

Curriculum Vitae

Personal details

Name: Piotr Skrzypacz
Home address: 53 Kabanbay Batyr Ave., Block 38
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Email: piotr.skrzypacz@nu.edu.kz
Date and place of birth: 03.12.1973, Wrocław, Poland
Nationality: Polish
Marital Status: Married with Kazakh wife, daughter Julia Alua Skrzypacz

Education

- 2002 - 2010
 - PhD
 - Supervisor: Prof. Dr. Lutz Tobiska
 - doctoral thesis “Finite element analysis for flows in chemical reactors” defended on 12.11.2010 with the final grade magna cum laude
- 1996 -2002
 - Otto-von-Guericke-University of Magdeburg
 - course of studies: Diploma Mathematics, M.Sc. thesis: “Superkonvergenz von finite Elemente Methoden für skalare elliptische Gleichungen und für die stationären Stokes- und Navier-Stokes-Probleme”
 - (“Superconvergence of finite element methods for scalar elliptic equations and stationary Stokes and Navier-Stokes problems”)
 - second subject: Physics
- 1994-1995
 - Technical University in Wismar,
 - course of studies: Diploma Computer Science
- 1992-1994
 - Technical University in Wrocław,
 - course of studies: Electrical Engineering
- 1988-1992
 - Comprehensive Secondary School in Bolesławiec

Research Projects with Fundings

- Wire extrusion, Nazarbayev University, Social Policy Grant, 2016, 10 000 USD.
- Modeling and Simulation of Nonlinear Material Structures for Mechanical Pressure Sensing and Actuation Applications, Nazarbayev University Oak Ridge Associated Universities (ORAU) Grant, 2016 - 2019, 113 636 USD.
- Finite Element Methods for Dirichlet feedback control problems in chemical reaction engineering, Nazarbayev University Oak Ridge Associated Universities (ORAU) Grant, 2018 - 2020, 98,000 USD.

Research Experience

- 2014 - • Assistant Professor in Department of Mathematics, School of Science and Technology, Nazarbayev University in Astana, Kazakhstan, research work on finite elements in CFD and nonlinear elasticity, Micro-Electro-Mechanical-Systems (MEMS), interdisciplinary projects
- 2013 - 2014 • Postdoc research assistant at Institute for Analysis and Numerical Mathematics, Otto-von-Guericke-University Magdeburg, research work on stabilized finite elements
- 2012 - 2013 • Postdoc research work on feedback stabilization of flow problems at the Max-Planck-Institute Magdeburg in the group of Prof. Dr. Peter Benner
- 2010 - 2012 • Postdoc research work on the project “Non-conforming elements of higher order” under supervision of Prof. Dr. Friedhelm Schieweck, Institute for Analysis and Numerical Mathematics, Otto-von-Guericke-University Magdeburg
- 2002 - 2010 • research assistant at Institute for Analysis and Numerical Mathematics under supervision of Prof. Dr. Lutz Tobiska, Otto-von-Guericke-University Magdeburg, research work on the interdisciplinary project “Membrane supported reaction engineering“
- 1997 - 2001 • Teaching Assistant

Reviewer Work

- Reviewer for Mathematical Reviews
- Member of editorial boards of several journals in Applied Mathematics.
- External reviewer of the Undergraduate and Master Programs in Applied Mathematics at KazNu Alfarabi University in Almaty

