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Gamifying quantum research: harnessing human intuition

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In the emerging field of citizen science ordinary citizens have already contributed to research in as diverse fields as astronomy, protein and RNA folding, and neuron mapping by playing online games. In the www.scienceathome.org project, we have extended this democratized research to the realm of quantum physics by gamifying a class of challenges related to optimization of gate operations in a quantum computer. The games have been played by more than 150,000 players and perhaps surprisingly we observe that a large fraction of the players outperform state-of-the-art optimization algorithms [1]. With a palette of additional games within cognitive science, behavioral economics, and corporate innovation we investigate the general features of individual and collaborative problem solving to shed additional light on the process of human intuition and innovation and potentially develop novel models of artificial intelligence. We have also developed and tested in classrooms educational games within classical and quantum physics and mathematics at high-school and university level. The games provide individualized learning and enhance motivation for the core curriculum by actively creating links to modern research challenges, see eg [2]. Finally, we have recently launched our new democratic lab: an easily accessible remote interface for our ultra-cold atoms experiment allowing amateur scientists, students, and research institutions world-wide to perform state-of-the-art quantum experimentation. In first tests, nearly a thousand players helped optimize the production of our BEC and discovered novel efficient strategies. [1] J.J. Srensen et al, Nature, 532, 210 (2016). [2] M.K. Pedersen et al, arXiv:1608.07391