Konstantin BURLACHENKO
Ph.D. student in Computer Science program, CEMSE division at KAUST

@ burlachenkok@gmail.com   @ konstantin.burlachenko@kaust.edu.sa   S skypeid : bruziuz

stackoverflow.com/bruziuz   in linkedin.com/in/burlachenkok   twitter.com/burlachekok

bitbucket.org/bruziuz   github.com/burlachenkok

i Homepage : https://burlachenkok.github.io/

I have created state-of-the-art systems for Machine Learning, Computer Graphics, Computer Vision, and Computational Physics, exploiting hardware via DSL and using contemporary areas of Applied Math and CS. My current focus is Federated Learning, the branch of ML co-invented by my advisor in 2016 [1] which will be the next big step of Machine Learning.

🎓 EDUCATION

2020-Now	Saudi Arabia : Ph.D. program in CEMSE/CS Program at King Abdullah University of Science and Technology. Member of Prof. Peter Richtárik's Optimization and Machine Learning Lab inside KAUST AI initiative. *Awards :* Dean's Award 2019, KAUST. Transcript : Link-1. *GPA : 3.81/4.0*
2015-2019	USA, Stanford : Graduate Non-Degree Program. Transcript : Link-2. *GPA : 3.96/4.3*
2015-2018	USA, Stanford : Data, Models and Optimization Graduate Certificate Link-3 (Program)
2016 - 2019	USA, Stanford : Artificial Intelligence Graduate Certificate Link-4 (Program)
2003-2009	Russia, Bauman Moscow State Technical University : Master Degree (Bologn process equivalent) in Computer Science and Control Systems. *GPA : Not Applicable/Conversion is needed.* (Original scans)
Conferences	ICML-2021 (Certificate) ; NeurIPS-2021 (Certificate) ; ACM CoNEXT 2021(Certificate) ; ACM SIGGRAPH 2012.
Summer Schools	Regularization Methods for ML 2021 (Certificate) ; The PRAIRIE/MIAI AI summer school 2021 (Certificate) ; Oxford ML Summer School-2021(Certificate) ; The HSE/MIPT/Sirius Optimization without Border.

✏️ PAPERS

FEDERATED OPTIMIZATION ALGORITHMS WITH RANDOM RESHUFFLING AND GRADIENT COMPRESSION   2022
🔗 https://arxiv.org/abs/2206.07021

SHARPER RATES AND FLEXIBLE FRAMEWORK FOR NONCONVEX SGD WITH CLIENT AND DATA SAMPLING   2022
🔗 https://arxiv.org/abs/2206.02275

FASTER RATES FOR COMPRESSED FEDERATED LEARNING WITH CLIENT-VARIANCE REDUCTION   2021
🔗 https://arxiv.org/abs/2112.13097

FL_PYTORCH : OPTIMIZATION RESEARCH SIMULATOR FOR FEDERATED LEARNING   2021
🔗 https://arxiv.org/abs/2202.03099   🔗 https://dl.acm.org/doi/abs/10.1145/3488659.3493775/
Accepted for presentation and proceedings to 2nd ACM International Workshop on Distributed Machine Learning

MARINA : FASTER NON-CONVEX DISTRIBUTED LEARNING WITH COMPRESSION   2021
🔗 https://arxiv.org/abs/2102.07845   🔗 https://proceedings.mlr.press/v139/gorbunov21a.html
Accepted for presentation and proceedings 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

🧍 PRESENTATIONS

MAR-2022	Rising Stars in AI Symposium KAUST : FL_PyTorch : Optimization Research Simulator for Federated Learning
DEC-2021	Session in ACM 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 Communication Efficient Distributed Optimization at NSF-TRIPODS Workshop.
FEB-2020	Moscow, Russia. Speaker in OpenTalks.AI conference : Huawei technologies for AI developers.
JULY-2019	Sochi, Russia. Educational center Sirius : Deep Learning Course with D.Kamzolov.
DEC-2018	MIPT(Moscow Institute of Physics and Technologies) : Two guest lectures about subtle things around Decision Trees. Slides : Link. Presentions : Session-#1, Session-#2.
APR-2016	GTC 2016, San Hose, USA : Presenter in Driveworks NVIDIA booth.
AUG-2012	ACM SIGGRAPH 2012, LosAngeles, USA : Presenter in CentiLeo booth.

