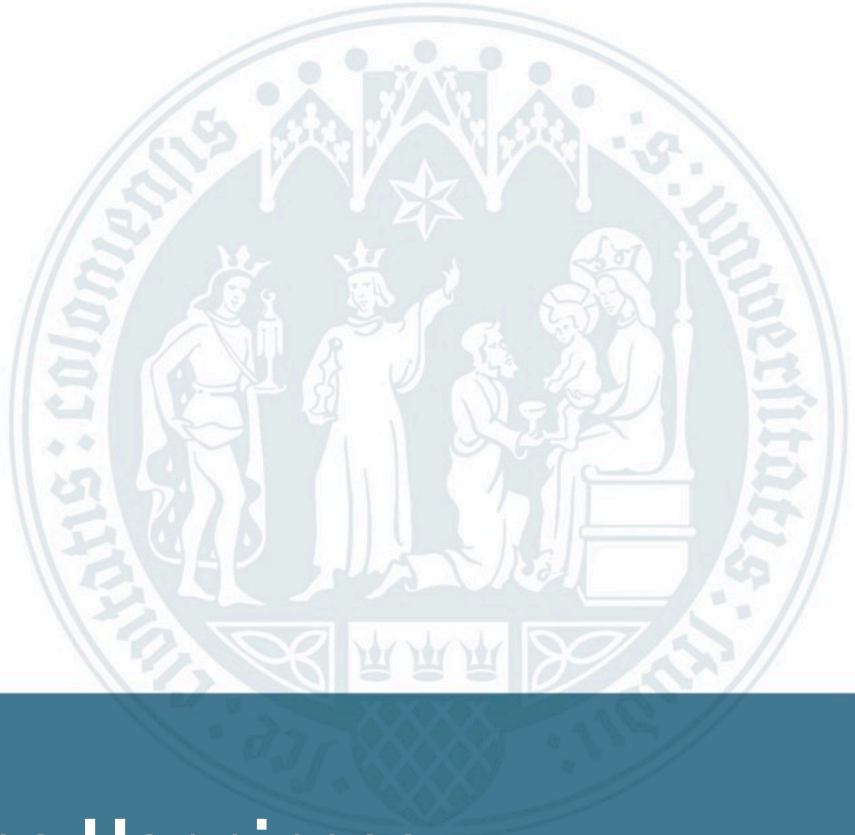

Measuring Happiness Increases Happiness

A Case Study of Wearable Technology Enhancing Professionals‘ Well Being

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Motivation & Research Question

Definition: Happiness

Happiness is

… fixing electronics by hitting them.

… fresh cotton sheets.

Definition:
Happiness can be described in terms of **physical**, **social** and **psychological** well-being[1]

Happiness at work

Several studies have examined the relationship between happiness and work, they found that happy employees

… are more creative and proactive
… are more productive
… have higher career success
… have less interpersonal conflicts

[1] Robertson, I., & Cooper, C. (2011). Well-being: Productivity and happiness at work. Palgrave Macmillan.

Motivation & Research Question

Measuring Happiness

How can we measure happiness?

Self-report questionnaires e.g.,

- Survey of subjective life-satisfaction
- U-Index
- Day Reconstruction Method (DRM)

- Self-assessment
- Cognitive bias
- Time-consuming
- Expensive
- No real-time analysis

We need a system which automatically tracks the mood of a person at any time of the day

Previous studies showed that physiological information can be used to assess well-being and thus, we decided to …

- use wearable sensor technology i.e. smartwatches to collect physiological information
- use machine learning to extract high-level features from body sensors

Motivation & Research Question

Research Question

Can we use body sensors from a smartwatch to (a) measure and predict happiness, stress, and activity to make individuals aware of their positive and negative feelings, and (b) find ways to increase individual well-being?

