Decoding Smartwatch Body Signals for Personal Trait Prediction

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Extended Abstract

Body signals appear to be surprisingly informative in reflecting long-term personal traits (Gloor et al. 2010). In this project we use the Happimeter, a smartwatch based system to correlate body-signals with mood states (Budner et al. 2017) Based on the data collected by Pebble smartwatches from over 200 individuals during a year, we are able to develop statistical learning models that have substantial predictive power over the users' personal traits. In this short paper we describe two studies, (1) predicting FFI personality characteristics (McCrae & Costa 2003), and (2) individual creativity measured with the Torrance test (Torrance 1980).

In study 1, we trained an autoregressive long-short term memory model (LSTM) to encode people's daily activity pattern into 128-dimensional feature representation, which explains over 60% variance of the body signals.

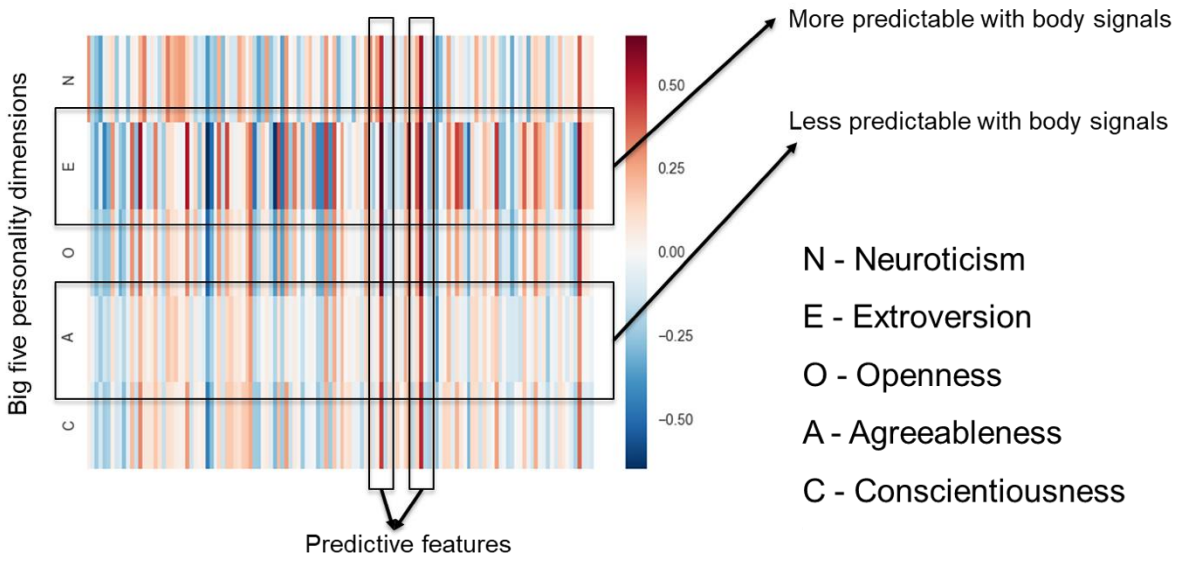

Figure 1 The correlation between features and personality traits

As shown in Figure 1, the features are of different powers in predicting Big Five personality traits. The different dimensions of personality traits, on the other hand, are of different predictability. For example, consistent with previous findings, the extroversion dimension appears to be the most predictable dimension with intensive correlation with many features, while the agreeableness dimension is the least predictable. From these 128 dimension, we used Lasso regression to identify the highly predictive features that explain over 50% variance in each of the Big Five personality traits.

