

# Konstantin BURLACHENKO

## Ph.D. student in CS program, CEMSE division at KAUST

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I have created Systems for Machine Learning, AI, Computer Graphics, Computer Vision, Computational Physics via fully exploiting hardware via domain-specific languages and via using contemporary areas of various fields of Applied Math and Computer Science. My current focus is Federated Learning, the area that my advisor has proposed in 2016 with his peers "*Federated Learning: Strategies for Improving Communication Efficiency*", which will be the next big breakthrough in Machine Learning for society.

## EDUCATION

2020-Now	Saudi Arabia : Ph.D. program in <a href="#">CS Program at King Abdullah University of Science and Technology</a> under supervision of prof. <a href="#">P.Richtárik</a> . Awards : Dean's Award 2019, KAUST. Transcript : <a href="#">Link-1</a>
2015-2019	USA (remote) : Graduate Program. Leland Stanford Jr. University, Stanford, USA. Transcript : <a href="#">Link-2</a>
2015-2018	USA (remote) : Leland Stanford Jr. University, Stanford, USA. Data, Models and Optimization Graduate Certificate : <a href="#">Link-3</a> . Program Description : <a href="#">Link-4</a>
2016 - 2019	USA (remote) : Leland Stanford Jr. University, Stanford, USA. Artificial Intelligence Graduate Certificate : <a href="#">Link-5</a> . Program Description : <a href="#">Link-6</a>
2003-2009	Russia : Master Degree in Computer Science and Control Systems. Bauman Moscow State Technical University, Russia. Transcript evaluated by <a href="#">World Education Service</a> : <a href="#">Link-7</a>
Shools and Conferences	<a href="#">Regularization Methods for ML 2021</a> ( Certificate ); <a href="#">The PRAIRIE/MAI AI summer school 2021</a> ( Certificate ); <a href="#">ICML-2021</a> ( Certificate ); <a href="#">Oxford ML Summer School-2021</a> ( Certificate )

## SELECTED PAPER AND NOTES

FL_PYTORCH : OPTIMIZATION RESEARCH SIMULATOR FOR FEDERATED LEARNING	2021
<a href="https://dl.acm.org/doi/abs/10.1145/3488659.3493775/">https://dl.acm.org/doi/abs/10.1145/3488659.3493775/</a> Accepted for presentation and publication to 2nd Workshop on Distributed Machine Learning (co-located with CoNEXT 2021)	
MARINA : FASTER NON-CONVEX DISTRIBUTED LEARNING WITH COMPRESSION	2021
<a href="https://arxiv.org/abs/2102.07845">https://arxiv.org/abs/2102.07845</a> Accepted for presentation and publication to Thirty-eighth International Conference on Machine Learning (ICML 2021)	
PERSONALIZED FEDERATED LEARNING WITH COMMUNICATION COMPRESSION	2021
E. Bergou, A. Dutta, K. Burlachenko, P. Kalnis and P. Richtárik	
NOTE : MAIN MATH MODELS IN AREA OF INTEREST OF MACHINE LEARNING	2018
<a href="https://sites.google.com/site/burlachenkok/articles/main-math-models-in-area-of-interest-of-machine-learning">https://sites.google.com/site/burlachenkok/articles/main-math-models-in-area-of-interest-of-machine-learning</a>	
NOTE : ABOUT BOOK A.N.KOLOMOGOROV, S.V.FOMIN INTRODUCTORY REAL ANALYSIS	2020
<a href="https://sites.google.com/site/burlachenkok/articles/notes-about-the-book-of-ankolomogorovsvfomin">https://sites.google.com/site/burlachenkok/articles/notes-about-the-book-of-ankolomogorovsvfomin</a>	
NOTES ABOUT VARIOUS ASPECTS IN ML, AI, CS, OPTIMIZATION, PROGRAMMING LANGUAGES, PHYSICS, APPLIED MATH	2010-2021
<a href="https://sites.google.com/site/burlachenkok/articles">https://sites.google.com/site/burlachenkok/articles</a>	

## PRESENTATIONS

DEC-2021	A session talk in DistributedML2021 : FL_PyTorch : Optimization Research Simulator for Federated Learning.
JULY-2021	Poster and spotlight for in ICML-2021 : MARINA Faster Non-Convex Distributed Learning with Compression
APR-2021	Poster presentation at <a href="#">Communication Efficient Distributed Optimization at NSF-TRIPODS Workshop</a> .
FEB-2020	Moscow, Russia. Speaker in <a href="#">OpenTalks.AI conference : Huawei technologies for AI developers</a>
JULY-2019	Sochi, Russia. Educational center <a href="#">Sirius</a> : Deliver one month Deep Learning course with <a href="#">D.Kamzolov</a>
DEC-2018	MIPT(Moscow Institute of Physics and Technologies). Deliver guest lectures about subtle things around Decision Trees. Slides : <a href="#">Slides in github</a> . Presentations : <a href="#">Presentation 1 record</a> , <a href="#">Presentation 2 record</a> .
APR-2016	<a href="#">GTC 2016, San Jose, USA</a> : Presenter in <a href="#">Driveworks</a> NVIDIA Booth
AUG-2012	<a href="#">ACM SIGGRAPH 2012, Los Angeles, USA</a> : Presenter in <a href="#">CentiLeo</a> Booth.

