

# DELTA SYMBOLS AND THE SUBCONVEXITY PROBLEM

organized by

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## Workshop Summary

We had a very intellectually stimulating and engaging week. We had two talks each day, followed by very active working group sessions. The talks were as follows:

- Monday, Ritabrata Munshi, *Delta Symbols and Subconvexity, I*
- Monday, Keshav Aggarwal, *Subconvexity for  $2 \times 1$  and the Simple Delta Method*
- Tuesday, Ritabrata Munshi, *Delta Symbols and Subconvexity, II*
- Tuesday, Qingfeng Sun, *Analytic Twists of  $3 \times 2$  Automorphic Forms and Applications*
- Wednesday, Saurabh Kumar Singh, *Subconvexity bounds for  $(3) \times (2)$   $L$ -functions*
- Wednesday, Lillian Pierce, *Interactions between harmonic analysis and analytic number theory*
- Thursday, Rizwan Khan, *Moments and hybrid subconvexity for symmetric square  $L$ -functions*
- Thursday, Jack Butcane, *Kuznetsov Formulas for  $(3)$*
- Friday, Olga Balkanova, *Spectral Moment Identities*
- Friday, Philippe Michel, *Algebraic twists of automorphic  $L$ -functions*

The first five talks served as a helpful introduction to the  $\delta$ -method and gave us the chance to glimpse at the unifying threads connecting its multifaceted applications. The last five talks surveyed recent work on related topics.

Monday afternoon consisted of a problem session, which lasted the two hours and generated many interesting questions. On Tuesday, we voted on problems and split up into groups aimed at the following objectives.

- (1) Study sums of Fourier coefficients with sharp cutoffs using  $\delta$ -methods.
- (2) Understand simple applications of the  $\delta$ -methods (e.g., to  $2 \times 1$ ) in terms of families.
- (3) Use the  $\delta$ -method to improve upper bounds for the  $n$ th moment of the zeta function,  $4 < n \leq 12$ .
- (4) Explore toy problems involving  $\delta$ -methods.
- (5) Apply  $\delta$ -methods to bound additive twists of  $3$  Fourier coefficients.
- (6) Study the level aspect on  $2$  via  $\delta$ -methods.
- (7) Study zeros on the critical line for  $3$  via  $\delta$ -methods.

The last five of these problems were of sustained interest in the final three days of the online workshop.

Progress was made in several of these working groups. Some groups plan to continue meeting regularly. We plan to host monthly follow-up sessions to learn about further progress that has been made. We hope to continue meeting inside the Sococo space, which we found conducive to collaborative research.

We thank the AIM staff for their support in helping us to run a successful workshop. Based on initial follow-up conversations, it seems likely that there will be future results to report, details on which we will be happy to submit as they become available.