AMERICAN UNIVERSITY OF BEIRUT

CENTER FOR ADVANCED MATHEMATICAL SCIENCES

AMERICAN UNIVERSITY OF BEIRUT

FACULTY OF ARTS & SCIENCES

Department of Mathematics

LARGE VALUES OF THE RIEMANN ZETA FUNCTION: CODE, DATA, EXPERIMENT

DR. GHAITH HIARY

Ohio State University,

USA

One of the oldest open questions about the Riemann zeta function ζ is its precise growth rate on the critical line, a question even the Riemann Hypothesis would not settle. The best proved bounds for the record value of |ζ(1/2+it)| up to height T are far from the rate predicted by random matrix theory. I describe a numerical search, implemented with an AI assistant, that found every successive record up to height 3 × 1017. Each record, called a “zeta champion,” is certified by interval arithmetic and by Turing’s method for counting zeros, with the completeness of the champions list conditional on the Riemann Hypothesis. The resulting data have already revealed some striking phenomena, among them that a zeta champion is an almost-period of ζ. This project started at the American Institute of Mathematics workshop “AI and Number Theory” and is joint work with the Champions Team.

Dr. Ghaith Hiary is a professor of mathematics at The Ohio State University in Columbus, Ohio. He works in computational and analytic number theory. His research interests include the Riemann zeta function and L-functions, their computation, the statistics of their values and zeros, and explicit estimates in number theory. Dr. Hiary enjoys mentoring mathematical talent at all levels.

THURSDAY, NOVEMBER 12, 2026 | 1:00 PM

ASFARI INSTITUTE CONFERENCE HALL

Landscape of 1/|ζ(σ+it)| around zeta champion #123, t0 = 2.73 x 10^10