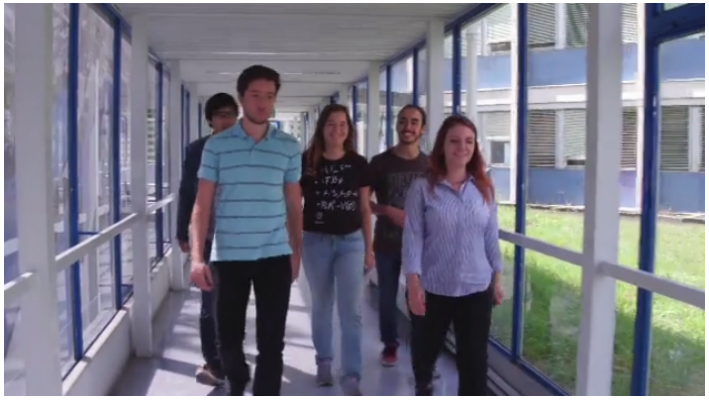
Winners Announced! Highly Talented CERN Student Researchers Innovate on HPC, AI & IOT in the Modern Code Developer Challenge

Updated November 15, 2017 Translate

CERN openlab and Intel are pleased to announce the winners of the Intel® Modern Code Developer Challenge (/en-us/articles/the-modern-code-developer-challenge)! The announcement was made today at 'SC17', the International Conference for High Performance Computing, Networking, Storage, and Analysis (http://sc17.supercomputing.org/), in Denver, Colorado, USA.

(https://cds.cern.ch/record/2290433)



Two winners were selected: Elena Orlova, for her work on improving particle collision simulation algorithms, and Konstantinos Kanellis, for his work on cloud-based biological simulations.

A Challenge for CERN Openlab Summer Students

CERN openlab (http://openlab.cern/) is a unique public-private partnership between CERN (http://home.cern/) and leading companies, helping accelerate development of the cutting-edge ICT solutions that make the laboratory's ground-breaking physics research possible. Intel (https://www.intel.com/content/www/us/en/homepage.html) has been a partner in CERN openlab since 2001, when the collaboration was first established.

Each year, CERN openlab runs a highly competitive summer-student programme (http://openlab.cern/news/2017-cern-openlab-summer-student-programme-comes-close) that sees 30-40 students from around the world come to CERN for nine weeks to do hands-on ICT projects involving the latest industry technologies.

This year, five students were selected to take part in the Intel® Modern Code Developer Challenge. This competition showcases the students' blogs about their projects — all of which make use of Intel technologies or are connected to broader collaborative initiatives between Intel and CERN openlab. You can find additional information about these projects on a dedicated website (/en-us/articles/the-modern-code-developer-challenge) that also features audio and video interviews.

"We are thrilled to support these students through the Modern Code Developer Challenge," says Michelle Chuaprasert, Director, Developer Relations Division at Intel. "Intel's partnership with CERN openlab is part of our continued commitment to education and building the next generation of scientific coders that are using high-performance computing, artificial intelligence, and Internet-of-things (IoT) technologies to have a positive impact on people's lives across the world."

Selecting a Winner from Five Challenging Projects

The competition featured students working on exciting challenges within both high-energy physics and other research domains.

At the start of the challenge, the plan was for a panel of judges to select just one of the five students as the winner and to invite said winner to present their work at the SC17 conference. However, owing to the high quality of the students' work, the judges decided to select two winners, both of whom received full funding from Intel to travel to the USA and present their work.

Smash-simulation Software

(https://cds.cern.ch/record/2290434)Elena Orlova, a third-year student in applied mathematics from the Higher School of Economics in Moscow (https://www.hse.ru/en/), Russia, was selected as one of the two winners. Her work focused on teaching algorithms to be faster at simulating particle-collision events.

