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Counting newforms with prescribed ramified supercuspidal components

We recently gave a general trace formula which counts the number of classical newforms of fixed weight and level whose local components at the primes dividing the level are prescribed supercuspidal representations. To make the formula explicit, one must compute certain local orbital integrals at each such prime. At present, this has been carried out only when the fixed supercuspidals have conductor exponent 2 or 3.

In joint work with Kimball Martin, we obtain a dimension formula that allows for prescribed supercuspidals of any odd-power conductor (the so-called ramified supercuspidals). We are able to get around having to compute the tricky orbital integrals by using the trace of an Atkin-Lehner operator. As a consequence of our formula, we observe a bias in global dimension formulas favoring certain supercuspidals over others with the same conductor exponent, though asymptotically there is balance as first shown in a much more general setting by Kim, Shin and Templier. Interestingly, the magnitude of this bias is independent of the (odd) conductor exponents. The sign of the bias is the global root number.