Mathematics and CS Seminar

Nonvanishing at the critical point of the Dedekind zeta functions of cubic S_3-fields

Arul Shankar
University of Toronto

Host: Tim Browning

Let K be a number field, and denote the Dedekind zeta function of K by $\zeta_K(s)$. A classical question in number theory is: Can this zeta function vanish at the critical point $s=1/2$? In successive works, Armitage, and then Frohlich, gave examples of number fields which satisfy $\zeta_K(s)=0$. Conversely, it is believed that certain conditions on K can guarantee the nonvanishing of $\zeta_K(s)$ at the critical point. For example, it is believed that $\zeta_K(s)$ is never 0 when K is an S_n-number field for any $n\geq 1$.When $n=1$, $\zeta_K(s)$ is simply the Riemann zeta function, and Riemann himself established the non vanishing of $\zeta(1/2)$. When $n=2$, there has been amazing progress towards understanding the statistics of $\zeta_K(1/2)$. Jutila first proved that infinitely many quadratic fields K satisfy $\zeta_K(1/2)\neq 0$, and Soundararajan establishes that this is in fact true for at least 87.5% of fields K in families of quadratic fields.In this talk, I will discuss joint work with Anders Södergren and Nicolas Templier, in which we study the statistics of $\zeta_K(1/2)$ in families of S_3-cubic fields. In particular, we will prove that the Dedekind zeta functions of infinitely many such fields have nonvanishing critical value.

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