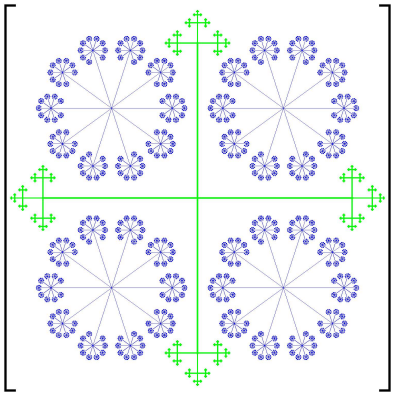
institute for pure & applied mathematics

Free Entropy Theory and Random Matrices

February 24 - 28, 2025



Scientific Overview

Free probability was introduced by Voiculescu in the 80's in an attempt to study the notorious free group factors, which are certain fundamental—and in many ways prototypical—examples of von Neumann algebras. The subject has been intimately connected with random matrix theory ever since Voiculescu's breakthrough result that the large N-limits of independent random matrices are freely independent. The notion of free entropy, which quantifies this connection, has recently seen spectacular success in applications to von Neumann algebras, including the resolution of the long-standing Peterson–Thom conjecture through the use of Hayes's 1-bounded entropy.

Free probability has transformed into an interdisciplinary field connecting operator algebras, harmonic analysis, probability, and combinatorics. This workshop will bring together experts and early career researchers from operator algebras and random matrix theory to better understand this intersection and expand the reach of free entropy methods. Topics will include:

- Free entropy dimension and 1-bounded entropy
- Strong and weak convergence of laws in random matrix theory
- Applications to von Neumann algebras, random graphs, and other topics
- Consequences of the resolution of the Peterson–Thom Conjecture

This workshop will include a poster session. A request for posters will be sent to registered participants before the workshop.

Participation

Additional information about this workshop including links to register and to apply for funding, can be found on the webpage listed below. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission, and we welcome their applications.

Organizers

Rolando de Santiago (CSU Long Beach)
Ben Hayes (University of Virginia)
Srivatsav Kunnawalkam Elayavalli (UCSD)
Brent Nelson (Michigan State University)
Nikhil Srivastava (UC Berkeley)

Speakers

Octavio Arizmendi (Center of Investigations in Mathematics (CIMAT))
Marwa Banna (New York University)
March Boedihardjo (Michigan State University)
Tatiana Brailovskaya (Duke University)
Chi-Fang Chen (University of California, Berkeley (UC Berkeley))
Benoit Collins (Kyoto University)
David Gao (University of California, San Diego (UCSD))
Aldo Garcia Guinto (Michigan State University)
Jorge Garza Vargas (California Institute of Technology)
Vadim Gorin (University of California, Berkeley (UC Berkeley))
Ben Hayes (University of Virginia)
Ella Hiesmayr (UMPA ENS Lyon)
Samuel Johnston (King's College London)
Srivatsav Kunnawalkam Elayavalli (University of California, San Diego (UCSD))
Yoonkyeong Lee (Michigan State University)
Theo McKenzie (Stanford University)
Hariharan Narayanan (Tata Institute of Fundamental Research)
Félix Parraud (Queen's University)
Jesse Peterson (Vanderbilt University)
Jennifer Pi (University of California, Irvine (UCI))
Hui Tan (University of California, Los Angeles (UCLA))
Ramon van Handel (Princeton University)
Dan-Virgil Voiculescu (University of California, Berkeley (UC Berkeley))
Ping Zhong (University of Houston)

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For more information, visit the program webpage:
www.ipam.ucla.edu/fet2025