

## **Boštjan Gabrovšek** – *Curriculum vitae*

University of Ljubljana, Faculty of Mechanical Engineering  
Aškerčeva 6, 1000 Ljubljana, Slovenia

Phone: +386 1 4771 516

E-mail: [bostjan.gabrovsek@fs.uni-lj.si](mailto:bostjan.gabrovsek@fs.uni-lj.si)

Webpage: <https://mat.fs.uni-lj.si/people/gabrovsek/>

### **Research interests**

Low-dimensional topology, knot theory in 3-manifolds, algebraic knot theory, applications in topology, topological protein and DNA structures, machine learning, computational mathematics, graph theory, operations research, optimization.

### **Education**

- 2013, Ph.D., Mathematics, University of Ljubljana, Slovenia.
- 2006, B.Sc., Mathematics and Computer Science in Education, University of Ljubljana, Slovenia.

### **Academic Titles**

- 2018–present, assist. prof., Mathematics, University of Ljubljana.
- 2009–2018, habilitated teaching assistant, Mathematics, University of Ljubljana.
- 2006–2011, habilitated teaching assistant, Computer science in education, University of Ljubljana.

### **Employment**

- 2021–present, assist. prof. (20%) & habilitated teaching assistant(80%), University of Ljubljana, Faculty of Mechanical Engineering, Slovenia.
- 2012–2020, habilitated teaching assistant, University of Ljubljana, Faculty of Mechanical Engineering, Slovenia.
- 2022–present, research fellow (part-time), University of Ljubljana, Faculty of Education, Slovenia.
- 2009–2010, 2017–present, research fellow (part-time), Institute of Mathematics, Physics and Mechanics, Slovenia.
- 2009–2010, 2016–present, research fellow (part-time), University of Ljubljana, Faculty of Mathematics and Physics, Slovenia.
- 2009–2012, habilitated teaching assistant, University of Ljubljana, Faculty of Computer and Information Science, Slovenia.
- 2008–2019, system administrator (part-time), University of Ljubljana, Faculty of Medicine, Slovenia.

- 2006–2007, habilitated teaching assistant, University of Ljubljana, Faculty of Education, Slovenia.

## Teaching

- Lectures
  - University of Ljubljana, Faculty of Mechanical Engineering (2021–present): *Analysis*.
- Exercises
  - University of Ljubljana, Faculty of Mechanical Engineering (2021–present): *Analysis and ordinary differential equations, Analysis, Linear algebra and vector analysis, Ordinary differential equations and linear algebra*.
  - University of Ljubljana, Faculty of Mechanical Engineering (2012–2020): *Mathematics 1/2/3, Technical mathematics 1/2*.
  - University of Ljubljana, Faculty of Computer and Information Science (2009–2012): *Fundamentals of mathematical analysis, Discrete structures, Probability and Statistics*.
  - University of Ljubljana, Faculty of Mathematics and Physics (2009–2010): *Operational research, Programming*.
  - University of Ljubljana, Faculty of Education (2006–2007): *Programming 2, System software, Multimedia and hypertext*.

## Research Grants

- 2022–2025, Slovenian Research agency project J1-4031, *A computational library for knotted structures and applications*, principal investigator.
- 2023–2025, Polish-Czech-Slovenian trilateral ARRS project N1-0278, *Biological code of knots – identification of knotted patterns in biomolecules via AI approach*, principal investigator.
- 2019-2020, United States-Slovenian bilateral project BI-US/19-21-111, *Khovanov homology and skein modules*, principal investigator.

## Research Papers

17. *2-rainbow independent domination numbers on product graphs*, to appear in *Cent. Eur. J. Oper.*, 2022 (with A. Peperko & J. Žerovnik).
16. *Topological invariants of bonded proteins*, *Symmetry* 14:8, 2022 (with N. Gügümcü & L. Kauffman).
15. *On nonlocal Dirichlet problems with oscillating term*, *Discrete Contin. Dyn. Syst. Ser. S*, published online, 2022 (with G. Molica Bisci & D. D. Repovš).
14. *Clustering as a dual problem to colouring*, *Comput. Appl. Math.* 41:4, 2022 (with N. Ikica, J. Povh, & J. Žerovnik).

