Vissarion Fisikopoulos

✉ vissarion [dot] fisikopoulos [at] gmail [dot] com
⌂ https://vissarion.github.io
☎ +30 6946951347
📍 Athens, Greece

Research Interests

- Geometry

    - High dimensional computational geometry: convex hulls, triangulations
    - Polyhedral combinatorics and polyhedral computation
    - Analysis and efficient evaluation of geometric predicates
    - Discrete geometric algorithms and structures for algebraic problems

- Optimization

    - Algorithms for volume computation of convex sets
    - Geometric algorithms for studying combinatorial optimization problems
    - Algorithms for separation, optimization and boundary polytope oracles
    - Randomized algorithms for optimization and volume computation

- Applications

    - Design of geometric software and efficient implementation of geometric algorithms
    - Geometric algorithms and computation for computer aided design, algorithmic game theory, databases, geographical information systems, biogeography

Professional/Academic/Research Positions

9/2016 - present	**Research Collaborator** Department of Informatics & Telecommunication, University of Athens, Greece *Geometric algorithms & optimization.*
5/2016 - present	**Senior Software Engineer** (Level 4) Oracle Corp. (remote worker) *Design & implement algorithms for computational geometry & scientific computing to provide geography support to the MySQL database.*

7/2014 - 4/2016	**Postdoc Researcher**
	Algorithms Research Group, Université libre de Bruxelles (ULB), Belgium
	Scientific Supervisors: Prof. Samuel Fiorini, Prof. Stefan Langerman
	Design, analyse and implement algorithms and analyse geometric structures motivated by combinatorial optimization and computational complexity problems.
5/2014 - 6/2014	**Visiting Postdoc Researcher**
	National Institute for Mathematical Sciences, Daejeon, South Korea
	Scientific Supervisor: Prof. Bernd Sturmfels
	Thematic Program on Applied Algebraic Geometry
9/2009 - 4/2014	**Researcher / Phd Candidate**
	Department of Informatics & Telecommunication, University of Athens, Greece
	PhD Supervisor: Prof. Ioannis Z.Emiris
	High-dimensional computational geometry, geometric algorithms and connections to computational algebraic geometry and geometric optimization.
7-8/2009	**Intern**
	Geometrica group, INRIA Sophia-Antipolis, France
	Scientific Supervisor: Research Director Monique Teillaud
	Geometric algorithms for meshing of periodic minimal surfaces in CGAL

EDUCATION

2014	**PhD**, Computer Science, University of Athens, Greece
	Title: "High-dimensional polytopes defined by oracles: algorithms, computations and applications"
2009	**MSc**, Logic, Algorithms and Computation, University of Athens, Greece
2007	**Diploma** (5-year-degree), Computer Engineering and Informatics, University of Patras, Greece

RESEARCH VISITS

2015	Laboratory of Algebraic & Geometric Algorithms, University of Athens, Greece (3 weeks)
2015	London School of Economics, Department of Mathematics, UK (1 week)
2014	Geometrica group, INRIA Sophia-Antipolis, France (3 weeks)
2012	Theory of Combinatorial Algorithms Group, ETH Zurich, Switzerland (1 month)

Teaching Experience

2015	**Visiting Lecturer**, Department of Informatics & Telecom/tions, University of Athens
	• Advanced Geometric Algorithms (graduate course)
	Mini-seminar on volume computation, project assignments (theory, software)
2009 - 2014	**Teaching Assistant**, Department of Informatics & Telecom/tions, University of Athens
	• Computational Geometry (undergrad/grad course) (5 years: 2010-2014)
	Lectures, writing notes & slides, assignments (theory, software) & grading.
	• Foundations of Databases (grad course) (2009)
	Assignments and grading
2009 - 2011:	**Teacher** in "Prisma secondary private school"; course: "Algorithms"

Invited Lectures & Seminars

1. "Polyhedral computations in computational algebraic geometry and optimization", Lunch seminar, London School of Economics, UK, 2015.
2. "Volume and edge-skeleton computation in high dimensions", Geometrica seminar, INRIA Sophia-Antipolis, France, 2014.
3. "Polytopes defined by oracles: algorithms and combinatorics", Discrete Mathematics seminar, Korea Advanced Institute of Science and Technology (KAIST), S. Korea, 2014.
4. "Polytopes defined by Oracles: Algorithms and Combinatorics", Dept. of Mathematics seminar, University of Padova, Italy, 2014.
5. "Efficient Edge-Skeleton and Volume Computation for Polytopes Defined by Oracles", Discrete Mathematics Optimization Seminar, McGill, Canada, 2013.
6. "Constructing Polytopes via a Vertex Oracle." Mittagsseminar, ETH Zurich, Switzerland, 2012.

