MAD@ WORK

MENTAL HEALTH AND PRODUCTIVITY BOOSTING IN THE WORKPLACE

Mad@Work during the year 2021: ESS | P. PORTO contribution

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Abstract

Our work life is changing rapidly. Globalization is ramping up competition, and digitalization is transforming all but the simplest manual labor into knowledge work. These changes don't come without a price – and it seems that the price is paid in an increase of stress and burnout. The cost of work-related stress in Europe was estimated to be around 200 billion annually and, in the USA, job stress alone is estimated to cost companies approximately 300 billion dollars a year. To face the high costs, the key to success requires tackling the work stress-related issues, first, in an individual level.

This project aims to develop novel stress detection solutions for workplaces, which will help to manage and reduce stress in the work context and build safe, positive, and productive work environments. Existing technologies for stress detection have been developed in relatively short-term studies and are not practical and/or mature enough for continuous, real-life usage.

To overcome these shortcomings, we will develop novel solutions to detect workplace problems and stress, convenient for long-term real-life use. Pilots in real workplaces will be conducted to achieve project goals and to evaluate developed solutions. Ultimately, our goal is to support and mitigate ongoing transformation, helping individuals flourish and companies thrive, paving the way for healthier workplaces where people throw up their arms, not in frustration or anger but inspiration and excitement.

Introduction

The International Labor Organization (ILO) defines work-related stress as "the harmful physical and emotional response caused by an imbalance between the perceived demands and the perceived resources and abilities of individuals to cope with those demands" (ILO, 2016). Stress is highly destructive, causing several mental health problems (anxiety, insomnia, depression, fatigue, and concentration difficulties), cardiovascular diseases, poor immune function, and presenteeism, as it is costly, making it cost companies hundreds of Billions Worldwide (Hassard et al., 2017).

Studies estimate that about 50% of all lost workdays are related to occupational stress. At a national and pan-European level, the total estimated cost of work-related stress in 2014 was observed to be considerable and ranged substantially from 195.29€ million to 165€ billion. Productivity-related losses were observed to proportionally contribute most of the total cost of work-related stress (between 70 to 90%), with healthcare and medical costs constituting the remaining 10% to 30%.

Solutions to mitigate risk factors related to working settings present an enormous potential and a clear substantial contribution. There is a tremendous need for the development of applications/software that combines multiple sources of data to gather the information that can improve employees' well-being, commitment, and performance. Existing solutions still largely rely on supervised learning methods, requiring extremely large sets of labeled data for each situation enabling work adaptivity. Also, these solutions rarely integrate

recommendations and active lifestyle changes to counterbalance high-stress situations. Research into assessing stress and mental conditions is still mainly conducted in laboratory environments and the results are not directly linked to real-life settings. By proposing an intelligent recommender system that ensures longitudinal data collection, will improve not only the research studies and making the end-users are highly interested in the 'quantified self'. What is the purpose of making stress detection software/systems? If stress has become a significant predictor of disease and illness in modern society, we shall act for change.

Project Evolution

The main goal of the Portuguese consortia is to explore video feed data and turn it into a physiological set using specific software to assess mental health and correlating this dataset with a daily stress report. This will increase accuracy and coverage in comparison to individual data sources. It will also allow detection of long-lasting problems and to assess the evolution of mental states over time, thus providing feedback on effectiveness of interventions.

To evaluate the user acceptance of the software, we conducted a Focus Group to obtain opinions, perceptions, and concerns of end users regarding the system under development to get the necessary information to define the requirements for the system, including monitoring of worker' stress and solutions to support mental health. The goal of these innovations is to get a better understanding of the trigger stressors (poor office environments, work culture, daily routines etc.), as to validate long-term effectiveness of stress-reducing interventions and to identify risk groups.

The needed data to provide this level of individual recommendation can only result from long-term pilots in real workplaces/settings. The developed solutions will be evaluated in multi-month pilots covering varying working periods, e.g., before and after holidays, so that the obtained data will enable (1) deep understanding of stress manifestation in different working situations and (2) thorough evaluation of the developed solutions.

Technological Solutions

The architecture of our solution is divided into three main components that encapsulate a set of features and tasks:

The first component, data acquisition, is on the user-area and provides several features about the employees' behavior. It contains a video-based application that collects, in a non-intrusive way, physiological features of the workers

such as, pupil diameter, eye gaze and blinking, heart rate variability and facial expressions. The employees will also provide several self-reports of stress at the workplace during the working period that will complement data collected through video.

