An interface for explaining the automatic classification of runners' trainings

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ABSTRACT

This paper discusses an explainable intelligent interface supporting coaches in providing feedback to runners tracking their progress through a mobile application. The interface explicitly shows the confidence on the assigned ratings, it supports the impact analysis of the different recorded metrics and it allows controlling and reinforcing the assessment.

CCS CONCEPTS

• **Human-centered computing** → **Human computer interaction (HCI)**; • **Computing methodologies** → *Machine learning*.

KEYWORDS

explainable user interface, intelligent user interface, classification, training, running

1 INTRODUCTION

In the last years, there has been an increasing interest in the *e-fitness*, including mobile software and wearable solutions for workout activities [4]. Such solutions increased the number of people enjoying the running activity but, at the same time, the number of inexperienced athletes increased too. They encounter difficulties in maintaining the motivation and in reaching satisfying results since they are not able to set appropriate goals and to adapt the training to the progress [2].
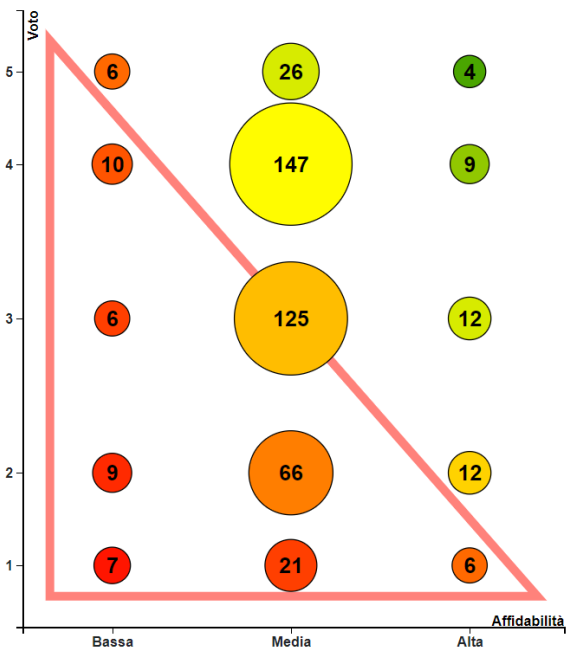
Figure 1: Workout rating in AI4Fit

The *u4fit* mobile application[1] tries to mitigate this problem connecting real coaches with the athletes. The coach follows their progress, creates training plans and supports them in preparing for competitions. The goal of the *AI4fit* project is introducing intelligent support for coaches, automatizing ratings and feedback under the coach's supervision. We do not aim at substituting the human support to the athletes, which is the strongest asset in *u4fit*, but we would like to relieve them from the burden of executing the routine work, focusing their expertise on complex cases. The correspondent user interface must provide support for *inspecting* and *controlling* [1] the actions of the intelligent support. We consider this research problem as orthogonal with respect to a direct human understanding of the training data [3]. Our project focuses on supporting coaches in inspecting the classification results, in order to understand how the intelligent support automatically rates the

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[1]https://www.u4fit.com

workouts. In this paper, we discuss the work-in-progress interface we are developing in the project.

2 THE EXPLAINABLE INTERFACE

The AI4Fit interface has a twofold design goal. On the one hand, it supports coaches in evaluating runners' training sessions, displaying the data collected through smartphones and other wearable devices. On the other hand, it provides information regarding the automatic evaluation produced by the underlying AI-powered classification algorithm. The rating explanation relies on representing the classification uncertainty. Figure 1 shows a sample overview of the trainings requiring the coach evaluation. The visualization groups them according to the assigned rate (y axis, 1 to 5 scale) and the system confidence level in assigning such rating (x axis). The latter value is a simplified representation of the classification probability, reported in three discrete levels: low, medium and high.

Each value pair in these scales defines a subset of the recorded sessions. The groups requiring an explicit check by the coach are those including a poor athlete's performance (low values for the score), low confidence of the scoring algorithm or both. A combination of low-rating and low-confidence represent the greatest risk for the feedback quality in the platform, so the coach should start analysing them first, then s/he should provide suggestions for the athletes that performed poorly and finally s/he may check the coherence of the ratings having a low or medium confidence, in order to find misjudged sessions. The interface suggests such priority through a simple colour-coding: it depicts the groups that should be analysed first in red, those requiring a low-priority check in yellow and those that do not require human intervention in green (see Figure 1).

The detailed interface for a single training includes session statistics (the distance covered, the time spent, the speed, the running pace, heartbeats per minute, altitude etc). Such information represents a human-readable version of the classification input. The AI4fit interface supports the coach in understanding how the classification works by showing, for each collected statistic, the values required for increasing or decreasing the predicted rating. This supports the coach in figuring out the impact of each metric in the classification: the higher the distance between the actual value and the thresholds for changing the rating, the lower the impact. Figure 2-a shows a sample visualization for the running speed.

The registered mean value, depicted in light-blue, is $\bar{x}$ km/h. Such performance resulted in a predicted rating of 4 in a 1 to 5 scale. The athlete was quite far from the previous level (3), associated to v_1 km/h, highlighted in red. An optimal rating (5) would require a smaller effort, v_2 km/h, highlighted in green in Figure 2-a. We obtain such values through a perturbation of the considered metric in the original sample. First, we iteratively increase the metric value and we classify the modified sample until we obtain a higher or lower rating. We repeat the process decreasing the value and reporting the results on the UI. The coach may change the rating assigned by the AI algorithm using the interface in Figure 2-b. The bot icon represents the agent that automatically assigns ratings, while the user icon reports the value specified by the coach. Each human-change in the evaluation is used for reinforcing the classification support.
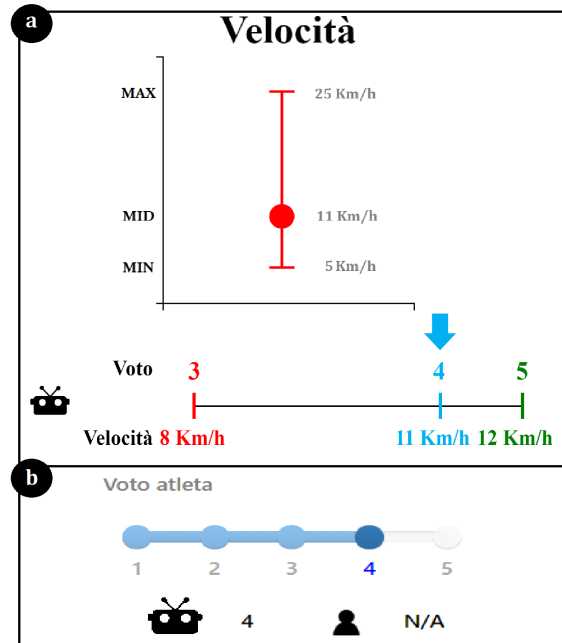

Figure 2: Part a) Effect of each measure on the predicted training rating; Part b) Modifying the automated rating

3 CONCLUSIONS AND FUTURE WORK

The interface discussed in this paper supports the explanation and the control of automatically assigned ratings to running trainings. In future work, we aim at refining the interface design, including the support for collecting and displaying more data for fulfilling the requirements discussed in [5]. Finally, we will evaluate the interface with real coaches.

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