

Virginia Vassilevska Williams

Curriculum Vitae

Assistant Professor
Stanford University
Computer Science Department
353 Serra Mall, Gates 468
Stanford, CA 94305
Tel. (650) 723-3705
Email: virgi@cs.stanford.edu

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

- Hoover Fellow, Stanford School of Engineering;
- Plenary talk at CSR 2016;
- Plenary survey talk at Highlights in Algorithms (HALG'16);
- Plenary talk at MFCS 2016;
- Plenary talk at STACS 2016;
- Plenary talk at ALGO/IPEC 2015;
- Plenary talk at China Theory week 2015;
- Plenary lecture at China Theory week 2014 (declined);
- Invited to be a session chair at ICM 2014 (declined);
- US Junior Oberwolfach Fellow, 2012;

- Paper on matrix multiplication one of 3 highlighted papers at STOC 2012;
- Computing Innovation Fellow 2009–2011;
- Paper selected as one of the top 33 exceptional papers at AAAI 2010;
- Special issue papers for SODA 2008, FOCS 2015, STOC 2015 and SODA 2016;
- 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.

Grants

- AFOSR MURI (until Sept. 2016)
- NSF Small Grant CCF-1528078 (2015-2018)
- NSF Medium Grant CCF-1514339 (2015-2019)
- NSF Travel Grant CCF-1417238 (2013-2017)
- BSF Grant # 2012338 (2013-2017)

Work Experience

- Assistant professor, Stanford University, Sept. 2013 – now
- Research associate at Stanford University, Sept. 2011–Sept. 2013
- Assistant research engineer at UC Berkeley, Sept. 2011–Sept. 2013
- 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)

Teaching

- CS 161, Stanford, Spring 2015, Spring 2016: Introduction to Algorithms
- CS 367, Stanford, Spring 2014, Fall 2015: Algebraic Graph Algorithms
- CS 267, Stanford, Winter 2014, Winter 2015, Winter 2016: Graph Algorithms
- CS 266, Stanford, Spring 2013: Parameterized Algorithms
- (*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.

Peer-Refereed Conference Publications

- *Deterministic Time-Space Tradeoffs for k -SUM*, Andrea Lincoln, V. Vassilevska Williams, Josh R. Wang, Ryan Williams, ICALP 2016.
- *Simulating Branching Programs with Edit Distance and Friends or: A Polylog Shaved is a Lower Bound Made*, Amir Abboud, Thomas D. Hansen, V. Vassilevska Williams and Ryan Williams, STOC 2016.
- *Who Can Win a Single-Elimination Tournament?*, Michael P. Kim, Warut Suksompong, V. Vassilevska Williams, AAI 2016.
- *Subtree Isomorphism Revisited*, Amir Abboud, Arturs Backurs, Thomas Dueholm Hansen, V. Vassilevska Williams, Or Zamir, SODA 2016.
- *Better Distance Preservers and Additive Spanners*, Greg Bodwin and V. Vassilevska Williams, SODA 2016.
- *Approximation and Fixed Parameter Subquadratic Algorithms for Radius and Diameter in Sparse Graphs*, Amir Abboud, Josh Wang, V. Vassilevska Williams, SODA 2016.
- *If the Current Clique Algorithms are Optimal, so is Valiant's Parser*, Amir Abboud, Arturs Backurs and V. Vassilevska Williams, FOCS 2015.
- *Tight Hardness Results for LCS and other Sequence Similarity Measures*, Amir Abboud, Arturs Backurs and V. Vassilevska Williams, FOCS 2015.
- *Fixing tournaments for kings, chokers and more*, Michael P. Kim and V. Vassilevska Williams, IJCAI 2015.
- *Matching triangles and basing hardness on an extremely popular conjecture*, Amir Abboud, V. Vassilevska Williams and Huacheng Yu, STOC 2015.
- *Quantum algorithms for shortest paths problems*, Aran Nayebi and V. Vassilevska Williams, SQUINT 2015.
- *Better sparse spanners and emulators*, Greg Bodwin and V. Vassilevska Williams, ITCS 2015.
- *Subcubic Equivalences Between Graph Centrality Problems, APSP and Diameter*, Amir Abboud, Fabrizio Grandoni and V. Vassilevska Williams, SODA 2015.
- *Finding Four-Node Subgraphs in Triangle Time*, V. Vassilevska Williams, Josh Wang, Ryan Williams and Huacheng Yu, SODA 2015.
- *Popular conjectures imply strong lower bounds for dynamic problems*, Amir Abboud and V. Vassilevska Williams, FOCS 2014.
- *Listing triangles*, Andreas Bjorklund, Rasmus Pagh, V. Vassilevska Williams and Uri Zwick, ICALP 2014.

