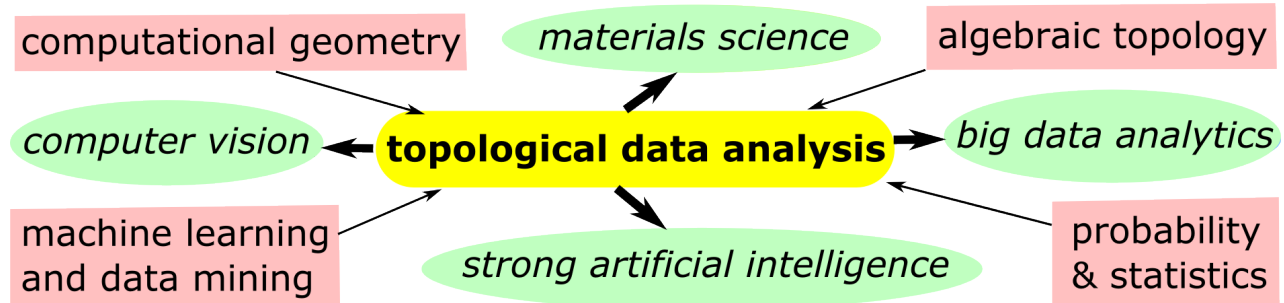




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Research : topological methods for Materials Science, Computer Vision and Climate.



Research grants

- **Knowledge Transfer Secondment** in Computer Vision at [Microsoft](#), Cambridge: £20K from [EPSRC](#) plus £75K in-kind contribution from Microsoft (since 2014).
- **EPSRC first grant** (2011 – 2013, value £100K) with a postdoc for 14 months
Topic: Persistent topological structures in noisy images, ref. [EP/I030328/1](#).
- **Marie Curie International Incoming Fellow** (2005 – 2007, €142K), Liverpool.
- Postdoctoral Fellowship by the Council of Burgundy (2003 – 2004, €22K), France.
- **INTAS PhD Fellowship** (value €10K, March 2001 – October 2003) at Moscow State University, visits to Montpellier II, Liverpool, Dijon, Toulouse III, Paris VII.
- **Applied Algebraic Topology** network (one of organisers since 2014) funded (£3.7K) by [LMS](#), [IMA](#), [GMJT](#) with meetings at Aberdeen, Durham, Queen Mary, Southampton.

Team and jobs

- Grzegorz Muszynski will start his PhD funded by the Berkeley lab in January 2017; [Chris Smithers](#), PhD in *Visual Culture* funded by the [Leverhulme Trust](#) since 2015.
- **Past members** (now collaborators): Dr [Alexey Chernov](#) (postdoc in 2011–2012); Dr [Marjan Safi-Samghabadi](#) (PhD student in 2009–2013, now lecturer in Tehran).
- **Teaching**: selected as 1 of 3 final nominees for *Lecturer of the Year Award* in 2013.
- *Sep 2007 – 2013*, Lecturer in Mathematics (permanent), Durham, United Kingdom.
- *June – Sep 2007*, Research Assistant in Sensor Networks, Lancaster University, UK.
- *Sep 2005 – May 2007*, Marie Curie postdoctoral fellow, University of Liverpool, UK.
- *February – July 2005*, Postdoctoral Fellow, Independent University of Moscow, Russia
- *December 2003 – November 2004*, Postdoctoral Fellow, University of Dijon, France

Member : [British Machine Vision Association](#), Higher Education Academy (UK).

Education

- *Postgraduate Certificate* in Teaching and Learning in HE, Durham University, 2009
- *PhD thesis* in Topology, ‘Basic embeddings and 3-page embeddings of graphs’, Moscow State Univ., Nov 2000 – Oct 2003, advisors: V. Buchstaber, A. Skopenkov
- *MSc thesis* in Mathematics, Independent Univ. of Moscow, Sep 1995 – March 2002
- *MSc thesis* in Mathematics, Moscow State University, September 1995 – June 2000

Collaborations since 2014, see all references to the list of publications below.

Superpixel segmentations of images with [A. Fitzgibbon](#), [Microsoft Research Cambridge](#), UK. To speed-up vision processing by 10^4 times based on papers [19,25,28], we split an image into a small number (1%) of superpixels without losing too much of the quality.