Selected Talks in Conferences & Workshops

(c): conference, (w): workshop, (p): poster

1. (cw) "Enumerating 2-level polytopes"

   - Applications in Computer Algebra, Kalamata, 2015
   - European Symposium on Algorithms (ESA), Patras, Greece, 2015

2. (cw) "The Newton polytope of the sparse resultant",

- 3nd ERC "SDModels" Workshop, Berlin, Germany, 2015
- Algebra and Combinatorics Seminar, ULB, Brussels, 2014

3. (cw) "Efficient random walk methods for approximating polytope volume",

   - Symposium on Computational Geometry (SoCG), Kyoto, Japan, 2014
   - Optimization and Algebraic Geometry, National Institute for Mathematical Sciences (NIMS), Daejeon, Korea, 2014
   - European Symposium on Computational Geometry, Dead sea, Israel, 2014

4. (c) "Combinatorics of 4-dimensional resultant polytopes", ACM International Symposium on Symbolic and Algebraic Computation (ISSAC), Boston, USA, 2013.

5. (p) "A software framework for computing Newton polytopes of resultants and discriminants", Effective Methods on Algebraic Geometry (MEGA), Frankfurt, Germany, 2013.

6. (w) "Efficient volume and edge-skeleton computation for polytopes given by oracles", European Symposium on Computational Geometry (EuroCG), Braunschweig, Germany, 2013.

7. (w) "Polytime volume and edge-skeleton computation for polytopes given by oracles"

   - Geometric Computing Workshop, Heraklion, Greece, 2013
   - Computational geometry learning school, Berlin 2012

8. (c) "Faster Geometric Algorithms via Dynamic Determinant Computation", European Symposium on Algorithms (ESA), Ljubljana, Slovenia, 2012.

9. (c) "An output-sensitive algorithm for computing projections of resultant polytopes", Symposium on Computational Geometry (SoCG), NC, USA, 2012.

10. (w) "Exact and approximate algorithms for resultant polytopes", European Symposium on Computational Geometry (EuroCG), Assisi, Italy, 2012.

11. (w) "Regular triangularions & resultant polytopes", European Symposium on Computational Geometry (EuroCG), Dortmund, Germany, 2010.

Research Projects Participation

07/2014 - 4/2015:	Frontiers of Extended Formulations, ERC, EU **Position:** Post-doc researcher http://cordis.europa.eu/project/rcn/188672_en.html
11/2013 - 04/2014 :	Advanced Geometric Computing, ESPA, Gr & EU **Position:** PhD Researcher http://excellence.minedu.gov.gr/thales/en/thalesprojects/375891
02/2011 - 10/2013 :	Computational Geometric Learning, FET Open, EU **Position:** PhD Researcher http://cglearning.eu
4-12/2010 :	Semantic Sensor Grids, ICT, EU **Position:** Researcher http://linkeddata4.dia.fi.upm.es/ssg4env/index.php

9-11/2009 :	ACS: Algorithms for complex shapes, ICT, EU
	Position: Graduate student / Researcher
	http://cordis.europa.eu/project/rcn/74641_en.html

Professional & Academic Activities

Scientific reviewing service

- Reviewer for Mathematical Reviews of the American Mathematical Society (since 2015)

- Reviewer for scientific journals: Algorithmica, Theoretical Computer Science, Journal of Symbolic Computation, Discrete & Computational Geometry

- Reviewer for scientific conferences: ACM Symposium on Computational Geometry (*SoCG*), ACM-SIAM Symposium on Discrete Algorithms (*SODA*), SIAM Algorithm Engineering and Experiments (*ALENEX*), European Symposium on Algorithms (*ESA*), Symposium on Experimental Algorithms (*SEA*), Algorithms and Data Structures Symposium (*WADS*), Symposium on Theoretical Aspects of Computer Science (*STACS*), Conf. on Effective Methods in Algebraic Geometry (*MEGA*), European Symposium on Computational Geometry (*EuroCG*).