Teaching Experience

- 2014 - 2018
- Assistant Professor in Department of Mathematics, School of Science and Technology, Nazarbayev University in Astana, Kazakhstan
 - ◇ chairman of the Curriculum Committee of Mathematics Department, developed Curriculums for Undergraduate and Master Programmes.
 - ◇ taught classes: Calculus I, Calculus III, Ordinary Differential Equations, Numerical Methods with Applications, Partial Differential Equations, Fourier Analysis, Applied Finite Element Methods, Seminars for Senior Students
 - ◇ supervision of Capstone Projects (Nonlinear Diffusion Equations, Nonlinear Equations in Elasticity, Nonlinear equations in MEMS)
 - ◇ organized math olympiads and math competitions
 - ◇ supervised and provided trainings for students participating in international math olympiads (IMC), my students won the first gold medal in the history of Kazakhstan
 - ◇ Personally trained and supervised students with my recommendations have been admitted to Master Programs at NU or abroad:
 1. Serikbolsyn Duisembay (Applied Math, King Abdullah University of Science and Technology, Saudi Arabia)
 2. Chingis Matayev (Economics, NU)
 3. Adiya Makhambetova (Mathematical Finance, Boston University)
 4. Olzhas Sagimbekov (Mathematical Finance, Moscow University)
 5. Gulzhan Tumenbayeva (Applied Math, King Abdullah University of Science and Technology, Saudi Arabia)
 6. Daniyar Omarov, (Applied Mathematics, PhD, Georgia Institute of Technology)
 7. Galymzhan Kenesbekov, (Actuarial Mathematics, PhD, Illinois State University)
 8. Marzhan Sagadiyeva, (Applied Math, Master programme at NU)

Teaching Experience (continued)

- 2002 - 2014
- tutor and teaching assistant at Institute for Analysis and Numerical Mathematics, Otto-von-Guericke-University Magdeburg
 - ◊ preparation of teaching materials for exercise courses, special seminars and lectures for undergraduate, graduate and PhD students
 - ◊ acting in place of supervisors to give lectures
 - ◊ preparation and supervision of written and oral exams for undergraduate and graduate students of mathematics, physics and engineering
 - ◊ evaluation of student projects and diploma thesis
- 2007
- supervisor of diploma thesis “Finite elements stabilisation by local projection for convection-diffusion-reaction problems“ Holger Stieler, defended with the highest mark, employed in EADS (European Aeronautic Defence and Space Company) in Manchester
- 2006
- supporter of student project “Axisymmetric Navier-Stokes equations with slip boundary condition“ Holger Stieler
- 2013
- supporter of student project “Effect of order reduction in discretisation of instationary problems“ Fabian Wölk
- 2013
- supervisor of student project “The discontinuous Galerkin method for convection-diffusion-reaction equations in one space dimension“ Anja Quasdorf
- 2016
- supervisor of Capstone Project “A Short Note On Solving 1-D Porous Medium Equation by Finite Element Method“ Chingis Matayev, Nazarbaev University
- 2017-18
- supervisor of Capstone Project “Analysis of Dynamic Pull-in for a Graphene-based MEMS Model“ Daniyar Omarov, Nazarbaev University

List of held classes and tutorials

Numerik für Ingenieure (Numerics for engineers) Prof. Dr. Lutz Angermann, SS 2000

Analysis I (Calculus I) bei Prof. Dr. Lutz Tobiska, WS 2003/2004, WS 2009/2010

Analysis II (Calculus II) bei Prof. Dr. Lutz Tobiska, SS 2003, SS 2010

Ergänzungsübung zu Analysis I (Calculus I Addendum) bei Prof. Dr. Tobiska, WS 2003/2004

Ergänzungsübung zu Analysis II (Calculus II Addendum) bei Prof. Dr. Tobiska, SS 2004

Mathematik III für Physiker (Math III for physicists) bei Prof. Dr. Ben Schweizer WS 2004/2005, Priv. Doz. Matthias Kunik WS 2005/2006, WS 2006/2007

Mathematik IV für Physiker (Math III for physicists) bei Prof. Dr. Hannes Uecker
SS 2006, Priv. Doz. Matthias Kunik SS 2006, SS 2007, SS 2008

Mathematik I für Ingenieure (Math I for engineers) bei Priv. Doz. Bernd Rummler
WS 2007/2008

Mathematik III für Ingenieure (Math III for engineers) bei Prof. Dr. Friedhelm
Schieweck, WS 2005/2006

Numerik für Mathematik Studenten (Numerics for students of Mathematics) bei
Prof. Dr. Lutz Tobiska, WS 2008/2009

