

# Constantinos P. Tsirogiannis *Curriculum Vitae*

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## Personal Information

*Nationality:* Greek

*Date of Birth:* 4/11/1983

*Gender:* Male

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## Research Interests

Algorithms for Big Data, Efficient Statistical Methods and Monte-Carlo Simulations, Computational Biology, Geographic Information Science, Computational Geometry.

## Programming and Software Skills

- Excellent knowledge of C++, R, Python, ArcGIS (Arcpy), Mathematica, and very good knowledge of Java, SQL, Haskell, Unix script programming, OpenGL, Latex and Maple. Experience with tools such as Boost, Scikit-learn, Git, Eclipse, Visual Studio, Valgrind and CMake.

## Languages

- Greek (mother tongue), English (proficient)<sup>1</sup>, German (basic knowledge)

## Work Experience and Education

SEPTEMBER 2014 – ONWARDS

### Post Doctoral Researcher

- Institute: Center of Massive Data Algorithmics, Department of Computer Science at the University of Aarhus, Denmark.
- Project Description: Designing algorithms for Big Data and computational problems in Biology.

NOVEMBER 2013 – AUGUST 2014

### Service at the Greek Army

- Served at the Informatics Research Corps, Greek Pentagon, Athens.

SEPTEMBER 2011 – SEPTEMBER 2013

### Post Doctoral Researcher

- Institute: Center of Massive Data Algorithmics, Department of Computer Science at the University of Aarhus, Denmark.
- Project Description: Designing algorithms for Big Data and computational problems in Biology.

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<sup>1</sup>Certificate of Proficiency in English, Cambridge University ESOL

NOVEMBER 2007 –  
SEPTEMBER 2011

### Ph.D Student

- Institute: Department of Mathematics and Computer Science at Technical University of Eindhoven, The Netherlands.
- Thesis: *Analysis of Flow and Visibility on Triangulated Terrains*.
- Advisors: Prof. Mark de Berg and Dr. Herman Haverkort.
- Area of Study: Computational Geometry and applications to GIS.

OCTOBER 2006 –  
OCTOBER 2007

### MSc on Computational Science and Algorithms, completion with the mark of Excellent 8.92/10.

- Institute: Department of Informatics and Telecommunications, National & Kapodistrian University of Athens, Greece.
- Master Thesis Title: *Voronoi diagrams of circles and respective CGAL implementations*.
- Advisor: Ioannis Z. Emiris.
- Area of Study (Thesis): Computational Geometry.

AUTUMN 2001 –  
SUMMER 2007

### Bachelor's on Informatics and Telecommunications, graduation with the mark of Excellent 8.71/10.

- Institute: Department of Informatics and Telecommunications, National & Kapodistrian University of Athens, Greece.
- Bachelor Thesis Title: *Geometric filtering on curved objects and applications in CGAL*.
- Advisor: Ioannis Z. Emiris.
- Area of Study (Thesis): Computational Geometry.

### Research Internships

#### July-August 2005

- Institute: Institute National de Recherche en Informatique et en Automatique (INRIA), SophiaAntipolis, France.
- Main activity: Implementation of Computational Geometry algorithms in C++.
- Supervisors: Monique Teillaud, Sylvain Pion.

### Contribution to Software Projects

- Main developer and maintainer of open source software **PhyloMeasures**, available as an R package ([phylomeasures.blogspot.com](http://phylomeasures.blogspot.com)).
  - Application: Fast algorithms for computing phylogenetic biodiversity measures and their statistical moments under several random models.
- Main developer and maintainer of open source software **CNull**, available as an R package (<https://cran.r-project.org/package=CNull>).
  - Application: Fast algorithms for statistical computations on large matrices.
- Main developer and maintainer of open source code **Geomstats**, available as a C++ library ([github.com/constantinosTsirogiannis/GeometryStats](https://github.com/constantinosTsirogiannis/GeometryStats)).
  - Application: Fast algorithms for computing the statistical moments of geometric volumes and measures under several random models.
- Contribution of code to the Computational Geometry Algorithms Library open-source software project
  - Application: Filtered Circular Kernel Package: Predicates on Geometric Filtering for Arrangements of Circular Arcs and Linear Segments.

