

Dr. Vedran Šego

CONTACT INFORMATION

Research Visitor
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Alan Turing Building
School of Mathematics
The University of Manchester
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RESEARCH INTERESTS

Indefinite scalar products: structured matrix decompositions and algorithms with the emphasis on the hyperbolic scalar products

ACADEMIC APPOINTMENTS

Research Assistant October 2009 to present
Faculty of Science, Department of Mathematics, The University of Zagreb

- Ministry of Science, Education and Sports (English)
 - “Mathematical Modeling of Multicriteria Decision Problems” (grant 037-0363078-2776, info)
 - Supervisor: Associate professor Lavoslav Čaklović

Research Associate February 2001 to September 2009
Faculty of Science, Department of Mathematics, The University of Zagreb

- Ministry of Science, Education and Sports (English)
 - “Mathematical Modeling of Multicriteria Decision Problems” (grant 037-0363078-2776, info)
 - Supervisor: Associate professor Lavoslav Čaklović
- Ministry of Science, Education and Sports (English)
 - “Mathematical Modeling of Multicriteria Decision Problems” (grant 0037113, info)
 - Supervisor: Associate professor Lavoslav Čaklović
- Ministry of Science, Education and Sports (English)
 - “Theory of critical points and singularities” (grant 037014, info)
 - Supervisor: Associate professor Lavoslav Čaklović

ACADEMIC COOPERATION

Research Visitor August 2012 to August 2015
NLA Group, School of Mathematics, The University of Manchester

- visiting prof. Françoise Tisseur

Research Visitor December 2001 and March 2002
AliEn Group, CERN

- developing AliEn monitoring system

EDUCATION

The University of Zagreb, Croatia

Ph.D., Faculty of Science, Department of Mathematics, September 2009

- Thesis Topic: *Two-sided hyperbolic singular value decomposition*
- Advisors: Associate professor Sanja Singer, Associate professor Saša Singer
- Area of Study: Numerical Linear Algebra
- URL: <http://viveka.math.hr/~vsego/file.php?file=vsego-drsc.pdf>

Magister Scientiae (equivalent of M.Phil), Faculty of Science, Department of Mathematics, March 2006

- Thesis Topic: *The conical potential method*
- Advisor: Associate professor Lavoslav Čaklović
- Area of Study: Decision theory

Graduate engineer (equivalent of MSc), Faculty of Science, Department of Mathematics, December 2000

- Graduate engineer in mathematics, major Computer science
- Thesis Topic: *Fundamentals of the object oriented programming*
- Advisor: Dr Goran Igaly

PUBLISHED
PAPERS

- [1] *The hyperbolic Schur decomposition*, Linear Algebra Appl., 440 (2014), 90–110.
- [2] *On a decomposition of partitioned J -unitary matrices*, Math. Commun., 17 (2012), 265–284.
- [3] *Two-sided hyperbolic SVD*, Linear Algebra Appl., 433 (2010), 1265–1275.
- [4] *AliEn-ALICE environment on the GRID* (with Pablo Saiz, Laurent B. Aphetche, Predrag Bunčić, Ružica Piskač, Jan-Erik Revsbech), Nucl. Instrum. Meth. A, 502 (2003), 437–440.
- [5] *Potential Method applied on exact data* (with Lavoslav Čaklović), Proceedings of the 9th International Conference on Operational Research (KOI2002), Trogir, Croatia, October 2–4, 2002., Croatian Operational Research Society, Faculty of Economics, 2003, 237–248.
- [6] *Improvement of AHP method* (with Lavoslav Čaklović, Ružica Piskač), Math. Commun., 6 (2001), S1, 13–21.

SUBMITTED
PAPERS

- [7] *Restoring Definiteness via Shrinking, with an Application to Correlation Matrices with a Fixed Block* (with Nick Higham and Nataša Strabić). Submitted to SIREV Research Spotlights section, available at MIMS EPrint Record 2014.54, November 2014.