## COMPETENCES

General Programming Languages that I have used	C89/C99, C++14/11/03, C#, Python, Cython, Bash, Perl, x386/ARM, Java
DSL Programming Languages that I have used	GL SL, TVM, Google Protobuf, CUDA, OpenCL, Matlab, R, SQL
Frameworks	Qt, CUDA, WinApi, Posix, OpenGL, OpenCL, PyTorch, TensorFlow
Selected open-source libraries	Numpy, CvxPy
Operating Systems	Windows, Linux based, Orbis, Xbox, Android, NDA OS-es
Development Environments	QtCreator, Visual Studio, Eclipse, WinDbg, Android Studio, TexStudio, Nsight
General purpose development tools	SysInternals, AqTime, Cmake, GNU Toolchain, CppCheck, Valgrind, Git, QMake
Markup and Type Languages	Latex, HTML, XML, Markdown
Areas of interest	Federated Learning, Stochastic Distributed Math Optimization, Computer Science, Machine Learning, AI, Computer Vision, System Programming, GPU Programming, Distributed Systems, Convex Optimization, Non Convex Optimization
Examples of own Projects	Provided under request. I have personal projects from 100 lines to 100K lines.
Recommendations from co-workers on recent projects	Provided under request
Sport achievements	Candidate for master of sport in chess by FIDE.

## PROFESSIONAL EXPERIENCE

August 2020 March 2019	<b>Principal Lead Engineer   Foundation AI Lab, HUAWEI, Moscow</b> <ul style="list-style-type: none"><li>► R&amp;D in internal ML/DL middleware for <a href="#">HUAWEI HiSilicon</a></li><li>► R&amp;D in internal projects in ML/DL middleware for <a href="#">HUAWEI Consumer Business Group</a></li><li>► Preseting HiSilicon solutions internally and externally.</li></ul> <div>Math Optimization AI Machine Learning C++ Python TVM Java Google Protobuf CMake Qt TensorFlow</div>
March 2019 July 2014	<b>Senior Developer Technology Engineer, NVIDIA, Moscow</b> <p>Created and supported different modules in middleware software before it tends to be open source.</p> <ul style="list-style-type: none"><li>► <a href="#">Driveworks SDK</a> - computer vision, machine learning, calibration, egomotion</li><li>► <a href="#">PhysX/Apex SDK</a> - physics simulation, graphical special effects .</li><li>► <a href="#">cuDNN/cuBLAS</a> libraries - GPU computation, machine learning</li><li>► <a href="#">RAPIDS</a> project - GPU based classical Machine Learning Framework</li></ul> <div>CUDA GLSL C++ SSE2/ARM NEON Linux Windows PS4 Xbox OpenGL Google Tests GitLab Perl Python CMake Make Qt Git TensorFlow Computer Vision Graphics Deep Learning CppCheck</div>
July 2014 May 2013	<b>Senior Developer Engineer   Yandex Video Team, YANDEX, Moscow</b> <p>Yandex is one of the available general-purpose web search engines in the world. I worked in a video search.</p> <ul style="list-style-type: none"><li>► Text and statistical machine learning features for Yandex video search <a href="http://video.yandex.ru">http://video.yandex.ru</a></li><li>► Infrastructure to store static aspects web document with embedded video</li><li>► Statistical analysis in several billions web documents with embedded video in MapReduce</li><li>► Infrastructure to show plots for internal team's processes</li></ul> <div>C++ Google Protobuf JavaScript Bash Python Computer Science HTML SVN MapReduce Decision Trees</div>
April 2013 March 2012	<b>Lead Physics Engine Developer, FITTING REALITY, Moscow</b> <p>CEO Inga Nakhmanson can prove that I brought big value to the project and company. I have left due to the stopped financial support of a startup company.</p> <ul style="list-style-type: none"><li>► Develop library for clothing simulation started with CUDA</li><li>► Migrate cloth simulation library to OpenCL</li><li>► Adapt to use this library for Ogre.</li><li>► Custom render engine for clothing visualizatio <a href="https://yadi.sk/d/tytygxSIYP62Tr">https://yadi.sk/d/tytygxSIYP62Tr</a></li><li>► Carry internal math/cs trainings</li></ul> <div>C++ OpenGL GLSL Qt Linux Windows QMake CUDA OpenCL Physics Computer Graphics gDebugger</div>
March 2012 September 2010	<b>Software Developer Engineer, ACRONIS, Moscow</b> <p>Acronis invited B.Stroustrup author of C++ to give an advanced series of lectures about C++ which gave me additional great knowledge on the subject.</p> <ul style="list-style-type: none"><li>► Low-level debugging in a big codebase</li><li>► Key member of GUI team for <a href="#">Acronis Backup and Recovery 2011 Enterprise</a></li></ul> <div>C++ C Windows WinDbg VmWare Specialized GUI library SVN SysInternals Suite AppVerifier CppCheck</div>