Numerik für Ingenieure (Numerics for engineers) bei Prof. Dr. Friedhelm Schieweck,
SS 2009

Numerik der Navier-Stokes-Gleichungen (Numerics of Navier-Stokes equations) bei
Prof. Dr. Friedhelm Schieweck, WS 2009/2010

Partielle Differentialgleichungen I (Partial Differential Equations I) bei Prof. Dr.
Jörg Wolf, WS 2010/2011

Numerics of Navier-Stokes Equations bei Prof. Dr. Friedhelm Schieweck, SS 2011

Numerik zeitabhängiger Differentialgleichungen (Numerics of time-dependent diffe-
rential equations) bei Prof. Dr. Friedhelm Schieweck, WS 2011/2012

Analysis II (Calculus II/III) bei Prof. Dr. Lutz Tobiska, SS 2014

Calculus I Fall 2014

Calculus III, Numerical Methods with Applications Spring 2015

Ordinary Differential Equations, Numerical Methods with Applications Fall 2015,
Spring 2016

Numerical Methods with Applications Fall 2016, Partial Differential Equations Fall
2016

Fourier Analysis, Calculus III Spring 2017

Numerical Methods with Applications, Calculus III Fall 2018

Applied Finite Element Methods, Calculus III Spring 2018

Additional Skills

- Computing: • Experienced in UNIX/Linux, document preparation system
 \LaTeX , programming in C/C++, Matlab, Maple, Mathema-
 tica, R, design of Web pages in HTML, Fortran 77, parallel
 programming (MPI), COMSOL (Femlab), Auto
- Languages: • English, German, Polish, Russian

Other

- Student Research Project: • “Some possibilities to handle domains with curved boundaries in finite element method”, Institute for Analysis and Numerics, Magdeburg, 2000
- Advanced Training Course: • Summer School in Prague “Simulation of Fluid and Structure Interaction”, 2001

Publications

1. M. Kunik, P. Skrzypacz:
Höhere Analysis durch Anwendungen lernen
Für Studierende der Mathematik, Physik und Ingenieurwissenschaften,
(Learning Higher Analysis by Applications)
Springer Spektrum 2013, 407 pp, ISBN-10: 3658022655, [textbook](#) for students of
mathematics, physics and engineering, available in [amazon.de](#)
2. D. Handtke, I. Mednev, J. Schmidt, P. Skrzypacz, L. Tobiska:
Transport Phenomena in Membrane Reactors, Proceedings of the 20th European
Symposium on Applied Thermodynamics, Lahnstein, Germany, (2003), 155–158
3. G. Matthies, P. Skrzypacz, L. Tobiska:
Superconvergence of a 3D finite element method for stationary Stokes and Navier-
Stokes problems. Numer. Methods Partial Differential Equations 21 (2005), no. 4,
701–725.
4. P. Skrzypacz, L. Tobiska:
Finite element method and matched asymptotic expansion methods for chemical
reactor flow problems. Proc. Appl. Math. Mech. 5(2005), 843-844
5. G. Matthies, P. Skrzypacz, L. Tobiska:
A unified convergence analysis for local projection stabilisations applied to the Oseen
problem. M2AN Math. Model. Numer. Anal. 41 (2007), no. 4, 713–742.
6. M. Kunik, P. Skrzypacz:
Diffraction of light revisited. Mathematical Methods in the Applied Sciences, 31
(2008), no. 7, 793–820
7. G. Matthies, P. Skrzypacz, L. Tobiska:
Stabilization of local projection type applied to convection-diffusion problems with
mixed boundary conditions.
Electron. Trans. Numer. Anal. 32 (2008), 90–105.
8. K. Georgieva-Angelova, V. Edreva, A. Hussain, P. Skrzypacz, L. Tobiska, A.