13. [An invariant for colored bonded knots](#), *Stud. Appl. Math.* 146, pp. 586-604, 2021.
12. [A Markov theorem for generalized plat decomposition](#), *Ann. Sc. Norm. Super. Pisa Cl. Sci.* 20:5, 2020 (with A. Cattabriga).
11. [The Alexander polynomial for closed braids in lens spaces](#), *J. Pure Appl. Algebra* 224:106253, 2020 (with E. Horvat)
10. [Independent rainbow domination numbers of generalized Petersen graphs  \$P\(n, 2\)\$  and  \$P\(n, 3\)\$](#) , *Mathematics* 8:996, 2020 (with B. A. Peperko & J. Žerovnik).
9. [Multiple Hungarian method for  \$k\$ -assignment problem](#), *Mathematics* 8:2050, 2020 (with T. Novak, J. Povh, D. Rupnik Poklukar, & J. Žerovnik).
8. [The Alexander polynomial of links in lens spaces](#), *J. Knot Theory Ramif.* 28:1950049, 2019 (with E. Horvat).
7. [Infinitely many sign-changing solutions for Kirchhoff type problems in  \$\mathbb{R}^3\$](#) , *Nonlinear Anal.* 186, pp. 33-54, 2019 (with J. Sun, L. Li & M. Cencelj).
6. [On the KBSM of links in lens spaces](#), *J. Knot Theory Ramif.* 27:1850006, 2018 (with E. Manfredi).
5. [Tabulation of prime knots in lens spaces](#), *Mediterr. J. Math.* 14:2, 2017.
4. [On the Seifert fibered space link group](#), *Topology Appl.* 206, pp. 255-275, 2016 (with E. Manfredi).
3. [The HOMFLYPT skein module of the lens spaces  \$L\_{p,1}\$](#) , *Topology Appl.* 175, pp. 72-80, 2014 (with M. Mroczkowski).
2. [The categorification of the Kauffman bracket skein module of  \$\mathbb{R}P^3\$](#) , *Bull. Aust. Math. Soc.* 88, pp. 407-422, 2013.
1. [Knots in the solid torus up to 6 crossings](#), *J. Knot Theory Ramif.* 21:1250106, 2012 (with M. Mroczkowski).

**Pure citations:** 82 (Scopus), 67 (WoS); **h10 index:** 5.

### Refereed Proceedings, Book Chapters, and Other Papers

6. [2-rainbow independent domination numbers of some graphs](#), *SOR '21 proceedings*, Slovenian Society Informatika, pp. 173-178, 2021 (with A. Peperko & J. Žerovnik).
5. [Knot invariants in lens spaces](#), *Knots, Low-Dimensional Topology And Applications*, Springer Proceedings in mathematics & Statistics, pp. 347-361, 2019 (with E. Horvat).
4. [Five heuristics for the  \$k\$ -matching problem](#), *SOR '19 proceedings*, pp. 101-106, Slovenian Society Informatika, 2019 (with T. Novak, J. Povh, D. Rupnik Poklukar & J. Žerovnik).
3. [On the independent rainbow domination numbers of generalized Petersen graphs  \$P\(n, 2\)\$  and  \$P\(n, 3\)\$](#) , *SOR '19 proceedings*, pp. 107-112, Slovenian Society Informatika, 2019 (with A. Peperko & J. Žerovnik).

2. Link diagrams in Seifert manifolds and applications to skein modules, *Algebraic modeling of topological and computational structures and applications: THALES*, Springer Proceedings in Mathematics & Statistics **2019**, pp. 117–141, 2019 (with M. Mroczkowski).
1. Hitro množenje velikih števil, *Presek* 44:1, 2017 (with A. Peperko).