ARTICLES

- [8] *Matrix sign function* (with Nataša Strabić, in Croatian), Math.e: hrvatski matematički elektronski časopis, 19, Zagreb, 2011.
http://e.math.hr/math_e_article/br19/sego
- [9] *$P=NP?$* (in Croatian), Matematičko-fizički list, Zagreb, 2010, LX, 4, 211–220.
- [10] *LiveGraphics3D* (in Croatian, with Ines Šimičić, Vedran Krčadinac), Hrvatski matematički elektronski časopis math.e, 11, Zagreb, 2007.
<http://e.math.hr/live/index.html>

CONFERENCES

- [11] IWASEP10, Dubrovnik, Croatia, June 2–5, 2014.
 - Coauthor with N. Higham and N. Strabić (speaker): *Shrinking an Invalid Correlation Matrix with a Fixed Block*.
 - Poster: *The hyperbolic Schur decomposition and the SVD it implies*.
- [12] 3rd SIAM National Student Chapter Conference, The University of Oxford, May 28, 2014.
 - Coauthor with N. Higham and N. Strabić (speaker): *Shrinking an Invalid Correlation Matrix with a Fixed Block*.
- [13] Annual Manchester SIAM Student Chapter Conference 2014, University of Manchester, May 2, 2014.
 - Poster: *The hyperbolic Schur decomposition and the SVD it implies*.
- [14] Workshop on Nonlinear Eigenvalue Problems, University of Manchester, April 23–25, 2014.

- [15] 12th annual Bath/RAL numerical analysis day, RAL, UK, January 30, 2014.
- [16] Manchester-NAG-RAL Workshop (MNR13), University of Manchester, October 23, 2013.
- [17] 25th Biennial Conference on Numerical Analysis, Glasgow, June 25–28, 2013.
- [18] Annual Manchester SIAM Student Chapter Conference 2013, May 20, 2013.
- Conference co-organizer.
- [19] Advances in Matrix Functions and Matrix Equations, Manchester, UK, April 10–12, 2013.
- [20] ApplMath11 – 7th Conference on Applied Mathematics and Scientific Computing, Trogir, Croatia, June 13–17, 2011.
- Talk: *One decomposition of hyperbolic unitary matrices.*
- [21] 7th International Workshop on Accurate Solution of Eigenvalue Problems, Dubrovnik, Croatia, June 9–12, 2008.
- [22] TERENA Networking Conference 2002, Limerick, Ireland, June 3–6, 2002.
- [23] The 9th International Conference on Operational Research KOI 2002, Trogir, Croatia, October 2–4, 2002.
- Coauthor with Lavoslav Čaklović (speaker): *Potential Method applied on exact data.*
- [24] 8th International Conference on Operational Research KOI 2000, Rovinj, Croatia, September 27–29, 2000.
- Coauthor with Lavoslav Čaklović and Ružica Piskač (speaker): *Improvement of AHP method.*
- SEMINARS
- [25] *The hyperbolic Schur decomposition*,
http://viveka.math.hr/~vsego/seminar/hyperbolic_schur-manchester
- [26] *Two-sided hyperbolic singular value decomposition (2)* (in Croatian),
<http://viveka.math.hr/~vsego/seminar/2hsvd-seminar-2>
- [27] *Two-sided hyperbolic singular value decomposition (1)* (in Croatian),
<http://viveka.math.hr/~vsego/seminar/2hsvd-seminar-1>
- MANUSCRIPTS
- [28] *Programming 1* (in Croatian), study materials for the undergraduate course “Programming 1”
<http://degiorgi.math.hr/prog1/materijali/p1-vjezbe.pdf>
- [29] *Programming 2* (in Croatian), study materials for the undergraduate course “Programming 2”
<http://degiorgi.math.hr/prog2/materijali/p2-vjezbe.pdf>
- SOFTWARE APPLICATIONS
- [30] *shrinking*, a Python module for restoring definiteness via shrinking (2014)
<https://github.com/vsego/shrinking>
- [31] *PyteArt*, a collection of generators of ASCII art with overlapping characters (2014)
<https://github.com/vsego/PyteArt>
- [32] Beamer themes: *vsego* (2011), *MIMS* (2013)
- [33] *On-line homework generator and verifier*, 2007–2011
 Used for courses: Programming 1, Programming 2, Numerical mathematics

