

Samara University's first project with CERN OpenLab

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CERN OpenLab is a public-private partnership, through which CERN collaborates with leading ICT companies and other research organizations. A partnership [was signed](#) in October 2018 between CERN OpenLab and Samara University. After a few months in this union, the university is proud to announce the birth of our first collaborative project: SmartLINAC.

The SmartLINAC project proposes to investigate an innovative method to understand and model the failure times and modes of LINAC systems and design predictive, easy-to-implement maintenance plans based on nominal Mean-Time-To-Failure information and operating conditions. Then dynamically refine and "personalize" the maintenance plans by securely collecting and analyzing real information extracted from production systems using a deep-learning-based approach.

Linear Accelerators (LINACs) are a type of particle accelerators able to accelerate charged particles to high speeds. They have today many different applications, from particle physics research, to cancer treatments, non-destructive material testing, nuclear waste disposal, security screening, or food sterilization. Typical medical or industrial LINACs are complex engineering systems and their operations, especially for in clinical environments, are highly impacted by down-time, costs of operations and lack of trained engineers.

In particular, the complexity of such systems is today severely limiting the availability and diffusion of LINACs for medical applications in facilities where costs are a major an issue, technical expertise is not available on site and down-time may impact the patients' life expectancy. The need for simpler-to-maintain-and-operate medical LINACs was highly stressed during a workshop jointly organized by CERN, the International Cancer Expert Corps (ICEC) and STFC in October 2017.

The project was born in the department of technical cybernetics by the hands of a PhD student from Switzerland working at university since 2018, **Yann Donon**, under the supervision of **Dr. Alexander Kupriyanov**.



Dr. Alberto Di Meglio, head of CERN OpenLab, during his presentation on "Big Data Challenges in Scientific Research at CERN", international conference on information technology and nanotechnology (ITNT-2019), Samara



Dr. Alexander Kupriyanov and his PhD student, Yann Donon at the international conference on information technology and nanotechnology (ITNT-2019), Samara