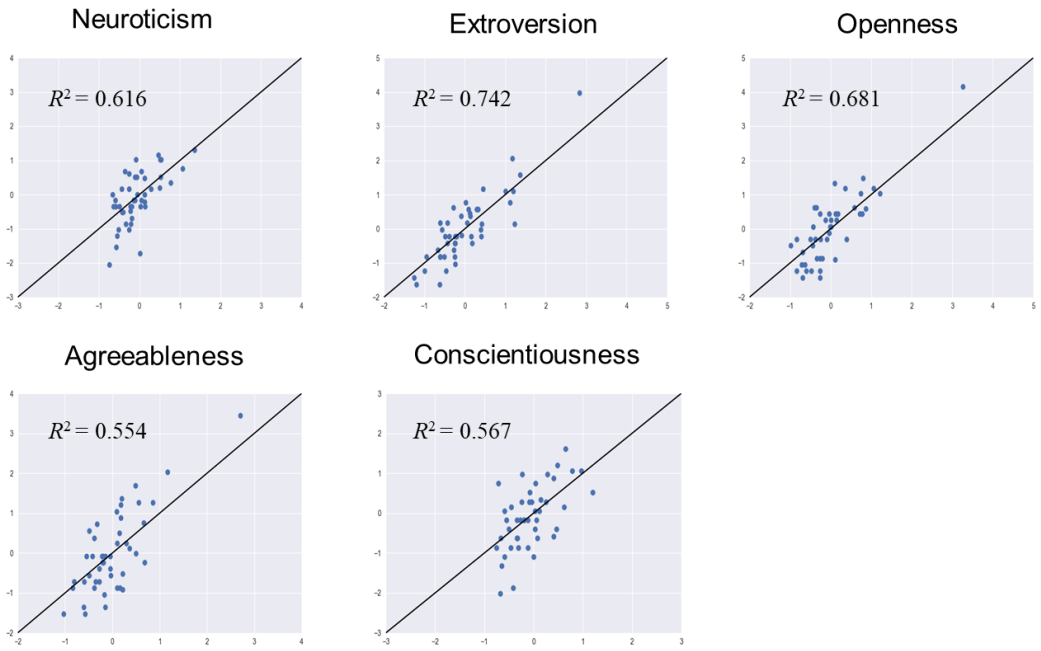

Figure 2 The prediction of the big five personality traits

Note: predicted values are on the vertical axis with real values on the horizontal axis

In study 2, we explore the possibility to predict an individual's creativity level based on the data collected from a limited period for 4 hours. Following the standard procedure to assess individuals' creativity from the Torrance test, we derived 40 individuals' creativity scores in four dimensions (i.e. fluency, originality, abstraction and resistance to premature closure).

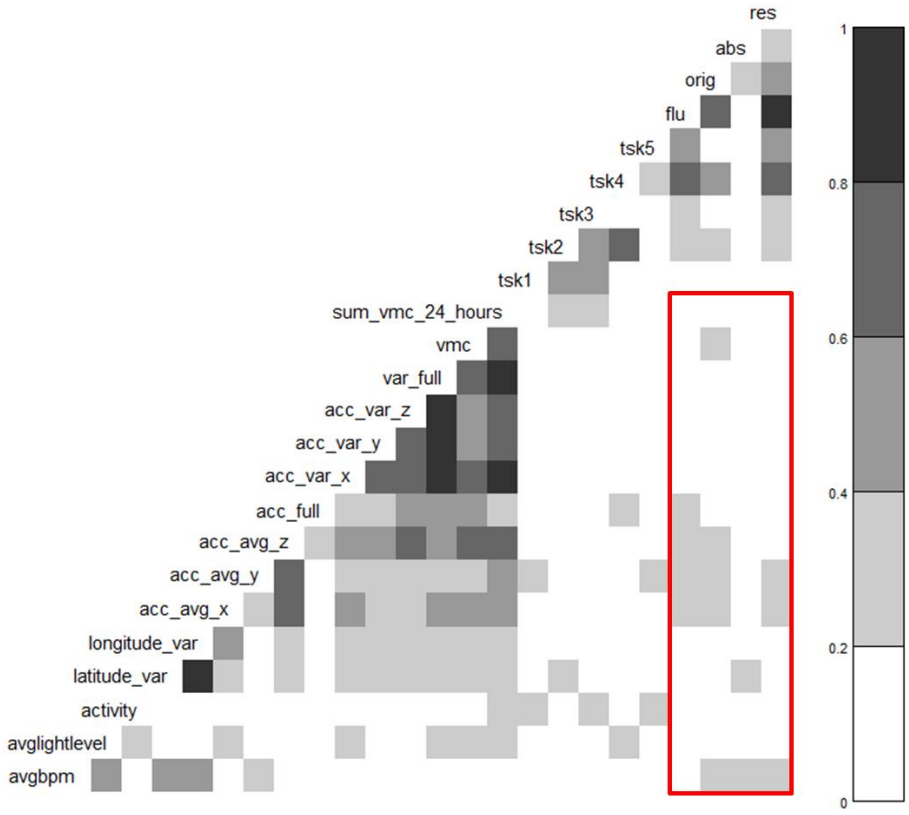

Figure 3 the correlation between creativity dimensions and raw body signals

According to Figure 3, there exist moderate-level correlation between each of the four creativity dimension and the raw body signals (averaged over the data collection period). Using the simple short-term body signals, we are able to predict the individuals' creativity scores in each dimension to a substantial extent as shown in Table 1.

Table 1 the predictive power of body signals

Dependent Variables (dimensions of creativity)	R^2
Fluency	0.399
Originality	0.437
Abstraction	0.276
Resistance of premature closure	0.390

Note: results are based on OLS regression.

The two study results clearly indicate the potential of using body signal to understand personal traits, even when the data are rather limited in terms of dimensionality and duration. Future research efforts should be directed to apply the proposed methods in meaningful real-world application settings, where there are more data available but stricter limitations on data usage.

Being able to infer personality traits from unobtrusive smartwatches would open up new possibilities in Human-Computer-Interaction (Nass et al. 1995). For example, understanding a user's personality might help a virtual speech assistant to interact more naturally. Another possible application might be recommender systems, which are said to be more accurate when they take a user's personality into account (Hu & Pu 2010).

References

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