

# Curriculum Vitae - Avishay Tal

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avishay.tal@gmail.com  
<http://www.avishaytal.org>

<b>RESEARCH INTERESTS</b>	Computational Complexity, Analysis of Boolean Functions, Circuit Complexity, Formula Complexity, Query Complexity, Pseudorandomness, Learning, Combinatorics, Quantum Computing, and the Connections between Algorithms and Lower Bounds.
<b>EDUCATION</b>	<p><b>Ph.D. in Computer Science</b> <span style="float: right;">2012-2015</span> <i>The Weizmann Institute of Science, Rehovot, Israel</i> Dissertation title: Analysis of Boolean Functions in Theoretical Computer Science. Advisor: Prof. Ran Raz</p> <p><b>M.Sc. (summa cum laude) in Computer Science</b> <span style="float: right;">2007-2012</span> <i>The Technion, Haifa, Israel</i> Thesis: On the Minimal Fourier Degree of Symmetric Boolean Functions Advisor: Prof. Amir Shpilka</p> <p><b>B.Sc. (summa cum laude) in Software Engineering</b> <span style="float: right;">2001-2005</span> <b>B.A. (summa cum laude) in Mathematics</b> <span style="float: right;">2001-2007</span> <i>The Technion, Haifa, Israel</i></p>
<b>EXPERIENCE</b>	<p><b>Research Fellow</b> <span style="float: right;">Fall 2018</span> <i>Simons Institute for the Theory of Computing, Berkeley, CA.</i></p> <p><b>Motwani Postdoctoral Fellow</b> <span style="float: right;">2017-current</span> <i>Stanford University, Stanford, CA.</i> <i>Hosted by Prof. Omer Reingold.</i></p> <p><b>Postdoctoral Researcher</b> <span style="float: right;">2015-2017</span> <i>Institute for Advanced Study, Princeton, NJ.</i> <i>Simons Collaboration on Algorithms and Geometry.</i> <i>Hosted by Prof. Avi Wigderson.</i></p> <p><b>Algorithmic Researcher &amp; Team Leader</b> <span style="float: right;">2005-2012</span> <i>IDF</i></p> <p><b>Teaching Assistant – Digital Systems</b> <span style="float: right;">2005</span> <i>The Technion, Haifa, Israel.</i></p> <p><b>Teaching Assistant – Introduction to Computer Science</b> <span style="float: right;">2003-2004</span> <i>The Technion, Haifa, Israel.</i></p>
<b>AWARDS &amp; HONORS</b>	<p><b>Postdoctoral Awards and Honors</b></p> <ul style="list-style-type: none"><li>• <b>Rothschild Postdoctoral Fellowship (withdrew)</b> <span style="float: right;">2015</span></li></ul> <p><b>Ph.D. Awards and Honors</b></p> <ul style="list-style-type: none"><li>• <b>Dimitris N. Chorafas Prize</b> <span style="float: right;">2016</span></li><li>• <b>Thalheimer Scholarship</b> <span style="float: right;">2014</span> for graduate students by the <i>Wolf Foundation</i></li></ul>

- **Adams Fellowship** 2013-2015  
by the *Israeli Academy of Sciences and Humanities*
- **ITCS Best Student Paper** 2013  
for “*Properties and Applications of Boolean Function Composition*”

#### Undergraduate Awards and Honors

- Special Excellence Award from The Israeli Knesset (Parliament) 2005
- SAMBA Scholarships for excellent undergraduate students  
in the Computer Science Department at The Technion 2003-2005
- Technion President’s Excellence Awards 2001-2005

#### SERVICE

**Program Committee Member:** FOCS 2019

**Conference Refereeing:** STOC 2014, FOCS 2015, STACS 2015, STOC 2016, CCC 2016, ICALP 2016, SODA 2017, ITCS 2017, STOC 2017, CCC 2017, FOCS 2017, STOC 2018, CCC 2018, ICALP 2018, RANDOM 2018, FOCS 2018, SODA 2019, ITCS 2019, STOC 2019.

**Journal Refereeing:** Journal of the ACM, SIAM Journal on Computing, ACM Transactions on Computation Theory, Computational Complexity, Theory of Computing, ACM Transactions on Algorithms, Discrete Analysis.

