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A discrete mean value for Dirichlet L-function over local extrema

The classical second integral moment of $\zeta(s)$ shows that the integral average of $|\zeta(\frac{1}{2}+it)|^2$ is $\log t$. Assuming the Riemann Hypothesis and letting γ, γ^+ be the imaginary parts of consecutive critical zeros of $\zeta(s)$, Conrey and Ghosh proved that the mean value of $|\zeta(\frac{1}{2}+it)|^2$ over the maxima between γ, γ^+ up to T is asymptotic to $\frac{1}{2}(e^2-5)\frac{T}{2\pi}\log(\frac{T}{2\pi})^2$. In other words, the discrete mean of $|\zeta(\frac{1}{2}+it)|^2$ at a critical point is $\frac{1}{2}(e^2-5)\log t$, which is a constant factor larger.

In this talk, we will demonstrate that the analogous phenomenon does not exist for the Z-function associated to a Dirichlet L-functions. Specifically, we show that the discrete mean value of Hardy's Z-function over its local extrema has an asymptotic formula with a negative leading coefficient. In contrast, Korolev and Jutila have proven that the integral mean value of Hardy's Z-function does not exhibit such behavior. Moreover, by improving Conrey and Ghosh's method, we can compute as many lower-order terms as desired.

This is joint work with Jonathan Bober (Bristol) and Micah Milinovich (Mississippi).