Seidel-Morgernstern, E. Tsotsas, J. Schmidt:

Transport phenomena in porous membranes and membrane reactors. A book chapter in Membrane Reactors. Distributing reactants to Improve Selectivity and Yield, 2010, Wiley-VCH, Weinheim

9. Piotr Skrzypacz:

Finite element analysis for flows in chemical reactors. Dissertation, date of defence 12.11.2010, available online in Digitale Hochschulbibliothek Sachsen-Anhalt <http://edoc.bibliothek.uni-halle.de/servlets/DocumentServlet?id=9744>

10. F. Schieweck, P. Skrzypacz:

A Local Projection Stabilization method with shock capturing and diagonal mass matrix for solving non-stationary transport dominated problems, Computational Methods in Applied Mathematics, Vol. 12 (2012), No. 2, pp. 221-240

11. P. Benner, J. Saak, F. Schieweck, P. Skrzypacz, H. Weichelt:

A Non-Conforming Composite Quadrilateral Finite Element Pair for Feedback Stabilization of the Stokes Equations, Journal of Numerical Mathematics, Vol. 22(2014), No. 3, pp. 191-220

12. P. Skrzypacz, D. Wei:

On the discrete maximum principle for the local projection scheme with shock capturing, Journal of Computational Mathematics, Vol.35, No.5, 2017, 545-566.
doi:10.4208/jcm.1605-m2015-0479

13. P. Skrzypacz, D. Wei:

Solvability of the Brinkman-Forchheimer-Darcy Equation, Journal of Applied Mathematics, Volume 2017, Article ID 7305230
<https://doi.org/10.1155/2017/7305230>

14. P. Skrzypacz, D. Wei, X. Yu

Nonlinear Waves in Rods and Beams of Power-Law Materials, Journal of Applied Mathematics Volume 2017 (2017), Article ID 2095425
<https://doi.org/10.1155/2017/2095425>

15. P. Skrzypacz:

Local Projection Stabilization for Linearized Brinkman-Forchheimer-Darcy Equation, in International Conference Functional analysis in interdisciplinary applications (FAIA2017), AIP Conference Proceedings 1880, 060010 (2017); edited by Tynysbek Kalmenov and Makhmud Sadybekov (American Institute of Physics, Melville, NY, 2017),
<http://doi.org/10.1063/1.5000664>

16. P. Skrzypacz, S. Kadirov, Y. Familiant:

A simple analysis of flying capacitor converter, COMPEL: The International Journal for Computation and Mathematics in Electrical and Electronic Engineering, 2018,
<https://doi.org/10.1108/COMPEL-07-2017-0282>

17. Daniyar Omarov, Daulet Nurakhmetov, Dongming Wei, Piotr Skrzypacz:
On the Application of Sturm's Theorem to Analysis of Dynamic Pull-in for a Graphene-based MEMS Model, Applied and Computational Mechanics, in press
18. P. Skrzypacz, S. Kadyrov, D. Nurakhmetov, D. Wei:
Analysis of Dynamic Pull-in Voltage of a Nonlinear Material NEMS Model, Nonlinear Analysis: Real World Applications, 45 (2019) 581-589
<https://doi.org/10.1016/j.nonrwa.2018.07.025>
19. P. Skrzypacz, F. Schieweck, L. Tobiska:
Construction of L2 orthogonal elements of arbitrary order for Local Projection Stabilization, Applied Mathematics and Computation, 337 (2018) 87-101
<https://doi.org/10.1016/j.amc.2018.04.070>
20. P. Skrzypacz, W. Arriagada:
On the inf-sup condition for the Brinkman-Forchheimer-extended Darcy equation, conditionally accepted for publication in Computers and Mathematics with Applications
21. P. Skrzypacz, W. Arriagada:
Finite Element Analysis for the Brinkman-Forchheimer-extended Darcy equation, conditionally accepted for publication in Computers and Mathematics with Applications
22. F. Schieweck, P. Skrzypacz:
A way how to improve the local projection scheme, preprint
23. P. Skrzypacz:
Superconvergence for the Brinkman-Forchheimer-extended Darcy equation, preprint
24. W. Arriagada, F. Schieweck, P. Skrzypacz:
A reaction-diffusion problem with dead-core at the boundary, preprint
25. P. Skrzypacz, D. Nurakhmetov, D. Wei:
Dynamic Pull-in for Micro-Electro-Mechanical Device with a Current-Carrying Conductor, preprint
26. D. Nurakhmetov, D. Wei, P. Skrzypacz:
Lumped model parameters for power-law Euler-Benoulli beams, preprint

