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Binary sequences with merit factors greater than 6.34

For decades the merit factor problem of binary sequences has been stuck at a value of 6 for the maximum asymptotic merit factor and indeed a number of authors speculated that this was best possible. We construct an infinite family of binary sequences that we conjecture have merit factors greater than 6.34. The numerical experimentation that led to this example is a significant and interesting part of the story. This problem is related to finding small L_4 norm of polynomials with $+1$ or -1 coefficients.

This is a joint work with Peter Borwein and Jonathan Jedwab.