

# Viktor Khristenko

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- *Linkedin* <https://www.linkedin.com/in/viktor-khristenko>
- *Github* <https://github.com/vkhristenko>
- *Languages* Russian(native) • English(native fluency) • French(B1)

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## Professional Activities

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### Software Engineer

2017 Sep - Current

**CERN** - *European Organization for Nuclear Research, Geneva, Switzerland*

- **DEEP-EST** Project Member - EU initiative to build a modular supercomputing architecture for *exascale* combining best of Big Data and HPC worlds. Following the co-design approach, contributed to the development and validation of one of the applications, **CMS Experiment data processing**. Formalized application requirements (e.g. existing benchmarks, overall application design, etc...), contributed to project deliverables and provided technical feedback to system architects to select and/or build/assemble hardware/software components that allow applications make efficient use of the system.
- **Large Scale HEP Data Processing with Apache Spark**. <https://www.youtube.com/watch?v=JTMdkSmwOKc> Implemented Apache Spark's Data Source for HEP standard file format which allowed using Big Data tools for HEP data analysis. The data source was successfully used to process TBs+ datasets in various environments (e.g. cloud and HPC resources) and allowed transparent integration with other tools from Big Data ecosystem.
- **Heterogeneous Computing for CMS Experiment**. Ported existing cpu based CMS Hadron and Electromagnetic Calorimeters workflows to CUDA and optimized to target Nvidia GPUs. Achieved 2-4x improvement in throughput (depending on the input dataset) over currently used CPU systems for CMS experiment (at HLT). Minimal viable reproducer was also ported to OpenCL (with FPGA specific extensions) and evaluated using Intel Arria 10 FPGA.

### Group Lead - CMS Hadron Calorimeter Data Quality Monitoring Group

2014-2017

**CERN** - *European Organization for Nuclear Research, Geneva, Switzerland*

- Led a small team (3-4 members), responsible for providing prompt feedback on the quality of collected data for CMS Hcal Operations, for both Online feedback and Offline certification. Personally was responsible for design and implementation of critical **data-driven quality control applications** from scratch, tuning the runtime performance of those to target Online CMS data taking conditions. Provided weekly status reports to CMS Hcal Operations

### Deputy Coordinator - CMS Hadron Calorimeter Operations Group

2015-2016

**CMS** - *Compact Muon Solenoid Experiment @CERN, Geneva, Switzerland*

- "CMS 2015 Achievement Award" - the annual Achievement Awards honor individuals who have distinguished themselves by performing significant and lasting contributions to different components of the CMS experiment.
- Served as Deputy Coordinator of the CMS Hadron Calorimeter operations group (10-15 students, engineers, scientists), responsible for commissioning, maintenance and other operational aspects (e.g. fixing problems during data-taking period) of all the components of the detector system.
- Contributed to on-call rotations for prompt response. Chaired weekly Hcal Operations meetings. Delivered weekly status reports during the overall CMS experiment operations progress meetings. Trained newcomers. Collaborated with other sub-detectors solving various operational problems.

### Graduate Research/Teaching Assistant

2014-Current

**CMS Experiment @CERN, Geneva, Switzerland** • **The University of Iowa, Iowa City, IA, USA**

- **Big Data** Analyses, e.g. **Higgs Boson** Searches. Employed various HPC and HTC facilities (e.g. Fermilab, UI, CERN)
- Design, construction and analysis of **Monte Carlo** Simulations of Particle Detectors using **Geant4**
- Teaching undergraduate physics labs and discussion sections

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## Education

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### PhD in Physics

2012-2017

*The University of Iowa, Iowa City, IA, USA*

- Thesis Title, "Search for the Standard Model Higgs Boson in the  $\mu^+\mu^-$  decay channel in pp collisions at  $\sqrt{s} = 13$  TeV in CMS, Calibration of CMS Hadron Forward Calorimeter and Simulations of Modern Calorimeter Systems"

### BA Physics and Mathematics; Cum Laude

2009-2012

*Coe College, Cedar Rapids, IA, USA*

- *Minor in Computer Science*
- Dean's List Spring 2010 & Fall 2010

## Department of Cybernetics

*Moscow Engineering Physics Institute, Moscow, Russia*

2008-2009

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# Programming Skills

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## Languages/etc - Experienced

