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Bedřich Sousedík

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Education

Ph.D. in Applied Mathematics (May 2010), University of Colorado Denver, USA

- Dissertation title: *Adaptive-Multilevel BDDC*
- Advisor: Jan Mandel

M.S. in Applied Mathematics (December 2008), University of Colorado Denver, USA

Ph.D. in Mathematics in Civil Engineering (December 2008), Czech Technical University in Prague, Faculty of Civil Engineering, Czech Republic

- Dissertation title: *Comparison of some domain decomposition methods*
- Advisors: Ivo Marek, Jan Mandel

Ing. (M.Eng. equivalent) in Automatic Control and Engineering Informatics (August 2001), Czech Technical University in Prague, Faculty of Mechanical Engineering, Czech Republic

- Thesis title: *Mathematical model of the contractile apparatus of a cardiac cell* (in Czech)
- Advisor: Jan Soukup

Fields of Interest

applied & computational mathematics, numerical analysis, scientific computing, uncertainty quantification, finite element methods, domain decomposition, multigrid, automatic control

Professional Experience

Employment History

University of Maryland, Baltimore County

Department of Mathematics and Statistics

Associate Professor

Assistant Professor

July 2020 – present

August 2014 – June 2020

University of Maryland, College Park

Department of Computer Science

Research Associate

August 2013 – August 2014

University of Southern California

Viterbi School of Engineering

Department of Aerospace & Mechanical Engineering

Research Associate

August 2011 – May 2013

Department of Mathematics

Lecturer

January 2013 – May 2013

University of Colorado Denver

Department of Mathematical & Statistical Sciences

Professional Research Assistant

February 2004 – September 2004

Research and Teaching Assistant
Research Assistant Professor
Senior Software Engineer

August 2005 – May 2010
June 2010 – July 2011
January 2011 – July 2011

Other positions

Academy of Sciences of the Czech Republic

Institute of Computer Science

Research Assistant

July 2004 – December 2008

Institute of Thermomechanics

Visiting Researcher

years 2007 and 2009 – 2012

Edinburgh Parallel Computing Center, Scotland

University of Edinburgh

Visiting Researcher

April – June 2003

Bibliography

Total 43: 24 refereed journal papers, 12 refereed conference proceedings, 7 others.

[Google Scholar](#): 826 citations, h-index 15

[Web of Science](#): 22 publications, 356 citations, h-index 10

[Math Reviews](#): 31 publications, 261 citations

Refereed Journal Publications

1. Bedřich Sousedík, Randy Price: A stochastic Galerkin method with adaptive time-stepping for the Navier-Stokes equations, *Journal of Computational Physics* 468, 111456, **2022**
2. Bedřich Sousedík: Inexact and primal multilevel FETI-DP methods: a multilevel extension and interplay with BDDC, *International Journal for Numerical Methods in Engineering* 123(20), 4844–4858, **2022**
3. Mohammad S. Ghavami, Bedřich Sousedík, Hooshang Dabbagh, Morad Ahmadnasab: Stochastic Galerkin finite element method for nonlinear elasticity and application to reinforced concrete members, *International Journal for Uncertainty Quantification* 12(6), 1–22, **2022**
4. Bedřich Sousedík, Kookjin Lee: Stochastic Galerkin methods for linear stability analysis of systems with parametric uncertainty, *SIAM/ASA Journal on Uncertainty Quantification* 10(3), 1101–1129, **2022**
5. Bedřich Sousedík, Howard C. Elman, Kookjin Lee, Randy Price: On surrogate learning for linear stability assessment of Navier-Stokes equations with stochastic viscosity, *Applications of Mathematics* 67(6), 727–749, **2022**
6. Kevin Williamson, Heyrim Cho, Bedřich Sousedík: Application of adaptive ANOVA and reduced basis methods to the stochastic Stokes-Brinkman problem, *Computational Geosciences* 25, 1191–1213, **2021**
7. Kookjin Lee, Howard C. Elman, Bedřich Sousedík: A low-rank solver for the Navier-Stokes equations with uncertain viscosity, *SIAM/ASA Journal on Uncertainty Quantification* 7(4), 1275–1300, **2019**
8. Kevin Williamson, Pavel Burda, Bedřich Sousedík: A posteriori error estimates and adaptive mesh refinement for the Stokes-Brinkman problem, *Mathematics and Computers in Simulation*, 166, 266–282, **2019**
9. Bedřich Sousedík: On adaptive BDDC for the flow in heterogeneous porous media, *Applications of Mathematics* 64(3), 309–334, **2019**
10. Kookjin Lee, Bedřich Sousedík: Inexact methods for symmetric stochastic eigenvalue problems, *SIAM/ASA Journal on Uncertainty Quantification* 6(4), 1744–1776, **2018**

