Curriculum Vitae

Artem NAPOV

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Personal Details

Position: Associate Professor
École polytechnique de Bruxelles, ULB
Date of birth: 29th of January, 1984
Age: 37 years

Positions

since 10.2017 — *Associate Professor* at Service de Métrologie Nucléaire, Université libre de Bruxelles, Belgium

10.2012–10.2017 — *Assistant Professor* at Service de Métrologie Nucléaire, Université libre de Bruxelles, Belgium

02.2011–08.2012 — *Postdoctoral Fellow* at Computational Science Division, Lawrence Berkeley National Lab., USA

Project title: *Development of a multi-frontal based superfast direct solver for general 2D domains*;
In collaboration with: Dr. Xaoye S. Li and Prof. Ming Gu

10.2007–01.2011 — *FNRS research fellow* at Université libre de Bruxelles, Belgium

Project title: *Development of algebraic multigrid methods for systems of partial differential equations. Implementation on parallel computers. Application to several fields, including computational fluid dynamics*;
Scientific Advisor: Prof. Yvan Notay

Education

10.2007–02.2010 — Ph.D. in Applied Science at Université libre de Bruxelles, Belgium

PhD Thesis: *Algebraic analysis of V-cycle multigrid and aggregation-based two-grid methods*;
Advisor: Prof. Yvan Notay

09.2004–07.2007 Master degree in Applied Science at Université libre de Bruxelles, Belgium

Specialization: Physics (Applied Mathematics, Nuclear Engineering and Microscopic Physics)

Master Thesis: *Algebraic analysis of V-cycle multigrid* (in fr.:*Analyse algébrique des méthodes multi-grilles en cycle V*);
Advisor: Prof. Yvan Notay

09.2002–07.2004 Bachelor degree in Applied Science at Université libre de Bruxelles, Belgium

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Research

Research interests

1. Multigrid methods
   - Theory of multigrid methods
   - Algebraic multigrid methods (especially based on unsmoothed aggregation)
   - Multigrid for systems of partial differential equations
2. Structured solvers
   - Algebraic multifrontal solvers and preconditioners based on hierarchically semiseparable (HSS) representation
   - Convergence properties of structured solvers
   - Parallel implementation of structured solvers

Publications and (Submitted) Technical Reports

[1] F. Moro, A. Napov, and L. Codecasa. A Hybrid a–ϕ Cell Method for Solving Eddy–Current Problems in 3–D Multiply–Connected Domains. Technical report, 2021.

[2] A. El Haman Abdeselam, A. Napov, and Y. Notay. Porting an aggregation-based algebraic multigrid method to GPUs. Report GANMN 21-03, Université Libre de Bruxelles, Brussels, Belgium, 2021. Available online at `http://metronu.ulb.ac.be/GANMN/reports/ganmn2103.pdf`.

[3] A. Napov and R. Perrussel. Algebraic analysis of two-level multigrid methods for edge elements. *Electron. Trans. Numer. Anal.*, 51:387–411, 2019.

[4] A. Napov and R. Perrussel. Revisiting aggregation-based multigrid for edge elements. *Electron. Trans. Numer. Anal.*, 51:118–134, 2019.

[5] A. Napov. A divide-and-conquer bound for aggregate's quality and algebraic connectivity. *Discrete Mathematics*, 340:2355–2365, 2017.

[6] A. Napov and Y. Notay. An efficient multigrid method for graph Laplacian systems II: robust aggregation. *SIAM J. Sci. Comput.*, 39:S379–S403, 2017.

[7] P. Ghysels, X. S. Li, F-H. Rouet, S. Williams, and A. Napov. An efficient multi-core implementation of a novel HSS-structured multifrontal solver using randomized sampling. *SIAM J. Sci. Comput.*, 38:S358–S384, 2016.