[34] *MetPot*, an application for decision making using the Potential method, 2001–2008
<http://decision.math.hr/download/MetPot.zip>

[35] *Decision*, a simple AHP calculator, 2000
<http://decision.math.hr/download/Decision.zip>

MEMBERSHIP ON RESEARCH PROJECTS
Research assistant, “Mathematical Modeling of Multicriteria Decision Problems”, MZOS, 037-0363078-2776 (info), 2007 to present.
Research associate, “Mathematical Modeling of Multicriteria Decision Problems”, MZOS, 0037113 (info), 2002.–2006.
Research associate, “Theory of critical points and singularities”, MZOS, 037014 (info), 1996.–2002.

STUDENT MENTORING
Tamara Bucić, “Databases for electronic libraries”, graduation thesis (in Croatian), 2012.
Advisor: Full professor Nenad Antić
Zoran Gaćeša, “Seminars web interface”, graduation thesis (in Croatian), 2010.
Advisor: Full professor Mladen Rogina
Nataša Strabić, “Matrix sign function”, graduation thesis (in Croatian), 2009.
Advisor: Associate professor Sanja Singer

TEACHING EXPERIENCE
School of Mathematics, The University of Manchester, Manchester, UK

Lecturer **January 2015 to June 2015**

- Lecturer for Programming with Python (MATH20622)
 - The aim of the course is to introduce students to the “algorithmic way of thinking” and to the basic programming concepts, laying strong foundations for computer-aided problem solving.
 - Responsible for developing the course materials, 1 hour per week of lectures, examinations, and marking.

Faculty of Science, Department of Mathematics, The University of Zagreb, Croatia

Lecturer **March 2012 to August 2012**

- Lecturer for Programming 2
 - Students are taught intermediate and advanced concepts of programming in C: recursive functions, multidimensional arrays, dynamic memory allocation, strings, structures, linked lists and files.
 - Responsible for 2 hours per week of lectures, providing written exams, marking and oral exams.

Instructor **March 2004 to August 2012**

- Instructor for Programming 2
 - Students are taught intermediate and advanced concepts of programming in C: recursive functions, multidimensional arrays, dynamic memory allocation, strings, structures, linked lists and files.
 - Responsible for 2 hours per week of exercises, providing written exams and marking.

Lecturer **September 2011 to March 2012**

- Lecturer for Programming 1
 - Students are taught basics of computer science (von Neumann computer, integer and real number representation and arithmetics) and basics of C (introduction, data types, operators, arrays, functions, simple algorithms).
 - Responsible for 2 hours per week of lectures, providing written exams, marking and oral exams.

Instructor **October 2001 to March 2012**

- Instructor for Programming 1
 - Students are taught introductory concepts (number systems, Boolean algebra, regular expressions) and basics of C (introduction, data types, operators, arrays, functions, simple algorithms).
 - Responsible for 2 hours per week of exercises, providing written exams and marking.

Instructor **March 2005 to August 2012**

- Instructor for Computer lab 2 (for the students of the educational programme)
 - Students are taught Microsoft Excel and PowerPoint, web page design, Mathematica (Maxima in the academic year 2011/2012).
 - Responsible for 4 hours per week of exercises and marking.

Instructor **October 2004 to March 2012**

- Instructor for Computer lab 1 (for the students of the educational programme)
 - Students are taught internet technologies, Microsoft Word and Excel.
 - Responsible for 4 hours per week of exercises and marking.

Instructor **March 2010 to September 2011**

- Instructor for Computer lab (for the students of The Department of Biology)
 - Students are taught web design (GoogleSites), Microsoft Word and PowerPoint, with the emphasis on presentation skills, and statistics in Microsoft Excel.
 - Responsible for 5 hours per week of lectures and exercises, and marking.

