Huy Tuan Pham: Curriculum Vitae

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Department of Mathematics, California Institute for Technology,
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Research Interests

Probabilistic and extremal combinatorics, additive combinatorics and number theory, probability theory, theoretical computer science, statistical learning

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Academic positions

Assistant Professor of Mathematics and Rosenberg Scholar,
California Institute of Technology 2025-
Research Fellow, Clay Mathematics Institute 2023-2028
Member, School of Mathematics, Institute for Advanced Study 2024-2025
Stanford Science Fellow, Stanford University 2023-2024

Education

Stanford University, Stanford, CA, USA 2019-2023
PhD in Mathematics. Advisor: Jacob Fox
University of Cambridge, Cambridge, UK 2018-2019
MASt in Mathematics with Distinction. **Rank 1 of Part III**
Stanford University, Stanford, CA, USA 2014-2018
MS in Statistics
BS in Mathematics (Honors) with a Minor in Computer Science.

Selected Awards and Distinctions

Dénes König Prize 2024

ICBS Frontiers of Science Award 2024

Clay Research Fellowship 2023-2028

Stanford Science Fellowship 2023-2024

Two Sigma Fellowship 2021-2023

Citadel Ph.D. Summit Award 2022
- Awarded $25000 for best poster presentation on research.

Pure Mathematics Prize - University of Cambridge 2019
- Awarded to best student in Pure Mathematics at Part III of the Mathematical Tripos.

Leslie Walshaw Prize, Examination Prize, Senior Scholarship - Trinity College, University of Cambridge 2019
- Awarded for exam performance at Part III of the Mathematical Tripos.

Honorable Mention - Morgan Prize 2018
- Awarded for outstanding research in mathematics.

Kennedy Thesis Prize in the Natural Sciences - Stanford University 2018
- Awarded to the best senior honors thesis in each of the following areas of study: humanities, social sciences, natural sciences, and engineering and applied sciences.

The Firestone Medal for Excellence in Undergraduate Research - Stanford University 2018

– Awarded to the top ten percent of all honors theses in the social sciences, natural sciences, and engineering and applied sciences.

J. E Wallace Sterling Award for Scholastic Achievement - Stanford University 2018

– Awarded to the top 25 graduating students of the School of Humanities and Sciences.

Deans' Award for Academic Achievement - Stanford University 2017

– Awarded to between five and ten extraordinary undergraduate students, based on excellent academic achievements and independent research.

Honourable Mention (Top 80) - Putnam Competition 2017, 2016, 2015, 2014
Gold Medal - International Mathematical Olympiad (IMO) 2014, 2013
Highest Score - Vietnam Mathematical Olympiad & Team Selection Test 2014, 2013

Published papers

1. H. T. Pham, *A Sharp Version of Talagrand's Selector Process Conjecture and an Application to Rounding Fractional Covers,* Proceedings of the 57th Annual ACM Symposium on Theory of Computing (STOC) (2025).
2. J. Park and H. T. Pham, *On a conjecture of Talagrand on selector processes and a consequence on positive empirical processes*, Ann. Math. (2023).
3. J. Park and H. T. Pham, *A proof of the Kahn–Kalai conjecture*, J. Amer. Math. Soc. (2023). Conference version appeared in 63rd Annual IEEE Symposium on Foundations of Computer Science (FOCS) (2022).
4. V. Jain and H. T. Pham, *Optimal thresholds for Latin squares, Steiner triple systems, and edge colorings*, ACM-SIAM Symposium on Discrete Algorithms (SODA) (2024).
5. N. Cook, A. Dembo and H. T. Pham, *Regularity method and large deviations principles for the Erdős–Rényi hypergraph*, Duke Math. J. (to appear).
6. J. Fox, H. T. Pham and Y. Zhao, *Tower-type bounds for Roth's theorem with popular differences*, J. Eur. Math. Soc. (2022).
7. J. Fox, S. Luo and H. T. Pham, *On random irregular subgraphs*, Random Struct. Algorithms (2024).
8. J. Fox, S. Luo, H. T. Pham and Y. Zhou, *Small subsets with large sumset: Beyond the Cauchy–Davenport bound*, Combin. Probab. Comput. (2024).
9. V. Jain, H. T. Pham and T.-D. Vuong, *Dimension reduction for maximum matchings and the Fastest Mixing Markov Chain*, Comptes Rendus. Mathématique (2023).
10. D. Conlon, J. Fox, H. T. Pham and Y. Zhao, *Set-coloring Ramsey numbers and error-correcting codes near the zero-rate threshold*, IEEE Transactions on Information Theory (2023).
11. J. He, H. T. Pham and M. W. Xu, *Universality for low degree factors of random polynomials over finite fields*, Int. Math. Res. Not. (2022).
12. J. He, H. T. Pham and M. W. Xu, *Mixing time of fractional random walk on finite fields*, Electron. J. Probab. **27** (2022), article no. 133, 1–15.

