Wellbeing in Medical Professionals

Medical professionals work long hours with irregular shift schedule. Moreover, their work especially requires accuracy. Because of this, they often suffer from fatigue and depression. Our project aims to analyze medical professionals’ data to understand the relationships among their work schedule, sleep and wellbeing ultimately to make them more efficient and happier. This poster introduces some preliminary data analysis and modeling results using our pilot experiment data.

Goals

- Analyze pilot study data of medical professionals to understand relationships between wearable data and their wellbeing
- Compare the findings to the previous research about college students
- Build machine learning models to predict their happiness
- Ultimately we aim to develop technologies to support them (e.g. optimize their work shift schedule, send notifications (ex. “you should take a rest now” “if you sleep x hours from y pm today, you will be able to be more alert tomorrow at work”) )

Wearable and Survey Data

- 5 medical professionals in Japan
- Fitbit data (Sleep duration, Sleep starting time, HeartRate, Steps, Calories)
- Wellbeing Indexes every morning and evening
- Morning and Evening questions
- 30-day wearable and survey data

Machine Learning to Predict Wellbeing

- Features:
  - Sleep Duration
  - HeartRate Mean
  - Steps
  - Calories
  - HeartRate SD
  - Work Time Shift
- Model: Linear Mixed Effects Model: Used for regression analysis with dependent data
- Output: Coefficient, Standard Error, Significance Level, P-Value

Data Analysis to Detect Relationship between Wearable Data and Wellbeing Index

- Sleep Duration: Morning (0:00-12:00), Workday (12:00-24:00)
- Social Jetlag Index: Non-working Sleep Midpoint
- Sleep Regularity Index: 200 x (Sleep Midpoint – Sleep Time in Bed) / 24 hours

Method

- Basic Statistics:
  
  \[ \text{Mean: } \mu = \frac{1}{N} \sum_{i=1}^{N} x_i \]  
  \[ \text{SD: } \sigma = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (x_i - \mu)^2} \]

- Linear Mixed Effects Model: Used for regression analysis with dependent data

- HW (50, 0: <50)
- Non: 1: Happy
- SD: 0.966
- P-Value: 0.015

- Healthiness of Morning:
  - HW: 0.998
  - SD: 0.217
  - P-Value: 0.038

- Sleep Time in Bed:
  - HW: 0.966
  - SD: 0.217
  - P-Value: 0.038

Conclusion

- There’s a possibility to predict medical professionals’ wellbeing by analyzing wearable data
- We may be able to compute relationships more accurately if we also collect more various data similarly in our previous college student research[2]

Future Research

- Use other ways to analyze the data and create a machine learning model
- Try another definition of “Happy day and Unhappy day”
- 0:00-30: 30-70: do not include, 70-100: happy
- Try other indexes to create machine learning model

References


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