



Svetlana Matculevich, PhD

curriculum vitae

Contact Details

Affiliation Geothermal Energy and Geofluids, Institute of Geophysics, ETH Zurich
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Github <https://github.com/mtsveta>

Education

- 10/2012 – 03/2016 **Candidate of Physical-Mathematical Science**, *St.Petersburg Department of Steklov Mathematical Institute*, St.Petersburg, Russia.
Thesis on 'Fully reliable a posteriori error control for evolutionary problems'.
07/2012 – 11/2015 **Doctor of Philosophy**, *University of Jyväskylä*, Jyväskylä, Finland.
Thesis on 'Fully reliable a posteriori error control for evolutionary problems'
09/2010 – 06/2012 **Master of Science in Mathematical Modeling and Informatics**, *Peter the Great Saint-Petersburg Polytechnic University*, St.Petersburg, Russia.
Thesis on 'Guaranteed error bounds for linear algebra problems and a class of Picard–Lindelöf iteration methods'.
10/2011 – 03/2012 **Master of Science in Information Technology**, *University of Jyväskylä*, Finland.
Thesis on 'Guaranteed error bounds for linear algebra problems and a class of Picard–Lindelöf iteration methods'.
09/2006 – 06/2010 **Bachelor of Science in Applied Mathematics and Informatics**, *Peter the Great Saint-Petersburg Polytechnic University*, St.Petersburg, Russia.

Work experience

- 12/2018 – **Post-Doctoral Associate**, *ETH Zurich, Institute of Geophysics, Geothermal Energy and Geofluids*, Zurich, Switzerland.
06/2016 – 11/2018 **PostDoc researcher**, *Johann Radon Institute for Computational and Applied Mathematics (RICAM), Austrian Academy of Sciences*, Linz, Austria.
10/2015 – 05/2016 **PostDoc researcher**, *University of Jyväskylä, Department of Mathematical Information Technology*, Jyväskylä, Finland.
06/2012 – 11/2015 **PhD researcher**, *University of Jyväskylä, Department of Mathematical Information Technology*, Jyväskylä, Finland.

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Geothermal Energy and Geofluids, Institute of Geophysics, ETH Zurich

- 10/2011 – 05/2012 **Research assistant**, *University of Jyväskylä, Department of Mathematical Information Technology*, Jyväskylä, Finland.
- 06/2011 – 09/2011 **Program coordinator**, *The Euler International Mathematical Institute*, St.Petersburg, Russia.
- 10/2010 – 02/2011 **Software developer**, *Yumasoft Software Development, Yuma-Developement LLC*, St.Petersburg, Russia.
- 10/2009 – 09/2010 **Software developer**, *GGA Software Service corp, 123 Service Co. Ltd*, St.Petersburg, Russia.

Publications

Peer-reviewed journal publications

On the a posteriori error analysis for linear Fokker-Planck models in convection-dominated diffusion problems, *S. Matculevich and M. Wolfmayr, Applied Mathematics and Computation*, 339, pp. 779–804, 2018, doi.

Functional approach to the error control in adaptive IgA schemes for elliptic boundary value problems, *S. Matculevich, Journal of Computational and Applied Mathematics*, 344, pp. 394–423, 2018, doi.

Fully reliable error control for evolutionary problems, *B. Holm and S. Matculevich, Comput. Math. Appl. (CAMWA)*, 75(4), pp. 1302–1329, 2018, doi.

Explicit constants in Poincaré-type inequalities for simplicial domains and application to a posteriori estimates, *S. Matculevich and S. Repin, Comput. Methods Appl. Math. (CMAM)*, 16(2), 2016, pp. 277–298, doi.

A posteriori error estimates for time-dependent reaction-diffusion problems based on the Payne–Weinberger inequality, *S. Matculevich, P. Neitaanmäki, and S. Repin, Discrete Contin. Dyn. Syst. - Series A*, 35(6), Springer, 2015, pp. 2659–2677, doi.

Computable estimates of the distance to the exact solution of the evolutionary reaction-diffusion equation, *S. Matculevich and S. Repin, Appl. Math. Comput.*, 247, Elsevier, 2014, pp. 329–347, doi.

Guaranteed error bounds for a class of Picard–Lindelöf iteration methods, *S. Matculevich, P. Neitaanmäki, and S. Repin, Numerical Methods for Diff. Eq., Opt., and Tech. Problems, Comput. Methods Appl. Sci., Springer Netherlands, Berlin*, 2013, pp. 151–168, doi.