## Publications

**Note:** unlike other scientific fields, in Algorithms Design the publications at conferences are full-text articles, and the length of the published material ranges from 10 to 20 pages. Publications at certain conferences are considered more prestigious than journal publications, and subsequent publication of the same paper in a journal serves mostly the purpose of providing a more extensive version, which includes detailed mathematical proofs and extra experimental material.

### Manuscripts and Work in Progress

- C. Tsirogiannis and B. Sandel. Incremental Monte-Carlo: A Fast Method for Batched Null Model Computations.
- B.J. Enquist, B. Sandel, B. Boyle, J.C Svenning, B.J. McGill, J.C. Donoghue, C.E. Hinchliff, P.M. Jørgensen, N.J.B. Kraft, A. Marcuse-Kubitza, C. Merow, N. Morueta-Holme, R.K. Peet, M. Schildhauer, N. Spencer, J. Regetz, I. Šímová, S.A. Smith, B. Thiers, C. Tsirogiannis, C. Violle, S.K. Wisser, S. Andelman, N. Casler, R. Condit, S. Dolins, D. Guaderama, B. Maitner, M.L. Narro, J.E. Ott, O. Phillips, L.L. Sloat and H. ter Steege. Plant Diversity in the New World is Driven by Climate-Linked Differences in Evolutionary Rates and Biotic Exclusion.
- K. Engemann Jensen, C. Bøcker Pedersen, C. Tsirogiannis, L. Arge, and J.C. Svenning. Greenspace at the Place of Residence: a Novel Risk Decreasing Mechanism for Schizophrenia.
- J.Y. Barnagaud, D. Kissling, C. Tsirogiannis, V. Fisikopoulos, S. Villeger, C. Sekercioglu, and J.C. Svenning. Biogeographic, Environmental and Anthropogenic Determinants of Global Patterns in Functional and Taxonomic Turnover in Birds.
- C. Tsirogiannis, A. Kalvisa, B. Sandel, and T. Conradi. Column-Shuffling Null Models Are Simpler Than You Thought.
- C. Tsirogiannis. Fast Weighted Sampling of Fixed-Size Subsets.
- C. Tsirogiannis, M. de Berg, P.K. Bøcher, and B. Benito. FasterRaster: an R Package for Fast Processing of Raster Data.

### Conference Publications

- F. Staals and C. Tsirogiannis. Computing the Expected Value and Variance of Geometric Measures. In *Proc. Nineteenth Workshop on Algorithm Engineering and Experiments (ALENEX)*, pages 232–246, 2017.
- P. Afshani, M. de Berg, H. Casanova, B. Karsin, C. Lambrechts, N. Sitchinava, and C. Tsirogiannis. An Efficient Algorithm for the 1D Total Visibility-Index Problem. In *Proc. Nineteenth Workshop on Algorithm Engineering and Experiments (ALENEX)*, pages 218–231, 2017.
- C. Alexander, L. Arge, P.K. Bøcher, M. Revsbæk, B. Sandel, J.-C. Svenning, C. Tsirogiannis, and J. Yang. Computing River Floods Using Massive Terrain Data. In *Proc. 9th International Conference on Geographic Information Science (GIScience)*, pages 3–17, 2016.
- C. Tsirogiannis and B. Sandel. Fast Phylogenetic Biodiversity Computations Under a Non-Uniform Random Distribution. In *Proc. 20th Annual International Conference on Research in Computational Molecular Biology (RECOMB)*, pages 225–236, 2016.

