

Human Acceptable Ergonomics Recommendations



Phillip Probst

p.probst@fct.campus.unl.pt

Hugo Gamboa¹

¹ LIBPhys-UNL, NOVA School of Science and Technology



MIT Portugal 2023 Annual Conference

Purpose:

Work-related disorders (WRDs) have a significant impact on the well-being and general health of workers. They contribute to decreased productivity and absenteeism, resulting in higher costs for companies and society. Occupational health assessments, which aim to identify and mitigate potential risk factors, are required by law. These assessments are typically conducted by experts within a limited time frame using subjective measures to evaluate workstations. Information about motor and physiological adaptations while carrying out work tasks is often not collected. This work aims to develop a multimodal occupational health recommendation system that appropriately addresses the multifactorial nature of WRDs, allows for assessment of occupational risks using commonly available smart devices, and generates recommendations that are tailored to the personal needs of workers.

Data Collection and Information Extraction

Data Layer:

Data collection encompasses both subjective and objective measures. Subjective measures are collected through validated questionnaires that cover various work-related risk factors. Objective measures are acquired using research-grade equipment (PLUX) and smart devices (Smartphones/-watches). Data was collected in industrial and office environments through the OPERATOR and PrevOccupAI projects, respectively.

Information Extraction Layer:

Low- and high-level features are going to be extracted by this layer. The development of high-level features that characterize work patterns (e.g.: repetitive movements, postural behavior, etc.) is currently being done. An exploration into whether meaningful latent information using autoencoders can be accomplished, is planned for the near future.

Model Input Layer:

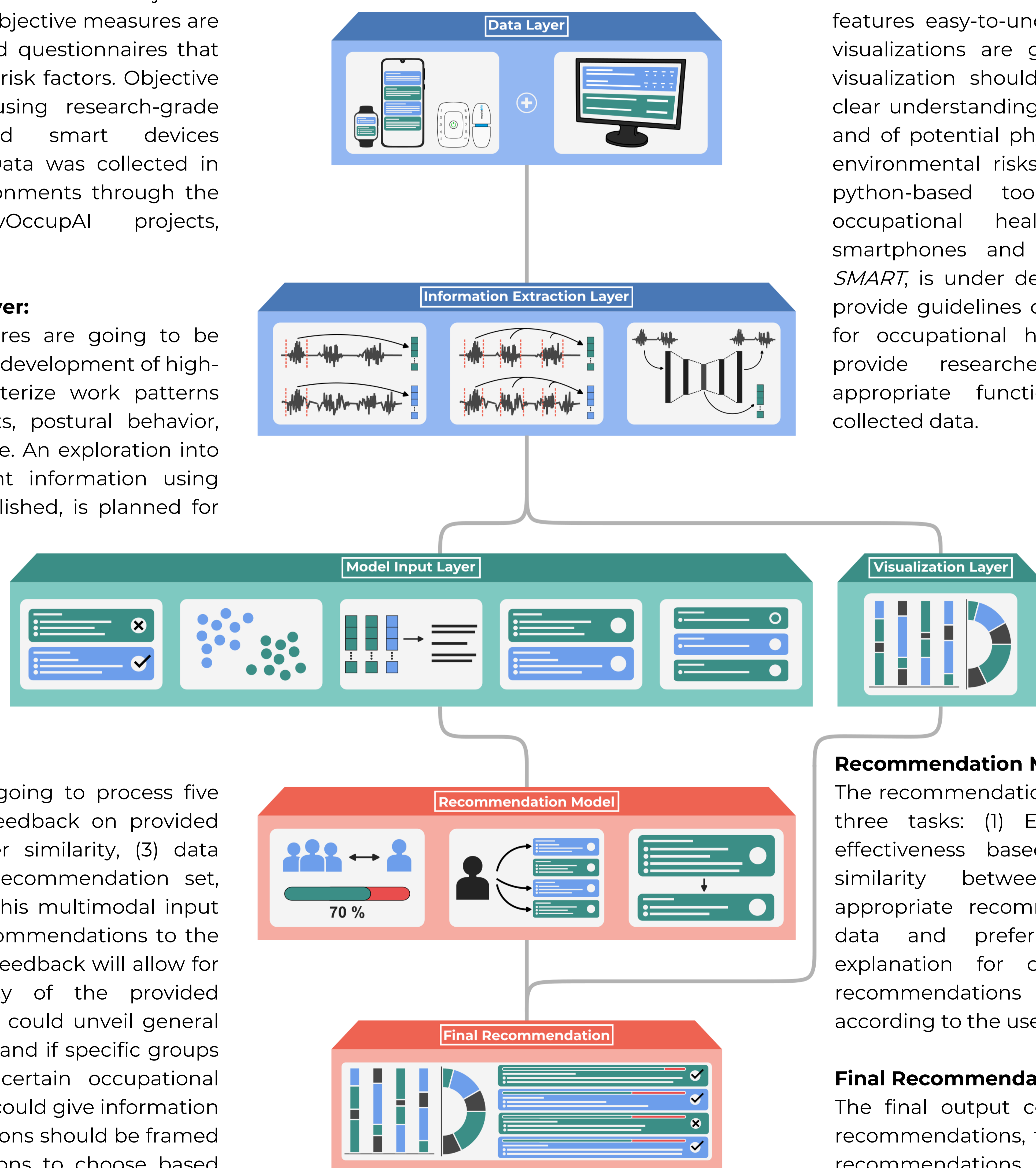
The model input layer is going to process five types of inputs: (1) user feedback on provided recommendations, (2) user similarity, (3) data transformations, (4) the recommendation set, and (5) user preferences. This multimodal input will allow for adapting recommendations to the user's specific needs. User feedback will allow for quantifying the efficacy of the provided information. User similarity could unveil general patterns of workers health and if specific groups are more vulnerable to certain occupational diseases. User preferences could give information on e.g., how recommendations should be framed and which recommendations to choose based on the time and effort a user can expend.

Multimodal Model Input

Easy-to-Understand Data Visualizations

Visualization Layer:

Based on the collected data and the extracted features easy-to-understand and aesthetic data visualizations are going to be created. These visualization should enable workers to gain a clear understanding of their occupational health and of potential physiological, psychosocial, and environmental risks. Currently, an open-source, python-based toolbox for visualization of occupational health data acquired with smartphones and smartwatches, called *OH-SMART*, is under development. This toolbox will provide guidelines on how to use smart devices for occupational health data acquisition and provide researchers and end-users with appropriate functionalities to visualize the collected data.



Recommendation Model:

The recommendation model is going to perform three tasks: (1) Estimating recommendation effectiveness based on user feedback and similarity between users, (2) mapping appropriate recommendations based on user data and preferences, while providing explanation for choices, and (3) adapting recommendations tone, length, and wording according to the user's preferences.

Final Recommendation:

The final output consists of the user-adapted recommendations, the explanations for why the recommendations were chosen, and the complementary data visualizations.

Recommendation Model and Final Output

Funded by: