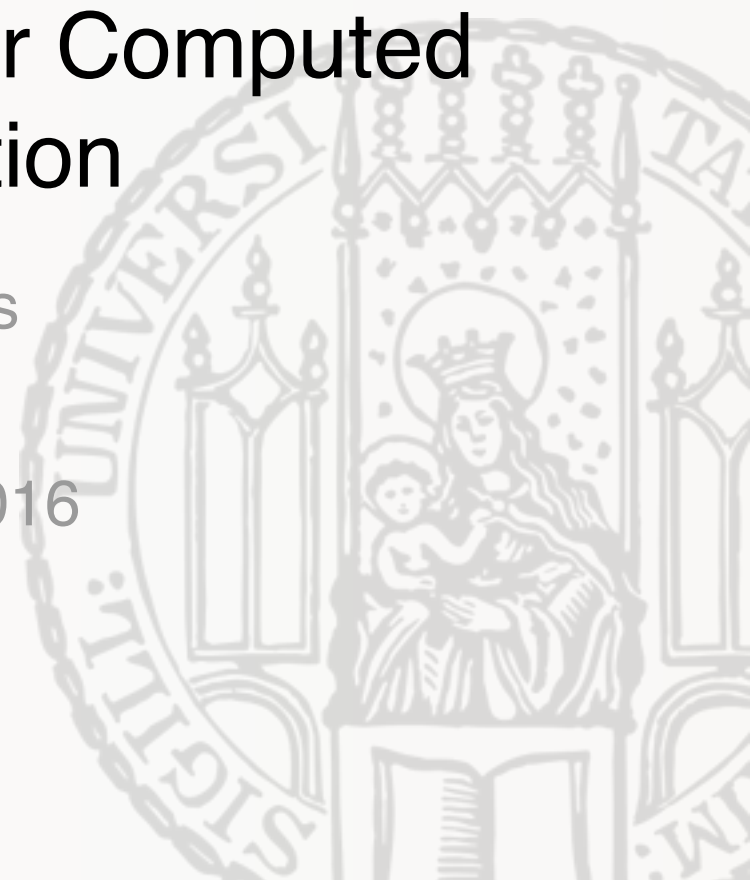


Conception and Implementation of a Mobile Application with Fitness Trackers as Supportive Tools for Computed Stress Detection

Bachelor Thesis

Marcel Heil

08. September 2016



Motivation

- Enhance teaching and learning at universities
- Help students to self-assess their emotional state such as stress
- Allow lecturers to gain access to emotional states of students in combination with their physiological data
- Align teaching to the students skills and their (physical and mental) capabilities

Goals

- Functional evaluation of the fitness trackers
- Conception of a stress detection model
- Implementation an Android app
- Improvement of the students awareness of computed stress
- Combining (learning) activities and self-assessments with the computed stress

Conception

- Focus on good user-experience
- Computed Stress Visualization
 - derived by heart rate data of fitness trackers
- Activities
 - users can record their daily activities...
 - ...and self-assess their emotional state
 - > combines the objective measures and the users self-assessments

Computed Stress Model

- Heart Rate
 - measured with blood volume pulse (BVP)



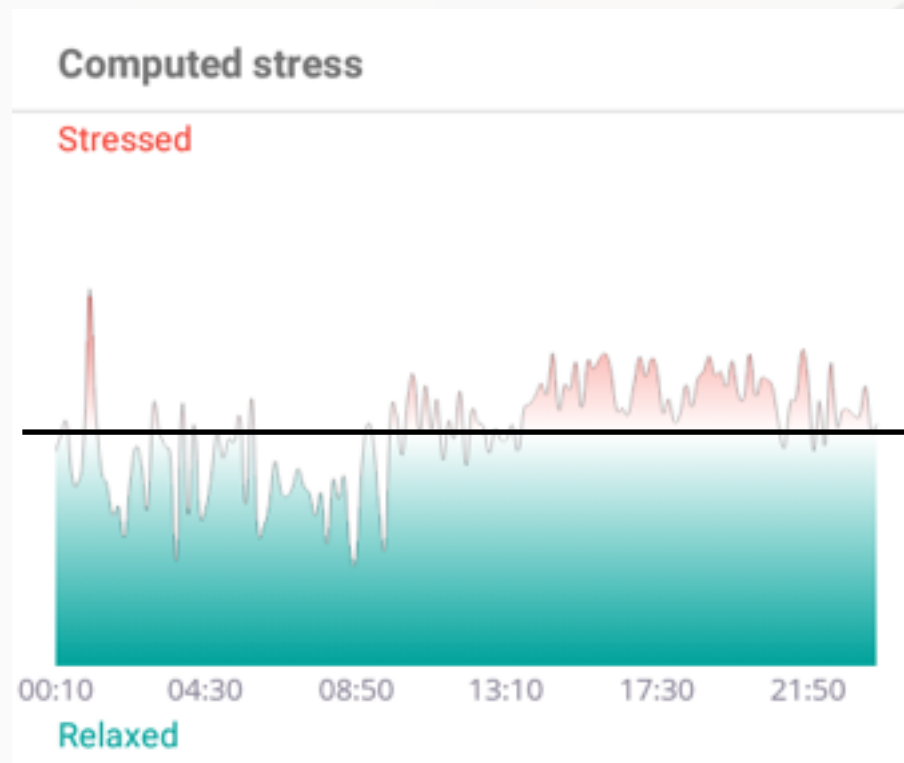
Fitbit Charge HR

Computed Stress Model

- HRV
 - measures variations in heart rate
 - depends on a set of factors
 - endogenous: age, gender
 - exogenous: fitness, body weight, drugs,...
 - constitutional: genetics, circadian rhythms
 - higher HRV \rightarrow lower stress and vice versa
- HRV Score
 - snapshot of the autonomic nervous system
 - very personal and individual score