The second component of the architecture is on the server side of the system. It is responsible for the consolidation of the data and its persistence in a database. Moreover, it allows for behavioral models to be trained based on the data and using machine learning algorithms to predict mental health conditions, concretely stress of knowledge workers.

Finally, the third component of the architecture includes a recommendation system that, using the behavioral models and data collected by the video-based application, predicts in real time if the worker will be in stress, informs the worker about his personal state and provides him with personalized stress mediation recommendations such as mindfulness, meditation, coaching, between others.

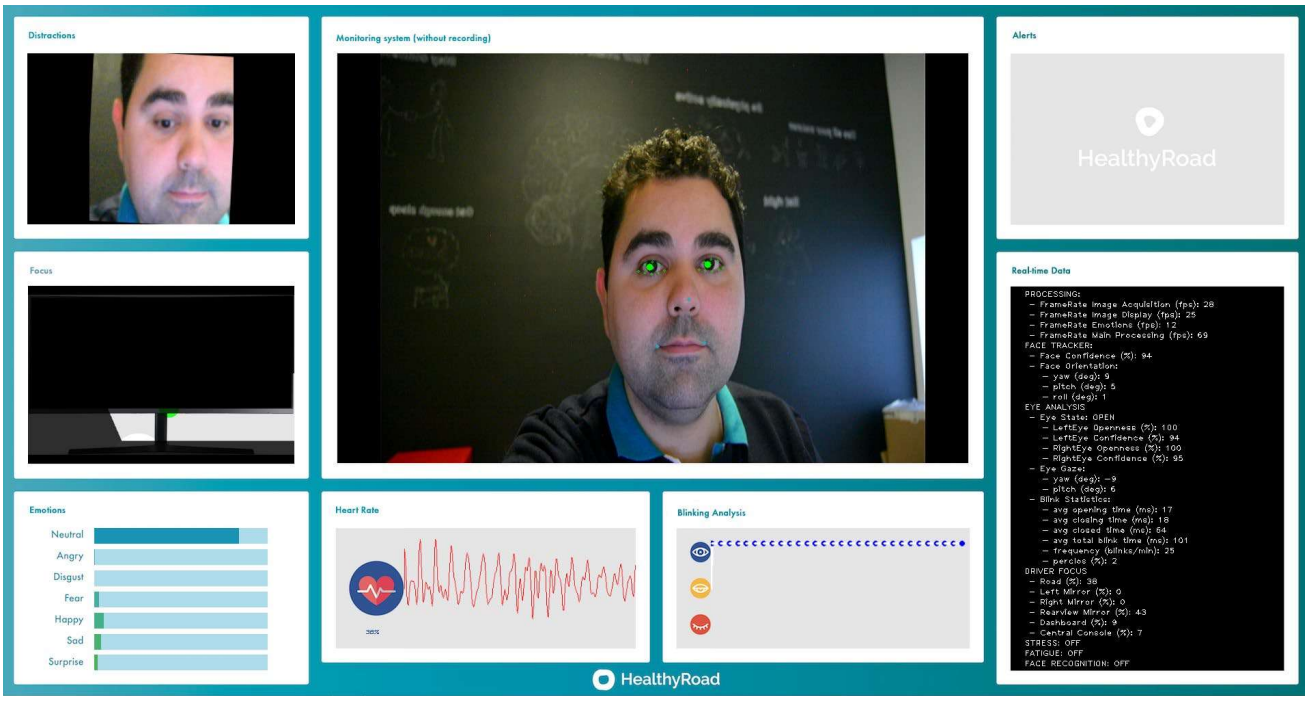

Figure 1: Mad@Work Software Solution for Stress Monitoring

Methods and Recommendations to support mental wellbeing

We are also developing a structured intervention model to mitigate stress that the users feel compelled in using. To do this, user preferences are our top priority, since their adherence and use of the recommended interventions are based on the premise that only preferred recommendations are in each person's model. The next step is to present recommendations for brief stress relief, since the alarm system works with immediate stress peaks, and real-time feedback on experienced stress levels. Experienced stress is analyzed during long periods of time with machine learning algorithms, that will provide the detection of long-term stress.

