

New particle search with the REINFORCE citizen science project

The REINFORCE EU project (Research Infrastructures FOR Citizens in Europe) engages and supports citizens to cooperate with researchers and actively contribute to the development of new knowledge for the needs of science and society. The overall aim is to bridge the gap between them, and reinforce society's science capital.

REINFORCE targets citizens of any age, without requiring prior physics or computing knowledge, and offers four "discovery demonstrators" from different areas of high-energy physics: Gravitational Wave Astronomy, Neutrino Physics, High-Energy Collider Physics, and the interplay of Cosmic Rays with Geoscience and Archaeology. The infrastructure of all demonstrators is based on ZOONIVERSE, the most popular citizen-science platform, which is expected to reach a large number of volunteers, and motivate them to play a part in frontier scientific research.

After a brief description of the demonstrators comprising REINFORCE, we will present in detail the demonstrator titled "Search for new particles at the LHC", which will engage citizen-scientists in searches for new elementary particles produced by the high-energy proton-proton collisions at the LHC of CERN. To make this possible, the demonstrator adopts a three-stage architecture. The first two stages use simulated data from the ATLAS detector to train citizens, but also to allow for a quantitative assessment of their performance and a comparison with machine learning algorithms. The third stage, on the other hand, uses real data from the ATLAS Open-Data subset, providing two research paths: (a) study of Higgs boson decays to two photons, one of which could be converted to an electron-positron pair by interaction with detector material, and (b) search for yet undiscovered long-lived particles, predicted by certain theories Beyond-the-Standard-Model. The collected citizens' results will be assessed and analyzed.

In addition to the aforementioned goals, REINFORCE will also establish communication and feedback channels between research and society through the REINFORCE community of practice, so that the citizens' voice can be heard.

Finally one of REINFORCE main goals is the exploitation of its potential for inclusion and diversity. More precisely its demonstrators' development will include users who can be sense-impaired people (especially visual-impaired) and senior citizens. A consortium partner has already developed software which sonifies the data.

Working group

Diversity, Education and Outreach

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