Topological Analysis of Climate Data with [Lawrence Berkeley Laboratory](#) (US). With [Prabhat](#) at [NERSC](#) we will supervise a summer intern, then a PhD student, to detect Atmospheric Rivers, which have caused all large floods in the UK in the past 10 years.

Topological Computer Vision with [G. Carlsson](#) (Stanford and [Ayasdi](#), US). In June 2016 we are starting a joint project on extending the Klein bottle model to colour images.

Relaxed ball packings with [H. Edelsbrunner](#) (IST Austria). We optimise packings of equal-sized balls with a partial overlap that models packed genes in chromosomes [23].

Classifications of periodic entanglements with [V. Robbins](#) (ANU), [G. Ellis](#) (NUI Galway), [M. Evans](#) (TU Berlin). Based on [27] we plan a Bernoulli brainstorm at EPFL in 2016.

Topological Data Analysis for Material Science with [M. Grinfeld](#) (Strathclyde University, UK). In March 2016 we organised the 1st workshop sponsored by [Alan Turing Institute](#).

Invited talks at international conferences since February 2015

- August 2016 BTM: British Topology Meeting (1-hour keynote lecture), Glasgow
- July 2016 ATMCS (Applied Topology: Methods, Computation, Science, Italy)
- July 2016 7ECM: European Congress of Mathematicians (20-min talk), Berlin
- April 2016 BAMC: British Applied Mathematical Colloquium, Oxford, UK
- January 2016 ATI scoping workshop on Learning for non-Euclidean Objects, London
- January 2016 Prospects in Data Science, University of Southampton, UK
- September 2015 ATI scoping workshop on Topological Data Analysis, Oxford
- July 2015 ACA: Applications of Computer Algebra, Kalamata, Greece
- July 2015 ACAT: Applied and Computational Algebraic Topology, IST Austria
- July 2015 SGP: Symposium on Geometry Processing, Graz, Austria
- June 2015 DyToComp: Dynamics, Topology and Computation, Poland
- May 2015 TopoInVis: Topology-based methods in Visualization, Germany
- April 2015 BAMC: British Applied Mathematical Colloquium, Cambridge, UK
- March 2015 IVAPP: Information Visualization Theory and Applications, Berlin
- February 2015 Algebraic Topology: Computation, Data Analysis, Applications, Oxford.

Selected publications in top journals and conference proceedings

- 28.** V. Kurlin. A fast persistence-based segmentation of noisy 2D clouds with provable guarantees, [Pattern Recognition Letters](#), to appear in 2016 (journal [impact factor 1.55](#)).
- 25.** V. Kurlin. A one-dimensional Homologically Persistent Skeleton of an unstructured point cloud in any metric space. [Computer Graphics Forum](#) (journal [impact factor 1.64](#)), v. 34, no. 5 (2015), p. 253-262.
- 19.** V. Kurlin. A fast and robust algorithm to count topologically persistent holes in noisy clouds. Proceedings [CVPR 2014: Computer Vision Pattern Recognition](#), p. 1458-1463 ([top 3 conference](#) in Computer Science and the [highest h-index conference](#) in any field).

