

# Virginia Vassilevska Williams

## Curriculum Vitae

UC Berkeley  
Computer Science Division  
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Stanford University  
Computer Science Department  
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Stanford, CA 94305  
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**Maiden Name: Virginia Panayotova Vassilevska**

### Education

B.S. California Institute of Technology, 2003,  
double major in mathematics and engineering and applied science (CS), with Honor

M.S. Carnegie Mellon University, 2007, computer science

Ph.D. Carnegie Mellon University, 2008, computer science,  
advisor: Guy Blelloch,  
thesis title: *Efficient Algorithms for Path Problems in Weighted Graphs*

### Awards and Honors

- Selected as a Computing Innovation Fellow 2009–2011;
- Paper selected as one of the top 33 exceptional papers at AAAI 2010;
- Paper invited to the special issue of SODA 2008 in Transactions on Algorithms (TALG);
- Carnegie Mellon School of Computer Science Anonymous Graduate Fellowship, 2005–2008;
- Invited to participate in China Theory Week 2008;
- Student Travel Awards (sponsored by IBM for SODA 2008 and by SIAM for the Workshop on Combinatorial Scientific Computing, 2004)
- NSF Honorable Mention;
- **Herbert Ryser Award** in Mathematics – Caltech, May 2002;
- Upper Class Merit Award (Carnation Merit Award) – 2001–2002, 2002–2003;
- Named Arthur R. Adams Summer Undergraduate Research Fellow – Summer 2002, and Marcella Bonsall Summer Undergraduate Research Fellow – Summer 2001;
- Member of the Tau Beta Pi Honor society – 2002–present.

## Work Experience

- Research associate at Stanford University, Sept. 2011–Sept. 2012
- Assistant research engineer at UC Berkeley, Sept. 2011–Sept. 2012
- Postdoctoral Scholar at UC Berkeley, Sept. 2009–Sept. 2011
- Postdoctoral Scholar – member at the Institute for Advanced Study, Sept. 2008–Sept. 2009
- Summer Internship at TTI–Chicago (2006)
- Summer Internship at LBNL (2003)
- Laboratory assistant in biochemistry lab (2000, 2001)
- Summer Research Fellowships at Caltech: in biochemistry (2000), in mathematics (2001, 2002)

## Research Experience

- Sept. 2009 - Sept. 2011* Postdoctoral scholar and Computing Innovation Fellow at UC Berkeley.
- Sept. 2008 - Sept. 2009* Member at the Institute for Advanced Study.
- Aug. 2003 - Aug. 2008* Graduate study in theoretical computer science, specializing in graph algorithms and data structures; advised by Prof. Guy Blelloch at the computer science department of Carnegie Mellon University.
- June - Aug. 2006* Summer Internship at the Toyota Technological Institute, Chicago – worked with Dr. Umut Acar on problems in data structures and dynamic algorithms.
- June - Aug. 2003* Summer Internship at the Lawrence Berkeley Lab - worked with Dr. Ali Pinar on improving the cache performance of sparse matrix operations by grouping nonzeros in dense blocks.
- July - Oct. 2002* Summer Undergraduate Research Fellowship at Caltech - worked with Prof. Richard Wilson and with Mark Bilinski on determining the crossing number of  $K_{9,9}$ .
- June - Sept. 2001* Summer Undergraduate Research Fellowship at Caltech - worked with Prof. Richard Wilson on graceful labeling and on dynamic Huffman coding algorithms.

## Teaching

- TA for Graduate Algorithms Course at Carnegie Mellon, Spring 2005 - created and graded homeworks and exams; held office hours
- TA for Undergraduate Algorithms Course at Carnegie Mellon, Spring 2007 - taught weekly recitation, created and graded homeworks and exams

- (*Wonderful and Crazy Ideas in Theoretical Computer Science and Math*), Summer 2009 - co-taught a course on theoretical computer science for high school students for the Governor's school of New Jersey.

**Citizenships:** USA, BG

## Related Skills

- Programming Languages:
  - C++ (top choice),
  - C, Java (some experience),
  - OCaml, Lisp, Scheme, Python (took classes using these)
- Text Formatting: L<sup>A</sup>T<sub>E</sub>X, HTML, CSS
- Languages: Bulgarian, English, German, Russian

## Manuscripts under submission

- *Improved Distance Sensitivity Oracles via Fast Single-Source Replacement Paths*, Fabrizio Grandoni and V. Vassilevska Williams.
- *Approximating the Diameter of a Graph*, Liam Roditty and V. Vassilevska Williams.
- *The Structure and Efficacy of Double-Elimination Tournaments*, Isabelle Stanton and V. Vassilevska Williams.