**Grant Reviewing:** Israel Science Foundation.

#### PUBLICATIONS

1. **On the Minimal Fourier Degree of Symmetric Boolean Functions**  
Amir Shpilka and Avishay Tal  
*IEEE Conference on Computational Complexity (CCC), 2011*  
*Combinatorica, June, 2014.*
2. **On the Degree of Univariate Polynomials over The Integers**  
Gil Cohen, Amir Shpilka and Avishay Tal  
*Innovations in Theoretical Computer Science (ITCS) conference, 2012*  
*Combinatorica, June, 2017.*
3. **Properties and Applications of Boolean Function Composition**  
Avishay Tal  
*Innovations in Theoretical Computer Science (ITCS) conference, 2013*  
**Best Student Paper Award**
4. **Improved Average-Case Lower Bounds for De Morgan Formula Size**  
Ilan Komargodski, Ran Raz and Avishay Tal  
*IEEE Symposium on Foundations of Computer Science (FOCS), 2013*  
*SIAM Journal on Computing, 2017.*
5. **On the Structure of Boolean Functions with Small Spectral Norm**  
Amir Shpilka, Avishay Tal and Ben Lee Volk  
*Innovations in Theoretical Computer Science (ITCS) conference, 2014*  
*Computational Complexity journal, 2017.*
6. **Shrinkage of De Morgan Formulae by Spectral Techniques**  
Avishay Tal  
*IEEE Symposium on Foundations of Computer Science (FOCS), 2014*
7. **Two Structural Results for Low Degree Polynomials and Applications**  
Gil Cohen and Avishay Tal  
*The 19th International Workshop on Randomization and Computation (RANDOM), 2015*

8. **Matrix Rigidity of Random Toeplitz Matrices**  
Oded Goldreich and Avishay Tal  
*The 48th Annual Symposium on the Theory of Computing (STOC), 2016*  
*Computational Complexity journal, 2018*
9. **On Fractional Block Sensitivity**  
Raghav Kulkarni and Avishay Tal  
*Chicago Journal of Theoretical Computer Science (CJTCS), 2016*
10. **On The Sensitivity Conjecture**  
Avishay Tal  
*The 43rd International Colloquium on Automata, Languages, and Programming (ICALP), 2016*
11. **Low-Sensitivity Functions from Unambiguous Certificates**  
Shalev Ben-David, Pooya Hatami and Avishay Tal  
*Innovations in Theoretical Computer Science (ITCS) conference, 2017*
12. **Time-Space Hardness of Learning Sparse Parities**  
Gillat Kol, Ran Raz and Avishay Tal  
*The 49th Annual Symposium on the Theory of Computing (STOC), 2017*
13. **Formula Lower Bounds via the Quantum Method**  
Avishay Tal  
*The 49th Annual Symposium on the Theory of Computing (STOC), 2017*  
Merge of **Computing Requires Larger Formulas than Approximating**  
and **The Bipartite Formula Complexity of Inner-Product is Quadratic**  
(both available on ECCC).
14. **Tight Bounds on The Fourier Spectrum of  $AC^0$**   
Avishay Tal  
*The 32nd Computational Complexity Conference (CCC), 2017*
15. **Lower Bounds for 2-Query LCCs over Large Alphabet**  
Arnab Bhattacharyya, Sivakanth Gopi and Avishay Tal  
*The 21st International Workshop on Randomization and Computation (RANDOM), 2017*
16. **Robust Sensitivity**  
Shachar Lovett, Avishay Tal and Jiapeng Zhang  
*The 29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA), 2018*
17. **Pseudorandom Generators for Low-Sensitivity Functions**  
Pooya Hatami and Avishay Tal  
*Innovations in Theoretical Computer Science (ITCS) conference, 2018*
18. **The Choice and Agreement Problems of a Random Function**  
Or Meir and Avishay Tal  
*Information Processing Letters, Volume 133, 2018*
19. **Extractor-Based Time-Space Lower Bounds for Learning**  
Sumegha Garg, Ran Raz and Avishay Tal  
*The 50th Annual Symposium on the Theory of Computing (STOC), 2018*
20. **Improved Pseudorandomness for Unordered Branching Programs through Local Monotonicity**  
Eshan Chattopadhyay, Pooya Hatami, Omer Reingold and Avishay Tal  
*The 50th Annual Symposium on the Theory of Computing (STOC), 2018*
21. **Cubic Formula Size Lower Bounds Based on Compositions with Majority**  
Anna Gál, Adrian Trejo Nuñez and Avishay Tal  
*Innovations in Theoretical Computer Science (ITCS), 2019*

22. **Pseudorandom Generators from the Second Fourier Level and Applications to AC0 with Parity Gates**  
Eshan Chattopadhyay, Pooya Hatami, Shachar Lovett and Avishay Tal  
*Innovations in Theoretical Computer Science (ITCS), 2019*
23. **Oracle Separation of BQP and PH**  
Ran Raz and Avishay Tal  
*QIP, 2019 - Plenary Talk.*  
*To appear in STOC, 2019.*
24. **Pseudorandom Generators for Width-3 Branching Programs**  
Raghu Meka, Omer Reingold and Avishay Tal  
*To appear in STOC, 2019.*
25. **Exponential Separation Between Shallow Quantum Circuits and Unbounded Fan-in Shallow Classical Circuits**  
Adam Bene Watts, Robin Kothari, Luke Schaeffer and Avishay Tal  
*QIP, 2019.*  
*To appear in STOC, 2019.*

