Paul R. Halmos - Lester R. Ford Awards

Balázs Gerencsér and Viktor Harangi

"Too acute to be true: The story of acute sets," *The American Mathematical Monthly*, 126(10), 905–914. 10.1080/00029890.2019.1655311.

Erdős popularized the problem of finding a large set of discrete points in high dimensional space with the property that any triangle formed by these points has acute angles. The authors then follow the threads of the history of the problem, from early linear bounds, to probabilistic exponential bounds, up to the current state of the art where the authors prove the current best bound which is within a factor of 2 of optimal. This gives more than just a problem and a result, but an understanding of how problems evolve over time and insight into how mathematics is done.

Response

We wrote this article with the goal of sharing the remarkable story of acute sets with a greater audience. The story includes: an Erdős problem with a proof from The Book; the first exponential construction, so aptly demonstrating the power of the probabilistic method; a simple and beautiful deterministic construction from a high-school student beating all prior results by a huge margin; and a crucial observation from an anonymous math enthusiast leading to the final twist in this problem.

All the results hinge on elegant ideas and do not require advanced mathematical tools. So we really wanted to make the paper as digestible and enjoyable as possible, hoping to reach high-school students as well. We are greatly honored by this recognition and hope that many readers will find this story just as fascinating as we do.

Biographical Sketch

Balázs Gerencsér and **Viktor Harangi** became familiar with acute angles in the same high-school class, where they even shared a desk. Currently, twenty years later, they share an office at the Rényi Institute, Budapest, where they work as research fellows. They have their own desks now. They both earned MSc and PhD degrees in mathematics from ELTE Eötvös University, Budapest.

Balázs Gerencsér spent a year at MIT as a Fulbright fellow and held a postdoctoral position at the Université Catholique de Louvain, Belgium. Since 2015 he has been a research fellow at the Rényi Institute and an assistant professor at ELTE Eötvös University. His work is mostly on Markov chain mixing behavior and on related distributed algorithms for networked systems, alongside graph limits and synchronizing automata.

Viktor Harangi was a postdoctoral fellow at University of Toronto, after which he returned to Budapest and started to work at the Rényi Institute. His main research interests are graph limits, random processes, and random graphs. He is managing editor of the journal *Combinatorica*.