## Peer-Refereed Conference Publications

- *Multiplying Matrices Faster than Coppersmith-Winograd*, V. Vassilevska Williams, STOC 2012.
- *Subquadratic Approximation Algorithms for the Girth*, Liam Roditty and V. Vassilevska Williams, SODA 2012.
- *Manipulating Stochastically Generated Single-Elimination Tournaments for Nearly All Players*, Isabelle Stanton and V. Vassilevska Williams, WINE 2011 (acceptance rate: 30%).
- *Minimum Weight Cycles and Triangles: Equivalences and Algorithms*, Liam Roditty and V. Vassilevska Williams, FOCS 2011.
- *Manipulating Single-Elimination Tournaments in the Braverman-Mossel Model*, Isabelle Stanton and V. Vassilevska Williams, WSCAI at IJCAI 2011.
- *Rigging Tournament Brackets for Weaker Players*, Isabelle Stanton and V. Vassilevska Williams, IJCAI 2011 (acceptance rate: 17%).
- *Faster Replacement Paths*, V. Vassilevska Williams, SODA 2011 (acceptance rate: 29.9%).
- *Rigging a Single-Elimination Tournament for Weaker Players*, Isabelle Stanton and V. Vassilevska Williams, workshop on "Computational Social Science and the Wisdom of Crowds" (NIPS 2010).

- *Subcubic Equivalences between Path, Matrix and Triangle problems*, V. Vassilevska Williams and Ryan Williams, FOCS 2010 (acceptance rate: 30.3%).
- *Fixing a Tournament*, V. Vassilevska Williams, AAI 2010 (acceptance rate: 26.9%), *exceptional paper*.
- *Finding, Minimizing and Counting Weighted Subgraphs*, V. Vassilevska and Ryan Williams, STOC 2009 (acceptance rate: 23%).
- *A New Combinatorial Approach to Sparse Graph Problems*, Guy Blelloch, V. Vassilevska, Ryan Williams, ICALP 2008 (acceptance rate: 26%).
- *Uniquely Represented Data Structures for Computational Geometry*, Guy Blelloch, Daniel Golovin, V. Vassilevska, SWAT 2008 (acceptance rate; 32.4%).
- *Nondecreasing Paths in a Weighted Graph or: How to Optimally Read a Train Schedule*, V. Vassilevska, SODA 2008 (acceptance rate: 29.7%), **invited to special issue**.
- *All Pairs Bottleneck Paths in General Graphs in Truly Subcubic Time*, V. Vassilevska, Ryan Williams, Raphael Yuster, STOC 2007 (acceptance rate: 25%).
- *Finding the Smallest H-Subgraph in Real Weighted Graphs and Related Problems*, V. Vassilevska, Ryan Williams, Raphael Yuster, ICALP 2006 (acceptance rate: 25.6%).
- *Finding a Maximum Weight Triangle in Sub-Cubic Time, With Applications*, V. Vassilevska and Ryan Williams, STOC 2006 (acceptance rate: 27%).
- *Confronting Hardness Using A Hybrid Approach*, V. Vassilevska, Ryan Williams and Shan Leung Maverick Woo, SODA 2006 (acceptance rate: 30.7%).
- *Explicit Inapproximability Bounds for the Shortest Superstring Problem*, V. Vassilevska, MFCS 2005 (acceptance rate: 45%).

## Peer-Refereed Journal Publications

- *Finding, Minimizing, and Counting Weighted Subgraphs*, V. Vassilevska Williams, Ryan Williams, SIAM Journal on Computing, (accepted with minor revisions, 2011).
- *Nondecreasing Paths in a Weighted Graph or: How to Optimally Read a Train Schedule*, V. Vassilevska, Transactions on Algorithms (TALG), 6(4) (2010), 1–24, special issue dedicated to the best papers of SODA 2008.
- *Finding Heaviest H-Subgraphs in Real Weighted Graphs, with Applications*, V. Vassilevska, Ryan Williams, Raphael Yuster, Transactions on Algorithms (TALG) 6(3) (2010), 1–23.
- *All Pairs Bottleneck Paths and Max-Min Matrix Products in Truly Subcubic Time*, V. Vassilevska, Ryan Williams, Raphael Yuster, Theory of Computing 5 (2009) 173–189.
- *Efficient Algorithms for Clique Problems*, V. Vassilevska, Information Processing Letters, 109(4) (2009), 254–257.
- *Finding Nonoverlapping Dense Blocks of a Sparse Matrix*, Ali Pinar, V. Vassilevska, the special issue of ETNA on Combinatorial Scientific Computing, 2005.

## Unpublished Manuscripts and Technical Reports

- *Uniquely Represented Data Structures for Computational Geometry*, Guy Blelloch, Daniel Golovin, V. Vassilevska, CMU Technical Report CMU-CS-08-115, 2008.
- *Ordered Subsets with Applications*, Guy Blelloch, V. Vassilevska, 2007.
- *A Two Player Game to Combat WebSpam*, Michelle Goodstein, V. Vassilevska, CMU Technical Report CMU-CS-07-134, 2007.
- *Traceable Data Structures*, Umut Acar, Guy Blelloch, Srinath Sridhar, V. Vassilevska, 2006.
- *A New Dynamic Algorithm for Planar Point Location*, Guy Blelloch, Srinath Sridhar, V. Vassilevska, 2005.
- *Confronting Hardness Using A Hybrid Approach*, V. Vassilevska, Ryan Williams and Shan Leung Maverick Woo, CMU Technical Report CMU-CS-05-125, 2005.

