

# Selfit – An Intelligent Tutoring System for Psychomotor Development

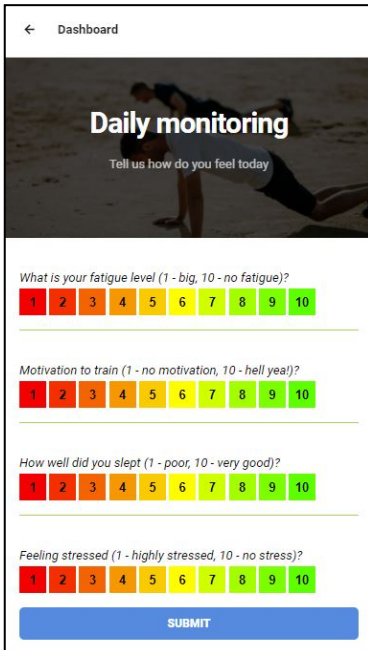
Laurentiu-Marian Neagu<sup>1,2</sup>, Eric Rigaud<sup>1</sup>, Vincent Guarnieri<sup>1</sup>,  
Sébastien Travadel<sup>1</sup> and Mihai Dascalu<sup>2</sup>

<sup>1</sup> École Nationale Supérieure des Mines de Paris, 1 Rue Claude Daunesse,  
Sophia Antipolis, France  
{eric.rigaud, vincent.guarnieri,  
sebastien.travadel}@mines-paristech.fr

<sup>2</sup> Computer Science Department, University Politehnica of Bucharest,  
313 Splaiul Independentei, Bucharest, 060042, Romania  
{laurentiu.neagu, mihai.dascalu}@upb.ro

*Topic and domain.* The *Selfit* intelligent tutoring system for psychomotor development aims to support adults' physical qualities improvement to perform safe and efficient movements in their daily life and professional and recreational activities.

*Pedagogical activity and feedback.* First, students perform exercises for screening their initial technical and strength levels. Then, every time they train, *Selfit* generates a training session considering their long-term objectives, training history, state of fatigue, willingness to train, time, and material available. After the training session, athletes provide feedback such as their perceived number of repetitions in reserve, perceived fatigue, and estimation of the session's difficulty. Periodically, students perform exercises to evaluate their evolution and update the training strategy. A training session is composed of a warmup bloc to prepare the body to perform exercises safely and efficiently, then development exercises blocs characterized by a movement (back squat, for example), the number of set and repetitions (3 sets of 10 repetitions, for example) and a load (2 repetitions to failure).



The screenshot shows a web interface titled 'Dashboard' with a 'Daily monitoring' section. It contains four Likert scales, each with 10 colored boxes (1-10) and a 'SUBMIT' button at the bottom.

- Question 1: "What is your fatigue level (1 - big, 10 - no fatigue)?"
- Question 2: "Motivation to train (1 - no motivation, 10 - hell yeah)?"
- Question 3: "How well did you slept (1 - poor, 10 - very good)?"
- Question 4: "Feeling stressed (1 - highly stressed, 10 - no stress)?"

*Instrumentation and evaluation.* A contextual Multi-Armed Bandits (Lu, Pal, D. & Pal, M., 2010) based learning algorithm support the tutoring functionalities. An ontology (Noy, McGuinness, 2001) structures the domain and the student model. The core concept of the domain model consists of the movement skill class, with associated psychomotor profile, movement patterns, and training program modalities. The ontology describes the relationships between body, muscle chains, joints movements, agonist, antagonist, and synergist muscles for strength qualities development. The *Selfit* Student model contains information about the trainee's psychomotor capacities, especially the ones related to the super-compensation cycle status and usage statistics. The tutor explores and optimizes different exercises, estimates trainee progress to choose the most appropriate alternative. The Monitoring module stores information on how trainees are using the system. The evaluation is done by computing the difference between trainee goals and level of achievement at the end of the training cycle.

*Implementation and novel technologies.* *Selfit* was developed as a PWA (Progressive Web Application), running a .NET Core framework (C#) and EF with a MySQL database. The tutoring module has been developed using the Flask framework (Python), and it has exposed REST endpoints for generating the right exercises. The approach is novel, using cutting-edge technologies and the system is available to everyone by accessing a web link.

*Related work.* A thorough analysis of similar works published in the ITS community related to psychomotor skills was conducted by (Neagu et al., 2020). The study presented 7 relevant papers, mapping several psychomotor domains, such as: acquiring driving skills, mili-tary (U.S. Army – GIFT), training for laparoscopic surgeries (robotic-assisted), postural retraining in health, improving motor learning (TIKL), or ball-passing training.

*Plans for availability.* *Selfit* is currently being tested with real users to evaluate whether it fulfills its requirements (quality test) and observe if trainees use it effectively, efficiently, and are satisfied (usability test). This phase is a long-term process that will last at least 12 consecutive weeks.

Lu, T., Pal, D., Pal, M.: Contextual Multi-Armed Bandits. Proceedings of the 13th international conference on Artificial Intelligence and Statistics, 9, 485–492 (2010)

Noy, N.F., McGuinness, D.L.: Ontology Development 101: A Guide to Creating Your First Ontology. Stanford Knowledge Systems Laboratory, Stanford, CA, USA (2001)

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