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Fourier Analysis and the zeros of the Riemann zeta-function

I will show how the classical Beurling-Selberg extremal problem in harmonic analysis arises naturally when studying the vertical distribution of the zeros of the Riemann zeta-function and other L-functions. Using this relationship, along with techniques from Fourier analysis and reproducing kernel Hilbert spaces, we can prove the sharpest known bounds for the number of zeros in an interval on the critical line and we can also study the pair correlation of zeros. Our results on pair correlation extend earlier work of P. X. Gallagher and give some evidence for a well-known conjecture of H. L. Montgomery. This is based on joint works with Emanuel Carneiro, Vorrapan Chandee, and Friedrich Littmann.