Conference proceedings

Functional type error control for stabilised space-time IgA approximations to parabolic problems, *U. Langer, S. Matculevich, and S. Repin, Lecture Notes in Computer Science (LNCS)*, proceedings of the conference ‘Large-Scale Scientific Computing (LSSC 2017)’, 10665, Springer-Verlag, 2017, pp. 57–66.

Technical reports

Guaranteed and computable bounds of approximation errors for the semi-discrete Biot problem (submitted), *K. Kumar, S. Matculevich, J. Nordbotten, and S. Repin, arXiv, math.NA:1808.08036*, pp. 1–25, 2018.

Adaptive space-time isogeometric analysis for parabolic evolution problems (submitted), *U. Langer, S. Matculevich, S. Repin, arXiv, cs.NA:1807.05950*, pp. 1–38, 2018.

Guaranteed error control bounds for the stabilised space-time IgA approximations to parabolic problems (submitted), *U. Langer, S. Matculevich, S. Repin, arXiv, cs.NA:1712.06017*, pp. 1–24, 2017.

Experience

Academic

- 12/2018 – onwards **PostDoc researcher**, *ETH Zurich, Institute of Geophysics*, Zurich, Switzerland.
- 1) Research group 'Geothermal Energy and Geofluids', research project 'Reaktoro as the Chemical Reaction Solver in Shell's Reservoir Simulator'. Development and testing of the geochemical and reactive transport modeling capabilities of Reaktoro, an open-source C++/Python unified framework for modeling chemically reactive systems; <http://reaktoro.org/>.
 - 2) Develop codes for fast computations of thermodynamic and thermophysical properties of fluids and rocks.
- 06/2016 – 11/2018 **PostDoc researcher**, *Johann Radon Institute for Computational and Applied Mathematics (RICAM), Austrian Academy of Sciences*, Linz, Austria.
- 1) Research group 'Computational Methods for PDEs', research project 'Fully adaptive fast space-time IgA schemes for parabolic I-BVPs'. Development of the fully adaptive error estimator modules for the space-time IgA approximations and its integration in the open-source C++ library G+smo.
 - 2) Collaboration with University of Bergen, Norway, (CPRU-2015/10040) on 'A posteriori error estimates for a poroelastic medium'. Simulations are carried out using The FEniCS Project library (Python).
 - 3) Collaboration with University of Jyväskylä, Finland, on the 'A posteriori error estimates for Fokker-Planck equation' (The FEniCS Project library and Python).
 - 4) Collaboration with KHT, Sweden, on the 'The FEniCS Project: automated and fully adaptive error control for the evolutionary equation. Comparison of functional approach and DWR approach'.
- 10/2015 – 05/2016 **PostDoc researcher**, *University of Jyväskylä, Department of Mathematical Information Technology*, Jyväskylä, Finland.
- 1) Collaboration with University of Bergen (CPRU-2015/10040) on 'A posteriori error estimates for a poroelastic medium'.
 - 2) Organization of the CMAM-7 conference.
- 06/2012 – 11/2015 **Ph.D. researcher**, *University of Jyväskylä, Department of Mathematical Information Technology*, Jyväskylä, Finland.
- 1) Work in a research team 'Reliable Methods for Computer Simulation' on theoretical and practical aspects of the functional a posteriori error estimates and indicators for a class of evolutionary problems.
 - 2) Organisation of the conferences and workshops, e.g., AANMPDE'15, '14, '12, RMMM '13, including coordination of scientific and social conference programs, implementation of the conference web-pages, designing the official flyers, arranging invitation letters, certificates for participation, and other practical matters related to the conference.
 - 3) Coordination of courses during summer schools JSS 15', 14'.
- 10/2011 – 05/2012 **Research assistant**, *University of Jyväskylä, Department of Mathematical Information Technology*, Jyväskylä, Finland.
- 1) Work in a research group 'Reliable Methods for Computer Simulation' on the Master thesis.
 - 2) Developing the numerical solver for fully reliable error control for parabolic I-BVPs using MATLAB.
 - 3) Organization of 5th Summer school on Advanced numerical methods for PDE's and PDE-constrained optimization, 2-4.8.2012, Konnevesi, Finland.
- 06/2011 – 09/2011 **Program coordinator**, *The Euler International Mathematical Institute*, St.Petersburg, Russia. Organization of the conferences, coordination of foreign guests.

