Daniil Svyatskiy

Curriculum Vitae

Applied Mathematics and Plasma Physics,
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Summary of Qualifications

- Ten years experience in scientific computing and mathematical modeling: Multi-level/Multigrid solvers and preconditioning of Krylov iterative methods; Mixed Finite Element, Finite Volume and Mimetic Discretizations of partial differential equations; Multilevel upscaling of strongly heterogeneous media for large multiscale simulations; Discrete maximum principle and monotone discretizations of partial differential equations.
- Extensive knowledge of C/C++, Fortran, Python; Highly experienced with Matlab, Maple, TechPlot, MPI, Data Explorer, LATEX, PostScript, HTML, version control system (SVN).

Education

2005 – 2006	Ph. D., Applied Mathematics, University of Houston, Houston, TX, 3.88/4.00.
2003 – 2004	M.S., Applied Mathematics, University of Houston, Houston, TX, 3.88/4.00.
1998 – 2000	M.S., Physics and Applied Mathematics, Moscow Institute of Physics and Technology (Technical University), Moscow, Russia, 4.91/5.00. with distinction
1994 – 1998	B.S., Physics and Applied Mathematics, Moscow Institute of Physics and Technology (Technical University), Moscow, Russia, 4.9/5.00. with distinction

Thesis

Ph.D. thesis	Discretization methods and iterative solvers for diffusion equation on unstructured polyhedral meshes.
supervisors	Prof. Yu. Kuznetsov
Master thesis	Matrix condensation and multigrid methods.
supervisors	Prof. E. E. Tyrtyshnikov

Training

- Completed the course on Nonlinear Finite Element Analysis taught by Ted Belytschko and Thomas J. R. Hughes, Austin, TX, 2007

Work Experience

2006 – present	Postdoctoral Research Associate, T-7, LANL, Los Alamos, NM. - develop monotone discretization methods for elliptic problems

- develop multilevel multiscale methods for flows in highly heterogeneous porous media
- work on modeling of ion transport through artificial ion channels
- work on numerical modeling of interactions between surface, vadose zone, and groundwater

2005   Graduate Research Assistant, T-7, LANL, Los Alamos, NM.

- developed and implemented a new multilevel preconditioner for diffusion-type problems on polyhedral meshes

2004   Graduate Research Assistant, T-7, LANL, Los Alamos, NM.

- developed and implemented the mimetic finite difference discretization of diffusion-type problems on unstructured polyhedral meshes

2003 – 2006   Research Assistant, Department of Mathematics, University of Houston, Houston, TX. Research is supported by ExxonMobil Upstream Research Co.

- developed and implemented advanced numerical algorithms for mathematical problems of basing modeling: discretization methods and preconditioning techniques on prismatic meshes with pinch-outs

1998–2003   Research Associate, Institute of Numerical Mathematics, Russian Academy of Sciences, Moscow, Russia.

- worked on the mixed finite element discretization method for electromagnetic problems

1998–2003   Programmer, Russian Research Centre Kurchatov Institute, Institute of High Technologies and Experimental Machine Building (IHTEMB), Moscow, Russia.

- developed the medical information complex which is intended for automation of medical processes in cardiological clinics

Awards

2001   Kurchatov prize for outstanding young scientists and engineers.

Publications

D. Svyatskiy, K. Lipnikov, and Y. Vassilevski. Interpolation-free monotone finite volume method for diffusion equations on polygonal meshes. 228(3):703–716, 2009.

D. Svyatskiy, D.Kuzmin, and M. Shashkov. A constrained finite element method satisfying the discrete maximum principle for anisotropic diffusion problems on arbitrary meshes. 228(9):3448–3463, 2009.

K. Lipnikov, J. D. Moulton, and D. Svyatskiy. A multilevel multiscale mimetic (M^3) method for infiltration problem. In Procceding of 6th International Workshop on Simulation of Multiphysics Multiscale Systems in conjunction with the International Conference on Computational Science, Baton Rouge, USA, 2009.

D. Svyatskiy, K. Lipnikov, and J. D. Moulton. A Multilevel Multiscale Mimetic (M^3) method for two-phase flows in porous media. 227(14):6727–6753, 2008.

D. Svyatskiy. Nonlinear monotone finite volume method. In R. Eymard and J.-M. Hérard, editors, Finite Volumes for Complex Applications V, pages 935–947, 2008.

D. Svyatskiy, J. D. Moulton, and C. Fox. Multilevel approximations in sample-based inversion from the dirichlet-to-neumann map. Technical Report LA-UR 07-7958, Mathematical Modeling and Analysis Group, Los Alamos National Laboratory, 2007. Proceedings of the First International Congress of IPIA Conference on Applied Inverse Problems 2007: Theoretical and Computational Aspects, June 25–29, 2007, Vancouver, Canada.

