

## CV : Dr Vitaliy KURLIN (September 2018)



**Post** Senior Lecturer (Associate Prof) **Materials Innovation Factory**  
**Web** <http://kurlin.org> and **Computer Science** department  
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**E-mail** [vitaliy.kurlin@gmail.com](mailto:vitaliy.kurlin@gmail.com) **Languages:** Russian, English, French

**Research** : Data Science for Materials and Climate Science, Computer Vision.

### Awards

- **EPSRC £3.5M grant** (2018 – 2023) with Oxford and Swansea, lead co-I at Liverpool  
*Topic:* Application-driven Topological Data Analysis, ref. [EP/R018472/1](#).
- **Royal Society International Exchanges** with Prof [Edelsbrunner](#)'s group at [IST Austria](#)  
*Topic:* Topological Data Analysis for a faster discovery of materials, 2017-2019, £12K.
- **Knowledge Transfer Secondment** in Computer Vision at [Microsoft](#), Cambridge:  
£20K from [EPSRC](#) plus £75K in-kind contribution from Microsoft (2014 – 2016).
- **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 (main organiser since 2017) funded (£4.9K) by [LMS](#), [IMA](#), [GMJT](#) with meetings at Liverpool, Queen Mary London, Southampton.
- **Teaching:** selected as 1 of 3 final nominees for *Lecturer of the Year Award* in 2013.

### Group in Topological Data Analysis

- *Postdoc* Dr [Ana Garcia](#) (2018-2023), funded by the EPSRC grant [EP/R018472/1](#)
- *PhD students* who I help as the first supervisor (ordered by start dates):  
Muszynski (Apr'17), Smith (Oct'17), Elkin (Nov'17), Mosca (Oct'18), Welsch (Oct'18)
- *PhD students* who I help as the second supervisor (ordered by start dates):  
Samardzhiev (Oct'17), Holloway (Oct'17), Vriza (Oct'18), Hargreaves (Oct'18), Torda
- *Past members:* Dr [A. Chernov](#) (postdoc in 2011–2012), now a Senior Lecturer;  
Dr [M. Safi-Samghabadi](#) (PhD student in 2009–2013, now a Lecturer in Tehran).

**Member** : EPSRC Peer review college, [British Machine Vision Association](#),  
[Computer Vision Foundation](#), UK [Higher Education Academy](#).

## Experience

*2014 – 2016*, Visiting scientist in Computer Vision, [Microsoft](#), Cambridge, UK.  
*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

## Education

*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  
*Postgraduate Certificate* in Teaching and Learning in HE, Durham University, 2009

## Invited talks at international conferences since 2016

June 2018 Data Science school (6-hour tutorial), Ecole Polytechnique, France  
 June 2018 SIAM Imaging Sciences conference (30-min invited talk), Italy  
 September 2017 Mathematical Signal Processing and Data Analysis (30 min), Germany  
 June 2017 Applied Topology conference (40-min invited talk), Poland  
 May 2017 Applied and Computational Algebraic Topology, Bonn, Germany  
 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

## Selected publications in top journals and conference proceedings

- [27] V. Kurlin. A fast persistence-based segmentation of noisy 2D clouds with provable guarantees, [Pattern Recognition Letters](#), v. 83P1 (2016) p. 3-12.
- [25] V. Kurlin. A one-dimensional Homologically Persistent Skeleton of an unstructured point cloud in any metric space. [Computer Graphics Forum](#), v. 34-5 (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).
- [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.

## All other peer-reviewed papers in the reverse chronological order

34. S. Kalisnik, V. Kurlin, D. Lesnik. A Higher-dimensional Homologically Persistent Skeleton. *Advances in Applied Mathematics*, to appear.
33. G. Muszynski, K. Kashinath, V. Kurlin, M. Wehner, Prabhat. Towards a topological pattern detection in fluid and climate simulation data. *Proc. Climate Informatics 2018*.
32. (joint with PhD student G. Muszynski and 34 co-authors) Atmospheric River Tracking Method Intercomparison Project. *Geoscientific Model Dev.* (2018), v. 11, p. 2455-2474.
31. V. Kurlin, D. Harvey. Superpixels Optimized by Color and Shape (SOCS). *Proceedings of EMMCVPR* (2017), p.297-311, LNCS 10746.
30. J. Forsythe, V. Kurlin. Convex Constrained Meshes for superpixel segmentations of images. *Journal of Electronic Imaging* (2017), 26(6), 061609 (13 pages).
29. V. Kurlin. Computing invariants of knotted graphs given by sequences of points in 3D. In *Topological Methods in Data Analysis and Visualization IV*, Springer series [MathVis: Mathematics and Visualization](#) (2017), p.349-363 (post-proceedings of [TopoInVis 2015](#)).
28. J. Forsythe, V. Kurlin, [A. Fitzgibbon](#). *Convex Constrained Meshes of superpixels without small angles*. LNCS Proceedings of ISVC: International Symposium on Visual Computing, v. 10072 (2016), p. 223-233.
26. V. Kurlin, C. Smithers. A linear time algorithm for embedding arbitrary knotted graphs into a 3-page book. In *Computer Vision, Imaging and Computer Graphics Theory and Applications*. Springer series [CCIS: Communications in Computer and Information Science](#) (2016), p. 99-122 (extended from proceedings of [IVAPP 2015](#)).
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 [CCCCG 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.
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 homomorphisms 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.