

GATE Monte Carlo simulations in medical physics: advances

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The GATE toolkit has been in the research landscape for almost 20 years. This open-source software is designed to help researchers and engineers to perform a large range of Monte Carlo simulations in the medical physics field: PET, SPECT, Compton Camera, CT, CBCT (Cone-Beam CT) and radiation therapies. The first publication on PET and SPECT developments has been published in 2004, the evolution towards radiation therapy in 2011, some extensions to other dosimetry applications in 2014 and, more recently in 2021, a specific topic for emission tomography imaging. A third long-term project has started, aiming to completely rethink the way the simulations are described by the user. It has been decided to investigate whether simulations can be directly described in Python instead of macro files. A first prototype is currently showing the feasibility of such an approach. The mechanism is based on the Geant4 python binding thanks to pybind11 that exposes to Python a fraction of the Geant4 API. The first public experimental version of this approach, that may become the future GATE 10.x series, is planned in 2023.