[Description for the general public]

Based on the current knowledge our Universe is made of fundamental constituents that can be divided into particles or anti-particles. Our understanding, confirmed by experimental results, is that every interaction that involves fundamental particles (in practice we take into account only strong or electro-weak interactions) leads to production of a final state with equal numbers of particles and anti-particles. On the other hand, astronomical observations showed that the visible Universe is completely bereft of any macroscopic amounts of anti-matter (like stars or galaxies). This puzzle is one of the most interesting ones that the modern physics is trying to explain and provide a strong motivation for the LHCb experiment at Large Hadron Collider at CERN. The LHCb Collaboration uses a spectrometer that is dedicated to studying particles containing beauty and charm quarks which may help in understanding the origin of asymmetry between matter and anti-matter. One of the most critical elements of this spectrometer is the silicon vertex detector called VELO (vertex locator). It operates near to the proton-proton interaction point and provides very accurate information on charged particle trajectories. It must be able to cope with very high radiation field produced in the proton-proton interactions. In order to run the VELO in reliable way we need to provide special control and monitoring software that is able to handle large stream of data pertaining to its condition. In this project we aim at providing such software platform for the new vertex detector for the upgraded LHCb experiment. Since the new system will be much more complicated than the current one the same technological jump must be applied for the control and monitoring software. We intend to use the latest machine learning techniques to provide an intelligent system that would be able to perform constant monitoring without human supervisor. Also, a part of this project is related to testing prototype pixel sensors for the upgraded VELO which allows to better understand the changes induced by the radiation.