

# RYAN O'DONNELL

## *Curriculum vitae*

February, 2012

CURRENT POSITION: Associate Professor, Computer Science Dept                      odonnell@cs.cmu.edu  
Carnegie Mellon University                      5000 Forbes Ave., Pittsburgh

CITIZENSHIP: Canadian

RESEARCH INTERESTS: Analysis of Boolean functions, Approximability of optimization problems,  
Learning theory, Complexity theory, Property Testing, Probability

EDUCATION: **Ph.D., Massachusetts Institute of Technology**, 1999 – 2003  
Department of Applied Mathematics  
Thesis: *Computational applications of noise sensitivity*  
Advisor: Madhu Sudan  
**B.Sc., University of Toronto**, 1995 – 1999  
Joint Specialist degree in Mathematics and Computer Science

PROFESSIONAL EXPERIENCE: **Associate Professor, Carnegie Mellon Comp. Sci. Dept.**, 2011 – present  
**Member, Sch. of Mathematics, Institute for Advanced Study**, 2010 – 2011  
**Assistant Professor, Carnegie Mellon Comp. Sci. Dept.**, 2006 – 2011  
**Lecturer (unofficial), University of Washington**, fall 2005  
**Postdoctoral researcher, Microsoft Theory Group**, 2004 – 2006  
**Postdoctoral researcher, Institute for Advanced Study**, 2003 – 2004  
**Research Assistant, MIT**, spring 2001, fall 2001, spring 2002, fall 2002  
**Intern, Microsoft Theory Group**, summer 2000  
**Teaching Assistant, MIT**, fall 2000, spring 2000, spring 2003

PH.D. STUDENTS SUPERVISED:	Karl Wimmer:	graduated 2009	(now Duquesne University)
	Yi Wu:	graduated 2010	(now IBM Research Almaden)
	Eric Blais	graduated 2012	(now MIT)
	Aaron Roth:	2006 – 2008	(joint with A. Blum)
	Ali Kemal Sinop:	2008 – 2011	(joint with V. Guruswami)
	Yuan Zhou	2009 – present	(joint with V. Guruswami)
	John Wright:	2010 – present	
	David Witmer:	2011 – present	(joint with A. Gupta)

PH.D. THESIS COMMITTEES:	R. Ryan Williams:	August 2007, Carnegie Mellon University
	Per Austrin:	November 2008, Royal Inst. Tech., Sweden
	Andrew Wan	April 2010, Columbia University
	Daniel Kane	June 2011, Harvard University
	Ali K. Sinop	July 2012, Carnegie Mellon University

GRANTS,  
AWARDS, AND  
HONORS:

**NSF Grant in Algorithmic Foundations**, 2011 – 2014  
for “Analysis of Boolean Functions”

**Microsoft Research–CMU Computational Thinking Grant**, 2011 – 2012  
for “Constraint Satisfaction Problems: Trichotomies”

**Microsoft Research–CMU Computational Thinking Grant**, 2010 – 2011  
for “The Dichotomy Conjecture”

**Von Neumann Fellowship** (IAS School of Mathematics, 2010 – 2011)

**NSF Grant in Algorithmic Foundations**, 2009 – 2012  
for “The Polynomial Method in Learning”

**Alfred P. Sloan Research Fellowship**, 2009

**Pazy Memorial Award**, 2009 (best BSF math/CS grant)

**Binational Science Foundation (BSF) US-Israel Grant**, 2008 – 2012  
for “Fourier-Analytic Methods for Boolean Functions”

**CyLab Grant** for “Fault-Tolerant Voting”, 2008 – 2009

**Okawa Foundation Research Grant**, 2008

**NSF Faculty Early Career Development (CAREER) Award**, 2008 – 2013  
for “Optimal Approximability”

**Best Paper Award, Conference on Computational Complexity**, 2003  
for the paper *Extremal properties of polynomial threshold functions*

