

## **On energy variants of the sum-product problem**

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A major open problem in arithmetic combinatorics is the sum-product conjecture, which roughly states that a finite set  $A$  of integers can not simultaneously exhibit both additive and multiplicative structure. The standard way of measuring this is via analysing the cardinalities of the sumset and the product set, that is, the sets of all distinct pairwise sums and products from  $A$ . This problem has been studied extensively over the past two decades, with major progress coming from work of Bourgain-Chang on many fold sumsets and product sets. In this talk, we will consider a generalisation of their work, wherein, we will study the so-called low energy decompositions, which allow us to partition  $A$  into two sets – the first lacking additive structure and the second lacking multiplicative structure.