The sum–product problem: New generalizations and applications

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Abstract

We give a brief survey of recent results related to the sum–product problem which dates back to work of Erdős and Szemerédi (1983), where it is shown that for any finite set A of real numbers, at least one of the sets $A + A = \{a + b : a, b \in A\}$ and $A \cdot A = \{a, b : ab \in A\}$ is large. More recently, Bourgain, Katz and Tao (2006) obtained similar results for sets A in prime finite fields.

We outline these and several other recent results in this area and also present a diverse scope of their applications to several other problems.

Finally we mention several open problems of perhaps different levels of difficulty.

This talk should be accessible to graduate students.