Conference Presentations

"Superconvergence of a 3d finite element method for stationary Stokes and Navier-Stokes problems" Chemnitz FEM-Symposium 2003

“Finite element and matched asymptotic expansion methods for chemical reactor flow problems” GAMM Conference, Luxembourg 2005

“Stabilisation methods of local projection type for convection-diffusion-reaction problems” FEM 20th Symposium, Chemnitz 2007

“On the discrete maximum principle for local projection scheme” LPS Workshop, Goettingen 2008

“Superconvergence results for Brinkman-Forchheimer-extended Darcy equation”, FEM Symposium, Chemnitz 2010

“A new LPS method with shock capturing applied to Burgers’ equation“ EFEF-2011, Paris, 2011

“A new oscillation free space-time discretization of higher order for non-stationary transport dominated convection diffusion equations“ Conference on Simulation and Optimization, Győr, 2011

“New variants of local projection stabilization for transport dominated problems“ European Finite Element Fair 2012, 8-9 June 2012, Bilbao, Basque Country, Spain

“Composite non-conforming elements and local projection stabilization for transport dominated flow problems“ 25th Chemnitz FEM Symposium, Chemnitz 2012

“On the construction of L_2 orthogonal elements of arbitrary order for Local Projection Stabilization“ Actual problems in mathematics and in mathematical modeling, 50-th anniversary of the foundation of the Institute of Mathematics and Mechanics in Almaty, Almaty, 2015

“On the construction of L_2 orthogonal elements of arbitrary order for Local Projection Stabilization“ Variational Multiscale and Stabilized Finite Elements (VMS), Magdeburg, Germany, 2016

“Superconvergence results for Brinkman-Forchheimer-extended Darcy equation“, 14th European Finite Element Fair (EFEF 2016), Bonn, Germany

“A way how to improve Local Projection Stabilization“ The Mathematics of Finite Elements and Applications, Brunel MAFELAP 2016, Brunel University London, UK

“On the way how to improve Local Projection Stabilization“ 11th EASIAM Conference, University of Macao, China, 2016

“On the construction of L_2 orthogonal elements of arbitrary order for Local Projec-

tion Stabilization“, Asian Mathematical Conference AMC 2016, Bali, Indonesia

“A reaction-diffusion problem with dead-core at the boundary“, The 10th International Conference on Computational Physics, Macao, China, 16-20 January, 2017

“Generalized trigonometric functions“, “On numerical crimes in Computational Fluid Dynamics“, 1st Summer School on Mathematical Methods in Science and Technology, 5-10 June, 2017, Nazarbayev University, Astana

“Bifurcation Analysis of Micro-Electro-Mechanical Pull-in Device“, 5th International Conference on Nanomaterials and Advanced Energy Storage Systems (INESS-2017), Astana, 9-10 August, 2017

“A Mixed Finite Element Method for the Ramberg-Osgood Bar“, Modern Finite Element Technologies (MFET 2017), Bad Honnef, Germany, 21-23 August, 2017

“Local Projection Stabilization for Linearized Brinkman-Forchheimer-extended Darcy equation“, VI Congress of the TurkicWorld Mathematical Society (TWMS-2017), October 2-5, 2017 Astana, Kazakhstan

“Finite Element Discretizations for Transmission Problems“, VI Congress of the Turkic World Mathematical Society (TWMS-2017), October 2-5, 2017 Astana, Kazakhstan

“On Nonlinear MEMS Statics and Dynamics“, The Third International Conference on Applications of Mathematics and Informatics in Natural Sciences and Engineering Dedicated to the 80th Birthday of David Gordeziani AMINSE 2017, Tbilisi, Georgia, 6.12-9.12.2017