#### MANUSCRIPTS

26. **#SAT Algorithms from Shrinkage**  
Avishay Tal  
*Available on ECCC (2015)*
27. **Degree and Sensitivity: Tails of Two Distributions**  
Parikshit Gopalan, Rocco A. Servedio, Avishay Tal and Avi Wigderson  
*Available on ECCC/Arxiv (2016)*  
*A preliminary version of this paper by Parikshit Gopalan, Rocco A. Servedio and Avi Wigderson appeared in CCC, 2016.*
28. **On Constant-Depth Canonical Boolean Circuits for Computing Multilinear Functions**  
Oded Goldreich and Avishay Tal  
*Available on ECCC (2017)*

#### INVITED TALKS

- Properties and Applications of Boolean Function Composition**  
Weizmann Institute Theory Seminar *Mar 2013*  
Technion Theory Lunch *Apr 2013*  
China Theory Week *Aug 2013*
- Average Case Lower Bounds for De Morgan Formulae**  
Tel Aviv University Theory Seminar *Nov 2013*  
Weizmann Institute Theory Lunch *Nov 2013*
- Two Structural Results for Low Degree Polynomials and Applications**  
Tel Aviv University Theory Seminar *Feb 2014*  
IAS Computer Science and Discrete Mathematics Seminar *Mar 2014*  
Weizmann Institute Theory Seminar *Mar 2014*
- Shrinkage of De Morgan Formula**  
Tel Aviv University & Weizmann Institute Joint Reading Group *May 2014*  
Hebrew University of Jerusalem Theory Seminar *May 2014*  
CMU Theory Lunch *Oct 2014*  
MIT Theory Seminar *Oct 2014*  
Stanford Theory Seminar *Oct 2014*
- Rigidity of Random Toeplitz Matrices**  
NYU Theory Seminar *Nov 2015*

<i>Oberwolfach Workshop on Complexity Theory</i>	Nov 2015
<i>IAS Computer Science and Discrete Mathematics Seminar</i>	Dec 2015
<i>Rutgers Theory Seminar</i>	Dec 2015
<b>Tight Fourier Tails for AC0 Circuits</b>	
<i>Simons Collaboration on Algorithms and Geometry</i>	Mar 2016
<i>St. Petersburg Small Depth Complexity Workshop</i>	May 2016
<b>Fourier Tails for Boolean Functions and Their Applications - Survey Talk</b>	
<i>IAS Computer Science and Discrete Mathematics Seminar</i>	May 2016
<b>On The Robust Sensitivity Conjecture</b>	
<i>IAS short talks by postdoctoral members</i>	Sep 2016
<i>Rutgers Discrete Math Seminar</i>	Oct 2016
<b>Time-Space Lower Bounds for Learning Sparse Parities</b>	
<i>CMU Theory Seminar</i>	Nov 2016
<i>NYU Theory Seminar</i>	Nov 2016
<i>UW Theory Seminar</i>	Dec 2016
<i>Caltech Theory Seminar</i>	Dec 2016
<i>Rutgers Theory Seminar</i>	Mar 2017
<i>JHU Theory Seminar</i>	Mar 2017
<b>Computing Requires Larger Formulas than Approximating</b>	
<i>Princeton Theory Lunch</i>	Mar 2017
<i>Dagstuhl Seminar on Computational Complexity of Discrete Problems</i>	Mar 2017
<i>TCS+ Online Seminar</i>	May 2017
<i>Stanford Theory Seminar</i>	Nov 2017
<i>UCSD Theory Seminar</i>	Nov 2017
<b>Improved Pseudorandomness for Unordered Branching Programs through Local Monotonicity</b>	
<i>Weizmann Institute Theory Seminar</i>	Dec 2017
<i>UT Austin Theory Seminar</i>	Feb 2018
<i>KTH Theory Reading Group</i>	Apr 2018
<i>4th TOCA-SV Day</i>	May 2018
<b>Time-Space Lower Bounds for Learning - Two Part Tutorial</b>	
<i>Simons Institute Lower Bounds in Computational Complexity Boot Camp</i>	Aug 2018
<b>Oracle Separation of BQP and PH</b>	
<i>Oxford Complexity Workshop</i>	Jul 2018
<i>Oaxaca Workshop on Analytic Techniques in Theoretical Computer Science</i>	Aug 2018
<i>Simons Institute Workshop on Boolean Devices</i>	Sep 2018
<i>TCS+ Online Seminar</i>	Sep 2018
<i>Simons Collaboration on Algorithms and Geometry</i>	Sep 2018
<i>IAS Computer Science and Discrete Mathematics Seminar</i>	Oct 2018
<i>UT Austin Theory Seminar</i>	Oct 2018
<i>UC Berkeley Theory Seminar</i>	Oct 2018
<i>5th TOCA-SV Day</i>	Nov 2018
<i>Fall 2018 INTRIQ meeting</i>	Nov 2018
<i>MIT ToC Colloquium</i>	Nov 2018
<i>Tel Aviv University Theory Seminar</i>	Dec 2018
<i>Stanford Institute for Theoretical Physics Seminar</i>	Jan 2019