11. Bedřich Sousedík, Howard C. Elman: Stochastic Galerkin methods for the steady-state Navier-Stokes equations, *Journal of Computational Physics* 316, 435–452, **2016**
12. Bedřich Sousedík, Howard C. Elman: Inverse subspace iteration for spectral stochastic finite element methods, *SIAM/ASA Journal on Uncertainty Quantification* 4(1), 163–189, **2016**
13. Jakub Šístek, Jan Březina, Bedřich Sousedík: BDDC for mixed-hybrid formulation of flow in porous media with combined mesh dimensions, *Numerical Linear Algebra with Applications* 22(6), 903–929, **2015**
14. Bedřich Sousedík, Roger G. Ghanem: Truncated hierarchical preconditioning for the stochastic Galerkin FEM, *International Journal for Uncertainty Quantification* 4(4), 333–348, **2014**
15. Bedřich Sousedík, Roger G. Ghanem, Eric T. Phipps: Hierarchical Schur complement preconditioner for the stochastic Galerkin finite element methods, *Numerical Linear Algebra with Applications* 21(1), 136–151, **2014**
16. Bedřich Sousedík: Nested BDDC for a saddle-point problem, *Numerische Mathematik* 125(4), 761–783, **2013**
17. Bedřich Sousedík, Jakub Šístek, Jan Mandel: Adaptive-Multilevel BDDC and its parallel implementation, *Computing* 95, 1087–1119, **2013**
18. Jan Mandel, Bedřich Sousedík, Jakub Šístek: Adaptive BDDC in three dimensions, *Mathematics and Computers in Simulation* 82(10), 1812–1831, **2012**
19. Jakub Šístek, Bedřich Sousedík, Pavel Burda, Jan Mandel, Jaroslav Novotný: Application of the parallel BDDC preconditioner to the Stokes flow, *Computers and Fluids* 46(1), 429–435, **2011**
20. Bedřich Sousedík, Jan Mandel: On the equivalence of primal and dual substructuring preconditioners, *Electronic Transactions in Numerical Analysis* 31, 384–402, **2008**
21. Jan Mandel, Bedřich Sousedík, Clark R. Dohrmann: Multispace and Multilevel BDDC, *Computing* 83(2-3), 55–85, **2008**
22. Jan Mandel, Bedřich Sousedík: BDDC and FETI-DP under minimalist assumptions, *Computing* 81(4), 269–280, **2007**
23. Jan Mandel, Bedřich Sousedík: Adaptive coarse space selection in BDDC and FETI-DP iterative substructuring methods, *Computer Methods in Applied Mechanics and Engineering* 196(8), 1389–1399, **2007**
24. Pavel Burda, Jaroslav Novotný, Bedřich Sousedík: A posteriori error estimates applied to flow in a channel with corners. *Mathematics and Computers in Simulation* 61(3–6), 375–383, **2003**

Refereed Conference Proceedings

1. Jakub Šístek, Jan Mandel, Bedřich Sousedík, Pavel Burda: Parallel implementation of Multilevel BDDC, Proceedings of ENUMATH 2011, Leicester, UK, September 5-9, 2011, *Numerical Mathematics and Advanced Applications 2011*, A. Cangiani, R. L. Davidchack, E. Georgoulis, A. N. Gorban, J. Levesley, M. V. Tretyakov (eds.), Springer, 681–689, **2013**
2. Jakub Šístek, Jan Mandel, Bedřich Sousedík: Some practical aspects of parallel adaptive BDDC method, *Proceedings of Applications of Mathematics 2012*, Prague, Czech Republic, May 2-5, 2012, J. Brandts, J. Chleboun, S. Korotov, K. Segeth, J. Šístek, T. Vejchodský (eds.), Institute of Mathematics AS CR, 253–266, **2012**
3. Georgi Jordanov, Jonathan D. Beezley, Nina Dobrinkova, Adam K. Kochanski, Jan Mandel, Bedřich Sousedík: Simulation of the 2009 Harmanli fire (Bulgaria), 8th International Conference on Large-Scale Scientific Computations, Sozopol, Bulgaria, June 6-10, 2011, *Large-Scale Scientific Computing*, Ivan Lirkov, Svetozar Margenov, Jerzy Wasniewski (eds.), Lecture Notes in Computer Science, Volume 7116, Springer, 291–298, **2012**

