1176-05-326 **Surya Mathialagan*** (smathi@mit.edu) and **Adam Sheffer**. *Distinct distances on non-ruled surfaces and between circles.*

In this work, we improve the current best bound for distinct distances on non-ruled algebraic surfaces in $\mathbb{R}^3$. In particular, we show that n points on such a surface span $\Omega\left(n^{32/39-\epsilon}\right)$ distinct distances, for any $\epsilon > 0$. Our proof adapts the proof of Székely for the planar case, which is based on the crossing lemma.

As part of our proof for distinct distances on surfaces, we also obtain new results for distinct distances between circles in $\mathbb{R}^3$. Consider two point sets of respective sizes m and n, such that each set lies on a distinct circle in $\mathbb{R}^3$. We characterize the cases when the number of distinct distances between the two sets can be $O(m+n)$. This includes a new configuration with a small number of distances. In any other case, we use Elekes-Szabó type expanding polynomials and a new computational approach to prove that the number of distinct distances is $\Omega\left(\min\left\{m^{2/3}n^{2/3}, m^2, n^2\right\}\right)$. (Received January 25, 2022)