Research Methodology

The Happimeter

- Tracks and predicts human‘s mood
- Provides feedback to individuals about their mood and what influences it

Smartwatch

- Collects body sensing data through various sensors i.e., accelerometer, step counter, heart rate, microphone, GPS
- Exogeneous variables i.e. weather and time-related data were added
- Collects subjective information about the user‘s mood through a survey asking about happiness, stress and activity level

Phone

- Used for virtual mirroring
- Monitors emotions and mange social network
- Examines how happy a user has been on a specific day
- Evaluates mood input associated with specific place

Website

- Users could review their collected measures and mood inputs
- Insights about drivers
- By whom they are influenced and on whom they exert influence
- Modifies default interventions

Experimental Setup

Control and Experimental Group

Setup

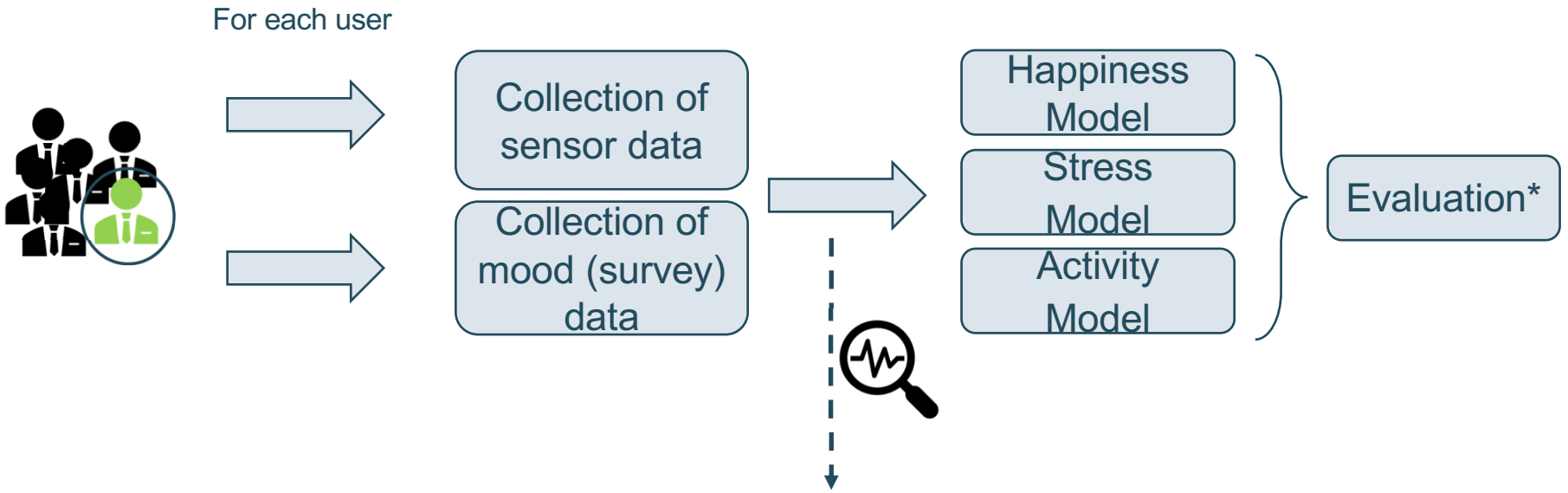
- Real-world experiment with the Sparkassen Innovation Hub (S-Hub) in Hamburg, Germany
- 3 ½ months from May 1, 2019 to August 19, 2019
- 18 participants: 16 male and 2 female
- Every participant was equipped with a smartwatch

Data Collection

- 10,830 sensor data
- 6,844 mood data
  - 2121 happiness answers
  - 2126 activity answers
  - 2115 stress answers

Analysis I

Can we predict happiness, stress and activity?



One machine learning model was created for each question (happiness, stress and activity)

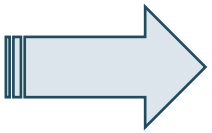
- Different algorithms have been evaluated
- Due to the availability of user-entered information about the mood, the algorithms could easily be evaluated by comparing real mood values and predicted mood values

* 10-fold cross-validation with stratification was used when evaluating the performance of each algorithm