Industry

- 10/2010 – 02/2011 **Software developer**, *Yumasoft Software Development*, St.Petersburg, Russia.
- Veriforce Project*: evaluation training system application and insurance. Development and upgrade of Veriforce internal portal, automation of web-based application, i.e., business logic and services for the company's clients. Management of the project: formulation of use-cases based on analysis of the project requirements, functional modules design and ect. Development using ASP.NET/VB.NET (Windows Server2008 and MSSQL Server 2008), T-SQL and SQL.
- Training modules in Flash for Medical School students*. Development using Action Script and Flex.
- 10/2009 – 09/2010 **Software developer**, *GGA Software Service corp*, St.Petersburg, Russia.
- 123Service project*: implementation of the platform/portal '123Hosting: Hosting For Companies' providing clients with tools of building their own websites. Front-end development: .NET, VB.NET and JavaScript; back-end: T-SQL. Design: HTML, CSS. Flash applications development using Flex.

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Research activities

Conferences with talks

Special Semester on Computational Methods in Science and Engineering. Workshop 2: Space-Time Methods for PDEs, Linz, Austria, 2016.

7–8th Conference CMAM, Jyväskylä, Finland, 2016.

The ECCOMAS Congress 2016, Crete, Greece, 2016.

3–11th Workshops on AANPDEs, Finland, Austria, Russia, 2010–2017.

5–7th Conferences on RMMM, Finland, Switzerland, 2010–2015.

10–11th Conferences LSSC, Sozopol, Bulgaria, 2015, 2017.

27th Nordic Seminar on Comp. Mechanics, KTH, Stockholm, Sweden, 2014.

Research visits

University of Bergen, Norway, Joint collaboration with Prof. K. Kumar and Prof. J. Nordbotten, 'Poroelasticity group', 11.2016.

KTH Royal Institute of Technology, Sweden, Joint collaboration with B. Janssen, Computational Technology Laboratory lab, 10.05.2014 – 11.06.2014.

University of Zurich, Switzerland, Joint collaboration with Dr. T. Samrowski, group of Prof. S. Sauter, 28.10.2013 – 18.12.2013.

Center of excellence IT4 Innovations | VSB-Technical University of Ostrava, Czech Republic, Joint collaboration with Dr. rer. nat. Ing. J. Valdman, SPOMECH, 07.10.2012 – 10.11.2012.

Postgraduate schools

10/2013 – 05/2016 **FICS Graduate School**, unfunded.

06/2014 – 12/2015 **DELTA Graduate School**, unfunded.

07/2014 – 07/2015 **COMAS Graduate School**, funded.

06/2012 – 12/2013 **GETA Graduate School**, funded.

Organization of the conferences

7th Conference on Computational Methods in Applied Mathematics, University of Jyväskylä, Finland, 2016, <http://www.mit.jyu.fi/scoma/cmam2016/>.

8th Workshop on Analysis and Advanced Numerical Methods for PDEs (AANPDEs), Särkisaari, Finland, 2015, <http://www.mit.jyu.fi/scoma/AANPDE2015/>.

7th Workshop AANPDEs, St. Petersburg Department of V.A. Steklov Institute of Mathematics of the RAS, Russia, 2014, <http://www.mit.jyu.fi/scoma/AANPDE2014/>.

6th Workshop on Reliable Methods of Mathematical Modeling (RMMM), University of Jyväskylä, Finland, 2013, <http://www.mit.jyu.fi/scoma/RMMM2013/>.

3rd-5th Workshops on AANPDEs, Konnevesi, Finland, 2012, <http://www.mit.jyu.fi/scoma/AANPDE2012/>; EIM Institute, St.Petersburg, Russia, 2011; Koivuniemi, Finland, 2010.

Research support

07/2015 – 06/2016 **Suomalainen Tiedeakatemia**, grant.

07/2014 – 06/2015 **COMAS Graduate School**, salary.

01/2014 – 06/2014 **Ella and Georg Ehrnrooth Foundation**, grant.

06/2012 – 12/2013 **GETA Graduate School**, salary.

Awards

06/2016 **Finalist, Best Ph.D. Theses in the field of Computational Methods in Applied Sciences and Engineering Awards (Ph.D. Awards 2015)**, diploma.

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