[8] F-H. Rouet, X. S. Li, P. Ghysels, and A. Napov. A distributed-memory package for dense Hierarchically Semi-Separable matrix computations using randomization. *ACM Transactions on Mathematical Software*, 42:No. 27, 2016.

[9] A. Napov and Y. Notay. An efficient multigrid method for graph Laplacian systems. *Electron. Trans. Numer. Anal.*, 45:201–218, 2016.

[10] A. Napov and X. S. Li. An algebraic multifrontal preconditioner that exploits the low-rank property. *Numer. Linear Algebra Appl.*, 23:61–82, 2016.

[11] Y. Notay and A. Napov. A massively parallel solver for discrete Poisson-like problems. *J. Comput. Phys.*, 281:237–250, 2015.

[12] A. Napov and Y. Notay. Algebraic multigrid for moderate order finite elements. *SIAM J. Sci. Comput.*, 36:A1678–A1707, 2014.

[13] A. Napov. Conditioning analysis of incomplete Cholesky factorizations with orthogonal dropping. *SIAM J. Matrix Anal. Appl.*, 34:1148–1173, 2013.

[14] Y. Notay and A. Napov. Further comparison of additive and multiplicative coarse grid correction. *Appl. Num. Math.*, 65:53–62, 2013.

[15] A. Napov and Y. Notay. An algebraic multigrid method with guaranteed convergence rate. *SIAM J. Sci. Comput.*, 34:A1079–A1109, 2012.

[16] A. Napov and Y. Notay. Algebraic analysis of aggregation-based multigrid. *Numer. Linear Algebra Appl.*, 18:539–564, 2011.

[17] A. Napov and Y. Notay. Smoothing factor, order of prolongation and actual multigrid convergence. *Numer. Math.*, 118:457–483, 2011.

[18] A. Napov and Y. Notay. Comparison of bounds for V-cycle multigrid. *Appl. Num. Math.*, 60:176–192, 2010.

[19] A. Napov and Y. Notay. When does two-grid optimality carry over to the V-cycle? *Numer. Linear Algebra Appl.*, 17:273–290, 2010.

Conference Proceedings

[1] E. Agullo, P. R. Amestoy, A. Buttari, A. Guermouche, J-Y. L'Excellent G. Joslin, X. S. Li, A. Napov, F-H. Rouet, S. Wang M. Sid-Lakhdar, C.Weisbecker, and I. Yamazaki. Recent advances in sparse direct solvers. In *Proceedings of 22nd Conference on Structural Mechanics in Reactor Technology*, SanFrancisco, CA, 18–23 August 2013. `https://crd.lbl.gov/assets/pubs_presos/paper3.pdf`.

[2] F. Musy, A. Napov, Y. Notay, R. Perrussel, and R. Scorretti. Krylov-based algebraic multigrid for edge elements. In Nathan Ida, editor, *Proceedings of COMPUMAG 2009*, Florianópolis (Brazil), 22–26 November 2009. `http://hal.archives-ouvertes.fr/hal-00412347/fr/`.