Grants & Distinctions

- Short visit research grant (to visit University of Athens), National Fund for Scientific Research (FNRS), Belgium, 2015.
- Conference travel & accommodation grant for WACOGEO'14, ESA'15, ACA'15 conferences, National Fund for Scientific Research (FNRS), Belgium.
- Travel and accommodation stipend for "Convex Geometry - discrete & computational" school, Berlin Mathematical School, Germany, 2015.
- Invited to participate with a talk to the 2nd ERC "SDModels" Workshop & travel and accommodation stipend, FU Berlin, Germany, 2015.
- Visiting Researcher Fellowship, National Institute for Mathematical Sciences, S.Korea, 2014.

Event organization

- Final Research Workshop of EU project "Computational Geometry Learning", Vravrona, Greece, 2013
  Member of the Organizing Committee
- 7th Athens Colloquium on Algorithms and Complexity University of Athens, Athens, Greece, 2012
  Member of the Organizing Committee
- Fall School "ShApes, Geometry and Algebra (SAGA)", Kolympari, Greece, October 4-8 2010
  Member of the Organizing Committee
- Organising the informal research seminar of the theoretical computer science sector of department of informatics and telecommunications at university of Athens, 2012-2014.

Scientific and professional memberships

- Technical Chamber of Greece (TEE-TCG), ACM Symbolic and Algebraic Manipulation

TECHNICAL SKILLS

PROGRAMMING:	C, C++, Java, Lisp, Assembly
SCRIPT:	Python, Perl, linux shell
SCIENTIFIC:	Matlab, Maple, HPC, Flex/Bison
WWW/DATABASES:	PHP, SQL, Javascript
SYSTEMS:	Unix/Linux/Minix, MS Windows

LANGUAGE SKILLS

GREEK (native), ENGLISH (fluent), GERMAN (basic), FRENCH (basic)

PERSONAL DATA

Born: 1983, Greece   Gender: Male   Citizenship: Greek

REFERENCES

- Prof. Dr. Ioannis Z. Emiris
  Department of Informatics and Telecommunications
  University of Athens
  `http://www.di.uoa.gr/~emiris`

- Prof. Dr. Samuel Fiorini
  Department of Mathematics
  Université libre de Bruxelles
  `http://homepages.ulb.ac.be/~sfiorini`

- Prof. Bernhard von Stengel
  Department of Mathematics
  London School of Economics and Political Science
  `http://www.maths.lse.ac.uk/personal/stengel`

- Senior Researcher Dr. Monique Teillaud
  Vegas Research Group
  INRIA Nancy - Grand Est - LORIA
  `http://www.loria.fr/~teillaud`

LIST OF PUBLICATIONS

PREPRINTS / IN PROGRESS

[M1] V. Fisikopoulos and B. Stengel. Maximal numbers of Nash equilibria in square bimatrix games. Manuscript, 2016.

[M2] V. Fisikopoulos and M. Garoussian. Pseudograph associahedra, matroidal rank tests and the submodular cone. Manuscript, 2016.

[M3] Y. Faenza, S. Fiorini, V. Fisikopoulos, M. Macchia, and K. Pashkovich. 2-level polytopes: a survey. Manuscript, 2016.

[M4] J. Barnagaud, W. Kissling, C. Tsirogiannis, V. Fisikopoulos, S. Villeger, C. Sekercioglu, and J. Svenning. Biogeographic, environmental and anthropogenic determinants of global patterns in functional and taxonomic turnover in birds. Submitted to journal, 2016.

[M5] V. Anagnostopoulos, I. Emiris, and V. Fisikopoulos. Polytope oracles in high dimension. Manuscript, 2016.

JOURNAL ARTICLES

[J1] V. Fisikopoulos and L. Peñaranda. Faster geometric algorithms via dynamic determinant computation. *Computational Geometry: Theory and Applications*, 54:1–16, 2016.

[J2] I. Emiris, V. Fisikopoulos, and B. Gärtner. Efficient edge-skeleton computation for polytopes defined by oracles. *Journal of Symbolic Computation*, 73:139–152, 2016.

