

August 27, 2021

Jennifer Balakrishnan Awarded the 2022 AWM-Microsoft Research Prize

The 2022 AWM-Microsoft Research Prize in Algebra and Number Theory will be presented to **Jennifer Balakrishnan** in recognition of outstanding contributions to explicit methods in number theory, particularly her advances in computing rational points on algebraic curves over number fields.



Professor Balakrishnan is internationally recognized as a leader in computational number theory. Her doctoral dissertation presents the first general technique for computing iterated p -adic Coleman integrals on hyperelliptic curves. In the course of her collaboration with Minhyong Kim at Oxford, Balakrishnan helped realize the substantial practical potential of Kim's non-abelian Chabauty method, and with her collaborators, turned it into a powerful tool for identifying integral and rational points on curves that are entirely beyond reach using the traditional Chabauty approach. In an impressive tour de force, Balakrishnan, Dogra, Müller, Tuitman and Vonk used the quadratic Chabauty method for computing the rational points on the split Cartan modular curve of level 13. Facetiously known as the “cursed curve” among number theorists because 13 is the only prime level that had stubbornly resisted all such prior attempts, this work represents a major breakthrough. It not only completes the proof of the split Cartan cases of Serre's uniformity conjecture for Galois images of elliptic curves, but also opens an avenue for tackling nonsplit Cartan modular curves at higher level.

Balakrishnan's research exhibits extraordinary depth as well as breadth. In joint work with Besser, Çiperiani, Dogra, Müller, Stein and others, she has worked extensively on computing p -adic height pairings for hyperelliptic curves. Applications of this research include the formulation, along with numerical evidence, of a p -adic analogue of the celebrated Birch and

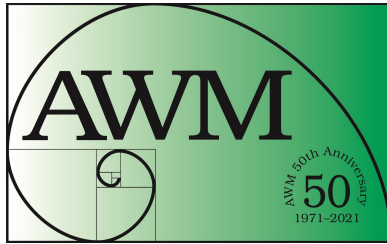
Swinnerton-Dyer conjecture, some new explicit examples in Iwasawa theory, and more. With Ho, Kaplan, Spicer, Stein and Weigandt, Balakrishnan has assembled the most extensive computational evidence to date on the distribution of ranks and Selmer groups of elliptic curves over the rational numbers, thereby providing the most convincing evidence thus far in support of the widely believed conjecture that the average rank of a rational elliptic curve is $\frac{1}{2}$.

After receiving her doctorate from the Massachusetts Institute of Technology in 2011, Professor Balakrishnan held appointments as an NSF Postdoctoral Fellow at Harvard University as well as a Junior Research Fellow and a Titchmarsh Fellow at the University of Oxford. She is currently the Clare Boothe Luce Associate Professor of Mathematics at Boston University, a Sloan Research Fellow, and a recipient of an NSF CAREER award. Her research is also supported by the Simons Foundation, through the Simons Collaboration in Arithmetic Geometry, Number Theory, and Computation.

Association for Women in Mathematics

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PRESS RELEASE

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Balakrishnan has delivered an impressive array of invited and plenary lectures in locations across four continents. Beyond her outstanding scientific achievements, she has assumed leadership roles in service to her institution and the community, especially in bringing more women into math, devoting untold hours to mentoring and advocating for junior women in the profession, and striving to create supportive environments for them. In addition to her extensive record of student supervision at all levels, she has co-organized numerous research conferences, thematic programs and summer schools, including many Women in Sage gatherings. She serves on the editorial boards for five top quality journals, the AMS Short Course

Subcommittee, the Scientific Advisory Board for the Institute for Computational and Experimental Research in Mathematics, the Board of Directors for the Number Theory Foundation, and the Steering Committee for the Women in Numbers Network.

Jennifer Balakrishnan's work is widely known and recognized across the globe within the number theory community and beyond. AWM congratulates her for her well-deserved AWM-Microsoft Research Prize.

Established in 2012, the biennial presentation of this prize serves to highlight to the community outstanding contributions by women in the field of algebra and number theory, and to advance the careers of the prize recipients. This award is made possible by a generous contribution from Microsoft Research. The 2022 award will be presented at the Joint Mathematics Meetings in Seattle, WA from January 6 - 9. The 2022 award was recommended by a selection committee of Melanie Matchett Wood (Chair), Lillian Pierce, Renate Scheidler, and Monica Vazirani.

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