Sleep condition analysis of social media selfies

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**ABSTRACT**

Sleep condition is closely related to individuals' health, poor sleep condition such as sleep disorder and sleep deprivation affects one's daily performances, and long-termly it may also cause many chronic diseases. With the hope of alleviating and preventing the sleep-related issues ahead, many efforts are invested in predicting or detecting people's sleep condition; however, traditional methodologies not only require sophisticated equipment but also consume a lot of time. In this paper, we build a light, rapid, and novel way to measure individual's sleep condition via scrutinizing facial cues. Instead of being connected to polysomnography wires, subject only needs to provide a sequence of his/her selfies, then our model will tell if this subject is encountering sleeping issues. Moreover, to gain more insights about human sleep conditions, we apply our model to a massive amount of social media selfies to explore the sleep condition patterns for individuals and analyze the sleep condition distribution among ages, genders, and races.

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# INTRODUCTION

In modern societies, with growing pressures from life and work, sleep condition is becoming more and more concerned by us. Individuals who encounter sleep disorders such as insomnia, sleep deprivation, sleep apnea, and etc., may not only appear less healthy and attractive [1], but also suffer poor physical and mental performances during the daytime [6]. In order to prevent and minimize the impairments brought from sleep disorders, many researchers endeavor in predicting and detecting human sleep disorder. Traditionally, there are two popular types of methods. The first type is self-report based, one outstanding example of such type is the Pittsburgh Sleep Quality Index (PSQI), which assesses sleep quality and disturbances for individuals over a one-month period [2]. Another type is electronic device based, this type of methods measures individual sleep quality via digital PSG recording and scoring [3]. Nonetheless, the former relies on individual's own report, which may carry significant biases, and the latter requires complicated medical equipment and occasions. The drawbacks of these two types of methods prevent us from gaining insights about sleep conditions in a large population base.

Therefore, we are particularly eager to

* Find a new way that can detect sleep disorder easily, rapidly, and accurately.
* Then, apply this new way to analyze the sleep condition on the tremendous amount of selfies across the social media.

With respect to our first goal, we understand that measuring the sleep condition directly could be hard, thus we have decided to attack it indirectly. [in our research, we were primarily focusing on the sleep deprivation caused sleep disorder, need to use some logic to transfer from dancing around between saying sleep disorder to sleep deprivation.] It has been clinically identified that fatigue is the most common symptom of sleep disorder, and a research also quantitatively associates sleep-deprived fatigue level with human facial cues [5]. According to that research, sleep deprivation caused fatigue level is heavily correlated with eight facial cues, they are hanging eyelids, red eyes, dark circles under eyes, pale skin, droopy corner mouth, swollen eyes, glazed eyes, and wrinkles/lines around eyes. Figure 1, which is reprinted from [5] shows the correlations between fatigue level and the rate (e.g. from not at all red eye to very red eye) of those facial cues.

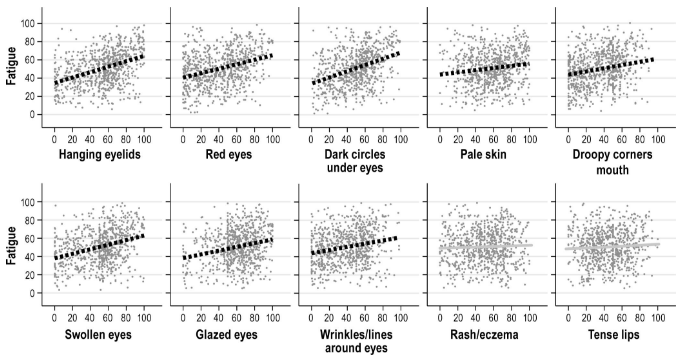


Figure 1. Relationships between rated fatigue and facial cues, cited from [5] [need more details, what does the slope indicates, the light gray line for the last two charts represents what?]

Given above correlations, we, thereby, can construct a model to measure the eight facial cues of each individual and quantify his/her fatigue, and treat it as a strong sleep deprivation indicator.

By using this model, given a selfie, we can predict the fatigue level of that face within milliseconds, and a sequence of selfies is enough to judge preliminarily if this particular individual is undergoing sleep deprivation.

We were not stopped at this point, subsequently, we have applied our model on over 100,000 faces obtained from Twitter and Instagram user timelines. For each face, we first utilize Face++ [] cloud service to get its age, gender, and race, and then send it to our model and obtain a numeric fatigue level prediction.

[interesting pattern generalization]

[main contributions]??

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