

Curriculum Vitae of Tomaž Košir

- 1962 Born in Kranj, Slovenia.
- 1969-81 Elementary and high school education in Kranj.
- 1982-86 Undergraduate studies of theoretical mathematics at the University of Ljubljana. Graduated with the BSc thesis '*Common Jordan chains of matrices*'. My supervisor was Professor Matjaž Omladič. Received a university Prešeren Prize for the thesis.
- 1986-89 Graduate studies of mathematics at the University of Ljubljana. Graduated with the MSc thesis '*Operator polynomials*'. My supervisor for the thesis was Professor Matjaž Omladič.
- 1989-93 Graduate student in applied mathematics at the University of Calgary in Calgary, Alberta, Canada. My supervisor was Professor Paul Binding.
- 1993 Defended PhD thesis '*Commuting matrices and multiparameter eigenvalue problems*' in April.
- 1993-95 Postdoctoral student at Dalhousie University in Halifax, Nova Scotia, Canada. My supervisor was Professor Luzius Grunenfelder.
- 1995 In the fall I returned to Ljubljana.
- 1995-2000 Assistant professor at the Department of Mathematics, Faculty of Mathematics and Physics of the University of Ljubljana.
- since 1995 Part time researcher at the Institute of Mathematics, Physics and Mechanics, Ljubljana, Slovenia.
- 2000-05 Associate professor at the same department.
- since 2005 Professor at the same department.
- fall 2000 Sabbatical semester at the University of Southern California in Los Angeles.
- spring 2001 Sabbatical semester at Dalhousie University in Halifax.
- 2001-03 Chairman of the Department of Mathematics, Faculty of Mathematics and Physics of the University of Ljubljana for the two academic years.
- 2003 Received the Zois Certificate of Recognition. The Certificate is conferred to researchers for their achievements to scientific, research and development activities in the Republic of Slovenia.
- 2003-07 Coordinator of the curriculum reform at the Department of Mathematics, Faculty of Mathematics and Physics of the University of Ljubljana.
- 2007-20 Coordinator of the study program Financial Mathematics at the Department of Mathematics, Faculty of Mathematics and Physics of the University of Ljubljana. It is organized as a five year program (3+2).
- 2017-19 Deputy chair for finance of the Department of Mathematics, Faculty of Mathematics and Physics.
- 2021-23 The dean of the Faculty of Mathematics and Physics.

Teaching experience

As a graduate student at the University of Ljubljana and the University of Calgary I was a teaching assistant for various courses. Among them were Linear Algebra, Abstract Algebra, Calculus, Differential Equations, Tensor Analysis, Probability, Statistics, and others.

After graduating in 1993 I taught a summer course in Complex Variables at the University of Calgary. As a postdoctoral student at Dalhousie University I taught courses in Calculus (3 terms) and a course in Geometry (1 term).

At the University of Ljubljana I have so far taught undergraduate courses in Linear Algebra, Calculus, Affine and Projective Geometry, Differential Equations, Algebraic Curves, Mathematical Statistics, and Financial Mathematics, and graduate courses in Commutative Algebra, Associative Algebra, Lie Algebras, p -groups, Introduction to Algebraic Geometry, Topics in Financial Mathematics, and Econometric Methods.

I am a coauthor of *Solved Problems in Probability* (in Slovene) and a coauthor of a textbook in affine and projective geometry '*Transformations in Geometry*' (also written in Slovene). which were published by the Society of Mathematicians, Physicists and Astronomers of Slovenia. I prepared lecture notes in linear algebra and in introductory financial mathematics (both in Slovene) that are available on the web.

I supervised about 145 BSc theses, 56 MSc theses, and 2 PhD theses.

Research interests

My research interests include the following topics:

- problems in multiparameter spectral theory,
- problems involving commuting matrices, commuting varieties, and their representations as commutative zero-dimensional algebras,
- determinantal varieties and their applications,
- problems in matrix groups and semigroups,
- theoretical questions in the theory of copulas and quasi-copulas,
- problems of numerical linear algebra,
- applications of the above to financial mathematics,
- applications of algebra (commutative and associative) and algebraic geometry to the problems in linear algebra and partial differential equations.

