

# Yuval Filmus

## Curriculum Vitæ and Publication List

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### Employment and Education

- 2015–current **Assistant Professor**, *Technion*, Haifa, Israel.
- 2014–2015 **Member**, *Institute for Advanced Study*, Princeton, NJ.
- Fall 2013 **Research Fellow**, *Simons Institute for the Theory of Computing*, Berkeley, CA.  
Special semester on real analysis in computer science.
- Fall 2011 **Early Stage Researcher**, *Charles University*, Prague.  
Special semester in logic and complexity.
- 2009–2013 **Ph.D. in Computer Science**, *University of Toronto*.  
Advisor: Prof. Toniann Pitassi.  
Thesis: Spectral methods in extremal combinatorics.  
**Winner of the 2015 Canadian Mathematical Society Doctoral Prize.**
- 2000–2002 **M.Sc. in Computer Science**, *Weizmann Institute*.  
Advisor: Prof. Uriel Feige.  
Thesis: Bandwidth approximation of many-caterpillars.
- 1997–2000 **B.A. in Computer Science**, *The Open University of Israel*, Summa cum laude.  
Dean's honors (1998,1999,2000).

### Community Service

- 2019 Program committee of CCC, FOCS and FSTTCS.
- 2017 Program committee of ICALP.
- 2015 Program committee of STOC.
- 2014 Program committee of ITCS.

### Students

- 2018– Avi Kaplan (Ph.D.), Igor Margulis (M.Sc.), Idan Mehalel (M.Sc.)
- 2015–2018 Yuval Dagan (M.Sc.)

### Prizes

- 2016 Alon fellowship

### Grants

- 2019–2024 European Research Council
- 2016–2020 Israel Science Foundation

### Research Interests

Discrete Harmonic Analysis, Computational Complexity, Combinatorics

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## Journal Publications

- [1] Yuval Filmus, “Lower bounds for context-free grammars,” *Information Processing Letters*, vol. 111, no. 18, pp. 895–898, 2011.
- [2] David Ellis, Yuval Filmus, and Ehud Friedgut, “Triangle-intersecting families of graphs,” *Journal of the European Mathematical Society*, vol. 14, no. 3, pp. 841–885, 2012.
- [3] Yuval Filmus, “Inequalities on submodular functions via term rewriting,” *Information Processing Letters*, vol. 113, no. 13, pp. 457–464, 2013.
- [4] Yuval Filmus, “Universal codes of the natural numbers,” *Logical Methods in Computer Science*, vol. 9, no. 3, paper no. 7, 2013.
- [5] Yuval Filmus and Justin Ward, “A tight combinatorial algorithm for submodular maximization subject to a matroid constraint,” *SIAM Journal on Computing*, vol. 43, no. 2, pp. 514–542, 2014.
- [6] Stephen A. Cook, Yuval Filmus, and Dai Tri Man Lê, “The complexity of the comparator circuit value problem,” *ACM Transactions on Computation Theory*, vol. 6, no. 4, article no. 15, 2014.
- [7] David Ellis, Yuval Filmus, and Ehud Friedgut, “A quasi-stability result for dictatorships in  $S_n$ ,” *Combinatorica*, vol. 35, no. 5, pp. 573–618, 2015.
- [8] David Ellis, Yuval Filmus, and Ehud Friedgut, “A stability result for balanced dictatorships in  $S_n$ ,” *Random Structures and Algorithms*, vol. 46, no. 3, pp. 494–530, 2015.
- [9] Yuval Filmus, Toniann Pitassi, and Rahul Santhanam, “Exponential lower bounds for  $AC^0$ -Frege imply superpolynomial Frege lower bounds,” *ACM Transactions on Computation Theory*, vol. 7, no. 2, article no. 5, 2015.
- [10] Yuval Filmus, Massimo Lauria, Mladen Mikša, Jakob Nordström, and Marc Vinyals, “From small space to small width in resolution,” *ACM Transactions on Computational Logic*, vol. 16, no. 4, p. 28, 2015.
- [11] Yuval Filmus, Massimo Lauria, Jakob Nordström, Neil Thapen, and Noga Ron-Zewi, “Space complexity in polynomial calculus,” *SIAM Journal on Computing*, vol. 44, no. 4, pp. 1119–1153, 2015.
- [12] Yuval Filmus, “An orthogonal basis for functions over a slice of the Boolean hypercube,” *Electronic Journal of Combinatorics*, vol. 23, no. 1, P1.23, 2016.
- [13] Yuval Filmus, “Friedgut–Kalai–Naor theorem for slices of the Boolean cube,” *Chicago Journal of Theoretical Computer Science*, 14:1–14:17, 2016.
- [14] Yuval Filmus, Hamed Hatami, Nathan Keller, and Noam Lifshitz, “On the sum of the  $L_1$  influences of bounded functions,” *Israel Journal of Mathematics*, vol. 214, no. 1, pp. 167–192, 2016.
- [15] David Ellis, Yuval Filmus, and Ehud Friedgut, “Low-degree Boolean functions on  $S_n$ , with an application to isoperimetry,” *Forum of Mathematics, Sigma*, vol. 5, 2017. DOI: 10.1017/fms.2017.24.
- [16] Yuval Filmus and Edinah K. Gnang, “On the spectra of hypermatrix direct sum and Kronecker products constructions,” *Linear Algebra and its Applications*, vol. 519, pp. 238–277, 2017.