- M. de Berg, C. Tsirogiannis and B.T. Wilkinson. Fast Computation of Categorical Richness on Raster Data Sets and Related Problems. In *Proc. ACM 23rd International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL)*, pages 18:1–18:10, 2015.
- C. Tsirogiannis, B. Sandel and A. Kalvisa. New Algorithms for Computing Phylogenetic Biodiversity. In *Algorithms in Bioinformatics*, LNCS 8701: 187 – 203, 2014.
- L. Arge, M. de Berg and C. Tsirogiannis. Algorithms for Computing Prominence on Grid Terrains. In *Proc. 21<sup>st</sup> ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM GIS)*, pages 254 – 263, 2013.
- C. Tsirogiannis and B. Sandel. Computing the skewness of the phylogenetic mean pairwise distance in linear time. In *Proc. 13<sup>th</sup> Workshop on Algorithms in Bioinformatics (WABI)*, pages 170 – 184, 2013.
- L. Arge, G. Brodal, J. Truelsen and C. Tsirogiannis. An Optimal and Practical Cache-Oblivious Algorithm for Computing Multiresolution Rasters. In *Proc. 21<sup>st</sup> European Symposium on Algorithms (ESA)*, pages 61 – 72, 2013.
- C. Tsirogiannis and C. Tsirogiannis. Uncovering the Missing Routes : An Algorithmic Study on the Illicit Antiquities Trade Network. *Computer Applications and Quantitative Methods in Archaeology*. 2013.
- L. Arge, H. Haverkort and C. Tsirogiannis. Fast Generation of Multiple Resolution Instances of Raster Data Sets. In *Proc. 20<sup>th</sup> ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM GIS)*. pages 52 – 60, 2012.
- C. Tsirogiannis, B. Sandel and D. Cheliotis Efficient Computation of Popular Phylogenetic Tree Measures. In *Proc. 12<sup>th</sup> Workshop on Algorithms in Bioinformatics (WABI)*, pages 30 – 43, 2012.
- M. de Berg and C. Tsirogiannis. Exact and Approximate Computations of Watersheds on Triangulated Terrains. In *Proc. 19<sup>th</sup> ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM GIS)*, pages 74 – 83, 2011.
- H. Haverkort and C. Tsirogiannis. Flow on Noisy Terrains: An Experimental Evaluation. In *Proc. 19<sup>th</sup> ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM GIS)*, pages 84 – 91, 2011.
- M. de Berg , H. Haverkort and C. Tsirogiannis. Implicit flow routing on terrains with applications to surface networks and drainage structures. In *Proc. 22<sup>nd</sup> ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pages 285–296, 2011.
- C. Tsirogiannis. Geometric Techniques to Speed Up Geospatial Feature Matching. In *Proc. 11<sup>th</sup> International Conference of Geocomputation*, pages 411–415, 2011.
- M. de Berg, H. Haverkort and C. Tsirogiannis. Visibility maps of realistic terrains have linear smoothed complexity. In *Proc. 25<sup>th</sup> ACM Symposium on Computational Geometry (SoCG)*, pages 163–168, 2009.

### Journal Papers and Book Chapters

- C. Tsirogiannis and C. Tsirogiannis. Uncovering the Missing Routes : An Algorithmic Study on the Illicit Antiquities Trade Network. In: T. Brughmans, A. Collar and F. Coward (eds), *The Connected Past: Challenging Networks in Archaeology and History*, Oxford University Press, 2016.

- A. Kalvisa, C. Tsirogiannis, I. Silamikelis, G. Skenders, L. Broka, A. Zirnitis, I. Jansone, and R. Ranka. MIRU-VNTR Genotype Diversity and Indications of Homoplasy in *M. Avium* Strains Isolated from Humans and Slaughter Pigs in Latvia. *Infection, Genetics and Evolution*, 43:15–21, 2016.
- C. Tsirogiannis, and B. Sandel. Fast Computation of Measures of Phylogenetic Beta Diversity. *PLoS ONE*, 11(4): e0151167, doi:10.1371/journal.pone.0151167, 2016.
- B. Sandel and C. Tsirogiannis. Species Introductions and the Phylogenetic and Functional Structure of Californias Grasses. *Ecology* 97: 472–483, doi:10.1890/15-0220.1, 2016.
- C. Tsirogiannis and B. Sandel. PhyloMeasures: A Package for Computing Phylogenetic Biodiversity Measures and Their Statistical Moments. *Ecography*, doi: 10.1111/ecog.01814, 2015.
- JY. Barnagaud, D. Kissling, B. Sandel, W. Eiserhardt, C. Sekercioglu, B. Enquist, C. Tsirogiannis, and J.C. Svenning. Ecological Traits Influence the Phylogenetic Structure of Bird Species Co-occurrences Worldwide. *Ecology Letters*, 17(7):811–820, 2013.
- M. de Berg, H. Haverkort and C.Tsirogiannis. Visibility maps of realistic terrains have linear smoothed complexity. *Journal of Computational Geometry* 1: 57–71 (2010).