Instructor **March 2011 to September 2011**

- Instructor for Numerical mathematics
 - Students are taught systems of linear equations (Gauss eliminations, LU and Cholesky factorization), real function evaluation, polynomial interpolation (Newton, Lagrange, Chebyshev, Hermite), spline interpolation, discrete least squares problem, numerical integration (Newton-Cotes, Gauss, method of undetermined coefficients), non-linear equations solving (Newton, bisection).
 - Responsible for 2 hours per week of exercises and marking.

Instructor **October 2006 to March 2007**

- Instructor for Computer lab 2
 - Students are taught Motif, Perl and HTML.
 - Responsible for 4 hours per week of exercises and marking.

Instructor **Oct 2002 to Mar 2004, Mar 2006 to Sep 2006**

- Instructor for Decision making and game theory
 - Students are taught paradoxes, strong and weak insecurity, axioms of decision making, two methods of the hierarchical decision making (the analytical hierarchy process and the potential method), Nash equilibrium, matrix games.
 - Responsible for 2 hours per week of exercises and marking.

Instructor **March 2004 to September 2004**

- Instructor for Fuzzy computing
 - Students are taught fuzzy logic and programming of the artificial intelligence in Wolfram Mathematica.
 - Responsible for 2 hours per week of exercises and marking.

Instructor **October 2002 to March 2003**

- Instructor for Data structures and algorithms
 - Students are taught various data structures (stack, queue, priority queue, etc.) and the algorithms relying on those, as well as their implementations in C.
 - Responsible for 2 hours per week of exercises and marking.

Instructor **October 2002 to March 2003**

- Instructor for Web programming
 - Students are taught CSS, PHP with MySQL, Perl.
 - Responsible for 2 hours per week of exercises and marking.

Instructor **March 2002 to September 2002**

- Instructor for Computer graphics
 - Students are taught mathematical background behind computer graphic algorithms (meshes, projections, Bezier curve, etc.).
 - Responsible for 2 hours per week of exercises and marking.

Marker **March 2001 to September 2001**

- Marked homeworks (Programming in Pascal)

REFeree

- *Linear and Multilinear Algebra*

PROFESSIONAL MEMBERSHIPS

Croatian Mathematic Society, Member (2001 to present)

SERVICE

- Manchester SIAM Student Chapter webmaster (2012–2013) and annual 2013 conference co-organizer,
- System administrator of `degiorgi.math.hr`, with web forum for teaching support (founder and administrator), web pages for several courses, actuarial studies, Seminar in numerical mathematics and scientific computing and Scientific colloquium (2001 to present),
- System administrator of `decision.math.hr`, with lectures, research materials and papers in decision theory (2005 to present),
- Secretary for Seminar in numerical mathematics and scientific computing (2010 to 2012),
- Technical editor of Math.e (Croatian mathematical electronic journal) (2009 to 2012),
- Doctoral students' representative in the Faculty of Science Committee (September 2010 to October 2011),
- Doctoral students' representative in the Committee of Study Programme Directors (July 2005 to October 2011),
- Doctoral students' representative in the Department of Mathematics Committee (October 2004 to October 2011).

SOFTWARE SKILLS

Computer Programming:

- Perl, C, PHP, JavaScript, UNIX shell scripting, SQL, MySQL, ImageMagick, Pascal, Python, Mathematica, and others

Productivity Applications:

- $\text{T}_{\text{E}}\text{X}$ ($\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$, $\text{B}_{\text{I}}\text{B}_{\text{T}}\text{E}_{\text{X}}$, Beamer), Vim/Gvim, LibreOffice, Gimp, Microsoft Office

Operating Systems:

- Linux (power user and administrator), Microsoft Windows, HP-UX

AWARDS

- Rector's award for the joint work "Multicriteria decision making" with coauthor R. Piskač, under the guidance of Associate professor L. Čaklović, 2000

LANGUAGES

- Croatian, mother tongue
- English, fluent