4. Jakub Šístek, Pavel Burda, Jan Mandel, Jaroslav Novotný, Bedřich Sousedík: A parallel implementation of the BDDC for the Stokes flow, *Proceedings of the 6th ICCFD Conference*, St. Petersburg, Russia, July 12-16, 2010, *Computational Fluid Dynamics 2010*, A. Kuzmin (ed.), Springer, 807–812, **2011**
5. Bedřich Sousedík, Jan Mandel: On Adaptive-Multilevel BDDC, *Proceedings of Domain Decomposition Methods in Science and Engineering XIX*, Zhangjiajie, China, August 17-22, 2009, Y. Huang, R. Kornhuber, O. Widlund, J. Xu (eds.), *Lecture Notes in Computational Science and Engineering*, Volume 78, Part 1, Springer, 39–50, **2011**
6. Jan Mandel, Bedřich Sousedík: Coarse space over the ages, *Proceedings of Domain Decomposition Methods in Science and Engineering XIX*, Zhangjiajie, China, August 17-22, 2009, Y. Huang, R. Kornhuber, O. Widlund, J. Xu (eds.), *Lecture Notes in Computational Science and Engineering*, Volume 78, Part 2, Springer, 213–220, **2011**
7. Jan Mandel, Bedřich Sousedík, Clark R. Dohrmann: On Multilevel BDDC, *Proceedings of Domain Decomposition Methods in Science and Engineering XVII*, St. Wolfgang-Strobl, Austria, July 3-7, 2006, U. Langer, M. Discacciati, D. Keyes, O. Widlund, W. Zulehner (eds.), *Lecture Notes in Computational Science and Engineering* 60, 287–294, Springer-Verlag, **2007**
8. Jan Mandel, Bedřich Sousedík: Adaptive coarse space selection in BDDC and FETI-DP Iterative substructuring methods: Optimal face degrees of freedom, *Proceedings of Domain Decomposition Methods in Science and Engineering XVI*, New York, USA, January 12-15 2005, O. Widlund, D. Keyes (eds.), in: *Lecture Notes in Computational Science and Engineering* 55, 421–428, Springer-Verlag, **2006**
9. Pavel Burda, Jaroslav Novotný, Bedřich Sousedík, Jakub Šístek: Finite element mesh adjusted to singularities applied to axisymmetric and plane flow, ENUMATH 2003, the 5th European conference on numerical mathematics and advanced applications, Prague, Czech Republic, August 18-22, 2003, *Numerical mathematics and advanced applications: Proceedings of ENUMATH 2003*, M. Feistauer et al. (eds.), Springer, 186–195, **2004**
10. Bedřich Sousedík: Simulation study of cardiac cell contractility, *Proceedings of the First International Congress on Computational Bioengineering (ICCB2003)*, Zaragoza, Spain, September 24-26, 2003, Miguel Doblaré, Helder Rodrigues, Miguel Cerrolaza (eds.), **2003**
11. Pavel Burda, Jaroslav Novotný, Bedřich Sousedík: Adaptive mesh refinement based on a-posteriori error estimates for Stokes flow in a 2D problem, ENUMATH 2001, the 4th European conference on numerical mathematics and advanced applications, Ischia, Italy, July 23-28, 2001, *Numerical mathematics and advanced applications: Proceedings of ENUMATH 2001*, F. Brezzi et al. (eds.), Springer, 681–690, **2003**
12. Jan Soukup, Bedřich Sousedík, Vladimír Novák: Mathematical model of contractile apparatus of cardiac cell, *Proceedings of the XIIIrd International Autumn Colloquium*, Velké Losiny, Czech Republic, September 11-13, 2001, *Advanced Simulation of Systems*, J. Štefan (ed.), Acta Mosis 86, 23–28, **2001**

Refereed Student Publications

1. Theodore Weinberg, (faculty sponsor Bedřich Sousedík): Fast implementation of mixed RT0 finite elements in Matlab, *SIAM Undergraduate Research Online*, 12, 246–256, **2019**

Other Presentations

1. Jonathan D. Beezley, Adam Kochanski, Volodymyr Y. Kondratenko, Jan Mandel, Bedřich Sousedík: Simulation of the Meadow Creek fire using WRF-Fire, (poster) AGU Fall Meeting, San Francisco, **2010**
2. Jan Mandel, Jonathan D. Beezley, Adam K. Kochanski, Volodymyr Y. Kondratenko, Bedřich Sousedík, Erik Anderson, Joel Daniels: Wildland fire simulation by WRF-Fire, (poster) AGU Fall Meeting, San Francisco, **2010**
3. Bedřich Sousedík: Numerical solution of the Stokes problem using stabilized finite element method (in Czech), student research conference, Czech Technical University in Prague, **2000**