Service to Mathematics Community

I was a member of the editorial board of the *Rendiconti dell'Istituto di Matematica dell'Università di Trieste: An International Journal of Mathematics* that is published since 1969.

I am helping with the organizations of a series of international conferences *Linear Algebra Workshop (LAW)* in Slovenia, every third year since 1996. The 8th LAW was held in Ljubljana, Slovenia, in June 2017. The 9th was postponed due to current pandemic situation. I am also one

of the organizers of a minisymposium *Mathematical Challenges in Insurance* that is part of the European Congress in Mathematics in Portorož, Slovenia, June 20-26, 2021.

I organized the *Summer schools in financial mathematics* in Ljubljana in September 2009 and August/September 2011, and I was one of main organizers of the *5th General Conference in Advanced Mathematical Methods in Finance* that took place in Bled, Slovenia, May 4–8, 2010. It was organized as a part of the AMaMeF scientific program sponsored by the European Science Foundation (ESF).

I have been representing Slovenia in the Steering Committee of the AMaMeF since 2009.

With researchers from the Universities of Trieste and Udine, and SISSA with ICTP we organize one day meetings in Algebraic Geometry. In 2010 also the University of Ferrara joined the group. We organized TULS I in 2003, TULS IV in 2006, and TULSF VIII in 2013 in Ljubljana.

Selected Bibliography

On Commuting Matrices:

- with J. Irving and M. Mastnak. A proof of the Box Conjecture for commuting pairs of matrices. Preprint available on arXiv.org.
- with P. Oblak: On pairs of commuting nilpotent matrices. *Transform. Groups* 14 (2009), no. 1, 175–182.
- with B. Plestenjak: On stability of invariant subspaces of commuting matrices, *Linear Algebra and its Applications* 342 (2002), 133-147.

Multiparameter Eigenvalue Problems:

- with M. E. Hochstenbach and B. Plestenjak: Numerical methods for rectangular multiparameter eigenvalue problems, with applications to finding optimal ARMA and LTI models. *Num. Lin. Alg. Appl.* 31 (2024), Issue 2, Paper No. e2540. (open access)
- with M. E. Hochstenbach and B. Plestenjak: A Jacobi-Davidson Type Method for the Two-Parameter Eigenvalue Problem, *SIAM J. Matrix Anal. Appl.* 26 (2004/05), 477-497.
- with B. Plestenjak. On the singular two-parameter eigenvalue problem II. *Linear Algebra and its Applications.* 649 (2022), 433-451.
- The Cayley-Hamilton Theorem and Inverse Problems for Multiparameter Systems, *Linear Algebra and its Applications* 367 (2003), 155-163.
- with L. Grunenfelder : An Algebraic Approach to Multiparameter Spectral Theory, *Transactions Amer. Math. Soc.* 348 (1996), 2983-2998.
- with L. Grunenfelder: Geometric Aspects of Multiparameter Spectral Theory, *Transactions Amer. Math. Soc.* 350 (1998), 2525-2546.
- with P. Binding : Second Root Vectors for Multiparameter Eigenvalue Problems of Fredholm Type, *Transactions Amer. Math. Soc.* 348 (1996), 229-249.
- with P. Binding: Root Vectors for Geometrically Simple Two-Parameter Eigenvalues, *Transactions Amer. Math. Soc.* 356 (2004), 1705-1726.

On Copula Theory:

- with M. Omladič: Singular components of shock model copulas. *J. Comp. Appl. Math.* 400 (2022) Paper No. 113749.
- with D. Kokol Bukovšek, B. Mojškerč, and M. Omladič. Extreme generators of shock induced copulas. *Appl. Math. Comput.* 429 (2022), Paper No. 127214, 16 pp.
- with M. Omladič. Reflected maxmin copulas and modeling quadrant subindependence. *Fuzzy Sets and Systems* 378 (2020), 125143.
- with D. Kokol Bukovšek, B. Mojškerč, and M. Omladič. Relation between non-exchangeability and measures of concordance of copulas. *J. Math. Anal. Appl.* 487 (2020), art. 123951 (26pp).
- with D. Kokol Bukovšek, B. Mojškerč, and M. Omladič. Asymmetric linkages: Maxmin vs. Reflected Maxmin Copulas. *Fuzzy Sets and Systems* 393 (2020), 75–95.
- with M. Omladič. Reflected maxmin copulas and modelling quadrant subindependence. *Fuzzy Sets and Systems* 378 (2020), 125–143.
- with D. Kokol Bukovšek, B. Mojškerč, M. Omladič: Non-exchangeability of copulas arising from shock models, *J. of Comp. and Appl. Math.*, 358 (2019), 61–83.