[J3] I. Emiris and V. Fisikopoulos. Practical polytope volume approximation. *ACM Transactions Mathematical Software*, 2016. (accepted for publication with minor revision).

[J4] I. Emiris, V. Fisikopoulos, C. Konaxis, and L. Peñaranda. An oracle-based, output sensitive algorithm for projections of resultant polytopes. *International Journal of Computational Geometry and Applications (Special issue)*, pages 397–423, 2013.

REFEREED CONFERENCES

[C1] S. Fiorini, V. Fisikopoulos, and M. Macchia. Two-level polytopes with a prescribed facet. In *Combinatorial Optimization: 4th International Symposium, ISCO 2016, Vietri sul Mare, Italy, May 16-18, 2016, Lecture Notes in Computer Science*, pages 285–296. Springer International Publishing, 2016.

[C2] A. Bohn, Y. Faenza, S. Fiorini, V. Fisikopoulos, M. Macchia, and K. Pashkovich. Enumeration of 2-level polytopes. In *Algorithms - ESA 2015 - 23rd Annual European Symposium, Patras, Greece, September 14-16, 2015, Lecture Notes in Computer Science*, pages 191–202. Springer International Publishing, 2015.

[C3] I. Emiris and V. Fisikopoulos. Efficient random walk methods for approximating polytope volume. In *Proc. Symposium of Computational Geometry*, pages 318–327. ACM, 2014.

[C4] A. Dickenstein, I. Emiris, and V. Fisikopoulos. Combinatorics of 4-dimensional resultant polytopes. In *Proc. International Symposium on Symbolic and Algebraic Computation*, pages 173–180. ACM, 2013.

[C5] V. Fisikopoulos and L. Peñaranda. Faster geometric algorithms via dynamic determinant computation. In *ESA 2012 - 20th Annual European Symposium*, Lecture Notes in Computer Science, pages 443–454. Springer, 2012.

[C6] I. Emiris, V. Fisikopoulos, C. Konaxis, and L. Peñaranda. An output-sensitive algorithm for computing projections of resultant polytopes. In *Proc. Symposium of Computational Geometry*, pages 179–188. ACM, 2012.

[C7] K. Eftaxias, V. Fisikopoulos, and G. Spyrou. In silico tomographic image generation using Monte Carlo and computational geometry. In *Proceedings of 10th IEEE International Conference on Information Technology and Applications in Biomedicine*, 2010.

[C8] M. Caroli, V. Fisikopoulos, and M. Teillaud. Meshing of triply-periodic smooth surfaces in CGAL. In *Curves and Surfaces '10 Seventh International Conference on Curves and Surfaces*, 2010. poster presentation.

Conferences with limited review

[L1] V. Fisikopoulos, F. Staals, and C. Tsirogiannis. Computing the expected area of an induced triangle. In *Computational Geometry: Young Researchers Forum Boston, USA*, 2016.

[L2] I. Emiris and V. Fisikopoulos. Efficient random walk methods for approximating polytope volume. In *Proc. of 30th European Workshop on Computational Geometry*, 2014.

[L3] I. Emiris, V. Fisikopoulos, and C. Konaxis. A software framework for computing newton polytopes of resultants and (reduced) discriminants. In *12th International Conference on Effective Methods in Algebraic Geometry*, 2013.

[L4] I. Emiris, V. Fisikopoulos, and B. Gärtner. Efficient volume and edge-skeleton computation for polytopes given by oracles. In *Proc. of 29th European Workshop on Computational Geometry*, 2013.

[L5] I. Emiris, V. Fisikopoulos, and L. Peñaranda. Optimizing the computation of sequences of determinantal predicates. In *Proc. of 28th European Workshop on Computational Geometry*, 2012.

[L6] I. Emiris, V. Fisikopoulos, and C. Konaxis. Exact and approximate algorithms for resultant polytopes. In *Proc. of 28th European Workshop on Computational Geometry*, 2012.

[L7] I. Emiris, V. Fisikopoulos, and C. Konaxis. Regular triangulations and resultant polytopes. In *Proc. of 26th European Workshop on Computational Geometry*, pages 137–140, 2010.

Technical reports

[R1] I. Emiris, V. Fisikopoulos, and B. Gärtner. Efficient edge skeleton computation for polytopes defined by oracles. Technical Report CGL-TR-75, European FP7 project CGL, 2013.

