

# Vincent Pfenninger

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## Education

### University of Birmingham

PhD in Pure Mathematics  
Advisor: Dr Allan Lo

Birmingham, United Kingdom  
October 2018 - present

### ETH Zurich

MSc in Mathematics  
Advisors: Prof. Benny Sudakov and Dr Jonathan A. Noel  
Thesis: Graph bootstrap processes in complete bipartite graphs

Zurich, Switzerland  
September 2015 - July 2017

BSc in Mathematics

Advisor: Prof. Norbert Hungerbühler  
Thesis: Non-attacking wazirs on a rectangular chess board

September 2012 - July 2015

## Publications

1. Allan Lo and Vincent Pfenninger, **Towards Lehel's conjecture for 4-uniform tight cycles**, *submitted to the Electronic Journal of Combinatorics*, [arXiv: 2012.08875](https://arxiv.org/abs/2012.08875), 2020, (36 pages)

Lehel's conjecture says that every red-blue edge-coloured complete graph can be partitioned into a red and a blue cycle. We study a generalisation of this conjecture to hypergraphs. In particular, we proved that every red-blue edge-coloured complete 4-uniform hypergraph contains a red and a blue tight cycle that are disjoint and together cover almost all vertices.

2. Peter Allen, Olaf Parczyk and Vincent Pfenninger, **Resilience for tight Hamiltonicity**, *submitted to Combinatorial Theory*, [arXiv: 2105.04513](https://arxiv.org/abs/2105.04513), 2021, (50 pages)

Using a version of the sparse hypergraph regularity lemma, we prove that random hypergraphs are asymptotically almost surely resiliently Hamiltonian. Specifically, for any  $\gamma > 0$  and  $k \geq 3$ , we show that, if  $p \geq n^{-\gamma-1}$ , then asymptotically almost surely, every subgraph of the binomial random  $k$ -uniform hypergraph  $G^{(k)}(n, p)$  in which all  $(k-1)$ -sets are contained in at least  $(\frac{1}{2} + \gamma)pn$  edges has a tight Hamilton cycle.

3. Victor Falgas-Ravry and Vincent Pfenninger, **1-independent percolation on  $\mathbb{Z}^2 \times K_n$** , *submitted to Random Structures & Algorithms*, [arXiv: 2106.08674](https://arxiv.org/abs/2106.08674), 2021, (21 pages)

A random graph model on a host graph  $H$  is said to be *1-independent* if for every pair of vertex-disjoint subsets  $A, B$  of  $E(H)$ , the state of edges (absent or present) in  $A$  is independent of the state of edges in  $B$ . For an infinite connected graph  $H$ , the *1-independent critical percolation probability*  $p_{1,c}(H)$  is the infimum of the  $p \in [0, 1]$  such that every 1-independent random graph model on  $H$  in which each edge is present with probability at least  $p$  almost surely contains an infinite connected component.

Balister and Bollobás observed in 2012 that  $p_{1,c}(\mathbb{Z}^d)$  is nonincreasing and tends to a limit in  $[\frac{1}{2}, 1]$  as  $d \rightarrow \infty$ . They asked for the value of this limit. We make progress towards this question by showing that

$$\lim_{n \rightarrow \infty} p_{1,c}(\mathbb{Z}^2 \times K_n) = 4 - 2\sqrt{3} = 0.5358\dots$$

4. Allan Lo and Vincent Pfenninger, **The Ramsey number for 4-uniform tight cycles**, *submitted to the SIAM Journal on Discrete Mathematics*, [arXiv: 2111.05276](https://arxiv.org/abs/2111.05276), 2021, (32 pages)

We prove that the Ramsey number for the 4-uniform tight cycle on  $4n$  vertices is  $(5 + o(1))n$ . This is asymptotically tight.

## Research Interests

Extremal and probabilistic combinatorics, graph and hypergraph theory, monochromatic cycle partitions, Lehel's conjecture, extremal set theory

## Seminars

*Large monochromatic tight cycles in 2-edge-coloured complete 4-uniform hypergraphs*, LSE PhD Seminar, October 2021

*Large monochromatic tight cycles in 2-edge-coloured complete 4-uniform hypergraphs*, Umeå University Discrete Seminar, February 2021

*Large monochromatic tight cycles in 2-edge-coloured complete 4-uniform hypergraphs*, e-PCC Seminar Series, February 2021

*Large monochromatic tight cycles in 2-edge-coloured complete 4-uniform hypergraphs*, University of Birmingham Combinatorics Seminar, November 2020

## Contributed Talks

*The Ramsey number for 4-uniform tight cycles*, European Conference on Combinatorics, Graph Theory and Applications, September 2021

*The Ramsey number for 4-uniform tight cycles*, British Early Career Mathematicians' Colloquium, University of Durham, July 2021

*The Ramsey number for 4-uniform tight cycles*, British Combinatorial Conference, University of Birmingham, July 2021

*Resilience for tight Hamiltonicity in random hypergraphs*, Bringing Young Mathematicians Together Conference, December 2020

*Towards Lehel's conjecture for 4-uniform tight cycles*, Polish Combinatorial Conference, September 2020

*Monochromatic cycle partitioning*, British Early Career Mathematicians' Colloquium, University of Birmingham, July 2020

*Monochromatic cycle partitioning*, British Combinatorial Conference, University of Birmingham, July 2019

*Monochromatic cycle partitioning*, Postgraduate Combinatorial Conference, University of Oxford, June 2019

## Research Visit, Workshop and Research School

Research visit to Umeå University to collaborate with Dr Victor Falgas-Ravry, January to June 2021

Summer School on Random Walks and Complex Networks, Université Nice Sophia Antipolis, France, July 2019

Workshop on Structure and Randomness in Hypergraphs, London School of Economics, December 2018

## Teaching Experience

**University of Birmingham**  
Postgraduate Teaching Assistant

Birmingham, United Kingdom  
October 2018 - present

During my time at the University of Birmingham, I was a teaching assistant for various courses including Graph Theory, Mathematical Modelling and Problem Solving and Real Analysis.

**ETH Zurich**  
Teaching Assistant

Zurich, Switzerland  
September 2016 - December 2016

When I did my master's degree at ETH, I was a teaching assistant for a course on discrete mathematics.

## Scholarship

My PhD is jointly funded by an EPSRC DTP award and a scholarship from the School of Mathematics at the University of Birmingham.

## Languages

I am fluent in both English and German.