#### Publications in Workshops and Technical Reports

- M. de Berg, D. Gerrits, A. Khosravi, I. Rutter, C.Tsirogiannis and A. Wolff. How Alexander the Great Brought the Greeks Together While Inflicting Minimal Damage to the Barbarians (Problems on Bichromatic Voronoi Diagrams). In *Abstracts 26th European Workshop on Computational Geometry*, pages 73–77, 2010.
- I.Emiris, A.Kakargias and C.Tsirogiannis. CGAL package for 2D filtered curved kernel. Research Report ACS-TR-243404-02, *Algorithms for Complex Shapes* (EU research project), 2008.
- I.Emiris, M.Karavelas, A.Kakargias and C.Tsirogiannis. CGAL package for 2D curved kernel. Research Report ACS-TR-123203-03, *Algorithms for Complex Shapes* (EU research project), 2007.
- I.Emiris, M.Karavelas, A.Kakargias and C.Tsirogiannis. Evaluation of results to different approaches in the 2D curved kernel. Research Report ACS-TR-123104-02, *Algorithms for Complex Shapes* (EU research project), 2007.
- M. Teillaud, S. Pion and C. Tsirogiannis. Geometric filtering of primitives on circular arcs. Research Report ACS-TR-121105-01, *Algorithms for Complex Shapes* (EU research project), 2006.

#### Theses

- C. Tsirogiannis. Analysis of Flow and Visibility on Triangulated Terrains. *PhD Thesis*, 2011, Technical University of Eindhoven
- C. Tsirogiannis. Voronoi diagrams of circles and respective CGAL implementations. *Master’s Thesis*, 2007, National & Kapodistrian University of Athens.
- C. Tsirogiannis. Geometric Filtering for the Acceleration of Geometric Algorithms and Applications in CGAL. *Bachelor’s Thesis*, 2006, National & Kapodistrian University of Athens.

- C. Tsirogiannis. Geometric Filtering for the Acceleration of Geometric Algorithms and Applications in CGAL. Published in the *Annual Selection of Bachelor and Master Theses of the Department of Informatics and Telecommunications 2006–2007*, National & Kapodistrian University of Athens.

#### Invited Talks

- “Implicit Flow Routing on Terrains with Applications to Drainage Structures”, presentation for the GIS Technology Group at the Technical University of Delft, the Netherlands, 26/11/2010
- “How Alexander the Great Brought the Greeks Together While Inflicting Minimal Damage to the Barbarians (Problems on Bichromatic Voronoi Diagrams)”, at the Institute of Theoretical Informatics, Karlsruhe Institute of Technology, Germany, 16/6/2010
- “Kernelisation of the Apollonius\_graph\_2 CGAL package”, at the Department of Mathematics and Computer Science, Technical University of Eindhoven, the Netherlands, 30/8/2007

#### Awards

- Microsoft Travel Award to support participation at ACM-SIAM Symposium on Discrete Algorithms 2011.
- Award for outstanding performance in the year 2006-2007 of the Computational Science and Algorithms Master Programme, Department of Informatics and Telecommunications, National & Kapodistrian University of Athens

#### Teaching Experience

- Spring 2011: Instructor for the Bachelor’s course **Data Structures** at the Department of Mathematics and Computer Science, Technical University of Eindhoven (teaching in tutorial and grading assignments).
- Spring 2010: Instructor for the Bachelor’s course **Data Structures** at the Department of Mathematics and Computer Science, Technical University of Eindhoven (teaching in tutorial and grading assignments).
- Spring 2009: Instructor for the Bachelor’s course **Algorithms** at the Department of Mathematics and Computer Science, Technical University of Eindhoven (teaching in tutorial and grading assignments).
- Spring 2008: Instructor for the Bachelor’s course **Algorithms** at the Department of Mathematics and Computer Science, Technical University of Eindhoven (teaching in tutorial and grading assignments).
- Spring 2007: Assistant for the Bachelor’s course **Discrete Mathematics** at the Department of Informatics and Telecommunications, National & Kapodistrian University of Athens (grading assignments).

#### Other Responsibilities

- Spring 2008 – Spring 2011  
Organizing the research seminar of the Algorithms group at the Department of Mathematics and Computer Science, Technical University of Eindhoven.