Physicists widely use a software toolkit called GEANT4 (http://geant4.cern.ch/) to simulate what will happen when a particular kind of particle hits a particular kind of material in a particle detector. This toolkit is so popular that researchers use it in other fields to predict how particles will interact with other matter, such as in assessing radiation hazards in space, in commercial air travel, in medical imaging, and in optimizing scanning systems for cargo security.

An international team, led by researchers at CERN (http://home.cern/about), is developing a new version of this simulation toolkit known as GeantV (http://geant.cern.ch/). This work is supported bya CERN openlab project with Intel on code modernization (http://openlab.cern/technical-area/computing-platforms-

offline). GeantV will improve physics accuracy and boost performance on modern computing architectures.

The team behind GeantV is implementing a deep learning tool intended to make simulations faster. Orlova worked to write a flexible mini-application to help train the deep neural network on distributed computing systems.

“I’m really glad to have had this opportunity to work on a breakthrough project like this with such cool people,” says Orlova. “I’ve improved my skills, gained lots of new experience, and have explored new places and foods. I hope my work will be useful for further research.”

Cells In the Cloud

(https://cds.cern.ch/record/2290495)

Konstantinos Kanellis, a final-year undergraduate in the Department of Electrical and Computer Engineering at the University of Thessaly (http://www.uth.gr/en/), Greece, is the other Modern Code Developer Challenge winner due to his work related to BioDynaMo (http://openlab.cern/knowledge-sharing-projects). BioDynaMo is one of CERN openlab’s knowledge-sharing projects (http://openlab.cern/knowledge-sharing-projects) (another part of CERN openlab’s collaboration with Intel on code modernization (http://openlab.cern/technical-area/computing-platforms-offline)). The project’s goal is to develop methods for ensuring that scientific software makes full use of the computing potential offered by today’s cutting-edge hardware technologies. This joint effort by CERN (http://home.cern/about), Newcastle University (http://www.ncl.ac.uk/), Innopolis University (https://university.innopolis.ru/en/), and Kazan Federal University is to design and build a scalable and flexible platform for rapid simulation of biological tissue development.

The project focuses initially on the area of brain tissue simulation, drawing inspiration from existing, but low-performance, software frameworks. By using the code to simulate development of both normal and

diseased brains, neuroscientists hope to learn more about the causes of — and identify potential treatments for — disorders such as epilepsy and schizophrenia.

Late 2015 and early 2016 saw algorithms already written in Java* code ported to C++. Once porting was completed, work began to optimise the code for modern computer processors and co-processors. However, to address ambitious research questions, more computational power was needed. Future work will attempt to adapt the code for high-performance computing resources over the cloud.

Kanellis's work focused on adding network support for the single-node simulator and prototyping the computation management across many nodes. "Being a summer student at CERN was a rich and fulfilling experience. It was exciting to work on an interesting and ambitious project like BioDynaMo," says Kanellis. "I feel honoured to have been chosen as a winner, and that I've managed to deliver something meaningful that can make an impact in the future."

ICT Stars of the Future

Alberto Di Meglio, head of CERN openlab, will present more details about these projects, as well as details about the entire competition, in a talk at SC17. The other three projects featured in the challenge focused on using machine learning techniques to better identify the particles produced by collision events (https://cds.cern.ch/record/2290436), integrating IoT devices into the control systems for the LHC (https://cds.cern.ch/record/2290435), and helping computers get better at recognising objects in satellite maps created by UNITAR, a UN agency hosted at CERN (https://cds.cern.ch/record/2290488).

"Training the next generation of developers — the people who can produce the scientific code that makes world-leading research possible — is of paramount importance across all scientific fields," says Meglio.

"We're pleased to partner with Intel on this important cause."

For more information, please visit the Intel® Modern Code Developer Challenge website (/en-us/articles/the-modern-code-developer-challenge). Also, if you're a student and are interested in joining next year's CERN openlab Summer Student Programme, please visit the dedicated page on our website (http://openlab.cern/summer-student-programme) (applications will open in December).

For more complete information about compiler optimizations, see our Optimization Notice (/en-us/articles/optimization-notice#opt-en).

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