Viktor Khristenko

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- *Github*   https://github.com/vkhristenko
- **Languages** Russian(native) • English(native fluency) • French(B1)

Professional Activities

Fellow   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. Contributed to the development and validation of one of the applications, **CMS Experiment data processing**. Provided technical feedback to system architects to select and/or build/assemble hardware/software components that allow applications make efficient use of the system.

- **Big Data with Apache Spark**.
  https://www.youtube.com/watch?v=JTMdkSmwOKc Developed 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.
  Dev Stack: scala/java, python, numpy/scipy, Apache Spark, Hadoop

- **High Performance/Throughput Computing with GPUs**.
  Ported existing CPU based (x86) CMS Hadron and Electromagnetic Calorimeters workflows to CUDA and optimized to target Nvidia GPUs. Achieved 2-4x improvement in throughput using GPU based systems over currently used CPU systems for Real-time Data processing at CMS experiment.
  Dev Stack: C++, CUDA, OpenCL, OpenMP, MPI, python, tbb, ...

- **HPC/HTC with FPGAs**.
  Ported of CPU based (x86) workloads to Intel FPGAs (Arria 10).
  Dev Stack: C++, OpenCL, Intel OneAPI

- **Hardware/Software Engineering**.
  Testing and Validating 10G Network Stack implementation (arp, ipv4, icmp, udp, tcp, etc...) IPs using Xilinx VCU118.
  Dev Stack: Xilinx Toolchain, Vivado HLS, C++, Verilog/System Verilog

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 Student/Teaching Assistant   2012-2017

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

- **Big Data Analytics**.
  Performed data analysis over data collected at Large Hadron Collider, e.g. **Higgs Boson** Searches. Employed various HPC and HTC facilities (e.g. Fermilab, UI, CERN)

- **Physics Simulations, Math Modeling**.
  Design, construction and analysis of **Monte Carlo** Simulations of Particle Detectors using **Geant4**. Mathematical modeling of various physical processes.

- Teaching undergraduate physics labs and discussion sections

Education

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 2008-2009
Moscow Engineering Physics Institute, Moscow, Russia

Programming Skills

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/mercury
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

Athletic Activities

Volunteer Assistant Tennis Coach 2013-2014
The University of Iowa Hawkeyes Men's Tennis Team, NCAA Division 1

Student Athlete 2009-2012
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)

Selected Publications & Presentations

- "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.