13. D. Conlon, J. Fox and H. T. Pham, *The upper logarithmic density of monochromatic subset sums*, Mathematika (2022).
14. J. Fox and H. T. Pham, *Popular progression differences in vector spaces*, Int. Math. Res. Not. **7** (2021), 5261–5289.
15. H. T. Pham and M. W. Xu, *Irreducibility of random polynomials of bounded degree*, Discrete Anal. 2021:7 (2021), 16pp.
16. J. Fox, H. T. Pham and Y. Zhao, *Common and Sidorenko linear equations*, Q. J. Math. **72** (2021), 1223–1234.
17. J. Fox and H. T. Pham, *Popular progression differences in vector spaces II*, Discrete Anal. 2019:16 (2019), 39pp.
18. N. Anari, V. Jain, F. Koehler, H. T. Pham and T. D. Vuong, *Universality of Spectral Independence with Applications to Fast Mixing in Spin Glasses*, ACM-SIAM Symposium on Discrete Algorithms (SODA) (2024).
19. M. Michelen, V. Jain, H. T. Pham and T. D. Vuong, *Optimal mixing of the down-up walk on independent sets of a given size*, 64th Annual IEEE Symposium on Foundations of Computer Science (FOCS) (2023).
20. N. Anari, V. Jain, F. Koehler, H. T. Pham and T.-D. Vuong, *Entropic Independence: Optimal mixing of down-up random walks*, 54th ACM Symposium on Theory of Computing (STOC) (2022).
21. V. Jain, H. T. Pham and T.-D. Vuong, *Spectral independence, coupling, and the spectral gap of the Glauber dynamics*, Inf. Process. Lett. **177** (2022).
22. V. Jain, H. T. Pham and T.-D. Vuong, *Towards the sampling Lovász Local Lemma*, 62nd Annual IEEE Symposium on Foundations of Computer Science (FOCS) (2021).
23. H. T. Pham*[1] and P.-M. Nguyen*, *A rigorous framework for the mean field limit of multilayer neural networks*, Mathematical Statistics and Learning (2023).
24. H. T. Pham* and P.-M. Nguyen*, *Global convergence of three-layer neural networks in the mean field regime*, International Conference on Learning Representations (ICLR) (2021). Oral presentation (top 1.8% of submissions).
25. H. T. Pham* and P.-M. Nguyen*, *Limiting fluctuation and trajectorial stability of multilayer neural networks with mean field training*, Conference on Neural Information Processing Systems (NeuRIPS) (2021).

