

## Huy Tuan Pham

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RESEARCH INTERESTS      Extremal and probabilistic combinatorics, additive combinatorics, probability theory and applications, statistical learning, theoretical computer science

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EDUCATION      **Stanford University**, Stanford, CA, USA      2019-2024 (expected)  
PhD in Mathematics  
**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. GPA: **4.14/4.3**

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SELECTED AWARDS AND DISTINCTIONS      **Two Sigma Fellowship**      2021-2023  
**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

SELECTED  
PUBLICATIONS

1. J. Fox and H. T. Pham, Popular progression differences in vector spaces, International Mathematics Research Notices, to appear. [\[link\]](#)
2. J. Fox and H. T. Pham, Popular progression differences in vector spaces II, Discrete Analysis, 2019:16. [\[link\]](#)
3. J. Fox, H. T. Pham and Y. Zhao, Common and Sidorenko linear equations, Quarterly Journal of Mathematics, to appear. [\[arXiv\]](#)
4. H. T. Pham and M. W. Xu, Irreducibility of random polynomials of bounded degree, Discrete Analysis, 2021:7. [\[link\]](#)
5. 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 (1.8% of submissions). [\[link\]](#)
6. V. Jain, H. T. Pham, T. D. Vuong, Towards the sampling Lovasz Local Lemma, to appear in 62nd Annual IEEE Symposium on Foundations of Computer Science (FOCS 2021).
7. N. Cook, A. Dembo and H. T. Pham, Regularity method and large deviations principles for the Erdos-Renyi hypergraph, submitted. [\[arXiv\]](#)
8. D. Conlon, J. Fox, H. T. Pham, Subset sums, completeness and colorings, submitted. [\[arXiv\]](#)
9. D. Conlon, J. Fox, H. T. Pham, The upper logarithmic density of monochromatic subset sums, submitted. [\[arXiv\]](#)
10. J. Fox, H. T. Pham and Y. Zhao, Tower-type bounds for Roth's theorem with popular differences, submitted. [\[arXiv\]](#)
11. P.-M. Nguyen\* and H. T. Pham\*, A Rigorous Framework for the Mean Field Limit of Multilayer Neural Networks, to be submitted. [\[arXiv\]](#)
12. P.-M. Nguyen\* and H. T. Pham\*, A Note on the Global Convergence of Multilayer Neural Networks in the Mean Field Regime, to be submitted. [\[arXiv\]](#)
13. V. Jain, H. T. Pham, T. D. Vuong, On the sampling Lovasz Local Lemma for atomic constraint satisfaction problems, to be submitted. [\[arXiv\]](#)
14. V. Jain, H. T. Pham, T. D. Vuong, Spectral independence, coupling with the stationary distribution, and the spectral gap of the Glauber dynamics, to be submitted. [\[arXiv\]](#)
15. N. Anari, V. Jain, F. Koehler, H. T. Pham, T. D. Vuong, Entropic Independence in High-Dimensional Expanders: Modified Log-Sobolev Inequalities for Fractionally Log-Concave Polynomials and the Ising Model, to be submitted. [\[arXiv\]](#)
16. J. He, H. T. Pham, M. W. Xu, Mixing time of fractional random walk on finite fields, submitted. [\[arXiv\]](#)
17. J. Fox and H. T. Pham, Popular monochromatic progression differences, to be submitted.
18. J. Fox and H. T. Pham, A multipartite analogue of Dilworth's Theorem, in preparation.

PRESENTATIONS Additive Combinatorics Webinar June 2021  
 Number Theory Seminar, University of Mississippi September 2021  
 – Present works on subset sums, colorings and completeness.  
 One World Theoretical Machine Learning Seminar July 2020  
 International Conference on Learning Representations (ICLR) May 2021  
 – Present works on mean field limit of deep neural networks.  
 Vietnam Workshop on Graph Theory and Discrete Geometry, Vietnam Institute for  
 Advanced Study in Mathematics Sep 2016  
 Pseudorandomness, Simons Institute for the Theory of Computing April 2017  
 Combinatorics Seminar, Stanford University Oct 2017  
 – Present works on popular progression differences in groups.

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WORKSHOPS AND RESEARCH PROGRAMS Workshop on Additive Combinatorics, Center of Mathematical Sciences and Applications, Harvard University Oct 2017  
 Pseudorandomness, Simons Institute for the Theory of Computing Jan 2017 - May 2017  
 Workshop on Probabilistic and Extremal Combinatorics, Center of Mathematical Sciences and Applications, Harvard University Feb 2017

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PROFESSIONAL SERVICE – Review for: Combinatorica; Annals of Probability; Combinatorics, Probability and Computing; Electronic Journal of Combinatorics; Australasian Journal of Combinatorics.

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TEACHING EXPERIENCE – Teaching Assistant for: Math 104 (Applied Linear Algebra), Math 138 (Stochastic Processes and Applications), Math 61DM (Modern Mathematics: Discrete Methods), Math 107 (Introduction to Graph Theory), Math 108 (Introduction to Combinatorics).

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TECHNICAL BACKGROUND & COURSEWORK – Probability: Probability theory. Stochastic calculus. Schramm-Loewner evolution. Random matrix theory. Stochastic processes on graphs. Concentration inequalities. Percolation and random walk on graphs.  
 – Combinatorics: Additive combinatorics. Extremal combinatorics. The probabilistic method. Non-constructive methods in combinatorics. The polynomial method in combinatorics. Algebraic combinatorics and symmetric polynomials. Polyhedral techniques in combinatorics. Approximate groups. Geometric graph theory.  
 – Machine learning. Deep learning. Optimal transport. Convex optimization. Sum-of-squares hierarchy. Advanced algorithms. Pseudo-randomness. Information theory. Game theory. Matching theory.  
 – Graduate real analysis. Graduate algebra. Riemannian geometry. Algebraic topology. Analysis of PDEs. Analytic number theory. Ergodic theory. Geometric group theory.

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OTHERS – Programming skills: Working proficiency in Matlab, Python. Experience in R, C, C++, Java.