Conference Presentations

13.07.2017	(seminar) *Aggregation-based Algebraic Multigrid, with application to graph Laplacian systems*, Seminar given during Visiting Professor stay, Toulouse, France
5 – 9.12.2016	(talk) *An efficient algebraic multigrid method for graph Laplacian systems*, *IMG* (2016 International Multigrid Conference), Bruchsal, Germany
24 – 26.06.2015	(invited plenary talk) *Incomplete Cholesky factorizations by orthogonal low-rank approximations*, *Workshop on fast solvers*, Toulouse, France
17 – 19.06.2015	(talk) *Incomplete Cholesky preconditioners that exploit the low-rank property*, *PRECOND15* (2015 International Conference on Preconditioning Techniques for Large Sparse Matrix Problems in Scientific and Industrial Applications), Eindhoven, The Netherlands
27.11.2014	(invited talk) *Incomplete Cholesky preconditioners based on orthogonal dropping: theory and practice*, *RAL seminar*, Rutherford Appleton Laboratory, Harwell, UK
16 – 20.09.2013	(invitation to a minisymposium) *Conditioning of incomplete Cholesky factorizations with orthogonal approximations*, *SciCADE13* (International Conference on Scientific Computation and Differential Equations), Valladolid, Spain
19 – 21.06.2013	(invited plenary talk) *Aggregation-based Algebraic Multigrid: Overview and Recent Advances*, *PRECOND13* (2013 International Conference on Preconditioning Techniques for Large Sparse Matrix Problems in Scientific and Industrial Applications), Oxford, UK
20.08.2012	(seminar) *A multifrontal preconditioner that exploits a low-rank structure*, LBNL, Berkeley, California
11.04.2012	(seminar) *Conditioning analysis of incomplete Cholesky factorizations with orthogonal dropping*, *LAPACK Seminar*, UC Berkeley, California
25 – 30.03.2012	(talk) *Conditioning analysis of incomplete Cholesky factorizations with orthogonal dropping*, *Copper Mountain 2012*, Copper Mountain, Colorado
15 – 17.02.2012	(talk) *A multifrontal preconditioner that exploits a low-rank structure*, *SIAM PP12*, Savannah, Georgia
1 – 2.08.2011	(talk) *Black-box superfast multifrontal solver: multifrontal aspects*, *CACHE annual meeting*, Berkeley, California
6.04.2011	(seminar) *An algebraic multigrid method with guaranteed convergence rate*, *LAPACK Seminar*, UC Berkeley, California
27.03 – 1.04.2011	(talk) *An algebraic multigrid method with guaranteed convergence rate I: the symmetric case*, *Copper Mountain 2011* (15th Copper Mountain Conference on Multigrid methods), Copper Mountain, Colorado, USA

23.11.2010	(invited plenary talk) *An algebraic multigrid method with proved convergence rate*, workshop *Solveurs de systèmes linéaires de grande taille : les avancées récentes*, Lyon, France
19 – 23.09.2010	(talk) *An algebraic multigrid method with proved convergence rate I: two-grid analysis*, *EMG10* (10th European Multigrid Conference), Ischia, Italy
7 – 8.09.2010	(seminar) *Solving linear systems of equations with aggregation-based multigrid* at LLNL, Livermore and LBNL, Berkeley, California
3 – 9.04.2010	(talk) *Algebraic analysis of aggregation-based multigrid* (winner of the student paper competition), *Copper Mountain 2010* (11th Copper Mountain Conference on Iterative Methods), Copper Mountain, Colorado, USA
22 – 27.03.2009	(talk) *V-cycle multigrid convergence analysis: comparison of bounds and relation with the two-grid convergence factor*, *Copper Mountain 2009* (14th Copper Mountain Conference on Multigrid methods), Copper Mountain, Colorado, USA
20 – 24.10.2008	(talk) *Algebraic analysis of V-cycle multigrid*, *EMG08* (9th European Multigrid Conference), Bad Herrenalb, Germany
17 – 20.03.2008	(talk) *Algebraic analysis of V-cycle multigrid*, *IMACS09* (9th IMACS International Symposium on Iterative Methods in Scientific Computing), Lille, France
9 – 12.07.2007	(poster) *Algebraic analysis of V-cycle multigrid*, *PRECOND07* (2007 International Conference on Preconditioning Techniques for Large Sparse Matrix Problems in Scientific and Industrial Applications), Toulouse, France

Short research visits

25.06 – 22.07.2017	Visiting Professor at INP, Toulouse, France

Honors and Awards

04.2010	Winner of the Student Paper Competition at 2010 Copper Mountain Conference
07.2008	FRERICHS award, Applied Science Faculty, Université libre de Bruxelles
07.2007	Best poster award at *PRECOND07*, Toulouse, France
03.2006	André BECKERS award, A.Ir.Br. (Engineers Association of Brussels)