### Submitted Papers

1. Invariants of multi-linkoids, arXiv:2204.11234 [math.GT], 2022 (with N. Gügümcü)

### Invited Conference Talks

15. On heuristics for parallel graph colouring, *KOI 2022, 19th International Conference on Operations Research*, Split, Croatia, Sep 2022.
14. Bonded knotoids and linkoids, *Topology, Physics, and Chemistry of Soft Matter (Eutopia IV)*, Trento, Italia, Sep 2022.
13. Invariants of multi-linkoids and bondoids, *Second Congress of Greek Mathematicians, sec. Geometry and Topology*, Athens, Greece, July 2022.
12. Bonded knots: a topological model for knotted proteins, *8th European Congress of Mathematics, sec. Low-dimensional Topology* (online), Portorož, Slovenia, June 2021.
11. 2-rainbow independent domination numbers of some graphs, *SOR'21, The 16th International Symposium on Operations Research* (online), Bled, Slovenia, Sep 2021.
10. On the independent rainbow domination numbers of generalized Petersen graphs  $P(n, 2)$  and  $P(n, 3)$ , *SOR'19, The 15th International Symposium on Operations Research*, Bled, Slovenia, Sep 2019.
9. *Knots in Gdańsk IV*, Gdańsk, Poland, June 2019, cancelled.
8. Skein modules of lens spaces and stratified Khovanov homology, *Hidden Algebraic Structures in Topology*, California Institute of Technology, Pasadena, United States, Mar 2019.
7. Bonded knots, *Knots in Gdańsk III*, Gdańsk, Poland, June 2019.
6. A Markov theorem for generalized plat decomposition *Knots in Gdańsk II*, Gdańsk, Poland, June 2018.
5. Knot invariants in lens spaces *Knots in Hellas 2016*, International Olympic Academy, Olympia, Greece, July 2016.
4. Link diagrams in Seifert manifolds and applications to skein modules, *Algebraic modeling of topological and computational structures and applications: THALES*, Athens, Greece, July 2015.
3. The link group of Seifert manifolds, *Glances @ Manifolds*, Kraków, Poland, July 2015.
2. The isomorphism function from  $S_3(L_{p,1})$  to the free module, *Workshop Thales: Algebraic modeling of topological and computational structures and applications*, Athens, Greece, July 2015.

1. [Implementation of Vogel's algorithm](#) *International Electrotechnical and Computer Science Conference ERK'06*, Portorož, Slovenia, Sep 2006.

### Invited Talks at Universities

10. [Bonded knots](#), MFO, Oberwolfach Research Institute for Mathematics, *Combinatorial and Geometric Knot Theory seminar* (hybrid), Oberwolfach, Germany, Nov 2021.
9. [Topological invariants for knots in proteins](#), University of Modena and Reggio Emilia, *Cycle of seminars on geometric topology*(online), Modena, Italia, Sep 2021.
8. [Bonded knots](#), George Washington University, *Greater Washington Topology Seminar* (online), Washington, D.C., United States, Nov 2020,
7. [Knot polynomials in the projective space](#), University of Maribor, *Ljubljana-Maribor-Zagreb topological seminar*, Maribor, Slovenia, Apr 2018.
6. [Hyperbolic 3-manifolds & When are two hyperbolic knots equal?](#), University of Bologna, *Algebra e geometria*, Bologna, Italia, Dec 2017.
5. [The HOMFLY-PT skein module of lens spaces](#), University of Warsaw, *Knot theory seminar*, Warsaw, Poland, Mar 2015.
4. [Skein modules](#), University of Bologna, *Algebra e geometria*, Bologna, Italia, feb 2015.
3. [Classification of knots in  \$L\(p, q\)\$](#) , National technical university of Athens, *Topological seminar*, Athens, Greece, Oct 2014.
2. [Classification of knots in  \$L\(p, q\)\$](#) , University of Bologna, *Algebra e geometria*, Bologna, Italia, Dec 2013.
1. [Vogel's algorithm](#), University of Gdańsk, *Topological seminar*, Gdańsk, Poland, June 2010.