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1. *Federated Learning : Strategies for Improving Communication Efficiency [J.Konečný, H.B.McMahan, F.X.Yu, P.Richtarik, A.T.Suresh, D.Bacon, NIPS 2016]*

≡ Competences

General Programming Languages that I have used	C89/C99, C++20/11/03, C#, Python, Cython, Bash, Perl, x86/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,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, AI, Computer Vision, Statistical/Machine Learning, System Programming, GPU Programming, Convex/Non Convex Math Optimization, Differential Privacy, Computer Graphics, Computational Physics, Datamining, Distributed Systems.
Recomendations from co-workers	Provided under request
Sport achievements	The Candidate Master in chess by FIDE. (My FIDE profile).

💼 Experience

August 2021

Research Scientist Intern (AI) offer, Facebook Inc., USA, Menlo Park
After passing competitive interviews I have read several papers that Dr. Hao-Jun Michael Shi has recommended. We had several discussions and we've selected the research topic that is important to the company and at the same time for my Ph.D. The internship has not happened due to the absence of a J1 VISA.

`Distributed Math Optimization` `AI` `Federated Learning`

Now
September 2020

CS Ph.D. student and a member of prof. Peter Richtárik's Optimization and ML Lab, KAUST, KSA
▶ Narrow area of research is Federated Learning(FL), Stochastic Distributed Math Optimization for AI.
▶ Broad area of my scientific interests : Math Optimization, AI, FL, Graphics and Vision, Control.

`Distributed Math Optimization` `Federated Learning` `Applied Math` `C/C++` `Python` `Qt` `PyTorch` `TF` `Latex` `Computer Vision`

August 2020
March 2019

Principal Lead Engineer | Foundation AI Lab, HUAWEI, Moscow
▶ R&D in internal classical Machine Learning and Deep Learning middleware for HUAWEI HiSilicon
▶ Present HiSilicon solutions for engineers, scientists working with ML/AI. OpenTalks.AI, HUAWEI News
▶ R&D in internal projects in Machine Learning HUAWEI Consumer Business Group

`Math Optimization` `AI` `Custome ISA` `C/C++` `Python` `TVM` `Java` `Google Protobuf` `CMake` `Qt` `TF` `SQL`

March 2019
July 2014

Senior Developer Technology Engineer, NVIDIA, Moscow
▶ Driveworks SDK - SDK for self-driving cars adopted by automotive partners. Computer vision, machine learning, calibration, egomotion. Implementation and presentation of the modules internally.
▶ PhysX/Apex SDK - An industry standard for game physics simulation, graphical special effects. Internal implementation and communication with extra customers (Blizzard).
▶ cuDNN/cuBLAS libraries - GPU computation libraries used by more than 1M customers in machine learning and HPC. Implementation, Documentation, and collaboration with Mathworks.
▶ RAPIDS - GPU based implementation of SkLearn, XgBoost, Pandas. I was resnposible for SkLearn.

`CUDA` `GLSL` `C++` `AARCH64` `SSE2/ARM NEON` `Linux` `Windows` `PS4` `XBox` `OpenGL` `Google Tests` `GitLab` `Perl` `Python` `CMake` `Make` `Qt` `Git` `TensorFlow` `Computer Vision` `Graphics` `Deep Learning` `CppCheck`

July 2014
May 2013

Senior Developer Engineer | Yandex Video Team, YANDEX, Moscow
▶ Text and statistical machine learning features for Yandex Video Search.
▶ Infrastructure for storage and analysis of all web documents with embedded video on the WWW
▶ Infrastructure to show plots for internal team's processes

`C++` `Google Protobuf` `JavaScript` `Bash` `Python` `Computer Science` `HTML/JS/CSS` `SVN` `MapReduce` `ML`

April 2013
March 2012

Lead Physics Engine Developer, FITTING REALITY, Moscow
▶ Develop library for clothing simulation in CUDA and in OpenCL with facade interface to C++/C#.
▶ Custom render engine for clothing visualization compatible with OpenGL 1.2. Demo.
▶ Prepare elements of the demo to investors. Carry internal MATH/CS/PHYS trainings.

`C++` `C` `OpenGL` `GLSL` `Qt` `Posix` `WinAPI` `QMake` `CUDA` `OpenCL` `Physics` `Graphics` `gDebugger` `C#`

March 2012
September 2010

Software Developer Engineer, ACRONIS, Moscow
▶ Key member of GUI team for Acronis Backup and Recovery 2011 Enterprise
▶ Profiling and optimization of the codebase working in user/kernel space for Windows OS.