- [17] Yuval Filmus, “The weighted complete intersection theorem,” *Journal of Combinatorial Theory, Series A*, vol. 151, pp. 84–101, 2017.
- [18] Yuval Filmus, Guy Kindler, Elchanan Mossel, and Karl Wimmer, “Invariance principle on the slice,” *ACM Transactions on Computation Theory*, vol. 10, no. 3, p. 11, 2018.
- [19] Yuval Dagan, Yuval Filmus, Hamed Hatami, and Yaqiao Li, “Trading information complexity for error,” *Theory of Computing*, vol. 14, no. 6, pp. 1–73, 2018.
- [20] Yoram Bachrach, Yuval Filmus, Joel Oren, and Yair Zick, “Analyzing power in weighted voting games with super-increasing weights,” *Theory of Computing Systems*, vol. 63, no. 1, pp. 150–174, 2019.
- [21] Yuval Filmus, “More complete intersection theorems,” *Discrete Mathematics*, vol. 342, no. 1, pp. 128–142, Jan. 2019.
- [22] Yuval Filmus and Ferdinand Ihringer, “Boolean degree 1 functions on some classical association schemes,” *Journal of Combinatorial Theory, Series A*, Accepted.
- [23] Yuval Filmus and Elchanan Mossel, “Harmonicity and invariance on slices of the Boolean cube,” *Probability Theory and Related Fields*, Accepted.
- [24] Yuval Filmus, Hamed Hatami, Yaqiao Li, and Suzin You, “Information complexity of the AND function in the two-party and multi-party settings,” *Algorithmica*, Accepted.
- [25] Yuval Dagan, Yuval Filmus, Ariel Gabizon, and Shay Moran, “Twenty (short) questions,” *Combinatorica*, Accepted.

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## Conference Publications

- [26] Allan Borodin, Yuval Filmus, and Joel Oren, “Threshold models for competitive influence in social networks,” in *Proceedings of the 6th Workshop on Internet and Network Economics (WINE 2010)*, 2010, pp. 539–550.
- [27] Yuval Filmus, Toniann Pitassi, and Rahul Santhanam, “Exponential lower bounds for  $AC^0$ -Frege imply superpolynomial Frege lower bounds,” in *Proceedings of the 38th International Colloquium on Automata, Languages and Programming (ICALP 2011)*, 2011, pp. 618–629.
- [28] Yuval Filmus and Justin Ward, “A tight combinatorial algorithm for submodular maximization subject to a matroid constraint,” in *Proceedings of the 53rd Annual IEEE Symposium on Foundations of Computer Science (FOCS 2012)*, 2012, pp. 659–668.
- [29] Philip Bohannon, Nilesh Dalvi, Yuval Filmus, Nori Jacoby, Sathiya Keerthi, and Alok Kirpal, “Automatic web-scale information extraction,” in *Proceedings of the 2012 ACM SIGMOD International Conference on Management of Data*, 2012, pp. 609–612.
- [30] Yuval Filmus and Justin Ward, “Maximum coverage over a matroid,” in *Proceedings of the 29th Symposium on Theoretical Aspects of Computer Science (STACS 2012)*, 2012, pp. 601–612.
- [31] Yuval Filmus, Massimo Lauria, Jakob Nordström, Neil Thapen, and Noga Ron-Zewi, “Space complexity in polynomial calculus,” in *Proceedings of the 27th Annual Conference on Computational Complexity (CCC 2012)*, 2012, pp. 334–344.
- [32] Yuval Filmus, Toniann Pitassi, Robert Robere, and Stephen A. Cook, “Average case lower bounds for monotone switching networks,” in *Proceedings of the 54th Annual Symposium on Foundations of Computer Science (FOCS 2013)*, 2013, pp. 598–607.