Submitted papers

1. D. Conlon, J. Fox, H. T. Pham and L. Yepremyan, *On the clique number of random Cayley graphs and related topics.*
2. H. T. Pham and D. Zakharov, *Sharp bound for the Erdő s-Straus non-averaging set problem.*
3. D. Conlon, J. Fox and H. T. Pham, *Subset sums, completeness and colorings.*
4. D. Conlon, J. Fox and H. T. Pham, *Homogeneous structures in subset sums and non-averaging sets.*

[1] *: Author ordering is randomized

5. R. Nenadov and H. T. Pham, *Spread blow-up lemma with an application to perturbed random graphs.*
6. B. Huang, A. Montanari and H. T. Pham, *Sampling from Spherical Spin Glasses in Total Variation via Algorithmic Stochastic Localization.*
7. H. T. Pham, A. Sah, M. Sawhney and M. Simkin, *A toolkit for robust thresholds.*
8. M. Bucić, J. Fox and H. T. Pham, *Equivalence between Erdő s-Hajnal and polynomial Rödl and Nikiforov conjectures.*
9. J. Fox, R. Nenadov and H. T. Pham, *The largest subgraph without a forbidden induced subgraph.*
10. R. Nenadov and H. T. Pham, *Short proof of the hypergraph container theorem.*
11. J. Fox and H. T. Pham, *A multipartite analogue of Dilworth's theorem.*
12. J. Balogh, A. Bernshteyn, M. Delcourt, A. Ferber and H. T. Pham, *Sunflowers in Set Systems with Small VC-Dimension.*
13. D. Conlon, J. Fox, X. He, D. Mubayi, H. T. Pham, A. Suk and J. Verstraete, *A question of Erdő s and Graham on Egyptian fractions.*
14. D. Dong, N. Mani, H. T. Pham and J. Tidor, *On monochromatic solutions to linear equations over the integers.*
15. V. Jain, H. T. Pham, M. Sawhney and D. Zakharov, *An explicit economical additive basis.*
16. V. Jain, H. T. Pham and T.-D. Vuong, *On the sampling Lovász Local Lemma for atomic constraint satisfaction problems.*
17. P.-M. Nguyen* and H. T. Pham*, *A rigorous framework for the mean field limit of multilayer neural networks.*

Preprints

1. N. Alon and H. T. Pham, *The independence number of sparse random Cayley graphs.*
2. J. Fox and H. T. Pham, *On the Freiman-Ruzsa conjecture in groups with bounded exponent.*
3. D. Conlon, J. Fox, H. T. Pham and L. Yepremyan, *Independence in random graph models.*
4. D. Conlon, J. Fox, D. Koukoulopoulos, H. T. Pham and T. Tao, *Subset sums avoiding perfect powers.*
5. J. Fox and H. T. Pham, *Popular monochromatic progression differences.*
6. P.-M. Nguyen* and H. T. Pham*, *A note on the global convergence of multilayer neural networks in the mean field regime.*