**Best Student Paper Award, Conf. on Computational Complexity**, 2002  
for the paper *Hardness amplification within NP*

**Best Student Paper Award, MIT Mathematics Department**, 2003  
for the paper *Hardness amplification within NP*

**NSERC (“Canadian NSF”) Graduate Fellowship**, 1999 – 2001

**Rosenblith Fellowship, MIT Mathematics Department**, 1999 – 2000

EDITORIAL  
WORK: **Theory of Computing**, editor  
**SIAM Journal on Discrete Mathematics**, editor  
**Electronic Colloquium on Computational Complexity**, scientific board  
**SIAM Journal of Computing**, guest editor,  
special issues for STOC 2005, FOCS 2010

CONFERENCE  
COMMITTEES: **RANDOM 2012, SODA 2012, FOCS 2010, COLT 2010, CCC 2009,**  
**ICALP 2008, NIPS 2008, STOC 2007, STOC 2005, CCC 2005**

CONFERENCE  
ORGANIZATION: **Simons Symposium.** Co-organizer, 2012 symposium on  
Analysis of Boolean Functions: new directions and applications.  
**Banff International Research Station.** Co-organizer, 2011 workshop on  
approximation algorithms and the hardness of approximation  
**Centre Emile Borel (Institute Henri Poincaré).** Co-organizer, 2011 special  
semester on metric geometry, algorithms, groups  
**Center for Computational Intractability.** Co-organizer, 2010 workshop  
on analysis and geometry of threshold functions.

JOURNAL  
REFEREEING: Annals of Mathematics, Annals of Probability, Combinatorica,  
Computational Complexity, Encyclopedia of Algorithms, Information  
Processing Letters, Journal of Computer and System Sciences, Journal of  
Machine Learning Research, Journal of Physics A: Mathematical and  
Theoretical, Journal of Theoretical Computer Science, Mathematics of  
Operations Research, SIAM Journal of Computing, SIAM Journal of  
Discrete Mathematics, Theory Of Computing

CONFERENCE  
REFEREEING: FOCS, STOC, SODA, CCC, ICALP, COLT, NIPS, ITCS, RANDOM,  
STACS, LATIN, MFCS,

GRANT  
REFEREEING: National Science Foundation, Israel Science Foundation

INVITED  
SYMPOSIUM  
TALKS:

**Mathematical Sciences Research Institute (MSRI):**

fall 2011 workshop on Quantitative Geometry in Computer Science

**4th Ann. Eastern Great Lakes (EaGL) Theory of Computation Workshop**

**Fields Institute:** summer 2011 workshop on Approximability of CSPs

**Isaac Newton Institute for Mathematical Sciences:**

spring 2011 semester on discrete analysis

**Centre Emile Borel (Institute Henri Poincaré):**

spring 2011 trimester on approximation algorithms (4 lectures)

**14th Semiannual New York Area Theory Day:** fall 2010

**China Theory Week 2010:** Keynote talk

**Institute for Advanced Study:**

summer 2010 workshop on Pseudorandomness in Mathematical Structures

**Toyota Technological Institute – Chicago (TTI-C):**

spring 2009 workshop on Approximation Algorithms and their Limitations

**Mathematical Sciences Research Institute (MSRI):**

fall 2008 workshop on Discrete Rigidity Phenomena in Additive Combinatorics

**Banff International Research Station (BIRS):**

summer 2008 workshop on Analytic Tools in Computational Complexity.