Theses

1. Bedřich Sousedík: Adaptive-Multilevel BDDC, doctoral dissertation, University of Colorado Denver, USA, published by VDM Verlag (ISBN-13: 978-3-639-31697-1), **2010**
2. Bedřich Sousedík: Comparison of some domain decomposition methods, doctoral dissertation, Faculty of Civil Engineering, Czech Technical University in Prague, Czech Republic, published by Lambert Academic Publishing (LAP) in 2010 (ISBN-13: 978-3-838-34031-9), **2008**
3. Bedřich Sousedík: Mathematical model of the contractile apparatus of a cardiac cell, (in Czech), M.Eng. thesis, Faculty of Mechanical Engineering, Czech Technical University in Prague, Czech Republic, **2001**

Submitted/In Preparation

1. Ashok Krishnamurthy, Bedřich Sousedík, Maya Mueller, Agatha E. Ojime, Loren Cobb, Jocelyn Boegelsack, Brittany Millis: Application of an SEIRD model to the COVID-19 outbreak in Nigeria, preprint, **2023**

Presentations at Conferences and Symposia

1. Seminar on Numerical Analysis – SNA'23 (In memoriam of professor Radim Blaheta), January, 2023, Ostrava, Czech Republic
2. QUIET 2017 - Quantification of Uncertainty: Improving Efficiency and Technology, July 2017, SISSA, International School for Advanced Studies, Trieste, Italy
3. SIAM Conference on Computational Science & Engineering (SIAM CSE17), March 2017, Atlanta, GA, USA
4. DelMar Numerics Day 2016, Annual Workshop on Computational Mathematics, May 2016, George Mason University, VA, USA
5. SIAM Conference on Applied Linear Algebra (SIAM LA15), October 2015, Atlanta, GA, USA
6. SIAM Conference on Computational Science & Engineering (SIAM CSE15), March 2015, Salt Lake City, UT, USA
7. SIAM Conference on Uncertainty Quantification (SIAM UQ14), April 2014, Savannah, GA, USA
8. SIAM Conference on Computational Science & Engineering (SIAM CSE13), February 2013, Boston, MA, USA
9. Conference Seminar on Numerical Analysis and Tutorial - SNA'13, January 2013, Rožnov pod Radhoštěm, Czech Republic (Invited tutorial *Introduction to stochastic finite element methods*)
10. SIAM Conference on Uncertainty Quantification (SIAM UQ12), April 2012, Raleigh, NC, USA
11. The 4th IMACS Conference on Mathematical Modelling and Computational Methods in Applied Sciences and Engineering (Modelling 2009), June 2009, Rožnov pod Radhoštěm, Czech Republic

12. Mathematics of Finite Elements and Applications (MAFELAP), June 2009, London, UK
13. Research and Creative Activities Symposium, University of Colorado Denver, April 2009, CO, USA
14. 6th International Congress on Industrial and Applied Mathematics (ICIAM 07), July 2007, Zurich, Switzerland
15. SIAM Front Range Student Conference, years 2006, 2007, 2008, Denver, CO, USA
16. 9th Copper Mountain Conference on Iterative Methods, April 2006, CO, USA
17. 1st International Congress in Computational Bioengineering, September 2003, Zaragoza, Spain
18. International Conference Mathematical and Computer Modelling in Science and Engineering in honour of the 80th birthday of K. Rektorys, January 2003, Prague, Czech Republic

Colloquium lectures

1. Applied and Comput. Math Seminar, George Mason University, November 2019, Fairfax, VA
2. Mathematics Department, United States Naval Academy, November 2016, Annapolis, MD
3. Department of Mathematical Sciences, University of Delaware, November 2015, Newark, DE
4. Institute of Mathematics, Academy of Sciences of the Czech Republic, August 2015, Prague, Czech Republic
5. Department of Mathematics, University of Maryland, College Park, Numerical Analysis Seminar, March 2014, College Park, MD, USA
6. Department of Mathematics and Statistics, University of Maryland, Baltimore County, Applied Mathematics Colloquium, February 2014, Baltimore, MD, USA
7. Sandia National Laboratories, seminar, April 2013, Albuquerque, NM, USA
8. National Renewable Energy Laboratory, Computational Science Center seminar, March 2013, Golden, CO, USA
9. Department of Mathematics and Statistics, University of North Carolina at Greensboro, department colloquium, March 2013, Greensboro, NC, USA
10. Department of Mathematical Sciences, Clemson University, department colloquium, January 2013, Clemson, SC, USA
11. Center for Computational Mathematics Colloquia Series, University of Colorado Denver, CO, USA, years 2007, 2009 and 2012, 2019