The digital coach (intervention model) will provide different recommendations and active lifestyle changes such as exercise, task management, weight management, sleep habits, structured pauses, etc. At this stage of the project, we are developing a clear structure that the intelligent software will introduce in the client's routine, preventing, teaching, and providing real-time exercises to mitigate acute stress, long-term stress and aim to change their perception about their own health habits, based on five modules: Be Ready, Be Aware, Be Responsive, Be Rested and Be Minded.

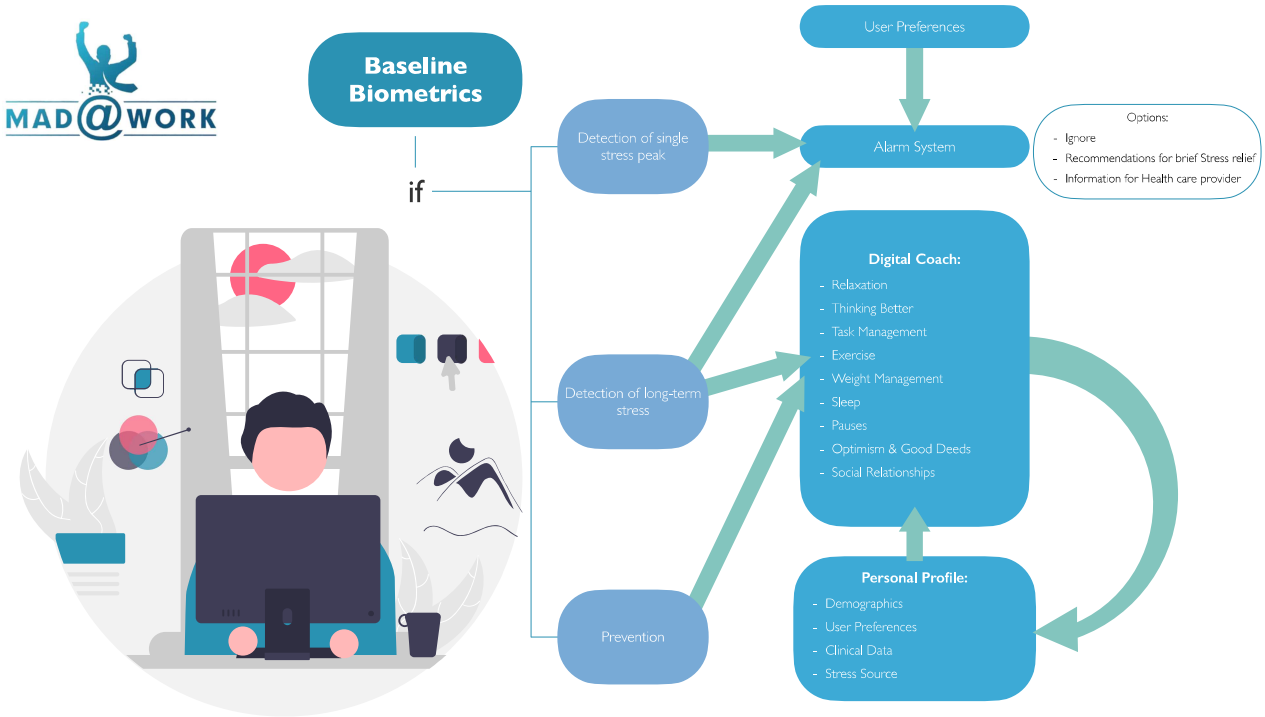

Figure 2: Initial draft of the modules of the Recommendation system for the Portuguese pilot

Be Ready is a module that contains important interventions to prevent stress. Be Aware is where the client can see and analyze his/her own stress data and perceive the needed changes to progress or maintain a healthy lifestyle and a truly improve wellbeing, engagement, and performance. Be Responsive is a module that contains an alarm system and immediate recommendations upon a stress peak during workhours. Be Rested compiles several recommendations of lifestyle changes that will help recovering from stress peaks. Be Minded is a module designed to shape some erroneous beliefs and expectations. The foreseen changes in client's lifestyle and routines will be able to modify his/her perception about certain habits and changes that will improve their performance and engagement, leading to a strong prevention against long-term stress.

For the following project, we collaborated with several Portuguese and international institutions. Specifically, eighteen partners from five different countries, and in Portugal, four principal players: AGEAS/MÉDIS Group, Glintt, ISEP and Healthyroad.

References

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