**STOC 2008:** Invited tutorial speaker.

**Cornell Workshop on Probability Theory and Computer Science:**

spring 2008 workshop on discrete harmonic analysis and its applications

**American Institute for Mathematics (AIM) Research Workshop:**

fall 2007 seminar on Algorithmic Convex Geometry

**Schloss-Dagstuhl Seminar:**

fall 2007 seminar on Algebraic Methods in Computational Complexity

**International Center for Mathematical Sciences (ICMS):**

spring 2007 workshop on Geometry and Algorithms

**Banff International Research Station (BIRS):**

summer 2006 workshop on Recent Advances in Computational Complexity

**American Mathematical Society (AMS) Central Section Meeting:**

fall 2005 special session on Randomness in Computation

**2nd Annual Pacific Northwest Theory Day:** spring 2005

**Mathematical Sciences Research Institute (MSRI):**

spring 2005 workshop on Phase Transitions in Computation and Reconstruction

**Yale Workshop on Discrete Mathematics and Theoretical Computer Sci.:**

fall 2004 workshop on Harmonic Analysis of Boolean Functions

**Schloss-Dagstuhl Seminar:**

fall 2004 seminar on Algebraic Methods in Comp. Complexity

INVITED  
ACADEMIC  
TALKS:

**Istanbul Center for Mathematical Sciences (IMBM):** Math seminar 2011

**Microsoft Redmond Theory Group:** CS Theory seminar 2011

**Institute for Advanced Study:** Discrete mathematics seminar 2011

**Institute for Advanced Study:** Discrete mathematics seminar 2010

**Microsoft Redmond Theory Group:** CS Theory seminar 2010

**University of Washington:** Probability seminar 2010

**Microsoft Silicon Valley Theory Group:** CS Theory seminar 2009

**Institute for Advanced Study (IAS):** CS Theory seminar 2009

**Microsoft New England Theory Group:** CS Theory seminar 2009

**MIT:** CS Theory colloquium 2009

**SUNY Buffalo:** CS Theory seminar 2008

**University of Toronto:** CS Theory seminar 2008

**MIT:** CS Theory colloquium 2007

**Carnegie Mellon:** ACO seminar 2007

**Penn State:** CS Theory seminar 2007

**Carnegie Mellon:** CS Theory seminar 2006

**Carnegie Mellon:** CS Theory seminar 2006 (again)

**UT Austin:** CS Theory seminar 2006

**MIT:** Applied Mathematics seminar 2006

**University of Pennsylvania:** CS Theory seminar 2006

**University of Chicago:** CS Theory seminar 2006

**Georgia Tech:** CS Theory seminar 2006

**Georgia Tech:** CS Theory seminar 2006 (again)

**Dartmouth College:** Mathematics seminar 2006

**University of British Columbia:** Math Colloquium 2006

**University of British Columbia:** Discrete Math seminar 2006

**UC Berkeley:** CS Theory seminar 2005

**UC Berkeley:** CS Theory seminar 2005 (again)

**Simon Fraser University:** CS Theory seminar 2005

**University of Washington:** Probability seminar 2005

**UC Berkeley:** CS Theory seminar 2004

**University of Washington:** CS Theory seminar 2004

**University of Washington:** CS Theory seminar 2004 (again)

**Microsoft Redmond Theory Group:** CS Theory seminar 2004

**Columbia University:** CS Theory seminar, 2004

**Yale University:** CS Theory seminar 2004

**Institute for Advanced Study (IAS):** CS Theory seminar 2004

**Institute for Advanced Study (IAS):** CS Theory seminar 2003  
**Institute for Advanced Study (IAS):** CS Theory seminar 2003 (again)  
**University of Washington:** CS Theory seminar 2002  
**Microsoft Redmond Theory Group:** CS Theory seminar 2002  
**University of Toronto:** CS Theory seminar 2002

CONFERENCE  
TALKS:

ICALP 2009, STOC 2008, FOCS 2006, LATIN 2006, FOCS 2005, STOC  
2005, FOCS 2003, CCC 2003, STOC 2003, FOCS 2002, STOC 2002,  
Mathematics and Computer Science II 2003, SODA 2002.