Invited Talks

Plenary talk at the ICBS 2025	July 2025
ACM Symposium on Theory of Computing (STOC) 2025	June 2025
UChicago Chern-Weil Symposium	May 2025
Plenary talk at the 2nd Brazillian School of Combinatorics	March 2025
IAS Computer Science/Discrete Mathematics Seminar II, 1& 2	February 2025
IBS Winter school on Synergies of Extremal and Probabilistic Combinatorics	January 2025
VIASM Minicourse on Synergies of Extremal and Probabilistic Combinatorics	August 2024
ICMS Workshop on Additive Combinatorics	July 2024
ICBS Frontiers of Science Award talk	July 2024
VIASM Annual meeting	July 2024
Plenary talk and König prize lecture at the SIAM Conference on Discrete Mathematics	July 2024
IAS Computer Science/Discrete Mathematics Seminar II	May 2024
IAS Computer Science/Discrete Mathematics Seminar I	May 2024
ICMS UK-Vietnam mathematics joint meeting	December 2023
IEEE Symposium on Foundations of Computer Science (FOCS) 2023	November 2023
ICERM workshop on Asymptotic Limits of Discrete Random Structures	September 2023
Simons Institute Structural Results Workshop	July 2023
NUS combinatorics & graph theory seminar	March 2023
Atlanta Combinatorics Colloquium	March 2023
Duke Probability Seminar	March 2023
CMU ACO Seminar	February 2023
Northwestern Mathematics Colloquium	January 2023
Brown University Probability Seminar	December 2022
MIT Combinatorics Seminar	December 2022
UC Berkeley Mathematics Colloquium	December 2022
Caltech Mathematics Colloquium	November 2022
Ohio State University Combinatorics Seminar	November 2022
University of Illinois at Chicago Combinatorics and Probability	November 2022
University of Illinois at Chicago Colloquium	November 2022
University of Chicago Combinatorics and TCS Seminar	November 2022
IEEE Symposium on Foundations of Computer Science (FOCS) 2022	November 2022
UC Berkeley Probability Seminar	October 2022
AMS Special Session on Extremal Graph Theory, Utah	October 2022
Online Asymptotic Geometric Analysis Seminar	October 2022
University of Washington Theory Seminar	October 2022
Banff Extremal Combinatorics and Geometry Workshop	August 2022
UC Santa Barbara summer school on spectral independence	August 2022
SIAM Conference on Discrete Mathematics	June 2022
LA Probability Forum	June 2022
UC San Diego Theory Seminar	June 2022
UC Los Angeles Discrete Mathematics Seminar	May 2022
Workshop on Combinatorial and Additive Number Theory 2022	May 2022
Stanford University Probability Seminar	May 2022
Korea-Taiwan-Vietnam Joint Seminar in Combinatorics and Analysis	May 2022

UC Berkeley Theory Lunch	May 2022
Percolation Today	May 2022
Oberwolfach Workshop in Combinatorics, Probability and Computing	April 2022
Stanford University Combinatorics Seminar	April 2022
IEEE Symposium on Foundations of Computer Science (FOCS) 2021	February 2022
Conference on Neural Information Processing Systems (NeurIPS) 2021	December 2021
Simons Institute Mean-field neural networks reading group	November 2021
University of Mississippi Number Theory Seminar	September 2021
Additive Combinatorics Webinar	June 2021
International Conference on Learning Representations (ICLR) 2021	May 2021
One World Theoretical Machine Learning Seminar	July 2020
Stanford University Combinatorics Seminar	October 2017
Pseudorandomness, Simons Institute for the Theory of Computing	April 2017
Vietnam Workshop on Graph Theory and Discrete Geometry, Vietnam Institute for Advanced Study in Mathematics	September 2016

Professional service

– Review for: Combinatorica; Annals of Probability; Probability Theory and Related Fields; Journal of Combinatorial Theory Series A; Combinatorics, Probability and Computing; Random Structures and Algorithms; Bernoulli; European Journal of Combinatorics; Electronic Journal of Combinatorics; Journal of Combinatorics; Australasian Journal of Combinatorics; Journal of Machine Learning Research; ACM Transactions on Algorithms; IEEE Symposium on Foundations of Computer Science (FOCS); ACM-SIAM Symposium on Discrete Algorithms (SODA); International Colloquium on Automata, Languages, and Programming (ICALP).
– Co-organize the Minisymposium on extremal and probabilistic combinatorics at the SIAM Conference on Discrete Mathematics 2024, the Minisymposium on additive combinatorics at the SIAM Conference on Discrete Mathematics 2022.
– Co-organize the Clay Workshop on Frontiers in extremal and probabilistic combinatorics at the Clay Annual conference 2024.

Teaching experience

– Teaching Assistant for: Math 104 (Applied Linear Algebra) - Fall 2019, Math 138 (Stochastic Processes and Applications) - Spring 2020, Math 61DM (Modern Mathematics: Discrete Methods) - Fall 2020, Math 107 (Introduction to Graph Theory) - Winter 2021, Math 108 (Introduction to Combinatorics) - Summer 2021.
– Instructor for: Math 108 (Introduction to Combinatorics) - Spring 2023.