On the inverse Collatz-Sinogowitz irregularity problem

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The Collatz-Sinogowitz irregularity index seems to be the oldest known numerical measure of graph irregularity. For a simple and connected graph G of oder n and size m, it is defined as $CS(G) = \lambda_1 - 2m/n$, where λ_1 is the largest eigenvalue of the adjacency matrix of G, and $2m/n$ is the average vertex degree of G. Here, we consider the so-called inverse problem for the Collatz-Sinogowitz irregularity. For every non-negative integer i, we show that there exists a graph G such that $CS(G) = i$. Also, for every interval $I_i = (i, i+1)$, we show that there are infinitely many graphs whose Collatz-Sinogowitz irregularity lays in I_i.