D. Svyatskiy, K. Lipnikov, M. Shashkov, and Y. Vassilevski. Monotone finite volume schemes for diffusion equations on unstructured triangular and shape-regular polygonal meshes. 227(1):492 − 512, Nov 2007.

D. Svyatskiy, O. V. Boiarkine, and Y. A. Kuznetsov. Diffusion equation on nonmatching distorted hexahedral meshes. Russian Journal of Numerical Analysis and Mathematical Modelling, 22(4):311 − 324, 2007.

D. Svyatskiy, K. Lipnikov, and M. Shashkov. The mimetic finite difference discretization of diffusion problem on unstructured polyhedral meshes. 211(2):473 − 491, 2006.

D. Svyatskiy, V. Chugunov, E. Tyrtyshnikov, and Y. Vassilevski. Parallel iterative multilevel solution of mixed finite element systems for scalar equations. Concurrency and Computation Practice & Experience, 18(5):501 − 518, Apr 2006.

D. Svyatskiy, Y. Achdou, J. Jaffré, and Y. Vassilevski. Numerical simulation of unsteady 3d flows on anisotropic grids. In Transactions of French-Russian Liapounov Institute for Applied Mathematics and Computer Science, volume 4, pages 107–124. MSU, Moscow, 2003.

Talks

- Svyatskiy D., Kuzmin D., Shashkov M., The Discrete Maximum Principle for Finite Element Approximations of Anisotropic Diffusion Problems on Arbitrary Meshes, Finite Element Methods in Engineering and Science (FEMTEC 2009), Granlibakken Conference Center, Lake Tahoe, 2009.
- Svyatskiy D., Lipnikov K. , Moulton D., A Multilevel Multiscale Mimetic (M^3) Method for Two-Phase Flows in Porous Media The XVII International Conference on Computational Methods in Water Resources (CMWR 2008), San Francisco, CA, 2008.
- Svyatskiy D., Lipnikov K. , Moulton D., A Multilevel Multiscale Mimetic (M^3) Method for Two-Phase Flows in Porous Media AGU Fall Meeting, San Francisco, CA, 2007.
- Svyatskiy D. Nonlinear monotone finite volume method for diffusion equation, CSE Seminar, University of Illinois at Urbana-Champaign, IL, 2007
- Svyatskiy D., Kuznetsov Y., New multilevel preconditioner for diffusion-type problems on polyhedral meshes. Eighth IMACS International Symposium on Iterative Methods in Scientific Computation, College Station, TX, 2006.
- Kuznetsov Y., Svyatskiy D. New multilevel preconditioner for diffusion-type problems on polyhedral meshes. French Petroleum Institute, Paris, 2006.
- Svyatskiy D., Kuznetsov Y. New multilevel preconditioner for diffusion-type problems on polyhedral meshes. LACSI Symposium 2005. Santa Fe, NM, 2005
- Svyatskiy D. Kuznetsov Y., Lipnikov K., Shashkov M. Mimetic finite difference discretization of diffusion-type problems on unstructured polyhedral meshes. Finite Element Rodeo 2005. Dallas, TX, 2005.
- Svyatskiy D. Kuznetsov Y., Lipnikov K., Shashkov M. Mimetic finite difference discretization of diffusion-type problems on unstructured polyhedral meshes. LACSI Symposium 2004. Santa Fe, NM, 2004.

Editorial Appointments

- Guest editor for Journal of Computational and Applied Mathematics
- Reviewer for Computer Methods in Applied Mechanics and Engineering
- Reviewer for SIAM Journal on Scientific Computing
- Reviewer for SIAM Journal on Numerical Analysis

Synergistic Activities:

- Organizer: Minisymposium "Conservative Monotone Discretization Methods for Convection-Diffusion Problems", SIAM Conference on Mathematical & Computational Issues in the Geosciences, Leipzig, Germany, 2009.

References

- Dr. Konstantin Lipnikov
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  MS B284, Los Alamos, NM 87544
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- Dr. David J. Moulton
  T-5, Los Alamos National Laboratory,
  MS B284, Los Alamos, NM 87544
  Phone: (505) 665 4712 Fax: (505) 665 5757 E-mail: moulton@lanl.gov

- Dr. Yuri Kuznetsov
  University of Houston, Department of Mathematics, 651 PGH
  Houston, TX 77204
  Phone: (713) 743-3493, Fax: (713) 743-3505, E-mail: kuz@math.uh.edu

- Dr. Roland Glowinski
  University of Houston, Department of Mathematics, 651 PGH
  Houston, TX 77204
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- Dr. Eugene E. Tyrtyshnikov
  Institute of Numerical Mathematics, Russian Academy of Sciences
  Gubkina Street, 8, Moscow, 119991, Russia
  Phone: +7-095-938-3921, Fax: +7-095-938-1821, E-mail: tee@inm.ras.ru