JOURNAL  
ARTICLES:

1. Joint with “D.H.J. Polymath” (a mathematical collective,  
see <http://michaelnielsen.org/polymath1/>)  
A new proof of the density Hales-Jewett theorem.  
*Annals of Mathematics*, accepted to appear, 2012.
2. R. O’Donnell, R. Servedio.  
The Chow parameters problem.  
*SIAM Journal of Computing*, accepted to appear 2011.
3. P. Gopalan, R. O’Donnell, R. Servedio, A. Shpilka, K. Wimmer.  
Testing Fourier dimensionality and sparsity.  
*SIAM Journal on Computing* 40(4), pp. 1075–1100 (2011).
4. E. Blais, R. O’Donnell, K. Wimmer.  
Polynomial regression under arbitrary product distributions.  
*Machine Learning* 80(2-3), pp. 273–294 (2010).
5. R. O’Donnell, R. Servedio.  
New degree bounds for polynomial threshold functions.  
*Combinatorica* 30(3), pp. 327–358 (2010).
6. E. Mossel, R. O’Donnell, K. Oleszkiewicz.  
Noise stability of functions with low influences: invariance and  
optimality  
*Annals of Mathematics* 171(1), pp. 295–341 (2010).
7. K. Matulef, R. O’Donnell, R. Rubinfeld, R. Servedio.  
Testing halfspaces.  
*SIAM Journal of Computing* 39(3), pp. 2004–2047 (2010).
8. S. Khot, R. O’Donnell.  
SDP gaps and UGC-hardness for Max-Cut-Gain.  
*Theory of Computing* 5, pp. 83–117 (2009).
9. J. Feldman, R. O’Donnell, R. Servedio.  
Learning mixtures of product distributions over discrete domains.  
*SIAM Journal of Computing* 37(5), pp. 1536–1564 (2008).
10. B. Bollobás, G. Kindler, I. Leader, R. O’Donnell.  
Eliminating cycles in the discrete torus.  
*Algorithmica* 50(4), pp. 446–454 (2008).
11. R. O’Donnell, R. Servedio.  
Extremal properties of polynomial threshold functions.  
*Journal of Computer and System Sciences* 74(3), pp. 298–312 (2008).  
(Invited paper, special issue for CCC 2003.)
12. R. O’Donnell, R. Servedio.  
Learning monotone decision trees in polynomial time.  
*SIAM Journal of Computing* 37(3), pp. 827–844 (2007).
13. I. Dinur, E. Friedgut, G. Kindler, R. O’Donnell.  
On the Fourier tails of bounded functions over the discrete cube.  
*Israel Journal of Mathematics* 160(1), pp. 389–412 (2007).

14. S. Khot, G. Kindler, E. Mossel, R. O'Donnell.  
Optimal inapproximability results for MAX-CUT and other two-variable CSPs?  
*SIAM Journal of Computing* 37(1), pp. 319–357 (2007).  
(Invited paper, special issue for FOCS 2004.)
  15. E. Mossel, R. O'Donnell, O. Regev, J. Steif, B. Sudakov.  
Non-interactive correlation distillation, inhomogeneous Markov chains, and the reverse Bonami-Beckner inequality.  
*Israel Journal of Mathematics* 154(1), pp. 299–336 (2006).
  16. N. Bshouty, E. Mossel, R. O'Donnell, R. Servedio.  
Learning DNF from random walks.  
*Journal of Computer and System Sciences* 71(3), pp. 250–265 (2005).  
(Invited paper, special issue for FOCS, STOC, COLT 2003.)
  17. E. Mossel, R. O'Donnell.  
Coin flipping from a cosmic source: On error correction of truly random bits.  
*Random Structures & Algorithms* 26(4), pp. 418–436 (2005).
  18. E. Mossel, R. O'Donnell, R. Servedio.  
Learning functions of  $k$  relevant variables.  
*Journal of Computer and System Sciences* 69(3), pp. 421–434 (2004).  
(Invited paper, special issue for STOC 2003.)
  19. R. O'Donnell.  
Hardness amplification within NP.  
*Journal of Computer and System Sciences* 69(1) pp. 68–94 (2004).  
(Invited paper, special issue for STOC 2002.)
  20. A. Klivans, R. O'Donnell, R. Servedio.  
Learning intersections and thresholds of halfspaces.  
*Journal of Computer and System Sciences* 68(4), pp. 808–840 (2004).  
(Invited paper, special issue for FOCS 2002.)
  21. E. Mossel, R. O'Donnell.  
On the noise sensitivity of monotone functions.  
*Random Structures & Algorithms* 23(3), pp. 333–350 (2003).
  22. A. Corduneanu, C. Hsia, R. O'Donnell.  
A greedy algorithm for solving meeting mixing problems.  
*UMAP Journal* 18(3), pp. 331–342 (1997).
- REFEREED  
CONFERENCE  
PUBLICATIONS:
23. G. Kindler, R. O'Donnell.  
Gaussian noise sensitivity and Fourier tails.  
*CCC 2012*.
  24. R. O'Donnell, J. Wright.  
A new point of NP-hardness for Unique Games.  
*STOC 2012*.
  25. G. Kun, R. O'Donnell, S. Tamaki, Y. Yoshida, Y. Zhou.