Determinantal varieties and determinantal representations:

- with B.A. Sethuraman: Determinantal Varieties Over Truncated Polynomial Rings, *Journal of Pure and Applied Algebra* 195 (2005), 75-95.
- with B.A. Sethuraman: A Groebner basis for the 2×2 determinantal ideal mod t^2 , *Journal of Algebra* 292 (2005), 138-153.
- with A. Buckley: Determinantal representations of smooth cubic surfaces, *Geometria Dedicata* 125 (2007), 115-140.
- with A. Buckley: Plane curves as Pfaffians. *Annali della Scuola Normale Superiore di Pisa, Classe di Scienze* 10 (2011), no. 2, 363–388.
- with A. Buckley: Simultaneously self-adjoint sets of 3×3 matrices. *Rendiconti dell’Istituto di Matematica dell’Universita di Trieste* 47 (2015), 81-105.

Other topics:

- with L. Grunenfelder, R. Guralnick, and H. Radjavi: Permutability of Characters on Algebras, *Pacific Journal of Mathematics* 178 (1997), 63-70.
- with L. Grunenfelder, M. Omladič, H. Radjavi. Finite groups with submultiplicative spectra. *J. Pure Appl. Algebra* 216 (2012), no. 5, 1196–1206.
- with K. Cvetko-Vah, D. Kokol Bukovšek, G. Kudryavtseva, Y. Lavrenyuk, and A. Oliynyk: Semitransitive and transitive subsemigroups of the inverse symmetric semigroups, *Semigroup Forum* 78 (2009), no. 1, 138-147.

- with B.A. Sethuraman we wrote an appendix to J. Holbrook and J. P. Schoch: Moving zeros among matrices, *Linear Algebra and its Applications* 424 (2007), 83-95,
- with J. Bernik, R. Drnovšek, D. Kokol Bukovšek, and M. Omladič: Reducibility and triangularizability of semitransitive operator spaces, *Houston J. Math.* 34 (2008), no. 1, 235-247.
- with J. Bernik, R. Drnovšek, M. Omladič, and H. Radjavi: Irreducible semigroups of matrices with eigenvalue one, *Semigroup Forum* 67 (2003), 271-287.

Some invited talks at international conferences and foreign universities

- *Geometric Description of Algebraic Multiplicities for Eigenvalue Problems in Several Parameters*, 927th AMS Meeting, Milwaukee, Wisconsin, USA, October 1997.
- *Multiparameter spectral theory*. Invited talk at Ferdowsi University of Mashhad: 33th Annual Iranian Mathematics Conference, 2002.
- *On stability of invariant subspaces of commuting matrices*. Northridge: Southern California Matrix Theory Meeting, California, USA, 2002.
- *Determinantal varieties over a truncated polynomial ring*. Invited talk at Università di Genova: Incontro di Algebra Commutativa e Computazionale, Genova, Italy, 2005.
- *Varieties of commuting matrices*. Lectures series at Himalaya Summer School on Geometric, Homological And Combinatorial Aspects in Commutative Algebra. Shogran, Khagan Valley, Pakistan, 2008.
- *Determinantal representations of cubic surfaces*. Invited talk at Workshop GeoLMI on the geometry and algebra of linear matrix inequalities, LAAS-CNRS, University of Toulouse, France, 2009.
- *Determinantal representations of cubic curves and applications*. Vector Bundle Days II, Trieste, Italy, 2014.
- *Simultaneously self-adjoint sets of 3×3 matrices*. The 4th Najman Conference, Opatija, Croatia, 2015.
- *On commuting nilpotent matrices*. Colloquium Talk, University of Osijek, Croatia, 2016.
- *Asymmetry for bivariate copulas and shock models*. Invited Seminar Talk, Taras Sevchenko National University, Kyiv, Ukraine, 2018.

Ljubljana, April 4, 2024.

Tomaž Košir