September 2010 March 2009	<b>Senior Software Developer Engineer, CAPITAL RESEARCH, Moscow</b> Left company due to that financial support of startup have starts be problematical. CEO Kirill Garanzha can prove that I was up to last moments. ▶ Developed Firefox plugin to create the three-dimensional HTML view for basics HTML elements Firefox C++ Windows HTML CSS Windows OpenGL GLSL
June 2009 December 2006	<b>C++ Programming Engineer, FLINT AND CO, Moscow</b> ▶ Created several computer games with computer vision and graphics part, hardware drivers ▶ Trips to customers C++ SDL Linux Windows Development Image Library Low level programming Computer Vision OpenGL SVN
November 2006 March 2006	<b>C++ Programming Engineer, ASTRASOFT TECHNOLOGY, Moscow</b> <i>Left company due no interconnection with my education in 2006</i> ▶ Developed visual elements of management system based on Qt and OpenGL C++ Qt Windows OpenGL SVN

## SOME OWN PROJECTS

<b>MATH OPTIMIZATION RESEARCH STUDIO</b> <a href="https://bitbucket.org/konstantin_burlachenko/opt_studio">https://bitbucket.org/konstantin_burlachenko/opt_studio</a> <a href="#">Project report Math Optimizaiton Research Studio</a> CS380 : Math Optimization Research Studio. C++ Linux Windows CUDA CMake	2020
<b>EXPERIMENTAL NEURAL NET FRAMEWORK</b> <a href="https://sites.google.com/site/burlachenkok/stanford-cs230-experimental-neural-net-framework">https://sites.google.com/site/burlachenkok/stanford-cs230-experimental-neural-net-framework</a> <a href="#">Poster Presentation Session, CS230 - 2019</a> <a href="#">4 minute presentation</a> <a href="#">bitbucket repo</a> CS230 : Experimental Neural Net Framework done under mentoring of Steven Ziqui Chen (stevenzc@stanford.edu) C++ Linux Windows CUDA Python CMake	2019
<b>CONVEX OPTIMIZATION SOLVERS WITH LEVERAGING INTO GPU/CPU POWER FOR AI/ML</b> <a href="https://sites.google.com/site/burlachenkok/convex-optimization-solvers-with-leveraging-into-gpucpu-power-for-aiml">https://sites.google.com/site/burlachenkok/convex-optimization-solvers-with-leveraging-into-gpucpu-power-for-aiml</a> <a href="#">Poster Presentation Session, CS221 - 2018</a> <a href="#">bitbucket repo</a> CS221 : Convex optimization solvers with leveraging into GPU/CPU power for AI/ML under mentoring of Steven Diamond <a href="http://web.stanford.edu/~stevend2/">http://web.stanford.edu/~stevend2/</a> C++ Linux Windows CUDA Python CMake Convex Optimization	2018
<b>CONVEX OPTIMIZATION FOR MACHINE LEARNING</b> <a href="https://sites.google.com/site/burlachenkok/articles/cvx4ml">https://sites.google.com/site/burlachenkok/articles/cvx4ml</a> <a href="#">Poster Presentation Session, CS229 - 2017</a> <a href="#">4 minute presentation</a> Stanford, CS229 : Convex Optimization for Machine Learning C++ Visual Studio Numerical Linear Algebra Convex Optimization Python CMake	2017
<b>ADVACNED TOOL TO PLOT DATA</b> <a href="#">40 minute presentation</a> <a href="https://github.com/burlachenkok/plotter_plusplus">github.com/burlachenkok/plotter_plusplus</a> This is an advanced plotter tool which receives commands over the network TCP connection. Goal of this program is to assist debugging and development process. It have been written in C++ and it use Qt Framework 5.7.* as only one external library. C++ Linux Windows Embedded Systems Qt Python	2017
<b>LANE DETECTION USING FOURIER BASED LINE DETECTOR</b> <a href="http://web.stanford.edu/class/cs231a/prev_projects_2016/final_konstantin_burlachenko.pdf">http://web.stanford.edu/class/cs231a/prev_projects_2016/final_konstantin_burlachenko.pdf</a> <a href="#">10 minute presentation</a> Lane detection from several image input videostream. Matlab	2016

## “ REFERENCES

### Andrew Ng

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