`C++` `C` `WinAPI` `WinDbg` `VmWare` `Specialized GUI library` `SVN` `SysInternals` `CppCheck` `ASM x86` `AqTime`

September 2010 March 2009	**Senior Software Developer Engineer, CAPITAL RESEARCH, Moscow** ▶ Developed Firefox plugin to create the three-dimensional HTML view for basics HTML elements. ▶ The startup terminated. CEO Kirill Garanzha can provide information about my work. `Firefox` `C++` `WinAPI` `HTML/JS/CSS` `Windows` `OpenGL` `GLSL` `SVN`
June 2009 December 2006	**C++ Programming Engineer, FLINT AND CO, Moscow** ▶ Created several computer games with computer vision and graphics part, hardware drivers. ▶ Spent time on factory floors to test and analyze the quality of my solutions. Carry trips to customers. `C++` `SDL` `Posix` `WinApi` `Development Image Library` `Low level programming` `Computer Vision` `OpenGL` `SVN`
November 2006 March 2006	**C++ Programming Engineer (Part time work), ASTRASOFT TECHNOLOGY, Moscow** ▶ Developed visual elements of management system based on Qt and OpenGL. `C++` `Qt` `Windows` `OpenGL` `SVN`

🖥 SELECTED PERSONAL PROJECTS

MATH OPTIMIZATION RESEARCH STUDIO   2020
🔗 Project report - Math Optimizaiton Research Studio   🔗 Description   🔗 Bitbucket repo
CS380 : Math Optimization Research Studio.
`C++` `Linux` `Windows` `CUDA` `CMake` `Dot` `Google Test` `Python` `Bash`

EXPERIMENTAL NEURAL NET FRAMEWORK   2019
🔗 Report.CS230 - 2019   🔗 Project description   🔗 Poster CS230 - 2019   🔗 bitbucket repo   🔗 Presentation
CS230 : Experimental Neural Net Framework. (Mentor : Steven Z. Chen(stevenzc@stanford.edu))
`C++` `Linux` `Windows` `CUDA` `Python` `CMake`

CONVEX OPTIMIZATION SOLVERS WITH LEVERAGING INTO GPU/CPU POWER FOR AI/ML   2018
🔗 Description   🔗 Poster CS221 - 2018   🔗 Bitbucket repo
CS221 : Convex optimization solvers with leveraging into GPU/CPU power for AI/ML. Mentor : Steven Diamond
`C++` `Linux` `Windows` `CUDA` `Python` `CMake` `Convex Optimization`

CONVEX OPTIMIZATION FOR MACHINE LEARNING   2017
🔗 Poster CS229 - 2017.   🔗 Description   🔗 Presentation
Stanford, CS229 : Convex Optimization for Machine Learning
`C++` `Visual Studio` `Numerical Linear Algebra` `Convex Optimization` `Python` `CMake`

PLOTTER++. STANDALONE TOOL FOR PLOT IMAGES, GRAPHS, POINT CLOUDS, TEXT LOGS VIA OBTAINING DATA FROM TCP/IP   2017
🔗 github.com/burlachenkok/plotter_plusplus   🔗 Presentation
This is an advanced plotter tool that receives commands over the network TCP connection. The goal is to assist debugging and development process. It has been written in C++, and it uses Qt Framework 5.7.* as only one external library.
`C++` `Linux` `Windows` `Embedded Systems` `Qt` `Python`

LANE DETECTION USING FOURIER BASED LINE DETECTOR   2016
🔗 Report   🔗 Presentation
Lane detection from input videostream.
`Matlab`

💬 REFERENCES

Andrew Ng
Assistant Professor, STANFORD, LETTER
@   ang@cs.stanford.edu
📞   +1 (650)725-2593

Timout Paltashev
AMD and Core faculty, NORTHWESTERN POLYTECHNIC UNIVERSITY, LETTER
@   Timour.Paltashev@amd.com
📞   +1 (408) 306 8508

Brad Osgood
Professor, STANFORD, UNDER REQUEST
@   osgood@stanford.edu
📞   +1 (650) 387-1287

Jerome H. Friedman
Professor, STANFORD, UNDER REQUEST
@   jhf@stat.stanford.edu
📞   +1 (650) 723-9329