- [33] Craig Boutilier, Yuval Filmus, and Joel Oren, “Efficient vote elicitation under candidate uncertainty,” in *Proceedings of the 23rd International Joint Conference on Artificial Intelligence (IJCAI 2013)*, 2013, pp. 309–316.
- [34] Yuval Filmus, Massimo Lauria, Mladen Mikša, Jakob Nordström, and Marc Vinyals, “Towards an understanding of Polynomial Calculus: New separations and lower bounds,” in *Automata, Languages, and Programming*, ser. Lecture Notes in Computer Science, vol. 7965, Springer Berlin Heidelberg, 2013, pp. 437–448.
- [35] Yuval Filmus and Joel Oren, “Efficient voting via the top- $k$  elicitation scheme: A probabilistic approach,” in *Proceedings of the 15th ACM conference on Economics and Computation (EC 2014)*, 2014, pp. 295–312.
- [36] Yuval Filmus, Massimo Lauria, Mladen Mikša, Jakob Nordström, and Marc Vinyals, “From small space to small width in resolution,” in *Proceedings of the 31st Symposium on Theoretical Aspects of Computer Science (STACS 2014)*, Ernst W. Mayr and Natacha Portier, Eds., ser. Leibniz International Proceedings in Informatics (LIPIcs), vol. 25, Schloss Dagstuhl–Leibniz-Zentrum für Informatik, 2014, pp. 300–311.
- [37] Andris Ambainis, Yuval Filmus, and François Le Gall, “Fast matrix multiplication: Limitations of the Coppersmith–Winograd method,” in *Proceedings of the 47th Annual Symposium on the Theory of Computing (STOC 2015)*, 2015, pp. 585–593.
- [38] Yoram Bachrach, Yuval Filmus, Joel Oren, and Yair Zick, “A characterization of voting power for discrete weight distributions,” in *Proceedings of the 26th International Joint Conference on Artificial Intelligence (IJCAI 2016)*, 2016.
- [39] Yoram Bachrach, Yuval Filmus, Joel Oren, and Yair Zick, “Analyzing power in weighted voting games with super-increasing weights,” in *Proceedings of the 9th International Symposium on Algorithmic Game Theory (SAGT 2016)*, 2016.
- [40] Yuval Filmus and Elchanan Mossel, “Harmonicity and invariance on slices of the Boolean cube,” in *31st Conference on Computational Complexity (CCC 2016)*, Ran Raz, Ed., ser. Leibniz International Proceedings in Informatics (LIPIcs), vol. 50, Dagstuhl, Germany: Schloss Dagstuhl–Leibniz-Zentrum fuer Informatik, 2016, 16:1–16:13, ISBN: 978-3-95977-008-8.
- [41] Yuval Filmus, Guy Kindler, Elchanan Mossel, and Karl Wimmer, “Invariance principle on the slice,” in *31st Conference on Computational Complexity (CCC 2016)*, Ran Raz, Ed., ser. Leibniz International Proceedings in Informatics (LIPIcs), vol. 50, Dagstuhl, Germany: Schloss Dagstuhl–Leibniz-Zentrum fuer Informatik, 2016, 15:1–15:10, ISBN: 978-3-95977-008-8.
- [42] Yuval Filmus, Pavel Hrubeš, and Massimo Lauria, “Semantic versus syntactic cutting planes,” in *33rd Symposium on Theoretical Aspects of Computer Science (STACS 2016)*, Nicolas Ollinger and Heribert Vollmer, Eds., ser. Leibniz International Proceedings in Informatics (LIPIcs), vol. 47, Dagstuhl, Germany: Schloss Dagstuhl–Leibniz-Zentrum fuer Informatik, 2016, 35:1–35:13, ISBN: 978-3-95977-001-9.
- [43] Yuval Filmus, Hamed Hatami, Yaqiao Li, and Suzin You, “Information complexity of the AND function in the two-party and multi-party settings,” in *23rd annual international computing and combinatorics conference (COCOON’17)*, 2017.
- [44] Yuval Dagan, Yuval Filmus, Hamed Hatami, and Yaqiao Li, “Trading information complexity for error,” in *32nd Conference on Computational Complexity (CCC 2017)*, 2017.

- [45] Yuval Dagan, Yuval Filmus, Ariel Gabizon, and Shay Moran, “Twenty (simple) questions,” in *49th ACM Symposium on Theory of Computing (STOC 2017)*, 2017.
- [46] Yotam Dikstein, Irit Dinur, Yuval Filmus, and Prahladh Harsha, “Boolean function analysis on high-dimensional expanders,” in *22nd International Conference on Randomization and Computation (RANDOM’2018)*, 2018.
- [47] Yuval Filmus, Ryan O’Donnell, and Xinyu Wu, “A log-Sobolev inequality for the multislice, with applications,” in *Proceedings of the 10th Innovations in Theoretical Computer Science conference (ITCS’19)*, 2019.
- [48] Irit Dinur, Yuval Filmus, and Prahladh Harsha, “Analyzing boolean functions on the biased hypercube via higher-dimensional agreement tests,” in *ACM-SIAM Symposium on Discrete Algorithms (SODA19)*, 2019.
- [49] Niv Buchbinder, Moran Feldman, Yuval Filmus, and Mohit Garg, “Online submodular maximization: Beating 1/2 made simple,” in *20th Conference on Integer Programming and Combinatorial Optimization (IPCO’19)*, 2019.