Results I

Summary

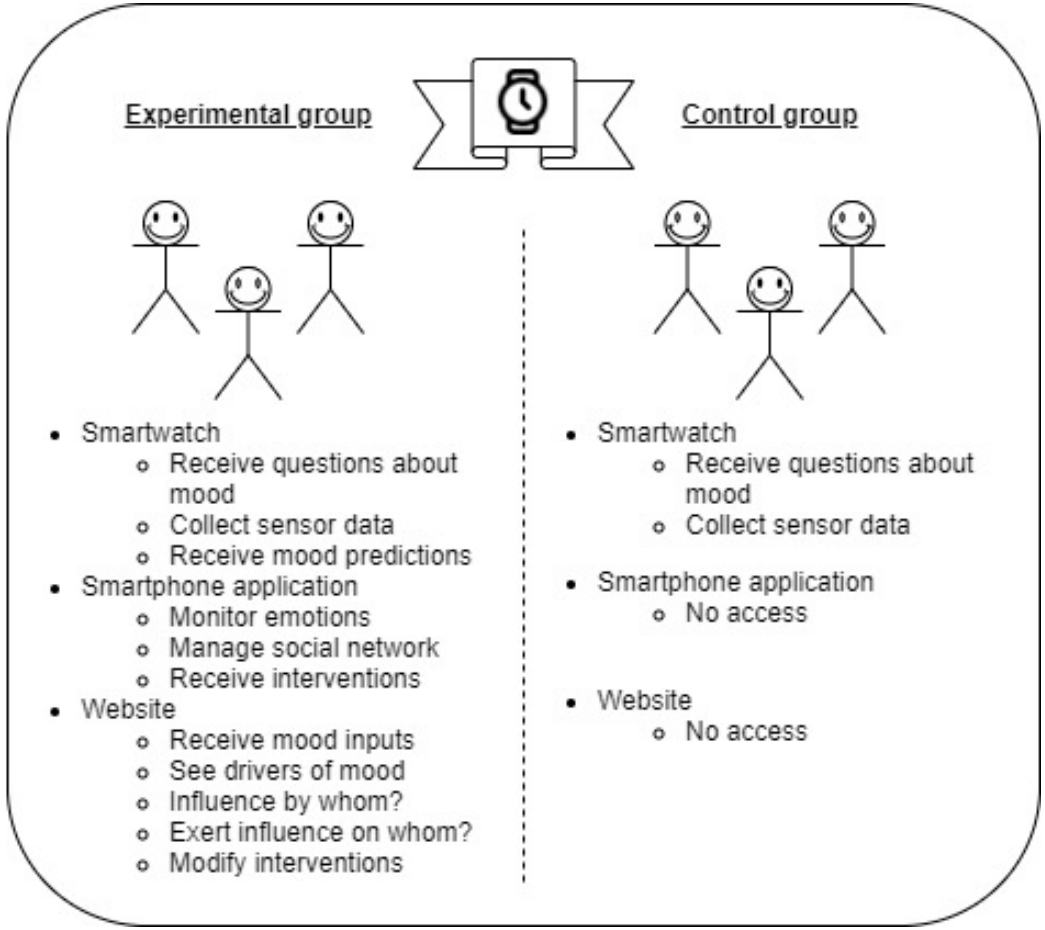
Happiness	• Best Algorithm: **Random Forest** with 88% accuracy and 86% f1-score • Other good performing algorithms: Gradient Boosting, SVM and decision tree
Stress	• Best Algorithm: **SVM** with 73% accuracy and 63% f1-score • Other good performing algorithms: Random Forest, Gradient Boosting, SVM and neural network
Activity	• Best Algorithm: **Random Forest** with 79% accuracy and 73% f1-score • Other good performing algorithms: Gradient Boosting and SVM



Sensor-based systems reliably predict happiness, activity, and stress

Analysis II

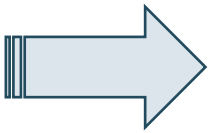
Can we increase individual well-being?



Results II

Summary

Happiness	• Average happiness was 16% higher in experimental group than in control group • Results were **significant**
Stress	• Average stress was 3% lower in the experimental group than in control group • Results were **not significant**
Activity	• Average activity was 26% higher in experimental group than in control group • Results were **significant**



Predictions made by the system can be used to provide feedback and recommendation, which, in turn, can increase happiness and activity

THANK YOU
&
BE HAPPY!

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