

CV of Alexander Zhiliakov

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Major skills: Scientific computing, applied mathematics, numerical analysis, (unfitted) finite element methods, preconditioners, computational fluid dynamics, computational haemodynamics, Unix / Windows, git, HPC (slurm, PAPI / TAU, OpenMP, Trilinos, Intel MKL), cmake, C++ 11 / 17, FORTRAN, Wolfram Mathematica

Languages: Russian (first), English (fluent)

I ask and answer questions on scientific computing on [SciComp](#). You can follow my research on [ResearchGate](#) and [Google Scholar](#). My code contributions are available on [Github](#).

Experience

Summer 2020 **Student Placement**

[ExxonMobil](#) Upstream Research Company, Reservoir Simulation Section
Implementing & researching constrained mesh adaptation techniques for [hydrofrac](#) simulations
Contacts: Vadim Dyadechko (mentor), Dakshina Valiveti (teamlead)

2019 – **Graduate Research Assistant**

University of Houston, [Department of Mathematics](#)

Spring 2020 Researching higher order [trace FEM](#) discretizations for surface (Navier–)Stokes equations and performing qualitative / quantitative comparison of numerical and experimental data for [surface phase separation in bio-membranes](#)

Fall 2019 Designing & implementing robust solvers / preconditioners for surface Oseen-type problem discretized with trace FEM

Spring 2019 Implementing Taylor–Hood ($\mathbf{P}_2\text{--}P_1$) finite elements for trace FEM discretization of (Navier–)Stokes equations posed on a surface; Investigating inf-sup stability
Contacts: Maxim Olshanskii molshan@math.uh.edu (advisor), Arnold Reusken reusken@igpm.rwth-aachen.de, Annalisa Quaini quaini@math.uh.edu, Sheereen Majd smajd9@uh.edu, Vladimir Yushutin yushutin@math.uh.edu

2018 – 2019 **Graduate Research Assistant**

Los Alamos National Laboratory, [Applied Mathematics and Plasma Physics Group](#)

Summer 2019 Generalizing analysis & implementation of the [higher order approximate static condensation \(ASC\)](#) algorithm to 3D

Summer 2018 Improving accuracy of the [ASC](#) algorithm for multi-material diffusion problems in the mixed form posed on general polygonal meshes
Contacts: Daniil Svyatsky dasvyat@lanl.gov (mentor), Mikhail Shashkov shashkov@lanl.gov

2017 – **Teaching Assistant in Mathematics**

University of Houston, [Department of Mathematics](#)

Teaching, grading, and tutoring experience: Calculus I / II; Introduction to PDEs

Education

- 2017 – **PhD in Computational Science**
University of Houston, [Department of Mathematics](#)
Contacts: Maxim Olshanskii molshan@math.uh.edu (advisor), Ronald Hoppe rohop@math.uh.edu, Annalisa Quaini quaini@math.uh.edu, Yuri Kuznetsov kuz@math.uh.edu
- 2013 – 2017 **Bachelor of Computer Science**
Novosibirsk State Technical University, [Faculty of Applied Mathematics and Computer Science](#)
Contacts: Mikhail Balandin balandin@corp.nstu.ru (advisor), Marina Persova persova@ami.nstu.ru
- 2010 – 2012 **C++ Developer Qualification**
[Novosibirsk Design and Programming Academy](#)

Publications

6. *Experimental validation of a phase-field model to predict coarsening dynamics of lipid domains in multicomponent membranes*, A. Zhiliakov, Y. Wang, A. Quaini, M. Olshanskii, S. Majd *Biochimica et Biophysica Acta*, Jan 2021
5. *Error analysis of higher order trace finite element methods for the surface Stokes equations*, T. Junkuhn, M. Olshanskii, A. Reusken, A. Zhiliakov
Preprint, March 2020
4. *Inf-sup stability of the trace \mathbf{P}_2 - P_1 Taylor–Hood elements for surface PDEs*, M. Olshanskii, A. Reusken, A. Zhiliakov
AMS: Mathematics of Computation, Sep 2019
3. *A higher order approximate static condensation method for multi-material diffusion problems*, A. Zhiliakov, D. Svyatsky, M. Olshanskii, E. Kikinzon, M. Shashkov
Journal of Computational Physics, Oct 2019
2. *A higher order approximate static condensation method for multi-material diffusion problems*, A. Zhiliakov, D. Svyatsky, M. Olshanskii, E. Kikinzon, M. Shashkov
LANL report LA-UR-18-31169, Nov 2018
1. *Construction and implementation of physics-based preconditioners for problems of computational haemodynamics*, A. Zhiliakov
BCS Thesis, June 2017

Conferences and Talks

Unfitted finite element methods for fluid flows on surfaces

8. Talk @ [SIAM Conference on Computational Science and Engineering](#), Fort Worth, TX, 1–5 Mar 2021
 7. Talk @ [SIAM Texas-Louisiana Section Annual Meeting](#), virtual meeting hosted by Texas A&M University, 16–18 Oct 2020
- A higher order approximate static condensation method for multi-material diffusion problems*
6. Talk @ [Finite Element Rodeo 2020](#), Waco, TX, 28 Feb 2020

5. Talk by D. Svyatsky @ [MultiMat 2019: 9th International Conference on Numerical Methods for Multi-Material Fluid Flow](#), Trento, Italy, 13 Sep 2019
4. [Poster @ SIAM Conference on Mathematical & Computational Issues in the Geosciences](#), Houston, TX, 12 Mar 2019
3. Talk @ [SIAM Conference on Computational Science and Engineering](#), Spokane, WA, 27 Feb 2019
2. Talk @ [SIAM Texas-Louisiana Section Annual Meeting](#), Baton Rouge, LA, 7 Oct 2018

Multigrid techniques for solving elliptic problems

1. Talk @ [FAMCS NSTU Student Scientific Conference](#) on Numerical Modeling in Physics, Novosibirsk, Russia, Mar 2017

School Projects

4. *Non-linear support vector machines* (joint work with S. Oyeleye)
Lecture notes for “Mathematics of Machine Learning” class taught by Prof. D. Labate, Feb 2020
3. *Matrix-free finite element method* (joint work with K. Williams)
Final project for “Introduction to high-performance computing” class taught by Prof. L. Johnson, 10 Dec 2019
2. *Multigrid techniques for elliptic and not-that-elliptic problems*
Presentation for “Multigrid & domain decomposition methods” class taught by Prof. M. Olshanskii, 22 Apr 2019
1. *Anderson’s mixing for nonlinear magnetostatic Poisson problem*
Presentation for “Numerical linear algebra” class taught by Prof. M. Olshanskii, 28 Nov 2017

Software

This is the list of software I contributed to and /or used in my research.

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| DROPS | CFD tool for simulating two-phase flows (C++)
Used and augmented during Spring and Fall 2019 UH research assistantship for surface PDEs simulations |
| AMANZI | Multi-process HPC simulator (C++)
Used and augmented during Summer 2018 and Summer 2019 LANL research assistantship for implementation of the ASC method |
| TANGRAM | Framework for interface reconstruction in computational physics applications (C++)
Used (with minor contributions) during Summer 2019 LANL research assistantship for implementation of the moment-of-fluid interface reconstruction in 3D |
| CATS’ PDEs | Modern OOP toolkit for efficient implementation of typical FEM routines (C++, FORTRAN, and Mathematica)
Developed during 2016–2017 as a part of the BCS project |

September 20, 2020

https://www.math.uh.edu/~alex/alexander_zhiliakov_cv.pdf