Honors Received

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| 2010 | <i>Prof. Babuška's prize for an important contribution to computer science</i>
(awarded jointly by the Union of Czech Mathematicians and Physicists and the Czech Society for Mechanics for the best doctoral dissertation of the year) |
| 2010 | <i>Outstanding Doctor of Philosophy</i>
College of Liberal Arts and Sciences, University of Colorado Denver |
| 2006 | <i>Lynn Bateman memorial fellowship</i> Department of Mathematical and Statistical Sciences, University of Colorado Denver |
| 2002 | <i>Zvoníček foundation award</i> (one of the best Master theses of the year)
Faculty of Mechanical Engineering, Czech Technical University in Prague |

Awards

2020	<i>Early Career Faculty Excellence Award</i> College of Natural and Mathematical Sciences, UMBC, \$2,000
2015	<i>NSF early career travel award</i> to attend SIAM LA15 conference in Atlanta, GA, \$1,154
2013	<i>NSF early career travel award</i> to attend SIAM CSE13 conference in Boston, MA, \$650

Contracts and Grants

2019-2023	<i>Collaborative Research: Multilevel Methods for Optimal Control of Partial Differential Equations and Optimization-Based Domain Decomposition</i> , NSF DMS-1913201, co-PI (PI Andrei Draganescu), \$219,999
2015-2019	<i>Multiscale multilevel iterative substructuring</i> , NSF DMS-1521563, PI, \$199,920
2017	UMBC Summer faculty fellowship, \$6,000
2015	UMBC Summer faculty fellowship, \$6,000
2003	<i>Application of a posteriori error estimates in numerical solution of blood flow</i> , FRVŠ Grant G1 1960 (Czech Republic), (co-PI Pavel Burda), approx. \$3,000

Advising

Graduate

1. MohammadJalil Ahmad (Ph.D. in progress, since Fall 2022)
2. Randy Price (Ph.D., Aug 2021), *Topics in Data Assimilation and Stochastic Partial Differential Equations*, (co-advisor with Animikh Biswas)
3. Sumaya Alzuhairy (Ph.D., Nov 2021), *Multilevel Methods For Optimal Control Of Elliptic Partial Differential Equation With Stochastic Coefficients*, (co-advisor with Andrei Draganescu)
4. Kevin Williamson (Ph.D., Dec 2020), *Accurate and efficient solution of the Stokes-Brinkman problem*
5. Eموke Galambos (M.S., Dec 2019), *Preconditioning in Large-Scale Unconstrained Optimization Problems*

Undergraduate Senior Theses

1. Alex Flitter (B.S. in progress, since Spring 2023)
2. Nathan Tamiru (B.S. in progress, since Spring 2023)
3. Yingbo Ma, (B.S., Dec 2021), *ModelingToolkit: A Composable Modeling Language in Julia*
4. Maya Mueller, (B.S., May 2020), *Applying the Optimal Interpolation Data Assimilation Method to an S-E-I-R-D Model to a Simulated Ebola Epidemic and to Forecast the Coronavirus (COVID-19) Pandemic in Nigeria*
5. Dongli Deng, (B.S., May 2018), *Numerical Optimization and its application to Molecular Conformation*
6. Theodore Weinberg (B.S., May 2018), *Fast Implementation of Mixed Finite Elements and Applications to Flow in Porous Media Using MATLAB*
7. Adaku Uchendu (B.S., Dec 2017), *Numerical Simulation of Vibrations of Mechanical Structures*
8. Jonathan Fritz (B.S., May 2016), *Finite Element Methods and Vectorized Procedures in MATLAB*

Other Professional Activities

Society Membership

Society for Industrial and Applied Mathematics (SIAM, since 2006)

Professional Service

2014-present SIAM Student Chapter (faculty adviser), University of Maryland, Baltimore County
2006-2010 Organizing committee of the SIAM Front Range Student Conference
2006-2010 SIAM Student Chapter (member), University of Colorado Denver

Reviewer and Referee Service

Reviewer for DOE, NSF, National Science Center (Poland)

Referee for Applications of Mathematics, Applied Mathematics and Computation, Computers and Mathematics with Applications, Computer Methods in Applied Mechanics and Engineering, Computer Physics Communications, Electronic Transactions in Numerical Analysis, International Journal for Uncertainty Quantification, Journal of Computational and Applied Mathematics, Mathematics and Computers in Simulation, Numerical Linear Algebra with Applications, Numerical Methods for Partial Differential Equations, SIAM/ASA Journal on Uncertainty Quantification, SIAM Journal on Numerical Analysis, SIAM Journal on Scientific Computing, Zentralblatt MATH,