[R2] I. Emiris and V. Fisikopoulos. Algorithms for volume approximation of convex bodies. Technical Report TR-76, European FP7 project CGL, 2013.

[R3] I. Emiris, V. Fisikopoulos, and L. Peñaranda. High-dimensional predicates: Algorithms and software. Technical Report TR-27, European FP7 project CGL, 2012.

[R4] I. Emiris, V. Fisikopoulos, C. Konaxis, and L. Peñaranda. An oracle-based, output-sensitive algorithm for projections of resultant polytopes. Technical Report TR-28, European FP7 project CGL, 2012.

[R5] M. Koubarakis, C. Nikolaou, and V. Fisikopoulos. Theoretical results on query processing for RDF/SPARQL with time and space. Deliverable D2.3, European FP7 project TELEIOS, 2011. http://www.earthobservatory.eu/deliverables/FP7-257662-TELEIOS-D2.3.pdf.

[R6] V. Fisikopoulos. Study of the effect of cost policies in the convergence of selfish strategies in pure nash equilibria in congestion games. Technical report, University of Patras, 2011. https://arxiv.org/abs/1103.5071.

[R7] V. Fisikopoulos. An implementation of range trees with fractional cascading in c++. Technical report, University of Athens, 2011. https://arxiv.org/abs/1103.4521.

[R8] I. Emiris, V. Fisikopoulos, and L. Peñaranda. Optimizing the computation of sequences of determinantal predicates. Technical Report TR-14, European FP7 project CGL, 2011.

[R9] I. Emiris, V. Fisikopoulos, and C. Konaxis. An output-sensitive algorithm for computing projections of resultant polytopes. Technical Report TR-08, European FP7 project CGL, 2011.

Thesis

[T1] V. Fisikopoulos. *High-dimensional polytopes defined by oracles: algorithms, computations and applications*. PhD thesis, University of Athens, 2015.

[T2] V. Fisikopoulos. Triangulations of point sets, high dimensional polytopes and applications. Master's thesis, University of Athens, 2010.

[T3] V. Fisikopoulos. Study of the effect of cost policies in the convergence of selfish strategies in pure nash equilibria in congestion games. Diploma thesis, University of Patras, 2007.

LIST OF SOFTWARE

1. *Software:* Algorithms for geodesics on ellipsoid
   Description: Algorithms for (1) area computation of a geodesic polygon, (2) geodesic distance computation between geometries, (3) set operations for geometries on sphere or ellipsoid, (4) envelope computation for geometries on ellipsoid
   Developers: V. Fisikopoulos
   Implementation: `C++`
   Published: https://github.com/boostorg/geometry, part of `Boost.Geometry` library

2. *Software:* 2LevelEnum
   Description: Open source software to efficiently enumerate 2-level polytopes in low dimensions (less than 10).
   Developers: V. Fisikopoulos
   Implementation: `Perl, polymake` - http://www.polymake.org
   Published: Code upon request

3. *Software:* VolEsti
   Description: Open source software that implements: (a) Monte Carlo algorithms for volume estimation—with small relative error ($< .1\%$)—of polytopes in high dimensions (up to 200) and (b) a sampling procedure using geometric random walks such as hit-and-run.
   Developers: V. Fisikopoulos
   Implementation: `C++, Boost, CGAL`
   Published: http://sourceforge.net/projects/randgeom

4. *Software:* HeaDDaCHe
   Description: Open source, `CGAL` based software that implements the scheme of hashed dynamic determinant predicates for faster geometric computation, such as convex hull, volume computation and point location.
   Developers: V. Fisikopoulos, Luis Peñaranda
   Implementation: `C++, CGAL`
   Published: Code upon request

5. *Software:* ResPol
   Description: Open source, `CGAL` based software to compute a projection of the Newton polytope of the resultant of a given polynomial system, or its orthogonal projection along a given direction. The resultant is fundamental and has applications in geometric modelling, algebraic elimination, optimization.
   Developers: V. Fisikopoulos, Luis Peñaranda
   Implementation: `C++, CGAL`
   Published: Part of the code is submitted to `CGAL` (Computational Geometry Algorithms Library - http://www.cgal.org) as "Lifted_Kernel_d package",
   full code: http://sourceforge.net/projects/respol