- Linear programming, width-1 CSPs, and robust satisfaction.  
*ITCS 2011.*
26. R. O'Donnell, J. Wright, Y. Zhou.  
The Fourier Entropy–Influence Conjecture for some classes of functions.  
*ICALP 2011.*
27. R. O'Donnell, Y. Wu, Y. Zhou.  
Hardness of Max-2Lin and Max-3Lin over integers, reals, and large cyclic groups.  
*CCC 2011.*
28. A. Moitra, R. O'Donnell.  
Pareto optimal solutions for smoothed analysts.  
*STOC 2011.*
29. I. Diakonikolas, R. O'Donnell, R. Servedio, Y. Wu.  
Hardness results for agnostic learning low degree polynomial threshold functions.  
*SODA 2011.*
30. R. O'Donnell, Y. Wu, Y. Zhou.  
Optimal lower bounds for locality sensitive hashing (except when  $q$  is tiny).  
*ICS 2011.*
31. V. Guruswami, S. Khot, R. O'Donnell, P. Papat, M. Tulsiani, Y. Wu.  
SDP gaps for 2-to-1 and other Label-Cover variants.  
*ICALP 2010.*
32. P. Gopalan, R. O'Donnell, Y. Wu, D. Zuckerman.  
Fooling functions of halfspaces under product distributions.  
*CCC 2010.*
33. E. Blais, R. O'Donnell.  
Lower bounds for testing function isomorphism.  
*CCC 2010.*
34. J. Aspnes, E. Blais, M. Demirbas, R. O'Donnell, A. Rudra, S. Uurtamo.  
 $k$ + decision trees.  
*ALGOSENSORS 2010.*
35. R. O'Donnell, K. Wimmer.  
KKL, Kruskal-Katona, and monotone nets.  
*FOCS 2009.*
36. K. Matulef, R. O'Donnell, R. Rubinfeld, R. Servedio.  
Testing  $\{-1,1\}$ -weight halfspaces.  
*RANDOM 2009.*
37. P. Gopalan, R. O'Donnell, R. Servedio, A. Shpilka, K. Wimmer.  
Testing Fourier dimensionality and sparsity.  
*ICALP 2009.*