### Research Visits by Invitation

- National Technical University of Athens, Athens, Greece, 2 weeks in July 2022 (Erasmus).
- Research in Pairs, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany, 3 weeks in Apr 2015.
- National Technical University of Athens, Athens, Greece, 2 weeks in Oct 2015.
- University of Warsaw, Warsaw, Poland, 1 week in Mar 2015.
- University of Bologna, Bologna, Italia, 1 week in Mar 2013, 2 weeks in Feb 2015, 2 weeks in Jun 2017.
- University of Gdańsk, Gdańsk, Poland, 2 week in Jun 2009, 4 weeks in Jun 2010, 4 weeks in Jun 2011, 1 week in Aug 2012.
- Steklov Mathematical Institute, Moscow, Russia, 1 week in Oct 2007.

## Teaching Textbooks

6. [Mathematics in art](#), University of Ljubljana, Faculty of Education, v delu, objavljeno online, 2022 (with M. Cencelj).
5. [Multi-variable functions and the fundamentals of vector analysis](#), University of Ljubljana, Faculty of Mechanical Engineering, 2022, ISBN 978-961-6980-87-6 (with A. Peperko).
4. [Linear algebra and vector analysis](#), University of Ljubljana, Faculty of Mechanical Engineering, 2022, ISBN 978-961-6980-86-9 (with J. Žerovnik, T. Novak, A. Peperko, H. Zakrajšek).
3. [Analysis](#), University of Ljubljana, Faculty of Mechanical Engineering, 2021, ISBN 978-961-6980-79-1 (with D. Rupnik Poklukar & J. Žerovnik)
2. [Analysis and ordinary differential equations](#), University of Ljubljana, Faculty of Mechanical Engineering, 2021, ISBN 978-961-6980-80-7 (with D. Rupnik Poklukar & J. Žerovnik).
1. [Kraut's engineering handbook](#), 17. popravljena izd., University of Ljubljana, Faculty of Mechanical Engineering, 2021, ISBN 978-961-6980-68-5 (B. Kraut et al.).

## Advising and Coadvising

7. A. Jeglič, [Symmedian point of a triangle and tetrahedra](#), M.Sc., coadviser, University of Ljubljana, 2020.
6. U. Šega, [Polynomial invariants of knots](#), M.Sc., adviser, 2019.
5. J. Mlinarič, [Geometric analysis of vocabulary](#), M.Sc., coadviser, University of Ljubljana, 2019.
4. M. Prevc, [Steiner tree problem](#), M.Sc., coadviser, University of Ljubljana, 2017.
3. S. Cof, [Art gallery problem](#), B.Sc., coadviser, University of Ljubljana, 2016.
2. A. Mandelj, [Grid planes and the generalization of Pick's theorem](#), M.Sc., coadviser, University of Ljubljana, 2016.
1. S. Subašić, [Disks on polyhedra edges](#), M.Sc., coadviser, University of Ljubljana, 2015.

## Refereeing

Bulletin of the Hellenic Mathematical Society, Journal of Knot Theory and its Ramifications, Journal of Pure and Applied Algebra, Indian Journal of Mathematics, MDPI Mathematics, Journal of Topology and its Applications.

## Popularization of Science

- Invited talk at the 33th Workshop for Teachers and General Public, University of Ljubljana, Faculty of Mathematics and Physics, [Zavozlane beljakovine](#) (eng. [Knotted proteins](#)), Sep 2021.

## Awards

- 2006, Faculty Prešeren award for B.Sc. thesis, University of Ljubljana.

## Other Activities

- 2021–present, coleader of the Seminar for Geometric Topology, University of Ljubljana, Faculty of Mathematics and Physics (with D. Repovš).
- 2021–present, board member of the Institute of Mathematics and Physics, Slovenia.

*Updated on Aug 4, 2022*