- *Consequences of faster sequence alignment*, Amir Abboud, V. Vassilevska Williams and Oren Weimann, ICALP 2014.
- *Better Approximation Algorithms for the Graph Diameter*, Shiri Chechik, Daniel Larkin, Liam Roditty, Grant Schoenebeck, Bob Tarjan and V. Vassilevska Williams, SODA 2014.
- *Fast approximation algorithms for the diameter and radius of sparse graphs*, Liam Roditty and V. Vassilevska Williams, STOC 2013 (acceptance rate: 27%).
- *Improved Distance Sensitivity Oracles via Fast Single-Source Replacement Paths*, Fabrizio Grandoni and V. Vassilevska Williams, FOCS 2012 (acceptance rate: 31%).
- *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

- *Matching triangles and basing hardness on an extremely popular conjecture*, Amir Abboud, V. Vassilevska Williams and Huacheng Yu, SIAM Journal on Computing, 2016, Special Issue for STOC'16, accepted with minor revisions.
- *Subcubic Equivalences Between Path, Matrix, and Triangle Problems*, V. Vassilevska Williams and Ryan Williams, Journal of the ACM, accepted with minor revisions.
- *The Structure and Efficacy of Double-Elimination Tournaments*, Isabelle Stanton and V. Vassilevska Williams, Journal of Quantitative Analysis of Sports, 2013.
- *Finding, Minimizing, and Counting Weighted Subgraphs*, V. Vassilevska Williams, Ryan Williams, SIAM Journal on Computing, 2013..
- *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.

Surveys and Book Chapters

- *An overview of the recent progress on matrix multiplication*. V. Vassilevska Williams, SIGACT News 43, 4 (December 2012), 57–69.
- *Knockout Tournaments*, V. Vassilevska Williams, in Handbook of Computational Social Choice, to appear.

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.
- *On the recent progress on matrix multiplication*, plenary talk at Oberwolfach, 2012.
- *Multiplying matrices faster than Coppersmith-Winograd*, UC San Diego, 2013.
- *Path problems, matrix products, algorithms, and equivalences*, Microsoft Research, Silicon Valley, 2013.
- *Path problems, matrix products, algorithms, and equivalences*, UT Austin, 2013.
- *Path problems, matrix products, algorithms, and equivalences*, Stanford University, 2013.
- *A tutorial on matrix multiplication*, Simons Institute, UC Berkeley, 2014.
- *Consequences of the strong exponential time hypothesis for problems in polynomial time*, Dagstuhl, 2014.
- *Subcubic Equivalences Between Graph Centrality Problems, APSP and Diameter*, FND'14, Lugano, 2014.
- *Invited tutorial on Hardness in P*, Tutorial at STOC'15, Portland, 2015.
- *Hardness for easy problems*, China Theory Week, Shanghai, 2015.
- *Hardness for easy problems: Implications of the Strong Exponential Time Hypothesis*, IPEC/ALGO, Patras, Greece, 2016.
- *A Fine-Grained Approach to Algorithms and Complexity*, MIT, 2016.
- *A Fine-Grained Approach to Algorithms and Complexity*, STACS, 2016.
- *A Fine-Grained Approach to Algorithms and Complexity*, ARC Theory Day, Georgia Tech, 2016.

Professional Service

- Co-organizer of a workshop at STOC 2016 on “Spanners”, June 2016.
- Co-organizer of a Dagstuhl workshop on “Hardness for polynomial time problems”, Fall 2016.
- Co-organizer of the semester-long program on “Fine-grained complexity and algorithm design” at the Simons Institute of Theoretical Computer Science, Fall 2015.
- Co-organizer of a tutorial/workshop at STOC 2015 on “Hardness for easy problems”, June 2015.
- Doctoral thesis defense committees: Andy Nguyen (2015), Hart Montgomery (2014), Mark Zhandry (2015), Eric Huang (2016), Kevin Lewi (2016), Rishi Gupta (2016), Yang Li (2016), Joe Zimmerman (2016), Stephen Reid (2016).
- Qualification exam committees: Greg Bodwin (2015), Huacheng Yu (2015), Okke Schrijvers (2015), Eric Huang (2015), Haden Lee (2015), Valeria Nikolaenko (2014), Rishi Gupta (2014).
- University chair for thesis defense oral exam of John Brunhaver (EE department), 2014.
- Associate editor for SICOMP for special issue of FOCS’13.
- Program committees: COMSOC 2012, AAMAS 2012, SWAT 2012, AAAI 2012, SODA 2013, ICALP 2013, STOC 2013, IJCAI 2013, FOCS 2013, COMSOC 2014, ESA 2015, FUN 2016, IJCAI 2016, SODA 2017.
- 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*)
- External reviewer for AAAI, FOCS, SODA, ICALP, TALG, IJCAI, SICOMP, IPL, SIDMA, STOC, APPROX, IPEC, CCC, ITCS and many more.

References

Available upon request.