*C/C++/STL/Boost/OpenMP/MPI/tbb/CUDA/pthreads/OpenCL/SYCL • Scala • Python • SQL • bash*

## Languages/etc - Familiar

*asm • Java • Go • Rust • php • Exilir/Erlang*

## Version Control

*git/mercurry*

## Big Data/Machine Learning

*Apache Spark/MapReduce • HDFS • ROOT • TensorFlow/Keras/Scikit-Learn/Graphlab*

## Hardware Design/FPGAs - Familiar

*Verilog/HLS • Xilinx Vivado/Cadence Xcelium • OpenCL*

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# Athletic Activities

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## Volunteer Assistant Tennis Coach

*The University of Iowa Hawkeyes Men's Tennis Team, NCAA Division 1*

2013-2014

## Student Athlete

*Coe College, Varsity Men's Tennis Team, NCAA Division 3*

- IIAC Team Champion (2012)
- NCAA Regionally Ranked in Singles (2011, 2012)
- IIAC All-Conference (2009, 2011, 2012)
- IIAC Conference Champion (2009, 2010, 2011, 2012)
- Team Captain (2011, 2012)

2009-2012

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# Selected Publications & Presentations

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- "CMS Hcal Reconstruction with GPUs"  
"CMS HCal DPG Meeting", CERN, Nov. 2019, [presentation link](#)
- "CMS Ecal Reconstruction with GPUs"  
"CMS ECAL DPG Meeting", CERN, Oct. 2019, [presentation link](#)
- "HEP Data Processing with Apache Spark"  
"Spark Summit", London, Oct. 2018, [youtube talk/presentation](#)
- "Integrating ROOT I/O with Apache Spark"  
"ROOT Users' Workshop", Sarajevo, Sep 2018, [presentation link](#)
- "spark-root: ROOT I/O for JVM and Applications for Apache Spark"  
"ROOT I/O Workshop", CERN, Feb 2017
- "10B NMR Powder Pattern Optimized for Distribution of the Quadrupole Parameters"  
"Borate 2011: 7th International Conference on Borate Glasses, Crystals and Melts" Halifax, NS Canada
- M. Cremonesi et al., "Using Big Data Technologies for HEP Analysis", EPJ Web Conf. 214 (2019) 06030, arXiv: <http://arxiv.org/abs/1901.07143>
- O. Gutsche et al., "CMS Analysis and Data Reduction with Apache Spark", J. Phys. Conf. Ser. 1085 (2018) 042030, arXiv: <http://arxiv.org/abs/1711.00375>
- A.M. Sirunyan, ..., V. Khristenko et al., "Search for the Higgs Boson Decaying to Two Muons in Proton-Proton Collisions at  $\sqrt{s} = 13$  TeV", Physical Review Letters, 14 January 2019, <https://doi.org/10.1103/PhysRevLett.122.021801>
- V. Khristenko et al., "SpectraFit: A New Program to Simulate and Fit Distributed 10B Powder Patterns: Application to Symmetric Trigonal Borons.", Phys. Chem. Glasses: Eur. J. Glass Sci Technol. B, June 2012, 53 (3), 121-127.
- U. Akgun, ..., V. Khristenko et al., "Characterization of 1800 Hamamatsu R7600-M4PMTs for CMS HF Calorimeter upgrade", Journal of Instrumentation, 2014 JINST 9 T06005

- M. Dettmann, ..., V. Khristenko et al., accepted for publication, “Radiation Hard Plastic Scintillators for a New Generation of Particle Detectors”, JINST\_023P\_0716
- U. Akgun, ..., V. Khristenko et al., “Quartz Plate Calorimeter Prototype with Wavelength Shifting Fibers”, Journal of Instrumentation, JINST 002P 0412, 2012
- A. Albayrak-Yetkin, ..., V. Khristenko “Secondary Emission Calorimetry: Fast and Radiation-Hard”, Snowmass White Paper, arXiv: 1307.8051.