Given a polynomial F in $\mathbb{R}[x_1, \ldots, x_n]$ and some finite set A of real numbers, we are interested in studying how large is the set

$$F(A, ..., A) = \{F(a_1, ..., a_n) : a_1, \ldots, a_n \in A\}.$$

A classic result in this setting is the Elekes–Rónyai theorem, which classifies all polynomials F satisfying

$$|F(A, ..., A)| \gg |A|^{1+c}$$

for every finite set A of real numbers, where $c > 0$ is some absolute constant. In this talk, we are interested in a sum-product type variation of this result. In particular, we want to categorise all polynomials F such that

$$|F(A, ..., A)| \gg |A|^n$$

for every finite set A of real numbers, which produces few products, that is,

$$|A \cdot A| = |a \cdot b : a, b \in A| \ll |A|.$$

This generalises earlier results of Chang, Hanson–Roche-Newton–Zhelezov and Pohoata.