Computed Stress Model

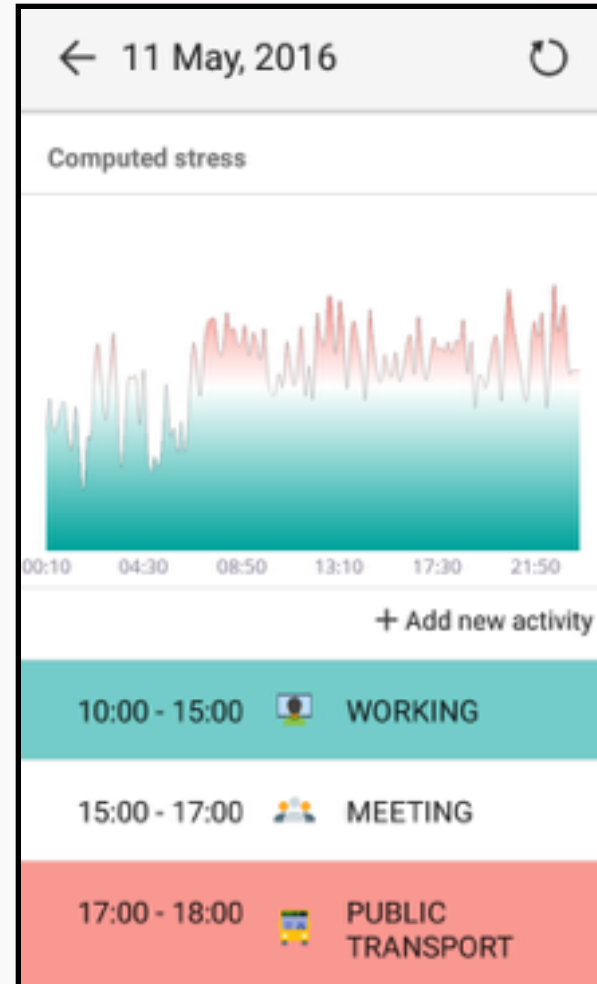
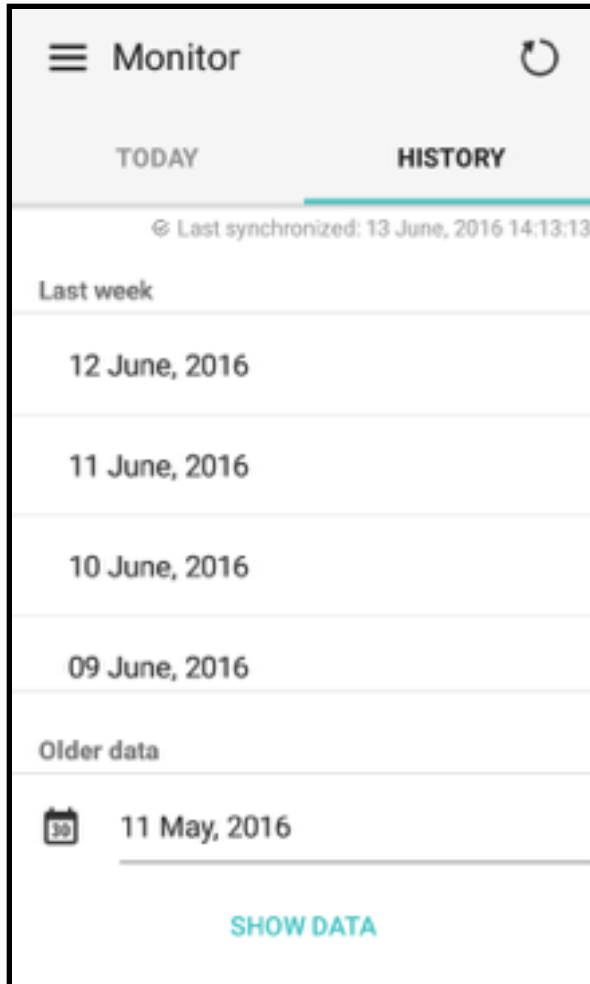
- Computed Stress
 - inverted HRV score
 - higher Computed Stress level → lower HRV score and vice versa



Computed Stress: 50

HRV Score: 60

CStress Demo



Evaluation Results

- **Computed Stress fairly reflects students stress levels**
- activity tracking in CStress is too sophisticated
- design approach is appropriate
- users ask for more possibilities of interaction and gamification

Future works

- automated activity tracking
- integration of different devices from different manufacturers
- usage of more and different sensors
- detect positive and negative stress
- align teaching to the students stress levels

More information about project Stila:

<http://stila.pms.ifi.lmu.de>

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