head comparisons with advance medical machines.

Thank You!