All other peer-reviewed papers in the reverse chronological order

- 27.** V. Kurlin. Computing invariants of knotted graphs given by sequences of points in 3D. To appear in the Springer book of the series *Mathematics & Visualization* (post-proceedings of [TopoInVis 2015: Topology-based Methods in Visualization](#)).
- 26.** V. Kurlin, C. Smithers. A linear time algorithm for embedding arbitrary knotted graphs into a 3-page book. To appear as a chapter in the Springer book of the series [CCIS: Communications in Computer and Information Science](#) (2016).
- 24.** V. Kurlin. A Homologically Persistent Skeleton is a fast and robust descriptor of interest points in 2D images. [Lecture Notes in Computer Science](#), v. 9256 (2015), p. 606-617 (Proceedings of [CAIP 2015: Computer Analysis of Images and Patterns](#)).
- 23.** H. Edelsbrunner, M. Iglesias-Ham, V. Kurlin. Relaxed disk packing. Proceedings of [CCCG 2015: Canadian Conference on Computational Geometry](#), p. 128–135.
- 22.** V. Kurlin. A linear time algorithm for visualizing knotted structures in 3 pages. Proceedings of [IVAPP 2015: Information Visualization Theory & Applications](#), p.5-16.
- 21.** V. Kurlin, M. Safi-Samghabadi. Computing a skeleton of the configuration space of 2 round robots on a metric graph. Proceedings of [ICRoM 2014: IEEE International Conference on Robotics and Mechatronics](#), p. 723-729.
- 20.** V. Kurlin. Auto-completion of contours in sketches, maps and sparse 2D images. Proceedings of [CTIC](#) (Computational Topology in Image Context) at [SYNASC 2014](#) (Symposium on Symbolic & Numeric Algorithms for Scientific Computing), p. 594-601.
- 18.** A. Chernov, V. Kurlin. Reconstructing persistent graphs structures from noisy images. [Journal Image-A](#), v. 3 (2013), no. 5, p. 19-22.
- 17.** V. Kurlin, L. Mihaylova. How many wireless sensors are needed to guarantee connectivity of a 1-dimensional network with random inter-node spacings? [Journal of Applied Probability and Statistics](#), v. 8 (2013), no. 2, p. 27–50.

16. V. Kurlin, Computing braid groups of graphs with applications to robot motion planning, [Homology, Homotopy and Applications](#), v. 14 (2012), no. 1, p. 159-180.
15. T. Fiedler, V. Kurlin, Recognizing trace graphs of closed braids, [Osaka J. Mathematics](#), v.47 (2010), no. 4, p. 885–909
14. T. Fiedler, V. Kurlin, A one-parameter approach to links in a solid torus, [J. Math. Soc. of Japan](#), v. 62 (2010), no. 1, p. 167–211.
13. T. Fiedler, V. Kurlin, Fiber quadriseccants in knot isotopies, [J. Knot Theory Ramifications](#), v. 17 (2008), no. 11, p. 1415–1428.
12. C. Kearton, V. Kurlin, All 2-dimensional links live inside a universal 3-dimensional polyhedron, [Algebraic and Geometric Topology](#), v. 8 (2008), no. 3, p. 1223–1247.
11. V. Kurlin, Gauss paragraphs of classical links and a characterization of virtual link groups, [Math. Proc. Camb. Phil. Soc.](#), v. 145 (2008), no. 1, p. 129–140.
10. V. Kurlin, D. Lines, Peripherally specified homomorphs of link groups, [J. Knot Theory Ramifications](#), v. 16 (2007), no. 6, p. 719–740.
9. V. Kurlin, The Baker-Campbell-Hausdorff formula in the free metabelian Lie algebra, [J. Lie Theory](#), v. 17 (2007), no. 3, p. 525–538.
8. V. Kurlin, Three-page encoding and complexity theory for spatial graphs, [J. Knot Theory Ramifications](#), v. 16 (2007), no. 1, p. 59–102.
7. V. Kurlin, Compressed Drinfeld associators, [J. Algebra](#), v. 292 (2005), p. 184–242.
6. V. Kurlin, V. Vershinin, Three-page embeddings of singular knots, [Functional Analysis and Its Applications](#), v. 38 (2004), no. 1, p. 14–27.
5. V. Kurlin, Basic embeddings of graphs and Dynnikov’s method of 3-page embeddings, [Russian Mathematical Surveys](#), v. 58 (2003), no. 2, p. 163–164.
4. V. Kurlin, Three-page Dynnikov’s diagrams of spatial 3-valent graphs, [Functional Analysis and Its Applications](#) v. 35 (2001), no. 3, p. 230–233.
3. V. Kurlin, Basic embeddings into a product of graphs, [Topology and Its Applications](#), v. 102 (2000), p. 113–137.
2. V. Kurlin, Reduction of framed links to ordinary links, [Russian Mathematical Surveys](#), v. 54 (1999), p. 845–846.
1. V. Kurlin, Invariants of colour links, [Moscow University Mathematical Bulletin](#), v. 54 (1999), p. 42–44.