## Press Coverage

Key mathematical tool sees first advance in 24 years, *New Scientist*, J. Aron, Dec. 9, 2011,  
<http://www.newscientist.com/article/dn21255-key-mathematical-tool-sees-first-advance-in-24-years.html>.

## Invited Talks

- *A Matrix Product Approach to Weighted Graph Problems*, California Institute of Technology, Computer Science Seminar, Pasadena, CA, 2007.
- *Algorithms for Path Problems*, University of Rochester, Rochester, NY, 2008.
- *Nondecreasing Paths in Weighted Graphs; Or: How to Optimally Read a Flight Schedule*, Rochester Institute of Technology, Rochester, NY, 2008.
- *Nondecreasing Paths in Weighted Graphs; Or: How to Optimally Read a Flight Schedule*, Tsinghua University, China Theory Week, Beijing, China, 2008.
- *Matrix Products and All Pairs Path Problems*, Princeton University, Intractability Center Meeting, Princeton, NJ, 2008.
- *Detecting, Finding and Minimizing Weighted Triangles*, Rutgers University, DIMACS Seminar, New Brunswick, NJ, 2009.
- *Detecting, Finding and Minimizing Weighted Triangles*, University of Toronto, Toronto, Ontario, Canada, 2009.
- *Detecting, Finding and Minimizing Weighted Triangles*, University of Pennsylvania, Philadelphia, PA, 2009.
- *Finding Patterns in Graphs*, Lawrence Livermore National Laboratory, Livermore, CA, 2009.
- *Finding Patterns in Graphs*, Sandia National Laboratory, Livermore, CA, 2009.
- *Matrix Products and Subgraph Problems*, Institute for Advanced Study, Princeton, NJ, 2009.
- *Weighted Triangles, 3SUM and Shortest Paths*, UC Berkeley, Berkeley, CA, 2009.

- *All Pairs Path Problems, Matrix Products and Triangles*, UC Davis, Davis, CA, 2009.
- *Weighted Triangles, 3SUM and Shortest Paths*, Microsoft Research, Silicon Valley, 2009.
- *Triangle Detection vs Matrix Multiplication*, Stanford University, 2010.
- *Fixing a Tournament*, IBM Almaden Research Center, 2010.
- *Subcubic equivalences between path, matrix and triangle problems*, Carnegie Mellon University, 2010.
- *Subcubic equivalences between path, matrix and triangle problems*, UC San Diego, 2010.
- *Faster replacement paths*, UC Berkeley, 2010.
- *Faster replacement paths*, MIT, 2010.
- *Faster replacement paths*, Google Research NY, 2010.
- *Path, matrix and triangle problems – subcubic algorithms and equivalences*, University of Michigan, 2011.
- *Path, matrix and triangle problems – subcubic algorithms and equivalences*, University of Southern California, 2011.
- *Path, matrix and triangle problems – subcubic algorithms and equivalences*, UC San Diego, 2011.
- *Path, matrix and triangle problems – subcubic algorithms and equivalences*, UC Berkeley, 2011.
- *Path, matrix and triangle problems – subcubic algorithms and equivalences*, Harvard, 2011.
- *Path, matrix and triangle problems – subcubic algorithms and equivalences*, MIT, 2011.
- *Path, matrix and triangle problems – subcubic algorithms and equivalences*, Google Research Mountain View, 2011.
- *Breaking the Coppersmith-Winograd Barrier*, UC Berkeley, 2011.
- *Multiplying matrices faster than Coppersmith-Winograd*, California Institute of Technology, 2012.
- *Multiplying matrices faster than Coppersmith-Winograd*, Stanford University, 2012.
- *Multiplying matrices faster than Coppersmith-Winograd*, Microsoft Research, Silicon Valley, 2012.
- *Multiplying matrices faster than Coppersmith-Winograd*, Georgia Institute of Technology, 2012.
- *Multiplying matrices faster than Coppersmith-Winograd*, Massachusetts Institute of Technology, 2012.

## Service

- Program committees: COMSOC 2012, AAMAS 2012, SWAT 2012, AAAI 2012, SODA 2013, ICALP 2013
- Mentored two graduate students (2007, 2010) and one undergraduate student (2010)
- Co-organized and co-taught a course on theoretical computer science for high school students for the Governor’s school of New Jersey (*Wonderful and Crazy Ideas in Theoretical Computer Science and Math*)

- Reviewer for AAAI, FOCS, SODA, ICALP, TALG, IJCAI, SICOMP, IPL, SIDMA, STOC, APPROX, IPEC, and many more
- CMU Speakers Club
- Graduate admissions committee, CMU
- Roadshows, Grad School Applications Workshop, Women at SCS, CMU
- Graduate Panel for CMU Grad Women's organization
- Student volunteer, FOCS 2005

## References

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