38. R. O'Donnell, Y. Wu.  
Conditional hardness for satisfiable 3-CSPs.  
*STOC* 2009.
39. R. O'Donnell, Y. Wu.  
3-Bit Dictator testing: 1 vs. 5/8.  
*SODA* 2009.
40. K. Matulef, R. O'Donnell, R. Rubinfeld, R. Servedio.  
Testing halfspaces.  
*SODA* 2009.
41. G. Kindler, R. O'Donnell, A. Rao, A. Wigderson.  
Spherical cubes and rounding in high dimensions.  
*FOCS* 2008.
42. A. Klivans, R. O'Donnell, R. Servedio.  
Learning geometric concepts via surface area.  
*FOCS* 2008.
43. E. Blais, R. O'Donnell, K. Wimmer.  
Polynomial regression in arbitrary product spaces.  
*COLT* 2008.  
(Invited to Machine Learning Journal, special issue for COLT 2008.)
44. R. O'Donnell, R. Servedio.  
The Chow Parameters problem.  
*STOC* 2008.
45. R. O'Donnell, Y. Wu.  
An optimal SDP algorithm for Max-Cut, and equally optimal Long Code tests.  
*STOC* 2008.
46. R. O'Donnell, K. Wimmer.  
Approximation by DNF: examples and counterexamples.  
*ICALP* 2007.
47. U. Feige, G. Kindler, R. O'Donnell.  
Understanding parallel repetition requires understanding foams.  
*CCC* 2007.
48. S. Khot, R. O'Donnell.  
SDP gaps and UGC-hardness for Max-Cut-Gain.  
*FOCS* 2006.
49. J. Feldman, R. O'Donnell, R. Servedio.  
PAC learning mixtures of Gaussians with no separation assumption.  
*COLT* 2006.
50. B. Bollobás, G. Kindler, I. Leader, R. O'Donnell.  
Eliminating cycles in the discrete torus.  
*LATIN* 2006.
51. I. Dinur, E. Friedgut, G. Kindler, R. O'Donnell.  
On the Fourier tails of bounded functions over the discrete cube.

- STOC* 2006.
52. R. O'Donnell, R. Servedio.  
Learning monotone decision trees in polynomial time.  
*CCC* 2006.
  53. E. Mossel, R. O'Donnell, K. Oleszkiewicz.  
Noise stability of functions with low influences: invariance and optimality.  
*FOCS* 2005.
  54. R. O'Donnell, M. Saks, O. Schramm, R. Servedio.  
Every decision tree has an influential variable.  
*FOCS* 2005.
  55. J. Feldman, R. O'Donnell, R. Servedio.  
Learning mixtures of product distributions over discrete domains.  
*FOCS* 2005.
  56. S. Khot, G. Kindler, E. Mossel, R. O'Donnell.  
Optimal inapproximability results for MAX-CUT and other two-variable CSPs?  
*FOCS* 2004.
  57. N. Bshouty, E. Mossel, R. O'Donnell, R. Servedio.  
Learning DNF from random walks.  
*FOCS* 2003.
  58. R. O'Donnell, R. Servedio.  
Extremal properties of polynomial threshold functions.  
*CCC* 2003.
  59. R. O'Donnell, R. Servedio.  
New degree bounds for polynomial threshold functions.  
*STOC* 2003.
  60. E. Mossel, R. O'Donnell, R. Servedio.  
Learning juntas.  
*STOC* 2003.
  61. A. Klivans, R. O'Donnell, R. Servedio.  
Learning intersections and thresholds of halfspaces.  
*FOCS* 2002.
  62. E. Mossel, R. O'Donnell.  
On the noise sensitivity of monotone functions.  
*Mathematics and Computer Science II* 2002.
  63. R. O'Donnell.  
Hardness amplification within NP.  
*STOC* 2002.
  64. L. Engebretsen, P. Indyk, R. O'Donnell.  
Derandomized dimensionality reduction with applications.  
*SODA* 2002.

- MANUSCRIPTS: 65. G. Kindler, R. O'Donnell, A. Rao, A. Wigderson.  
Spherical cubes: optimal foams from computational hardness  
amplification.
66. R. O'Donnell, K. Wimmer.  
Sharpness of KKL on Schreier graphs.
- INVITED  
CONFERENCE  
PAPER: 67. R. O'Donnell.  
Some topics in analysis of boolean functions.  
*Survey accompanying STOC 2008 tutorial*
- BOOKS: 68. R. O'Donnell.  
Analysis of Boolean Functions.  
*Blog/textbook in progress.*
69. R. O'Donnell.  
Computational aspects of noise sensitivity.  
MIT Ph.D. Thesis 2003.
- PATENT: 70. M. Aiken, R. O'Donnell.  
Fair share dynamic resource allocation scheme with a safety buffer.  
*US Patent #6625709*