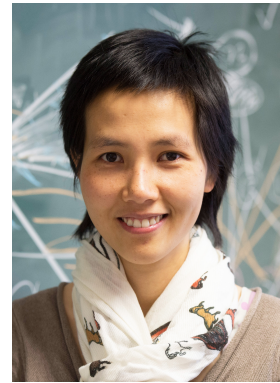


Ngoc Tran



Academic career

- 2009 - 2013 PhD, Statistics, University of California, Berkeley, CA, USA
- 2013 - 2015 Simons Postdoctoral Fellow, Mathematics, University of Texas, Austin, TX, USA
- Since 2015 Professor (W2, Bonn Junior Fellow), Mathematics, University of Bonn
- Since 2015 Assistant Professor, Mathematics, University of Texas, Austin, TX, USA (on leave)

Honours

- 2001 Gold Medal U13, Hanoi Chess Competition
- 2004 Premier's Award for All-round Excellence, NSW, Australia
- 2006 Margaret Pitcher Prize in Mathematics, University of Newcastle, NSW, Australia
- 2006 Summer Scholar, Australian National University, Canberra, ACT, Australia
- 2006 Head of College, International House, University of Newcastle, NSW, Australia
- 2007 SAS Institute Prize in Statistics, University of Newcastle, NSW, Australia
- 2007 Dean's List, University of Newcastle, NSW, Australia
- 2009 - 2015 Fellow, Vietnam Education Foundation
- 2013 - 2015 Postdoctoral Fellow, Simons Foundation
- Since 2015 Bonn Junior Fellow, Hausdorff Center for Mathematics, Bonn

Invited Lectures

- 2012 Tropical Mathematics and its Applications, Birmingham, England, UK
- 2012 Workshop for Women in Probability, Duke University, Durham, NC, USA
- 2013 Workshop on Mathematics of Partially Identified Objects, Oberwolfach
- 2014 Seminar on Stochastic Processes, San Diego, CA, USA
- 2014 Plenary Talk, CombinaTexas, Houston, TX, USA
- 2014 Conference on Algebraic Geometry and Optimization, Korea
- 2014 Workshop on Mathematics and Economics, Hokkaido, Japan
- 2015 Session on Probability and Applications, AMS Joint Meeting, San Antonio, TX, USA
- 2015 Session on Graph Theory, Combinatorics and Discrete Geometry, AMS Joint Meeting, San Antonio, TX, USA
- 2015 Computational and Systems Neuroscience (Cosyne), Salt Lake City, UT, USA
- 2015 Workshop on Nonlinear Algebra, Berlin
- 2015 Workshop on Algebraic and Stochastic Aspects in Graph Theory, Osnabrück
- 2016 Spring School on Combinatorial Stochastic Processes, Hanoi, Vietnam

Research profile

I use tools from tropical geometry and probability to create novel applications of mathematics in economics, neuroscience and other sciences. I love revisiting old problems with new geometric insights. In the immediate future, I have three main research themes: applications of tropical geometry in economics, combinatorial stochastic processes, and applications of discrete mathematics in neuroscience.

0.1. Applications of Tropical Geometry: Tropical geometry connects algebraic geometry, combinatorics and optimization theory. I use it to tackle optimization problems from a new geometric perspective. In the past I have worked on pairwise ranking problems [10, 5]. This motivates the classification of tropical eigenspaces [8], commuting matrices [4], culminating in [9], where I used techniques from commutative algebra to explicitly classify polytopes in dimension 3 and

4. Recently, this tool again proves valuable in other areas of economics, namely, auction theory [7] and mechanism design [3]. I am working on extensions of the results in [3] to Bayesian mechanisms and multi-player settings, as well as related problems on tropical polynomials.

0.2. Random tropical polynomials and partitions. In [2], with Francois Baccelli, I proved a point process approximation for zeros of a random tropical polynomial with i.i.d coefficients. We obtain simpler proofs of past results on vertices of random polytopes in R^2 , which are special cases of our setup. The higher dimension generalization of this work is particularly interesting. In particular, the power of our proof in [2] lies in a newly discovered connection between combinatorial stochastic processes (CSP) and random polytopes in R^2 , and is closely related to my work with Jim Pitman on size-biased permutations [6]. I am working on various extensions of this work [1], with applications in Bayesian clustering.

0.3. Discrete mathematics and neuroscience. In mathematical neuroscience, I use techniques from discrete mathematics to answer long-standing open questions in theoretical neuroscience, to provide theorems and algorithms for current analysis, and to inspire new developments in mathematics. Currently I have three separate projects with collaborators and master students: decoding grid cells by solving max-clique, classification of the disease Lupus using exchangeable random graph theory, and testing hypothesis on pairwise correlation in population code using lattice point enumeration algorithms.

Selected publications

- [1] Francois Baccelli and Ngoc M. Tran. Iterated gilbert mosaics and poisson tropical plane curves. *arXiv preprint arXiv:1610.08533*, 2016.
- [2] Francois Baccelli and Ngoc Mai Tran. Zeros of random tropical polynomials, random polygons and stick-breaking. *Trans. Amer. Math. Soc.*, 368(10):7281–7303, 2016.
- [3] Robert Alexander Crowell and Ngoc Mai Tran. Tropical geometry and mechanism design. *arXiv preprint arXiv:1606.04880*, 2016.
- [4] Ralph Morrison and Ngoc M. Tran. The tropical commuting variety. *Linear Algebra Appl.*, 507:300–321, 2016.
- [5] Ngoc Mai Tran. Hodgerank is the limit of perron rank. *Math. Oper. Res.*, 41(2):643–647, 2016.
- [6] Jim Pitman and Ngoc M. Tran. Size-biased permutation of a finite sequence with independent and identically distributed terms. *Bernoulli*, 21(4):2484–2512, 2015.
- [7] Ngoc Mai Tran and Josephine Yu. Product-mix auctions and tropical geometry. *arXiv preprint arXiv:1505.05737*, 2015.
- [8] Bernd Sturmfels and Ngoc Mai Tran. Combinatorial types of tropical eigenvectors. *Bull. Lond. Math. Soc.*, 45(1):27–36, 2013.
- [9] Ngoc Mai Tran. Enumerating polytopes. *arXiv preprint arXiv:1310.2012*, 2013.
- [10] Ngoc Mai Tran. Pairwise ranking: choice of method can produce arbitrarily different rank order. *Linear Algebra Appl.*, 438(3):1012–1024, 2013.